Texas Commission on Environmental Quality
Instructions and Procedural Information for Filing a Permit Application for a Hazardous Waste Storage, Processing, or Disposal Facility

Part A

[Form Availability: This form, as well as other Industrial and Hazardous Waste documents, is available on the Internet World Wide Web, Industrial and Hazardous Waste home page at address https://www.tceq.texas.gov/permitting/waste_permits/ihw_permits]

General Instructions

1. A person (individual, corporation or other legal entity) who stores, processes or disposes of hazardous waste (except where such storage and/or processing is excluded from permit requirements in accordance with 30 Texas Administrative Code (TAC) Section 335.2) must obtain a permit pursuant to the Texas Health and Safety Code. In applying to the Texas Commission on Environmental Quality, hereafter referred to as the Commission, the applicant shall follow the procedures outlined below, on the application and in the Rules of the Commission.

2. The application (one original plus three (3) complete copies[1]) should be mailed to:

   Texas Commission on Environmental Quality
   Attention: Waste Permits Division, MC126
   P. O. Box 13087
   Austin, Texas 78711-3087

3. Signature on Application [30 TAC 305.44]. The application shall be signed by the owner and operator or by a duly authorized agent, employee, officer, or representative of the owner or operator and shall be verified before a notary public. When another person signs on behalf of the owner and operator, this person's title or relationship to the owner or operator should be shown. In all cases, the person signing the form should be authorized to do so by the owner or operator (the Commission may require a person signing on behalf of an owner or operator to provide proof of authorization). An application submitted for a corporation must be signed by (or the signatory must be authorized by) a responsible corporate officer such as a president, secretary, treasurer,

[1] The third copy may optionally consist of paper copies of all plans and maps and a computer diskette of the remaining document. The document should be formatted in Word processing software up to and including version 6.1 or a 100% compatible format. Files may be compressed using PKZIP Ver. 2 or a 100% compatible program.

vice-president, or designated manager; or for a partnership or sole proprietorship, by a general partner or the proprietor, respectively. In the case of a municipal, state, federal, or other public facility, the application shall be signed by either a principal executive officer or ranking elected official.

4. An application will not be processed until all information required to properly evaluate the application has been obtained. When an application is severely lacking in detail and/or the applicant fails to submit additionally requested information in a timely manner, the application will not be considered to be "filed in accordance with the rules and regulations of the Commission."

   Please submit any application revisions with a revised date and page numbers at the bottom of the page(s).

5. Fees and Costs

   a. The fee for filing an application is discussed in Section XII of Part B, form number TCEQ-0376.

   b. The applicant for a permit is required to bear the cost of publication of notice of the application in a newspaper as prescribed by 30 TAC Section 39.5(g).

6. A person may not commence operation of a hazardous waste management facility until the Commission has issued a permit to authorize the storage, processing, or disposal of hazardous waste, except with the approval of the Commission.

7. Designation of Material as Confidential

   The designation of material as confidential is frequently carried to excess. The Commission has a responsibility to provide a copy of each application to other review agencies and to interested persons upon request and to safeguard confidential material from becoming public knowledge. Thus, the Commission requests that the applicant (1) be prudent in the designation of material as confidential and (2) submit such material only when it might be essential to the staff in their development of a recommendation.

   The Commission suggests that the applicant NOT submit confidential information as part of the permit application. However, if this cannot be avoided, the confidential information should be described in non-confidential terms throughout the application, and submitted as a document or binder, and conspicuously marked "CONFIDENTIAL."

   Reasons of confidentiality include the concept of trade secrecy and other related legal concepts which give a business the right to preserve confidentiality of business information to obtain or retain advantages from its right in the information. This includes authorizations under 18 U.S.C. 1905 and special rules cited in 40 CFR Chapter I, Part 2, Subpart B.

   Section 361.037 of the Texas Health and Safety Code does not allow an applicant for an industrial and hazardous waste permit to claim as confidential any record pertaining to the characteristics of the industrial solid waste.

   The applicant may elect to withdraw any confidential material submitted with the application. However, the permit cannot be issued, amended, or modified if the application is incomplete.

Part II

Procedural Information

After the submittal of Parts A and B of the application, the TCEQ will provide public notice of receipt of the application. The Executive Director's staff will review the application for completeness of information submitted. During the review, the applicant may be contacted for clarification or additional information. When all pertinent information is present, the application or a summary of its contents will be forwarded for review by other state agencies and local governmental entities interested in water quality control and solid waste management. After technical evaluation, opportunity for public hearing will be afforded.

Note that for facilities which had "commenced on-site storage, processing, or disposal of hazardous waste" [see 30 TAC Section 335.43(b)] on or before the date such waste is identified or listed as hazardous by EPA, the Texas Health and Safety Code provides in Section 361.082(f) that these facilities may continue to manage hazardous waste until such time as the Commission approves or denies the application, provided that the applicant has filed the permit application in accordance with the rules and regulations of the Commission.

The Commission may act upon an application for a permit, permit amendment, permit modification, or renewal of a permit without the necessity of holding a public hearing:

1. (a) When notice of the application has been mailed to persons possibly affected by the proposed permit; and

   (b) When notice has been published at least once in a newspaper regularly published or circulated within each county where the proposed facility is located; and

   (c) Within forty-five (45) days following publication of the Commission's notice, a Commissioner, the Executive Director or an affected person has not requested a public hearing; or

2. For a Class 1 or a Class 2 permit modification or a minor amendment to a permit. The Commission may, in certain cases, hold a public hearing for a Class 2 permit modification or a minor amendment.

A public hearing may be scheduled on an application for a RCRA hazardous waste permit when requested by a Commissioner, the Executive Director, or an affected person within forty-five (45) days following the newspaper publication.

Requirements of Giving Notice of the Application:

1. By the Applicant: Every applicant for a permit, permit amendment, permit modification, or permit renewal shall publish notice (see note below) of the application at least once in a newspaper regularly published or circulated within each county where the proposed facility is located. Where a public hearing has been requested, notice will be mailed to the applicant in ample time for publication, which shall be not less than thirty (30) days prior to the date set for the hearing. Except in the case of a notice of a permit modification request, the Commission will mail the appropriate notice and instructions for publication to the applicant.

   NOTE: Additional publication and direct mail notice to affected persons will result if a public hearing is requested following newspaper publication of the notice of application.

The cost of providing this additionally required publication and service of notice to affected persons will be assumed by the applicant.

2. By the Texas Commission on Environmental Quality: The Commission will mail notice of the application (except for permit modifications) to affected persons and certain governmental entities. The notice will be mailed at the same time instructions for newspaper publications are mailed to the applicant.

3. Bilingual Notice Instructions:

   For certain permit applications, public notice in an alternate language is required. If an elementary school or middle school nearest to the facility offers a bilingual program, notice may be required to be published in an alternative language. The Texas Education Code, upon which the TCEQ alternative language notice requirements are based, requires a bilingual education program for an entire school district should the requisite alternative language speaking student population exist. However, there may not be any bilingual-speaking students at a particular school within a district which is required to offer the bilingual education program. For this reason, the requirement to publish notice in an alternative language is triggered if the nearest elementary or middle school, as part of a larger school district, is required to make a bilingual education program available to qualifying students and either the school has students enrolled at such a program on-site, or has students who attend such a program at another location to satisfy the school's obligation to provide such a program.

   If it is determined that a bilingual notice is required, the applicant is responsible for ensuring that the publication in the alternate language is complete and accurate in that language. Electronic versions of the Spanish template examples are available from the TCEQ to help the applicant complete the publication in the alternative language.

Bilingual Notice Application Form:

Bilingual notice confirmation for this application:

1. Is the school district of the elementary or middle school nearest to the facility required by the Texas Education Code to have a bilingual program?

   ☒YES ☐ NO

   (If NO, alternative language notice publication not required)

2. If YES to question 1, are students enrolled in a bilingual education program at either the elementary school or the middle school nearest to the facility?

   ☒ YES ☐ NO

   (If YES to questions 1 and 2, alternative language publication is required; If NO to question 2, then consider the next question)

3. If YES to question 1, are there students enrolled at either the elementary school or the middle school nearest to the facility who attend a bilingual education program at another location?

   ☐ YES ☐ NO

(If Yes to questions 1 and 3, alternative language publication is required; If NO to question 3, then consider the next question)

4. If YES to question 1, would either the elementary school or the middle school nearest to the facility be required to provide a bilingual education program but for the fact that it secured a waiver from this requirement, as available under 19 TAC '89.1205(g)?

   ☐ YES ☐ NO

   (If Yes to questions 1 and 4, alternative language publication is required; If NO to question 4, alternative language notice publication not required)

   If a bilingual education program(s) is provided by either the elementary school or the middle school nearest to the facility, which language(s) is required by the bilingual program? _Spanish__

Consideration of the Permit Application by the Commission:

The applicant will be notified by the Commission when the application is set for final consideration. If the Commission issues the permit, the applicant will be mailed a copy of the permit by the TCEQ Office of the Chief Clerk within one (1) month following Commission approval. (NOTE: Only one copy is mailed to the applicant and that copy will be sent to the official mailing address of the applicant as shown on the permit application form.)

Table of Contents

Texas Commission on Environmental Quality
Permit Application for a Hazardous Waste Storage/Processing/Disposal Facility
Part A - Facility Background Information

I. General Information

A. Facility Name: CLEAN HARBORS LA PORTE, LLC

(Individual, Corporation, or Other Legal Entity Name)

TCEQ Solid Waste Registration No: 50225 EPA I.D. No.: TXD982290140

Street Address (If Available): 500 INDEPENDENCE PARKWAY SOUTH

City: LA PORTE, State: TEXAS Zip Code: 77571

County: HARRIS

Telephone Number: (281) 884-5500 Charter Number: 800102165

If the application is submitted on behalf of a corporation, please identify the Charter Number as recorded with the Office of the Secretary of State for Texas.

B. Facility Contact

1. List those persons or firms who will act as primary contact for the applicant during the processing of the permit application. Also indicate the capacity in which each person may represent the applicant (engineering, legal, etc.). The person listed first will be the primary recipient of correspondence regarding this application. Include the complete mailing addresses and phone numbers.

Steve Venti, General Manager
Clean Harbors LaPorte LLC
500 Independence Parkway South
La Porte, Texas 77571
(281) 884-5500

2. If the application is submitted by a corporation or by a person residing out of state, the applicant must register an Agent in Service or Agent of Service with the Texas Secretary of State's office and provide a complete mailing address for the agent. The agent must be a Texas resident.

CT Corporation System.
350 North St. Paul Street
Dallas, TX 75201

C. Operator[1]: Identify the entity who will conduct facility operations.

Operator Name: CLEAN HARBORS LA PORTE, LLC

Address: 500 INDEPENDENCE PARKWAY SOUTH

City: LA PORTE, State: TEXAS Zip Code: 77571

Telephone Number: (281) 884-5500 Charter Number: 800102165

[1] The operator has the duty to submit an application if the facility is owned by one person and operated by another [30 TAC 305.43(b)]. The permit will specify the operator and the owner who is listed on this application [Section 361.087 Texas Health and Safety Code].

D. Owner

1. Indicate the ownership status of the facility:

   a. Private ____X____

      (1) _____X___Corporation
      (2) _____Partnership
      (3) _____Proprietorship
      (4) _____Non-profit organization

   b. Public _____

      (1) _____Federal
      (2) _____Military
      (3) _____State
      (4) _____Regional
      (5) _____County
      (6) _____Municipal
      (7) _____Other (specify)

2. Does the operator own the facility units and facility property?

   ☒ Yes ☐ No

   If you checked "no",

   a. Submit as "Attachment A" a copy of the lease for use of or the option to buy said facility units and/or facility property, as appropriate; and

   b. Identify the facility units' owner(s) and/or facility property owner(s). Please note that the owner(s) is/are required to sign the application on page 5.

Owner Name: SAME AS OPERATOR, REFER TO SECTION I.C, AS SHOWN ABOVE____

Address: _____

City: _____, State: _____ Zip Code: _____

Telephone Number: _____

Owner Name: _____

Address: _____

City: _____, State: _____ Zip Code: _____

Telephone Number: _____

E. Type of Application Submittal:

Initial _____ or Revision ____X (Renewal)___

F. Registration and Permit Information

Indicate (by listing the permit number(s) in the right-hand column below) all existing or pending State and/or Federal permits or construction approvals which pertain to pollution control or industrial solid waste management activities conducted by your plant or at your location. Complete each blank by entering the permit number, or the date of application, or "none".

	Relevant Program and/or Law	Permit No.	Agency*
1.	Texas Solid Waste Disposal Act	50225	TCEQ
2.	Wastewater disposal under the Texas Water Code	None	
3.	Underground injection under the Texas Water Code	None	
4.	Texas Clean Air Act	PERMIT BY RULE ID#S: 55530	TCEQ
5.	Texas Uranium Surface Mining & Reclamation Act	None	
6.	Texas Surface Coal Mining & Reclamation Act	None	
7.	Hazardous Waste Management program under the Resource Conservation and Recovery Act	50225	TCEQ
8.	UIC program under the Safe Drinking Water Act	None	
9.	TPDES program under the Clean Water Act	TXR05U063	TCEQ
10.	PSD program under the Clean Air Act	None	
11.	Nonattainment program under the Clean Air Act	None	
12.	National Emission Standards for Hazardous Pollutants (NESHAP) Pre-construction approval under the Clean Air Act	None	
13.	Ocean dumping permits under the Marine Protection Research and Sanctuaries Act	None	

14. Dredge or fill permits under section 404 of the Clean Water Act	None	_____
15. Other relevant environmental permits	None	_____

*Use the following acronyms for each agency as shown below:

TCEQ	= Texas Commission on Environmental Quality
TRC	= Texas Railroad Commission
TDH	= Texas Department of Health
TDA	= Texas Department of Agriculture
EPA	= U.S. Environmental Protection Agency
CORPS	= U.S. Army Corps of Engineers

G. Give a brief description of the nature of your business.

Clean Harbors La Porte, LLC is a subsidiary of Clean Harbors Environmental Services, Inc. The facility is located at 500 Independence Parkway South in La Porte, Texas. It is a commercial storage, treatment, disposal and transportation facility operating under an Industrial and Hazardous Waste Permit. The facility functions both as a transit (less than ten day) facility and as a hazardous waste storage and consolidation and treatment facility for waste generated primarily from off-site sources. Treatment operations at facility include neutralization, oxidation and controlled release of certain hazardous and non-hazardous waste gases. Wastes accepted at the facility can be stored up to one year. The facility is approved to store Industrial Non-Hazardous, RCRA, PCB, and medical wastes. No onsite disposal is conducted. Most hazardous wastes are temporarily stored and/or repackaged prior to shipment offsite for final disposal.

H. TCEQ Core Data Form

The TCEQ requires that a Core Data Form (Form 10400) be submitted on all incoming applications. For more information regarding the Core Data Form, call (512) 239-1575 or go to the TCEQ website at http://www.tceq.texas.gov/permitting/central_registry/guidance.html.

See Appendix 1.

Signature Page

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature: Jan C Childress Date: 5/21/2020

Name and Official Title (type or print): **James Childress / VP of Environmental Compliance**

Owner Signature: _____ Date: _____

Name and Official Title (type or print): **James Childress / VP of Environmental Compliance**

To be completed by the operator if the application is signed by an authorized representative for the operator

I, _____ hereby designate _____
(operator) (authorized representative)
as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

(Note: Application Must Bear Signature & Seal of Notary Public)

Subscribed and sworn to before me by the said James C Childress on this 21st day of May, 2020.

My commission expires, of the 28th day of March, 2023

SHARON L HART
STATE OF TENNESSEE
NOTARY PUBLIC
COUNTY OF ROBERTSON

Sharon L. Hart
Notary Public in and for
Robertson County, ~~Texas~~ Tennessee

TCEQ Core Data Form

TCEQ Use Only

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (*If other is checked please describe in space provided.*)

☐ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.*)

☒ Renewal (*Core Data Form should be submitted with the renewal form*) ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN 603661844		RN 102949021

SECTION II: Customer Information

4. General Customer Information	5. Effective Date for Customer Information Updates (mm/dd/yyyy)	05/29/2020

☐ New Customer ☒ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)*	*If new Customer, enter previous Customer below:*
Clean Harbors La Porte, LLC	

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
0010068906	10426989991	481263744	1577936

11. Type of Customer: ☒ Corporation ☐ Individual Partnership: ☐ General ☐ Limited

Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☒ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?
☐ Yes ☒ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☐ Owner ☐ Operator ☒ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:	500 Independence Parkway South							
	City	La Porte	State	TX	ZIP	77571	ZIP + 4	9768

16. Country Mailing Information *(if outside USA)*	17. E-Mail Address *(if applicable)*

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(281) 884-5500	5519	( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information (*If 'New Regulated Entity" is selected below this form should be accompanied by a permit application*)

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☒ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name (*Enter name of the site where the regulated action is taking place.*)

Clean Harbors La Porte, LLC

23. Street Address of the Regulated Entity: *(No PO Boxes)*	500 Independence Parkway South							
	City	La Porte	**State**	TX	**ZIP**	77571	**ZIP + 4**	9768
24. County	Harris							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	500 Independence Parkway South				
26. Nearest City			**State**	**Nearest ZIP Code**	
La Porte			TX	77571	
27. Latitude (N) In Decimal:		**28. Longitude (W) In Decimal:**			
Degrees	**Minutes**	**Seconds**	**Degrees**	**Minutes**	**Seconds**
29	42	24.30	95	05	28.70

29. Primary SIC Code (4 digits)	**30. Secondary SIC Code** (4 digits)	**31. Primary NAICS Code** (5 or 6 digits)	**32. Secondary NAICS Code** (5 or 6 digits)
4953	4226	562211	493110

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

Hazardous/non-hazardous/biomedical waste transfer/consolidation/storage/treatment & distribution center

34. Mailing Address:	**500 Independence Parkway South**							
	City	**La Porte**	**State**	**TX**	**ZIP**	**77571**	**ZIP + 4**	**9768**
35. E-Mail Address:								

36. Telephone Number	**37. Extension or Code**	**38. Fax Number** *(if applicable)*
(281) 884-5500	**5519**	**( ) -**

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☒ Industrial Hazardous Waste
				50225
☒ Municipal Solid Waste	☒ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☒ PWS
50225	PRB - Multiple			1012759
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☒ Used Oil
				A85635
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☒ Other:
				TXD982290140

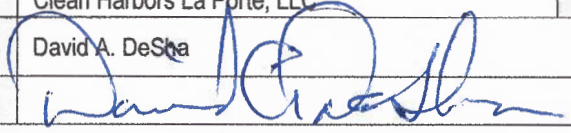
SECTION IV: Preparer Information

40. Name:	David DeSha	**41. Title:**	Sr. Environmental Compliance Mgr

42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(423) 413-1218		( ) -	desha.david@cleanharbors.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Clean Harbors La Porte, LLC	**Job Title:**	Sr. Environmental Compliance Manager
Name *(In Print):*	David A. DeSha	**Phone:**	(423) 413- 1218
Signature:		**Date:**	5/21/2020

II. Facility Background Information

A. Location of Facility for which the application is submitted

1. Give a description of the location of the facility site with respect to known or easily identifiable landmarks.

   The facility is located at 500 Independence Parkway South in a heavy industrialized area, and is immediately north east of the intersection of Independence Parkway South and the La Porte/Pasadena Highway 225.

2. Detail the access routes from the nearest U.S. or State Highway to the facility.

   A) Pasadena Highway 225
   B) Take Exit toward Independence Parkway/East Blvd and go northeast on Independence Parkway for approximately 350 feet.
   C) Turn right into the parking lot entrance and facility. Enter office building to the right for visitor check-in/out.

3. Enter the geographical coordinates of the facility:

   Latitude: 29 deg 42 min 24.30 sec

   Longitude: 95 deg 05 min 28.70 sec

4. Is the facility located on Indian lands?

   ☐ Yes ☒ No

B. Legal Description of Facility

Submit as "Attachment B" a legal description(s) of the tract or tracts of land upon which the waste management operations referred to in this permit application occur or will occur. Although a legal description is required, a metes and bounds description is not necessary for urban sites with appropriate "lot" description(s). A survey plat or facility plan drawing which shows the specific points referenced in the survey should also be included in Attachment B.

See Attachment B.

C. SIC Codes

List, in descending order of significance, the four digit standard industrial classification (SIC) codes which best describe your facility in terms of the principal products or services you produce or provide. Also, specify each classification in words. These classifications may differ from the SIC codes describing the operation generating the hazardous wastes.

4-digit SIC Code	Description
4953	Refuse Systems (hazardous waste treatment and disposal)
4226	Special Warehousing and Storage, Not Elsewhere Classified
6-digit NAICS Code	Description

562211 NAICS Code	Hazardous Waste Treatment and Disposal
493110 NAICS Code	General Warehousing and Storage

SIC code numbers are descriptions which may be found in the Standard Industrial Classification Manual prepared by the Executive Officer of the President, Office of Management and Budget, which is available from the Government Printing Office, Washington, D.C. Use the current edition of the manual.

II.B

Attachment B

EXHIBIT "A"

TRACT I:

A tract of land containing 6.53345 acres out of the GEORGE ROSS SURVEY, ABSTRACT NO. 646, in Harris County, Texas, being out of that fifty-acre tract conveyed to T. & H.O.R.R. by deed recorded in Volume 3020, Page 611, of the Deed Records of Harris County, Texas, which 50-acre tract was out of that 79.747 acre tract, being Tract No. 1 in deed to Carl C. Patrick, Trustee recorded in Volume 2793, Page 651, of the Deed Records of Harris County, Texas, subject tract being more particularly described by metes and bounds, as follows:

BEGINNING at a 5/8 inch iron pipe located South 00 degrees, 35 minutes, 00 seconds, East, a distance of 200.00 feet from the northeast corner of said 50-acre tract, on the east line of said Ross Survey, for the Northeast corner of this tract;

THENCE, continuing South 00 degrees, 35 minutes, 00 seconds, East, along the east survey line, a distance of 486.00 feet to a ½ inch iron pipe at the northeast corner of that 8.461 acre tract conveyed to Stahlman Lumber Co., by deed recorded in Volume 6027, Page 416 of the Deed Records, for the Southeast corner of this tract;

THENCE South 89 degrees, 29 minutes, 00 seconds West along a barbed wire fence on Stahlman's north line, a distance of 671.93 feet to a ½ inch iron rod on the southeasterly right-of-way line of Highway No. 134 (based on 120 feet width), for the southwest corner of this tract;

THENCE, North 19 degrees, 00 minutes, 00 seconds East, along the said southeasterly right-of-way line, a distance of 515.78 feet to a 5/8 inch iron rod for the northwest corner of this tract;

THENCE, North 89 degrees, 30 minutes, 00 seconds East, a distance of 499.05 feet to the PLACE OF BEGINNING.

TRACT II:

A 6.0113 acre tract out of a 8.4607 acre tract out of the GEORGE ROSS SURVEY, ABSTRACT 646, Harris County, Texas, (8.4607 acre tract described in instrument recorded under Film Code 191-21-1314 out of the Harris County Clerk's Records):

COMMENCING at a ¾ inch iron pipe located in the easterly right-of-way line of Battle Ground Road (State Highway No. 134) (120 feet wide), said iron pipe marking the southwest corner of said 8.4607 acre tract;

THENCE North 19 degrees 00 minutes 00 seconds East 106.10 feet along the easterly right-of-way line of Battle Ground Road to a ½ inch iron rod set at the Point of Beginning of this tract;

THENCE continuing North 19 degrees 00 minutes 00 seconds East 409.52 feet along the easterly right-of-way line of Battle Ground Road to a ¾ inch iron pipe at the northwest corner of said 8.4607 acre tract;

THENCE North 89 degrees 29 minutes 00 seconds East 671.93 feet to a found wood corner post at the northeast corner of said 8.4607 acre tract;

THENCE South 00 degrees 35 minutes 00 seconds East 226.00 feet along the east line of said 8.4607 acre tract to a ½ inch iron rod set for corner;

THENCE South 89 degrees 29 minutes 00 seconds West 150.00 feet to a ½ inch iron rod set for corner;

THENCE South 00 degrees 35 minutes 00 seconds East 160.00 feet to a ½ inch iron rod set for corner;

THENCE South 89 degrees 29 minutes 00 seconds West 659.19 feet to the Point of Beginning and containing 261,854 square feet or 6.0113 acres of land.

SAVE AND EXCEPT from the above-described property all of that portion of said property which lies within the 0.8154 acre tract described in deed from Corsan Trucking Company, Inc. and Technical Environmental Systems, Inc. to the State of Texas, dated May 1, 1989, and recorded under Clerk's File No. M-451973 of the Real Property Records of Harris County, Texas, reference to which is hereby made for all purposes.

TRACT III:

A 2.1192 acre tract of land being the residue of a called 50 acre tract, as conveyed from the Federal Reserve Bank of Dallas to T. & N.O.R.R., by deed dated June 30, 1955, as recorded in Volume 3020, Page 611 of the Deed Records of Harris County, Texas, said 2.1192 acres of land being more particularly described by metes and bounds as follows:

BEGINNING at a concrete monument found for the northeast corner of said 50 acre tract, from said monument a bent railroad tract rail was found, 0.69 feet north and 0.29 feet east;

THENCE South 00 degrees 35 minutes 00 seconds East along the east line of said 50 acre tract, a distance of 199.17 feet (called 200.00 feet as per a 6.53345 acre tract, as conveyed from Stefani Distributing Company, Inc. to Technical Environmental Systems, Inc., by deed dated September 4, 1987, as recorded in Harris County Clerk's File No. L-321643) to a point for corner, same point also being the northeast corner of said 6.53345 acre tract, from said point a ½ inch iron rod was found, 0.60 feet north and 1.75 feet west;

THENCE South 89 degrees 30 minutes 00 seconds West along the North line of said 6.53345 acre tract, a distance of 498.92 feet (called 499.05 feet) to a point for corner in the easterly Right-of-Way line of Battleground Road (State Highway 134) (based on a 120.00 foot wide Right-of-Way), same being the northwest corner of said 6.53345 acre tract, from said point a 5/8 inch iron rod was found bearing South 19 degrees 00 minutes 54 seconds West a distance of 0.75 feet;

THENCE North 19 degrees 00 minutes 54 second East along the easterly Right-of-Way Line of said Battleground Road, a distance of 211.31 feet to a point for corner in the north line of said 50 acre tract, from said point a concrete monument was found bearing South 19 degrees 00 minutes 54 seconds West a distance of 1.52 feet;

THENCE North 89 degrees 30 minutes 00 seconds East along the north line of said 50 acre tract, a distance of 428.04 feet (called 428.60 feet) to the PLACE OF BEGINNING of the herein described tract and containing within these calls 92,313 square feet or 2.1192 acres of land.

TRACT IV:

All of that certain 2.4494 acre tract, more or less, out of the GEORGE ROSS SURVEY, ABSTRACT 646, Harris County, Texas, and being that portion of the 8.4607 acre tract described in deed to Corsan Trucking Company, Inc. recorded under Clerk's File No. L310019 of the Real Property Records of Harris County, Texas (Film Code No. 191-21-1311) which was retained by Corsan Trucking, Inc. at the time it conveyed a 6.0113 acre tract, more or less, to Technical Environmental Systems, Inc. by deed recorded under Clerk's File No. M-039841 of the Real Property Records of Harris County, Texas (Film Code No. 139-74-0072).

SAVE AND EXCEPT from said 2.4494 acre tract all of that portion of said tract which lies within the 0.8154 acre tract described in deed from Corsan Trucking Company, Inc. and Technical Environmental Systems, Inc. to the State of Texas dated May 1, 1989 and recorded under Clerk's File No. M-451973 of the Real Property Records of Harris County, Texas, reference to which is hereby made for all purposes.

EXHIBIT "A"

All of that certain 2.4494 acre tract, more or less, out of the GEORGE ROSS SURVEY, ABSTRACT 646, Harris County, Texas, and being that portion of the 8.4607 acre tract described in deed to Corsan Trucking Company, Inc. recorded under Clerk's File No. L310019 of the Real Property Records of Harris County, Texas (Film Code No. 191-21-1311) which was retained by Corsan Trucking, Inc. at the time it conveyed a 6.0113 acre tract, more or less, to Technical Environmental Systems, Inc. by deed recorded under Clerk's File No. M-039841 of the Real Property Records of Harris County, Texas (Film Code No. 139-74-0072).

SAVE AND EXCEPT from said 2.4494 acre tract all of that portion of said tract which lies within the 0.8154 acre tract described in deed from Corsan Trucking Company, Inc. and Technical Environmental Systems, Inc. to the State of Texas dated May 1, 1989 and recorded under Clerk's File No. M-451973 of the Real Property Records of Harris County, Texas, reference to which is hereby made for all purposes.

Statement of Encroachments

There are no visual or apparent encroachments on subject property.

Legend of Symbols & Abbreviations

N	North	POB	Point of Beginning
S	South	o/h	Over Head Service
E	East	typ	Typical
W	West	W/	With
CC	County Clerk	( )	Record Datum
FC	Film Code	°	Degrees
FF	Finish Floor	'	Minutes
FL	Flow line	"	Seconds
(symbol)	Power pole	(symbol)	Pole
		(symbol)	Iron Rod

Notes Corresponding to Schedule B

9a An easement 30 feet in width for railroad, transportation and communication purposes over and across subject property in favor of Southern Pacific Transportation Company, as set forth in instrument recorded under Clerk's File No. E-787698 of the Real Property Records of Harris County, Texas. (Tract 1) APPLIES AND AFFECTS SUBJECT PROPERTY AS SHOWN HEREON.

9b An easement 10 feet in width, the centerline of which begins on the Northwest line of subject property 251.3 feet North of the Southwest corner, and extends into the property a distance of 145 feet, together with an unobstructed aerial easement 20 feet wide from a plane 20 feet above the ground upward centered thereon, in favor of Houston Lighting & Power Company, as set forth in instrument recorded under Clerk's File No. E-791126 of the Real Property Records of Harris County, Texas. (Tract 1) APPLIES AND AFFECTS SUBJECT PROPERTY AS SHOWN HEREON.

9c Unlocated Pipeline right-of-way and easement in favor of Houston Pipe Line Company, as set forth in instrument recorded in Volume 653 Page 530 of the Deed Records of Harris County, Texas as amended by instrument recorded in Volume 2792 Page 721 of the Deed Records of Harris County, Texas, wherein said easement was limited to a 25 foot wide strip. (All tracts) AFFECTS SUBJECT PROPERTY BUT UNABLE TO ASCERTAIN LOCATION DUE TO AMBIGUOUS DESCRIPTION.

9d A Houston Lighting & Power Company easement 10 feet in width and 213.5 feet in length, together with an unobstructed aerial easement 20 feet wide from a plane 20 feet above the ground upward centered thereon, over and across subject property, as set forth and located in instrument recorded under Clerk's File No. F-844922 of the Real Property Records of Harris County, Texas. (Tract 2) APPLIES AND AFFECTS SUBJECT PROPERTY AS SHOWN HEREON.

9e Easement containing 0.040 acre, more or less, for the construction, maintenance and operation of a spur tract in favor of Southern Pacific Transportation Company over and across subject property, as set forth, described and located in instrument recorded under Clerk's File No. M-236821 of the Real Property Records of Harris County, Texas. (Tract 3) APPLIES AND AFFECTS SUBJECT PROPERTY AS SHOWN HEREON.

General Notes

1) Except as shown there is no observable evidence of earth moving work, building construction or building additions within recent months.

2) There is no observable evidence of site use as a waste dump, sump or sanitary landfill.

3) There is no observable evidence of a cemetery or a burial ground observed or of record on the property that the surveyor is aware of.

4) There are no gores and/or overlaps between the parcel lines of the subject property and its adjoiners.

5) Portions of that certain Deed conveyed from Corson Trucking Company, Inc. a Louisiana Corporation, and Technical Environmental Systems, Inc. dated May 1, 1989 of record in Clerk's File No. M-451973 and in Film Code No. 165-66-0267 of the Real Property Records of Harris County.

6) The address posted on the building is 500 by observed building street numbers.

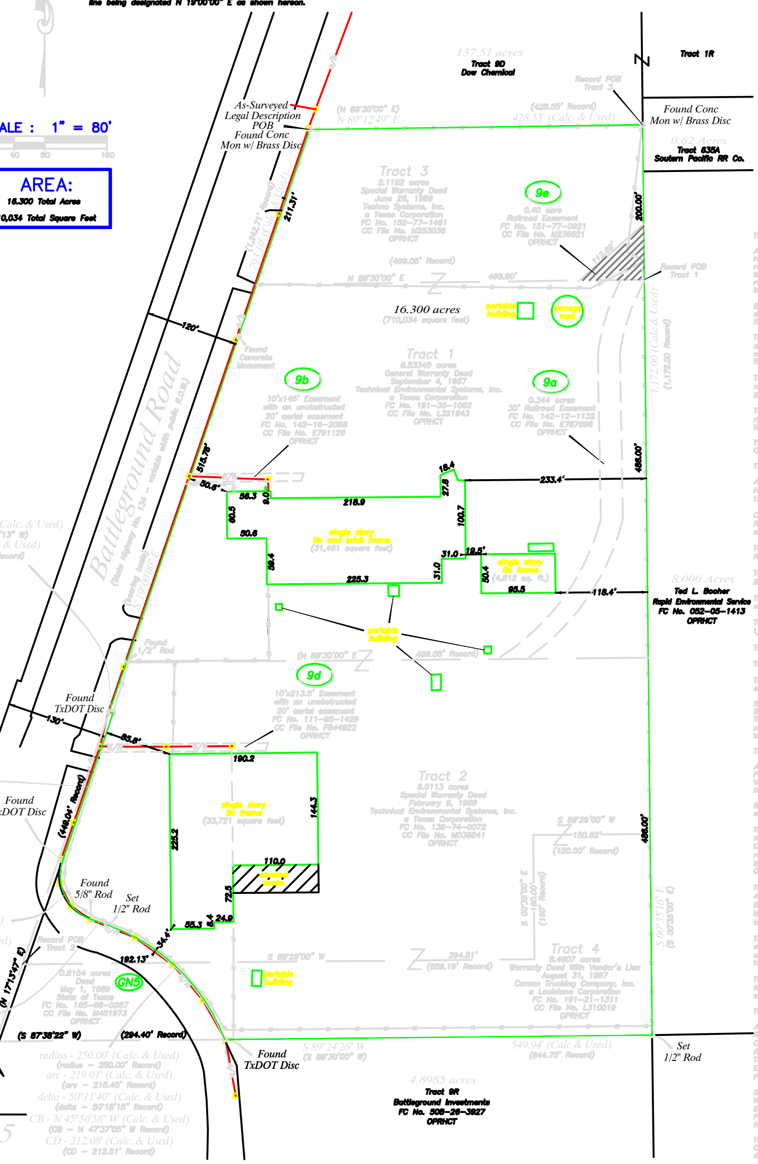
SCALE : 1" = 80'

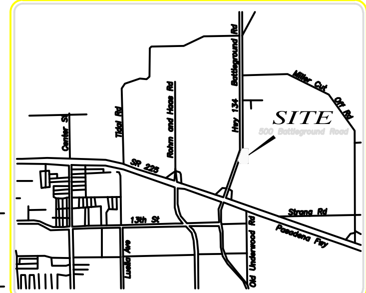
0 40 80 160

AREA:
16.300 Total Acres
710,034 Total Square Feet

Basis of Bearing

The bearing of N 19°00'00" E being the Easterly right-of-way line of Battleground Road/State Highway No. 134 and the Westerly lines of those certain four (4) tracts of land as described as: 2.1192 acres (Tract 3) as conveyed in a Special Warranty Deed dated June 26, 1989 to Techno Systems, Inc., a Texas Corporation, of record in Film Code No. 152-77-1461 and in County Clerk's File No. M253036 of the Official Public Records of Harris County, Texas, 6.53345 acres (Tract 1) as conveyed in a General Warranty Deed dated September 4, 1987 to Technical Environmental Systems Inc., a Texas Corporation, of record in Film Code No. 191-35-1062 and in County Clerk's File No. L321643 of the said Official Public Records, 6.0113 acres (Tract 2) as conveyed in a Special Warranty Deed dated February 9, 1989 to Technical Environmental Systems Inc., a Texas Corporation of record in Film Code No. 139-74-0072 and in County Clerk's File No. M039841 of the said Official Public Records and that certain 8.4607 acre (Tract 4) tract of land as conveyed in a Warranty Deed with Vendor's Lien dated August 31, 1987 to Corson Trucking Company Inc., a Louisiana Corporation of record in Film Code No. 191-21-1311 and in County Clerk's File No. L310019 of the said Official Public Records, was used as "The Basis of Bearings" for this survey. Said line being designated N 19°00'00" E as shown hereon.





Record Legal Description

TRACT 1

A tract of land containing 6.53345 acres out of the GEORGE ROSS SURVEY, ABSTRACT NO. 646, in Harris County, Texas, being out of that fifty acre tract conveyed to T. & H.O.R.R. by deed recorded in Volume 3020, Page 611, of the Deed Records of Harris County, Texas, which 50-acre tract was out of that 79.747 acre tract, being Tract No. 1 in deed to Carl C. Patrick, Trustee recorded in Volume 2793, Page 651, of the Deed Records of Harris County, Texas, subject tract being more particularly described by metes and bounds, as follows:

BEGINNING at 5/8 inch iron pipe located South 00 degrees, 35 minutes, 00 seconds, East, a distance of 200.00 feet from the northeast corner of said 50 acre tract, on the east line of said Ross Survey, for the Northeast corner of this tract;

THENCE, continuing South 00 degrees, 35 minutes, 00 seconds, East, along the east survey line, a distance of 486.00 feet to a 1/2 inch iron pipe at the northeast corner of that 8.461 acre tract conveyed to Stahlman Lumber Co., by deed recorded in Volume 6027, Page 416 of the Deed Records, for the Southeast corner of this tract;

THENCE South 89 degrees, 29 minutes, 00 seconds West along a barbed wire fence on Stahlman's north line, a distance of 671. 93 feet to a 1/2 inch iron rod on the southeasterly right-of-way line of Highway No. 134 (based on 120 feet width), for the southwest corner of this tract;

THENCE, North 19 degrees, 00 minutes, 00 seconds East, along the said southeasterly, right-of-way line, a distance of 515.78 feet to a 5/8 inch iron rod for the northwest corner of this tract;

THENCE, North 89 degrees, 30 minutes, 00 seconds East, a distance of 499.05 feet to the PLACE OF BEGINNING.

TRACT 2

A 6.0113 acre tract out of a 8.4607 acre tract out of the GEORGE ROSS SURVEY, ABSTRACT 646, Harris County, Texas, (8.4607 acre tract described in instrument recorded under Film Code 191-21-1314 out of the Harris County Clerk's Records):

COMMENCING at a 3/4 inch iron pipe located in the easterly right-of-way line of Battle Ground Road (State Highway No. 134) (120 feet wide), said iron pipe marking the southwest corner of said 8.4607 acre tract;

THENCE North 19° 00' 00" East 106.10 feet along the easterly right-of-way line of Battle Ground Road to a 1/2 inch iron rod set at the point of beginning of this tract;

THENCE continuing North 19° 00' 00" East 409.52 feet along the easterly right-of-way line of Battle Ground Road to a 3/4 inch iron pipe at the northwest corner of said 8.4607 acre tract;

THENCE North 89° 29' 00" East 671.93 feet to a found wood corner post at the northeast corner of said 8.4607 acre tract;

THENCE South 00° 35' 00" East 226.00 feet along the east line of said 8.4607 acre tract to a 1/2 inch iron rod set for corner;

THENCE South 89° 29' 00" West 150.00 feet to a 1/2 inch iron rod set for corner;

THENCE South 00° 35' 00" East 160.00 feet to a 1/2 inch iron rod set for corner;

THENCE South 89° 29' 00" West 659.19 feet to the point of beginning and containing 261,854 square feet or 6.0113 acres of land.

SAVE AND EXCEPT from the above-described property all of that portion of said property which lies within the 0.8154 acre tract described in deed from Corsan Trucking Company, Inc. and Technical Environmental Systems, Inc. to the State of Texas dated May 1, 1989 and recorded under Clerk's File No. M-451973 of the Real Property Records of Harris County, Texas, reference to which is hereby made for all purposes.

TRACT 3

A 2.1192 acre tract of land being the residue of a called 50 acre tract, as conveyed from the Federal Reserve Bank of Dallas to T. & N.O.R.R., by deed dated June 30, 1955, as recorded in Volume 3020, Page 611 of the Deed Records of Harris County, Texas, said 2.1192 acres of land being more particularly described by metes and bounds as follows:

BEGINNING at a concrete monument found for the northeast corner of said 50 acre tract, from said monument a bent railroad tract rail was found, 0.69 feet north and 0.29 feet east;

THENCE South 00° 35' 00" East along the east line of said 50 acre tract, a distance of 199.17 feet (called 200.00 feet as per a 6.53345 acre tract, as conveyed from Stefani Distributing Company, Inc. to Technical Environmental Systems, Inc., by deed dated September 4, 1987, as recorded in Harris County Clerk's File NO. L-321643) to a point for corner, same point also being the northeast corner of said 6.53345 acre tract, from said point a 1/2 inch iron rod was found, 0.60 feet north and 1.75 feet west;

THENCE South 89° 30' 00" West along the north line of said 6.53345 acre tract, a distance of 498.92 feet (called 499.05 feet) to a point for corner in the easterly Right-Of-Way line of Battleground Road (State Highway 134) (based on a 120.00 foot wide Right-Of-Way), same being the northwest corner of said 6.53345 acre tract, from said point a 5/8 inch iron rod was found bearing South 19° 00' 54" West a distance of 0.75 feet;

THENCE North 19° 00' 54" East along the easterly Right-Of-Way Line of said Battleground Road, a distance of 211.31 feet to a point for corner in the north line of said 50 acre tract, from said point a concrete monument was found bearing South 19° 00' 54" West a distance of 1.52 feet;

THENCE North 89° 30' 00" East along the north line of said 50 acre tract, a distance of 428.04 feet (called 428.60 feet) to the PLACE OF BEGINNING of the herein described tract and containing within these calls 92,313 square feet or 2.1192 acres of land.

TRACT 4

All of that certain 2.4494 acre tract, more or less, out of the GEORGE ROSS SURVEY, ABSTRACT 646, Harris County, Texas, and being that portion of the 8.4607 acre tract described in deed to Corsan Trucking Company, Inc. recorded under Clerk's File No. L-310019 of the Real Property Records of Harris County, Texas (Film Code No. 191-21-1311) which was retained by Corsan Trucking, Inc. at the time it conveyed a 6.0113 acre tract, more or less, to Technical Environmental Systems, Inc. by deed recorded under Clerk's File No. M-039841 of the Real Property Records of Harris County, Texas (Film Code No. 139-74-0072)

SAVE AND EXCEPT from said 2.4494 acre tract all of the portion of said tract which lies within the 0.8154 acre tract described in deed from Corsan Trucking Company, Inc. and Technical Environmental Systems, Inc. to the State of Texas dated May 1, 1989 and recorded under Clerk's File No. M-451973 of the Real Property Records of Harris County, Texas, reference to which is hereby made for all purposes.

The above description describes the same property as insured in Lawyers Title Insurance Corporation commitment for title insurance number no. LCS 2002 03 2331 bearing an effective date of March 24, 2002.

As-Surveyed Legal Description

Being 16.300 acres (710,034 square feet) of land lying in the George Ross Survey in Harris County, Texas, being out of and a portion of that certain 79.747 acre tract of land as described in an instrument of record in Volume 2124 on Page 676 of the Deed Records of Harris County, Texas, being all of that certain 2.1192 acre (Tract 3) tract of land as conveyed in a Special Warranty Deed dated June 26, 1989 to Techno Systems, Inc., a Texas Corporation of record in Film Code No. 152-77-1461 and in County Clerk's File No. M253036 of the Official Public Records of Harris County, Texas, all of that certain 6.53345 acre (Tract 1) tract of land as conveyed in a General Warranty Deed dated September 9, 1987 to Technical Environmental Systems Inc., a Texas Corporation of record in Film Code No. 191-35-1062 and in County Clerk's File No. L321643 of the said Official Public Records, out of and a portion of that certain 6.0113 acre (Tract 2) tract of land as conveyed in a Special Warranty Deed dated February 9, 1989 to Technical Environmental Systems Inc., a Texas Corporation of record in Film Code No. 139-74-0072 and in County Clerk's File No. M039841 of the said Official Public Records and out of and a portion of that certain 8.4607 acre (Tract 4) tract of land as conveyed in a Warranty Deed with Vendor's Lien dated August 31, 1987 to Corson Trucking Company Inc., a Louisiana Corporation of record in Film Code No. 191-21-1311 and in County Clerk's File No. L310019 of the said Official Public Records, save and accept that certain 0.8154 acre tract of land from the above described Tracts 2 and 4, as conveyed in a Deed dated May 1, 1989 to the State of Texas of record in Film Code No. 165-66-0267 and in County Clerk's File No. M451973 of the said Official Public Records, said 16.300 acres being more particularly described by metes and bounds as follows:

Beginning at a Concrete Monument with Brass Disc found marking the Easterly right-of-way line of Battleground Road (State Highway No. 134 - variable width public roadway), the South line of that certain 137.51 acre tract of land as described in an instrument to Dow Chemical as Tract 9-D, the Northwest corner of the said Tract 3 and being the Northwest corner of the herein described tract;

Thence N 89°12'49" E (N 89°30'00" E Record) with the South line of the said Tract 9-D, the North line of the said Tract 3 and the North line of the herein described tract for a distance of 428.55' (428.55' Record) to a Concrete Monument with Brass Disc found marking the West line of that certain 0.62 acre tract of land as described as Tract 635A in an instrument to the Southern Pacific Railroad Company, the Southeast corner of the said Tract 9-D, the Northeast corner of the said Tract 3 and being the Northeast corner of the herein described tract;

Thence S 00°35'16" E (S 00°35'00" E Record) with the West line of that certain 8.000 acre tract of land as described in an instrument to Ted L. Booker, Rapid Environmental Service of record in Film Code No. 052-05-1413 of the said Official Public Records, the East lines of the said Tracts 3, 2, 1 and 4, the West line of the said 0.62 acre tract and the East line of the herein described tract for a distance of 1,172.00' (1,172.00' Record) to a 1/2" Rod with yellow cap stamped "ACCESS-5163" set marking the Northeast corner of that certain 4.8985 acre (Tract 9-R) tract of land as described in an instrument to Battleground Investments of record in Film Code No. 508-26-3927 of the said Official Public Records, the Southeast corner of the said Tract 4 and being the Southeast corner of the herein described tract;

Thence S 89°24'26" W (S 89°30'00" W Record) with the North line of the said Tract 9-R, the South line of the said Tract 4 and the South line of the herein described tract for a distance of 549.94' (544.75' Record) to a TxDot Disc found marking the Southeast corner of the said 0.8154 acre tract, the point of curvature to a curve to the left having a radius of 250.00' (250.00' Record), the Easterly right-of-way line of Battleground Road, the Northwest corner of the said Tract 9-R and being the Southwest corner of the herein described tract;

Thence along said curve to the left, over and across the said Tracts 4 and 2, with the Easterly right-of-way line of Battleground Road and the Westerly line of the herein described tract, having a central angle of 50°11'40" (50°18'15" Record), an arc distance of 219.01' (215.45' Record) and whose chord bears N 45°50'58" W, 212.08' (N 47°37'05" W, 212.51' Record) to a 1/2" Rod set marking an angle point in the Easterly right-of-way line of Battleground Road and being an angle point in the Southwest line of the herein described tract;

Thence N 71°00'00" W (N 72°46'13" W Record) with the Northeast line of the said 0.8154 acre tract, the Easterly right-of-way line of Battleground Road, over and across the said Tract 2 and with the Southwest line of the herein described tract for a distance of 20.00' (20.00' Record) to a 5/8" Rod found marking the point of curvature to a curve to the right having a radius of 60.00' (60.00' Record) and being an angle point in the Southwest line of the herein described tract;

Thence along said curve to the right, over and across the said Tract 2, with the Easterly right-of-way line of Battleground Road and the Westerly line of the herein described tract, having a central angle of 89°32'25" (90°00'00" Record), an arc distance of 94.73' (94.25' Record) and whose chord bears N 26°17'56" W, 85.19' (N 27°46'13" W, 84.65' Record) to a TxDot Disc found marking an angle point in the Easterly right-of-way line of Battleground Road, an angle point in the Northeast line of the said 0.8154 acre tract and being an angle point in the Westerly line of the herein described tract;

Thence N 18°52'16" E (N 17°13'47" E Record) over and across the same, with the same for a distance of 200.05' (200.00' Record) to a point for corner marking an angle point in the Easterly right-of-way line of Battleground Road, the Northeast corner of the said 0.8154 acre tract and being an angle point in the Westerly line of herein described tract;

Thence N 67°27'32" W (N 72°46'13" W Record) over and across the same, with the same for a distance of 5.10' (5.00' Record) to a TxDot Disc found marking the Easterly right-of-way line of Battleground Road, the Westerly line of the said Tract 2, the Northwest corner of the said 0.8154 acre tract and being an angle point in the West line of the herein described tract;

Thence N 19°00'00" E (bearing basis) with the Easterly right-of-way line of Battleground Road, the Westerly line of the said Tracts 2, 1 and 3 and the West line of the herein described tract for a distance of 793.10' (1,242.71' Record) to the point and place of beginning, containing in area 16.300 acres (710,034 square feet) of land, more or less.

The above description describes the same property as insured in Lawyers Title Insurance Corporation commitment for title insurance number no. LCS 2002 03 2331 bearing an effective date of March 24, 2002.

ALTA\ACSM Land Title Survey

for

Saftey-Kleen Project
Site No. 13

#242
500 Battleground Road
La Porte, TX 77571

Based Upon Title Commitment No. LCS 2002 03 2331 of Lawyers Title Insurance Corporation bearing an effective date of March 24, 2002

Surveyor's Certification

The undersigned, a registered land surveyor in and for the State of Texas, does hereby certify to Clean Harbors, Inc., LandAmerica, Lawyers Title Insurance Corporation, and Bock & Clark Corporation as follows: (i) that he is a duly registered land surveyor of the State of Texas, (ii) the survey reflected by this plat was actually made upon the ground on March 27th, 2002 and (iii) thas this plat of survey is made at least in accordance with the "Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys" jointly established and adopted by American Land Title Association and American Congress on Surveying and Mapping in 1999 and includes no additional items of Table A thereof.

Mitchell Lee Brackin
Texas Registered Professional Land Surveyor No. 5163
Date of Survey: March 27, 2002
Date of Last Revision: August 7, 2002
Date Printed: August 7, 2002
Network Project No. 20020159-13

Survey Prepared by:

Access Surveyors
505 South Fourth Street
Beaumont, TX 77701
Phone: 409-838-6322
Fax: 409-838-6122
RPLS5163@AOL.com

Drawing No. 4129
Drawn by: S. Brothers

Sheet 1 of 1 (seal)

Bock & Clark's National Surveyors Network
National Coordinators of ALTA/ACSM Land Title Surveys
537 North Cleveland-Massillon Road Akron, Ohio 44333
Phone: (800) SURVEYS, Fax: (330) 666-3608 www.1800surveys.com

BOCK & CLARK 1-800-SURVEYS

III. Wastes and Waste Management

A. Waste Generation and Management Activities

Is any hazardous waste [see Title 40, Code of Federal Regulations (CFR), Part 261] presently or proposed to be generated or received at your facility?

☒ Yes ☐ No

If no, skip to question Number 2 below.

If yes, answer the following question.

1. Are you presently registered with TCEQ as a solid waste generator?

   ☒ Yes ☐ No ☐ Pending

   If no, contact the Industrial and Hazardous Waste Division of TCEQ in Austin, Texas to obtain registration information. Also, continue with the application form (go to Number 2 below).

   If yes, go to Section I of your TCEQ Notice of Registration, determine which of your wastes are hazardous, and list these wastes (and mixtures) in Table III-1 (see Number 2 below).

2. Complete Table III-1, Hazardous Wastes and Management Activities, below, listing all hazardous wastes, all mixtures containing any hazardous wastes, and hazardous debris which were, are presently, or are proposed to be handled at your facility in interim status or permitted units. See 40 CFR 261 and 268.2, attaching additional copies as necessary.

   Guidelines for the Classification & Coding of Industrial Wastes and Hazardous Wastes, TCEQ publication RG-22, contains guidance on how to properly classify and code industrial waste and hazardous waste in accordance with 30 TAC 335.501-335.515 (Subchapter R).

   If you are not registered with TCEQ, enter "NA" for TCEQ Waste Code Number.

   For the EPA Hazardous Waste Numbers, see 40 CFR 261.20-33. For annual quantity, provide the amount in units of pounds (as generated and/or received) for each waste and/or waste mixture.

B. Waste Management Units Summary

1. For each waste and waste mixture listed in Table III-1 that is stored, processed, and/or disposed on-site (except where such storage and/or processing is excluded from permit requirements in accordance with Texas Administrative Code (TAC) Section 335), complete Table III-2, Hazardous Waste Management Unit Checklist, and enter the name of each hazardous waste management unit (Note: Please make copies of Table III-2 if necessary).

Give the design capacity of each hazardous waste management unit in any of the units of measure shown. In the case of inactive or closed units for which design details are unavailable, an estimate of the design capacity is sufficient.

Please provide a description for each waste management unit described in your own words on the line provided for "Waste Management Unit."

2. Has the applicant at any time conducted the on-site disposal of industrial solid waste now identified or listed as hazardous waste?

   ☐ Yes ☒ No

   If yes, complete Table III-2 indicating the hazardous waste management units which were once utilized at your plant site but are no longer in service (i.e., inactive or closed facility units).

   If no, and if no hazardous waste is presently or proposed to be stored [for longer than 90 days (see 30 TAC Section 335.69)], processed, or disposed of at your facility, then you need not file this permit application. Otherwise proceed with the application form.

3. Provide an estimate of the total weight (lbs) of hazardous waste material that has been disposed of and/or stored within your site boundaries and not removed to another site. Not Applicable.

C. Location of Waste Management Units

1. Submit as "Attachment C" a drawn-to-scale topographic map (or other map if a topographic map is unavailable) extending one mile beyond the facility boundaries, depicting the following:

   a. The approximate boundaries of the facility (described in Section II.B) and within these boundaries, the location and boundaries of the areas occupied by each active, inactive, and proposed hazardous waste management unit (see Table III-2). Each depicted area should be labeled to identify the unit(s), unit status (i.e., active, inactive, or proposed), and areal size in acres.

   b. The overall facility and all surface intake and discharge structures;

   c. All on-site injection wells where liquids are injected underground;

   d. All known monitor wells and boreholes within the property boundaries of the facility; and

   e. All wells, springs, other surface water bodies, and drinking water wells listed in public records or otherwise known to the applicant within the map area and the purpose for which each water well is used (e.g., domestic, livestock, agricultural, industrial, etc.).

See Attachment C.

2. Submit as "Attachment D" photographs which clearly delineate all hazardous waste management storage, processing, and disposal units, as well as sites of future storage, processing and disposal units. See Attachment D

D. Flow Diagram/Description

Show as "Attachment E" process flow diagrams and step-by-step word descriptions of the process flow, depicting the handling, collection, storage, processing, and/or disposal of each of the hazardous wastes previously listed in this application.

The flow diagrams or descriptions should include the following information:

1. Originating point of each waste and waste classification code;

2. Means of conveyance utilized in every step of the process flow;

3. Name and function of each facility component through which the waste passes;

4. The ultimate disposition of all wastes (if off-site, specify "off-site") and waste residues.

See Attachment E.

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

			Waste Management Activities						
			Off-site			On-site			
Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	Annual Quantity Generated and/or Received
Ignitable Waste	N/A	D001	X	X	X	X	X	X	VARIES
Corrosive Waste	N/A	D002	X	X	X	X	X	X	VARIES
Reactive Waste	N/A	D003	X	X	X	X	X	X	VARIES
Arsenic	N/A	D004	X	X	X	X	X		VARIES
Barium	N/A	D005	X	X	X	X			VARIES
Cadmium	N/A	D006	X	X	X	X			VARIES
Chromium	N/A	D007	X	X	X	X			VARIES
Lead	N/A	D008	X	X	X	X			VARIES
Mercury	N/A	D009	X	X	X	X			VARIES
Selenium	N/A	D010	X	X	X	X	X		VARIES
Silver	N/A	D011	X	X	X	X			VARIES
Endrin	N/A	D012	X	X	X	X			VARIES
Lindane	N/A	D013	X	X	X	X			VARIES
Methoxychlor	N/A	D014	X	X	X	X			VARIES
Toxaphene	N/A	D015	X	X	X	X			VARIES
2,4-D	N/A	D016	X	X	X	X			VARIES
2,4,5-TP	N/A	D017	X	X	X	X			VARIES
Benzene	N/A	D018	X	X	X	X			VARIES
Carbon tetrachloride	N/A	D019	X	X	X	X			VARIES
Chlordane	N/A	D020	X	X	X	X			VARIES
Chlorobenzene	N/A	D021	X	X	X	X			VARIES
Chlorofrom	N/A	D022	X	X	X	X			VARIES
o-Cresol	N/A	D023	X	X	X	X			VARIES
m-Cresol	N/A	D024	X	X	X	X			VARIES
p-Cresol	N/A	D025	X	X	X	X			VARIES
Cresol	N/A	D026	X	X	X	X			VARIES
1,4-Dichlorobenzene	N/A	D027	X	X	X	X			VARIES
1,2-Dichloroethane	N/A	D028	X	X	X	X			VARIES
1,1-Dichloroethylene	N/A	D029	X	X	X	X			VARIES
2,4-Dinitrotoluene	N/A	D030	X	X	X	X			VARIES
Heptachlor (and its epoxide)	N/A	D031	X	X	X	X			VARIES
Hexachlorobenzene	N/A	D032	X	X	X	X			VARIES
Hexachlorobutadiene	N/A	D033	X	X	X	X			VARIES
Hexachloroethane	N/A	D034	X	X	X	X			VARIES
Methyl ethyl ketone	N/A	D035	X	X	X	X			VARIES
Nitrobenzene	N/A	D036	X	X	X	X			VARIES
Pentachlorophenol	N/A	D037	X	X	X	X			VARIES
Pyridine	N/A	D038	X	X	X	X			VARIES
Tetrachloroethylene	N/A	D039	X	X	X	X			VARIES
Trichloroethylene	N/A	D040	X	X	X	X			VARIES
2,4,5-Trichlorophenol	N/A	D041	X	X	X	X			VARIES
2,4,6-Trichlorophenol	N/A	D042	X	X	X	X			VARIES
Vinyl chloride	N/A	D043	X	X	X	X	X	X	VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

			Waste Management Activities						
			Off-site			On-site			
Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	Annual Quantity Generated and/or Received
The following spent halogenated solvents used in degreasing: tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluoro-carbons; all spent solvent mixtures/blends used in degreasing containing before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	N/A	F001	X	X	X	X			VARIES
The following spent halogenated solvents; tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing , before use, a total of ten percnet or more (by volume) of one or mor of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvent and spent solvent mixtures.	N/A	F002	X	X	X	X			VARIES
The following spent non-halogenated solvents; xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent/mixtures blends containing, before use, only the above spent non-halogenated solvents; and all spent mixtures/blends containing, before use, one or more othe the above non-halogenated solvents, and a total of ten percentor more (by volume) or one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	N/A	F003	X	X	X	X			VARIES
The following spent non-halogenated solvents: Cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing , before use, a total of ten percnet or more (by volume) of one or mor of the above halogenated solvents or those listed in F001, F002, or F005; and still bottoms from the recovery of these spent solvnets and spent solvent mixtures.	N/A	F004	X	X	X	X			VARIES
The following spent non-halogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitorpropane; all spent solvent mixtures/blends containing , before use, a total of ten percent or more (by volume) of one or mor of the above halogenated solvents or those listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	N/A	F005	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing or aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling in aluminum.	N/A	F006	X	X	X	X			VARIES
Spent cyanide plating solutions from electoplating operations.	N/A	F007	X	X	X	X			VARIES
Plating bath residues from the bottom of plating baths from electoplating operations where cyanides are in the process.	N/A	F008	X	X	X	X			VARIES
Spent stripping and cleaning bath solutions from electroplating operations where cyandies are used in the process.	N/A	F009	X	X	X	X			VARIES
Quenching bath resideues from oil baths from metal heat operations where cyanide are used in the process.	N/A	F010	X	X	X	X			VARIES
Spent cyanide solutions from salt pot cleaning from metal heat treating operations.	N/A	F011	X	X	X	X			VARIES
Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process.	N/A	F012	X	X	X	X			VARIES
Wastewater treatment sludges from the chemical conversion coating of aluminum except from zicronium phosphating in aluminum can washing when such phosphating is an exclusive conversion coating process.	N/A	F019	X	X	X	X			VARIES
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or a component in a formulating process) of tri- or tetrachlorophenol, or of intermediated used to produce their pesticide derivatives. (This listing does not include from the production of Hexachlorophene from highly purified 2,4,5-trichlorophenol).	N/A	F020	X	X	X	X			VARIES
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or a component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives	N/A	F021	X	X	X	X			VARIES
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or a component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	N/A	F022	X	X	X	X			VARIES
Wastes (except waste water and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production of use of Hexachlorophene from highly purified 2,4,5-trichlorophenol.)	N/A	F023	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Process wastes, including but not limited to , distillation residues, heavy ends, tars, and reactor clean-out wastes, from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution. (This listing does not include wastewaters, wastewater treatment sludges, spent catalysts, and wastes listed in 40 CFR 261.31 or 261.32.)	N/A	F024	X	X	X	X			VARIES
Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.	N/A	F025	X	X	X	X			VARIES
Wastes (except waste water and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexa-chlorobenzene under alkaline conditions.	N/A	F026	X	X	X	X			VARIES
Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This list does not include formulations containing hexachlorophene synthesized from the prepurified 2,4,5-trichlorophenol as the sole component).	N/A	F027	X	X	X	X			VARIES
Residues resulting fromthe incineration or thermal treatment of soil contaminated with EPA hazardous Waste Nos. F020, F021, F022, F023, F026 and F027.	N/A	F028	X	X	X	X			VARIES
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations for wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations (except potentially cross-contaminated waste that have had the F032 waste code deleted in accordance with 40 CFR 261.35 of this chapter or potentially cross-contaminated wastes that are otherwise regulated as hazardous wastes (i.e., F034 or F035), and where the generator does not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.	N/A	F032	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

			Waste Management Activities						
			Off-site			On-site			
Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	Annual Quantity Generated and/or Received
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations for wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.	N/A	F034	X	X	X	X			VARIES
Wastewaters (except those that have not come into contact with process contaminants), process residuals, preservative drippage, and spent formulations for wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.	N/A	F035	X	X	X	X			VARIES
Petroleum refinery primary oil/water/solids separation sludge-Any sludge generated from the gravitational Separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to, those generated in: oil/water/solids separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from the non-contact once-through cooling waters generated for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in 40 CFR 261.31(b)(2)(including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and K051 wastes are not included in this listing.	N/A	F037	X	X	X	X			VARIES
Petroleum refinery secondary (emulsified) oil/water/solids separation sludge-Any sludge and/or float generated from the physical and/or chemical separation of oil/water/solids in the process wastewaters and oily cooling wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in; included in air flotation (IAF) units, tanks and impoundments, and all sludges generated in DAF units. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from the non-contact once-through cooling waters generated for treatment from other process or oily cooling waters, sludges and floats generated in aggressive biological treatment units as defined in 40 CFR 261.31(b)(2) (including sludges and floats generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and F037, K048, and K051 wastes are not included in this listing	N/A	F038	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Leachate (liquids that have percolated through land disposed wastes) resulting from the disposal of more than one restricted waste classified as hazardous under Subpart D of this Part. (Leachate resulting from the disposal of one or more of the following EPA Hazardous Wastes and not other Hazardous Wastes retains its EPA Hazardous Wastes retains its EPA Waste Number(s): F020, F021, F022, F026, F027, and/or F028).	N/A	F039	X	X	X	X			VARIES
Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol	N/A	K001	X	X	X	X			VARIES
Wastewater treatment sludge from the production of chrome yellow and orange pigments	N/A	K002	X	X	X	X			VARIES
Wastewater treatment sludge from the production of molybate orange pigments	N/A	K003	X	X	X	X			VARIES
Wastewater treatment sludge from the production of zinc yellow pigments	N/A	K004	X	X	X	X			VARIES
Wastewater treatment sludge from the production of chrome green pigments	N/A	K005	X	X	X	X			VARIES
Wastewater treatment sludge from the production of chrome oxide green pigments(anhydrous and dyrated)	N/A	K006	X	X	X	X			VARIES
Wastewater treatment sludge from the production of iron blue pigments	N/A	K007	X	X	X	X			VARIES
Oven residue from the production of chrome oxide green pigments	N/A	K008	X	X	X	X			VARIES
Distillation bottoms from the production of acetaldehyde from ethylene	N/A	K009	X	X	X	X			VARIES
Distillation side cuts from the production of acetaldehyde from ethylene	N/A	K010	X	X	X	X			VARIES
Bottom stream from the wastewater stripper in the production of acrylonitrile	N/A	K011	X	X	X	X			VARIES
Bottom stream from the acrylonitrile column in the production of acrylonitrile	N/A	K013	X	X	X	X			VARIES
Bottoms from the acetonitrile purification column in the production of acrylonitrile	N/A	K014	X	X	X	X			VARIES
Still bottoms from the distillation of benzyl chloride	N/A	K015	X	X	X	X			VARIES
Heavy ends or distillation residue from the production of carbon tetrachloride	N/A	K016	X	X	X	X			VARIES
Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin	N/A	K017	X	X	X	X			VARIES
Heavy ends from the fractionation column in ethyl chloride production	N/A	K018	X	X	X	X			VARIES
Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production	N/A	K019	X	X	X	X			VARIES
Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production	N/A	K020	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

			Waste Management Activities						
			Off-site			On-site			
Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	Annual Quantity Generated and/or Received
Aqueous spent antimony catalyst waste from fluoromethanes production	N/A	K021	X	X	X	X			VARIES
Distillation bottom tars from the production of phenol/zcetone from cumene	N/A	K022	X	X	X	X			VARIES
Distillation light ends from the production of phthalic anhydride from naphtalene	N/A	K023	X	X	X	X			VARIES
Distillation bottoms from the production of phthalic anhydride from naphthalene	N/A	K024	X	X	X	X			VARIES
Distillation bottoms from the production of nitrobenzene by the nitration of benzene	N/A	K025	X	X	X	X			VARIES
Stripping still tails from the production of methyl ethyl pyridines	N/A	K026	X	X	X	X			VARIES
Centrifuge and distillation residues from toluene diisocyanate production	N/A	K027	X	X	X	X			VARIES
Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane	N/A	K028	X	X	X	X			VARIES
Waste from the product steam stripper in the production of 1,1,1-trichloroethane	N/A	K029	X	X	X	X			VARIES
Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene	N/A	K030	X	X	X	X			VARIES
By-product salts generated in the production monosodium methanearsonate (MSMA) and cacodylic acid	N/A	K031	X	X	X	X			VARIES
Wastewater treatment sludge from the production of chlordane	N/A	K032	X	X	X	X			VARIES
Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane	N/A	K033	X	X	X	X			VARIES
Filter solids from the filtration of hexachlorochyclopentadiene in the production of chlordane	N/A	K034	X	X	X	X			VARIES
Wastewater treatment sludges generated in the production of creosote	N/A	K035	X	X	X	X			VARIES
Still bottoms from toluene reclamation distillation in the production of disulfoton	N/A	K036	X	X	X	X			VARIES
Wastewater treatment sludges from the production of disulfoton	N/A	K037	X	X	X	X			VARIES
Wastewater from the washing and stripping of phorate production	N/A	K038	X	X	X	X			VARIES
Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate	N/A	K039	X	X	X	X			VARIES
Wastewater treatment sludge from the production of phorate	N/A	K040	X	X	X	X			VARIES
Wastewater treatment sludge from the production of toxaphene	N/A	K041	X	X	X	X			VARIES
Heavy ends or distillation residue from the distillation of tetraclorobenzene in the production of 2,4,5-T	N/A	K042	X	X	X	X			VARIES
Dichlorophenol waste from the production of 2,4-D,2,6-	N/A	K043	X	X	X	X			VARIES
Wastewater treatment sludges from the manufacturing and processing of explosives	N/A	K044	X	X	X	X			VARIES
Spent carbon from the treatment of wastewater containing explosives	N/A	K045	X	X	X	X			VARIES
Wastewater treatment sludges from the manufacturing, formulation, and loading of lead-based initiating compounds	N/A	K046	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Pink/red water from trinitrotoluene (TNT) operations	N/A	K047	X	X	X	X			VARIES
Dissolved air flotation (DAF) float from the petroleum refining industry	N/A	K048	X	X	X	X			VARIES
Slop oil emulsion solids from the petroleum refining industry	N/A	K049	X	X	X	X			VARIES
Heat exchanger bundle cleaning sludge from the petroleum refining industry	N/A	K050	X	X	X	X			VARIES
American Petroleum Institute(API) separator sludge from the petroleum refining industry	N/A	K051	X	X	X	X			VARIES
Tank bottoms (leaded) from the petroleum refining industry	N/A	K052	X	X	X	X			VARIES
Ammonia still lime sludge from coking operations	N/A	K060	X	X	X	X			VARIES
Emission control dust/sludge from the primary production of steel in electric furnaces	N/A	K061	X	X	X	X			VARIES
Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (Standard Industrial Classification [SIC] Codes 331 and 332)	N/A	K062	X	X	X	X			VARIES
Emission control dust/sludge from secondary lead smelting. - Calcium Sulfate (Low Lead) Subcatagory	N/A	K069	X	X	X	X			VARIES
Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used.	N/A	K071	X	X	X	X			VARIES
Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production.	N/A	K073	X	X	X	X			VARIES
Distillation bottos from aniline production	N/A	K083	X	X	X	X			VARIES
Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	N/A	K084	X	X	X	X			VARIES
Distillation or fractionation column bottoms from the production of chlorobenzenes	N/A	K085	X	X	X	X			VARIES
Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead	N/A	K086	X	X	X	X			VARIES
Decanter tank tar sludge from coking operations	N/A	K087	X	X	X	X			VARIES
Spent potliners from primary aluminum reduction	N/A	K088	X	X	X	X			VARIES
Distillation light ends from the production of phthalic anhydride from ortho-xylene	N/A	K093	X	X	X	X			VARIES
Distillation bottoms from the production of phthalic anhydride from ortho-xylene	N/A	K094	X	X	X	X			VARIES
Distillation bottoms from the production of 1,1,1-trichloroethane	N/A	K095	X	X	X	X			VARIES
Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane	N/A	K096	X	X	X	X			VARIES
Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane	N/A	K097	X	X	X	X			VARIES
Untreated process wastewater from the production of toxaphene	N/A	K098	X	X	X	X			VARIES
Untreated wastewater from the production of 2,4-D	N/A	K099	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

			Waste Management Activities						
			Off-site			On-site			
Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	Annual Quantity Generated and/or Received
Waste leching solution from acid leaching of emission control dust/sludge from secondary lead smelting	N/A	K100	X	X	X	X			VARIES
Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic and organo-arsenic compounds	N/A	K101	X	X	X	X			VARIES
Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	N/A	K102	X	X	X	X			VARIES
Process residues from aniline extraction from the production aniline	N/A	K103	X	X	X	X			VARIES
Combined wastewater streams generated from nitrobenzene/aniline production	N/A	K104	X	X	X	X			VARIES
Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes	N/A	K105	X	X	X	X			VARIES
Wastewater treatment sludge from the mercury cell process in chlorine production	N/A	K106	X	X	X	X			VARIES
Column bottoms from product separation from the production fo 1,1-dimethyl-hydrazine(UDMH)from carboxylic acid hydrazines	N/A	K107	X	X	X	X			VARIES
Condensed column overheads from product separation and condensed reactor vent gases from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazines	N/A	K108	X	X	X	X			VARIES
Spent filter cartridges from product purification from the production of 1,1-dimethylhydrazine (UDMH)from carboxylic acid hydrazines	N/A	K109	X	X	X	X			VARIES
Condensed column overheads from intermediate separation from the production of 1,1-dimethylhydrazine (UDMH) from carboxylic acid hydrazines	N/A	K110	X	X	X	X			VARIES
Product washwaters from the production of dinitrotoluene via nitration of toluene	N/A	K111	X	X	X	X			VARIES
Reaction by-product water from the drying column in the production of toluenediamine via hydrogenation of dinitrotoluene	N/A	K112	X	X	X	X			VARIES
Condensed liquid light ends from the purification of toluenediamine in the production of toluene diamine via hydrogenation of dinitrotoluene	N/A	K113	X	X	X	X			VARIES
Vicinals from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitroluene	N/A	K114	X	X	X	X			VARIES
Heavy ends from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitroluene	N/A	K115	X	X	X	X			VARIES
Organic condensate from the purification of toluenediamine in the production of toluenediamine via hydrogenation of dinitroluene	N/A	K116	X	X	X	X			VARIES
Wastewater from the reactor vent gas scrubber in the production of ethylene dibromide via bromination of ethene	N/A	K117	X	X	X	X			VARIES
Spent absorbent solids from the purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene	N/A	K118	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Process wastewater (including supernates, filtrates, and washwaters) from the production of ethylenebisdithiocarbamic acid and its salts	N/A	K123	X	X	X	X			VARIES
Reactor vent scrubber water from the production of ethylenebisdithiocarbamic acid and its salts	N/A	K124	X	X	X	X			VARIES
Filtration, evaporation and centrifugation solids fro the procduction of ethylenebisdithiocarbamic acid and its salts	N/A	K125	X	X	X	X			VARIES
Baghouse dust and floor sweepings in milling and packaging operations from the production or formulation of ethylenebisdithiocarbamic acid and its salts	N/A	K126	X	X	X	X			VARIES
Wastewater from the reactor and spent sulfuric acid from the acid drier from the production of methyl bromide	N/A	K131	X	X	X	X			VARIES
Spent absorbent and wastewater separator solids from the production of methyl bromide	N/A	K132	X	X	X	X			VARIES
Still bottoms from the purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene	N/A	K136	X	X	X	X			VARIES
Process residues from the recovery of coal tar, including, but not limited to, collecting sump residues from the production of coke from coal or the recovery of coke by-products produced from coal. This listing does not include K087 (decanter tank tar sludges from coking operations).	N/A	K141	X	X	X	X			VARIES
Tar storage tank residues from the production of coke from coal or from the recovery of coke by-products produced from coal.	N/A	K142	X	X	X	X			VARIES
Process residues from the recovery of light oil, including, but not limited to, those generated in stills, decanters, and wash oil recovery units from the recovery of coke by-products produced from coal.	N/A	K143	X	X	X	X			VARIES
Wastewater sump residues from light oil refining, including, but not limited to, intercepting or contamination sump sludges from the recovery of coke by-products produced from coal.	N/A	K144	X	X	X	X			VARIES
Residues from naphthalene collection and recovery operations from the recovery of coke by-products produced from coal.	N/A	K145	X	X	X	X			VARIES
Tar storage tank residues from coal tar refining.	N/A	K147	X	X	X	X			VARIES
Residues from coal tar distillation, including but not limited to, still bottoms.A74	N/A	K148	X	X	X	X			VARIES
Distillation bottoms from the production of alpha- (or methyl-) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups, (This waste does not include still bottoms from the distillation of benzyl chloride.).	N/A	K149	X	X	X	X			VARIES
Organic residuals, excluding spent carbon adsorbant, from the spent chlorine gas and hydrochloric acid recovery processes associated with the production of alpha (or methyl) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups.	N/A	K150	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

			Waste Management Activities						
			Off-site			On-site			
Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	Annual Quantity Generated and/or Received
Wastewater treatment sludges, excluding neutralization and biological sludges, generated during the treatment of wastewaters from the production of alpha (or methyl) chlorinated toluenes, ring-chlorinated toluenes, benzoyl chlorides, and compounds with mixtures of these functional groups.	N/A	K151	X	X	X	X			VARIES
Organic waste (including heavy ends, still bottoms, light ends, filtrates and decantates) from the production of carbamates and carbamoyl oximes	N/A	K156	X	X	X	X			VARIES
Wastewaters (including scrubber waters, condenser waters, wash waters, and separation waters) from the production of carbamates and carbamoyl oximes.	N/A	K157	X	X	X	X			VARIES
Bag house dusts and filter/separation solids from the production of carbamates and carbamoyl oximes	N/A	K158	X	X	X	X			VARIES
Organics from the treatment of thiocarbamate waste	N/A	K159	X	X	X	X			VARIES
Purification solids (including filtration, evaporation and centrifugation solids), bag house dust and floor sweepings from the production of dithiocarbamate acids an their salts. (This listing does not include K125 and K126)	N/A	K161	X	X	X	X			VARIES
Crude oil storage tank sediment from petroleum refining operations	N/A	K169	X	X	X	X			VARIES
Clarified slurry oil storage tank sediment and/or in-line filter/separation solids from petroleum refining operations	N/A	K170	X	X	X	X			VARIES
Spent hydrotreating catalyst from petroleum refining operations, including guard beds used to desulfurize feeds to other catalytic units	N/A	K171	X	X	X	X			VARIES
Spent hydro refining catalyst from petroleum refining operations, including guard beds used to desulfurize feeds to other catalytic units	N/A	K172	X	X	X	X			VARIES
Waste water treatment sludges from the production of ethylene dichloride or vinyl chloride monomer (including sludges that result from commingled ethylene dichloride or vinyl chloride monomer wastewater and other wastewater), unless the sludges meet the conditions specified in 40 CFR 261.32.	N/A	K174	X	X	X	X			VARIES
Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process.	N/A	K175	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Nonwastewaters from the production of dyes and/or pigments (including nonwastewaters commingled at the point of generation with nonwastewaters from other processes) that, at the point of generation, contain mass loadings of any of the constituents identified in paragraph (c) of this section that are equal to or greater than the corresponding paragraph (c), as on a calendar year basis. These wastes will not be hazardous if the nonwastewaters are: (i) disposed in a Subtitle D landfill unit subject to the design criteria in §258.40, (ii) disposed in a Subtitle C landfill unit subject to either §264.301 or §265.301, (iii) disposed in other Subtitle D landfill units that meet the design criteria in §258.40, §264.301, or §265.301, or (iv) treated in a combustion unit that is permitted under Subtitle C, or an onsite combustion unit that is permitted the Clean Air Act. For the purposes of this listing, dyes and/ or pigments production is defined in paragraph (b)(1) of this section. Paragraph (d) of this section describes the process for demonstrating that a facility's nonwastewaters are not K181. This listing does not apply to wastes that are otherwise identified as hazardous under §§261.21-261.24 and 261.31-261.33 at the point of generation. Also, the listing does not apply to wastes generated before any annual mass loading limit is met.	N/A	K181	X	X	X	X			VARIES
2H - Benzopyran-2-one,4-hydroxy-3-(3-oxo-1-phenylbutyl)-and salts, concentration > 0.3% (aka: Warfarin, and salts, concentration > 0.3%)	N/A	P001	X	X	X	X			VARIES
1-Acetyl-2-thiourea (aka: Acetamide, N-(aminothioxomethyl)-)	N/A	P002	X	X	X	X			VARIES
2-Propenal (aka: Acrolein)	N/A	P003	X	X	X	X			VARIES
1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1 alpha, 4 alpha, 4a beta, 5 beta, 8 beta, 8a, beta) (aka: Aldrin)	N/A	P004	X	X	X	X			VARIES
Allyl alcohol (aka: 2-Propen-1-ol)	N/A	P005	X	X	X	X			VARIES
Aluminum phosphide	N/A	P006	X	X	X	X			VARIES
5-(Aminomethyl)-3-isoxazolol (aka: 3(2H)-Isoxazolone, 5-(aminomethyl)-	N/A	P007	X	X	X	X			VARIES
4-Aminopyridine (aka: 4-Pyridinamine)	N/A	P008	X	X	X	X			VARIES
Phenol, 2,4,6-trinitro-, ammonium salt (aka: Ammonium picrate)	N/A	P009	X	X	X	X			VARIES
Arsenic Acid	N/A	P010	X	X	X	X			VARIES
Arsenic oxide [penta] (aka: Arsenic pentoxide)	N/A	P011	X	X	X	X			VARIES
Arsenic oxide [tri] (aka: Arsenic trioxide)	N/A	P012	X	X	X	X			VARIES
Barium Cyanide	N/A	P013	X	X	X	X			VARIES
Benzenethiol (aka: Thiophenol)	N/A	P014	X	X	X	X			VARIES
Berylium	N/A	P015	X	X	X	X			VARIES
Dichloromethyl ether: (aka: Methane, oxybis [chloro-)	N/A	P016	X	X	X	X			VARIES
1-bromo-2-Propanone (aka: Bromoacetone)	N/A	P017	X	X	X	X			VARIES
Strychnidine-10-one,2,3-dimethoxy- (aka: Brucine)	N/A	P018	X	X	X	X			VARIES
Phenol,2-(1-methylpropyl)-4,6-dinitro- (aka: Dinoseb)	N/A	P020	X	X	X	X			VARIES
Calcium cyanide CN-Ca-CN (aka: Calcium Cyanide)	N/A	P021	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Carbon Disulfide	N/A	P022	X	X	X	X			VARIES
Acetaldehyde, chloro- (aka: Chloroacetaldehyde)	N/A	P023	X	X	X	X			VARIES
4-chloro-Benzeneamine (aka: p-Chloroaniline)	N/A	P024	X	X	X	X			VARIES
1-(o-Chlorophenyl) thiourea (aka: Thiourea, (2-chlorophenyl)-)	N/A	P026	X	X	X	X			VARIES
3-chloro-Propanenitrile (aka: 3-Chloropropionitrile)	N/A	P027	X	X	X	X			VARIES
Benzene, (chloromethyl)- (aka: Benzyl Chloride)	N/A	P028	X	X	X	X			VARIES
Copper cyanide Cu (CN) (aka: Copper cyanide)	N/A	P029	X	X	X	X			VARIES
Cyanides, not otherwise specified	N/A	P030	X	X	X	X			VARIES
Ethanedinitrile (aka: Cyanogen)	N/A	P031	X	X	X	X	X	X	VARIES
Cyanogen chloride (CN)Cl (aka: Cyanogen chloride)	N/A	P033	X	X	X	X	X	X	VARIES
Phenol, 2-cyclohexyl-4,6-dinitro- (aka: 2-Cyclohexyl-4,6-dinitrophenol)	N/A	P034	X	X	X	X			VARIES
Arsonous dichloride, phenyl- (aka: Dichlorophenylarsine)	N/A	P036	X	X	X	X			VARIES
2,7:,6-Dimethanonaphyth [2,3-b] oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,(1a alpha, 2 beta, 2a beta, 3 beta, 6 beta, 6a alpha, 7 beta, 7a alpha)- (aka: Dieldrin)	N/A	P037	X	X	X	X			VARIES
Arsine, diethyl- (aka: Diethylarsine)	N/A	P038	X	X	X	X			VARIES
Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester (aka: Disulfoton)	N/A	P039	X	X	X	X			VARIES
Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester (aka: Diethyl O-pyrazinyl phosphorothioate,O,O-)	N/A	P040	X	X	X	X			VARIES
Phosphoric acid, diethyl 4-nitrophenyl ester (aka: Diethyl-p-nitrophenyl Phosphate)	N/A	P041	X	X	X	X			VARIES
1,2-Benzenediol,4-[1-hydroxy-2-(methylamino) ethyl] (aka: Epinephrine)	N/A	P042	X	X	X	X			VARIES
Phosphorofluoridic acid, bis (1-methyl-ethyl) ester (aka: Diisopropylfluorophosphate (DFP))	N/A	P043	X	X	X	X			VARIES
Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl]ester (aka: Dimethoate)	N/A	P044	X	X	X	X			VARIES
2-Butanone,3,3-dimethyl-1-(methylthio)-,O-[methylamino)carbonyl] oxime (aka: Thiofanox)	N/A	P045	X	X	X	X			VARIES
Benzeneethanamine, alpha, alpha-dimethyl- (aka: Alpha, Alpha-Dimethyl-phenethylamine)	N/A	P046	X	X	X	X			VARIES
Phenol, 2-methyl-4,6-dinitro-, and salts (aka: 4,6-Dinitro-o-cresol and salts)	N/A	P047	X	X	X	X			VARIES
2.4-dinitro-Phenol (aka: 2,4-Dinitrophenol)	N/A	P048	X	X	X	X			VARIES
Thioimidodicarbonic Diamide (aka: Dithiobiuret)	N/A	P049	X	X	X	X			VARIES
Methano-2,4,3-benzodioxathiepin,6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-,3-oxide,6,9- (aka: Endosulfan)	N/A	P050	X	X	X	X			VARIES
2,7:3,6-Dimethanonaphth [2,3-b] oxirene,3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,(1a alpha, 2 beta, 2a beta, 3 alpha, 6 alpha, 6a beta, 7a alpha)-, and metabolites (aka: Endrin) (aka: Endrin, and metabolites)	N/A	P051	X	X	X	X			VARIES
Ethyleneimine (aka: Aziridine)	N/A	P054	X	X	X	X			VARIES
Fluorine	N/A	P056	X	X	X	X	X	X	VARIES
Acetimide,2-fluoro- (aka: Fluoroacetamide)	N/A	P057	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Acetic Acid, fluoro-, Sodium Salt (aka: Fluorocacetic Acid, Sodium Salt)	N/A	P058	X	X	X	X			VARIES
Methano-1H-indene,1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro, 4,7- (aka: Heptachlor)	N/A	P059	X	X	X	X			VARIES
1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-, (1 alpha, 4 alpha, 4a beta, 5 beta, 8 beta, 8a beta) (aka: Isodrin)	N/A	P060	X	X	X	X			VARIES
Tetraphosphoric Acid, Hexaethyl Ester (aka: Hexaethyl tetraphosphate)	N/A	P062	X	X	X	X			VARIES
Hydrogen Cyanide (aka: Hydrocyanic Acid)	N/A	P063	X	X	X	X	X	X	VARIES
Methane, isocyanato- (aka: Methyl Isocyanate)	N/A	P064	X	X	X	X			VARIES
Fulminic Acid, Mercyr (II) Salt (aka: Mercury Fulminate)	N/A	P065	X	X	X	X			VARIES
Ethanimidothioic acid, N-[[(methylamino) carbonyl] oxy] - methyl ester (aka: Methomyl)	N/A	P066	X	X	X	X			VARIES
Aziridine, 2-methyl- (aka: 1,2-Propylenimine)	N/A	P067	X	X	X	X			VARIES
Hydrazine, methyl- (aka: Methyl Hydrazine)	N/A	P068	X	X	X	X			VARIES
Propanenitrile, 2-hydroxy-2-methyl- (aka: 2-Methyllactonitrile)	N/A	P069	X	X	X	X			VARIES
Propanal, 2-methyl-2-(methylthio)-O-[(methylamino) carbonyl] oxime (aka: Aldicarb)	N/A	P070	X	X	X	X			VARIES
Phosphorothioic acid, o,o-dimethyl O-(4-nitrophenyl)ester (aka: Methyl Parathion)	N/A	P071	X	X	X	X			VARIES
Thiourea, 1-naphathalenyl- (aka: Alpha-Naphthylthiourea)	N/A	P072	X	X	X	X			VARIES
Nickel carbonyl (T-4) (aka: Nickel Carbonyl)	N/A	P073	X	X	X	X			VARIES
Nickel (II) Cyanide (aka: Nickel Cyanide)	N/A	P074	X	X	X	X			VARIES
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, & salts (aka: Nicotine and Salts)	N/A	P075	X	X	X	X			VARIES
Nitrogen oxide (NO) (aka: Nitric Oxide)	N/A	P076	X	X	X	X	X	X	VARIES
Benzenamine, 4-nitro- (aka: Nitroaniline,p-)	N/A	P077	X	X	X	X			VARIES
Nitrogen (IV) Oxide (aka: Nitrogen Dioxide)	N/A	P078	X	X	X	X	X	X	VARIES
Propanetriol, trinitrate, 1,2,3- (aka: Nitroglycerine)	N/A	P081	X	X	X	X			VARIES
Methanamine, N-methyl-N-nitroso- (aka: Nitrosodimethylamine,N-)	N/A	P082	X	X	X	X			VARIES
Vinylamine, N-methyl-N-nitroso- (aka: Nitrosomethylvinylamine,N-)	N/A	P084	X	X	X	X			VARIES
Diphosphoramide, octamethyl- (aka: Octamethylpyrophosphoramide)	N/A	P085	X	X	X	X			VARIES
Osmium Tetroxide (aka: Osmium Oxide)	N/A	P087	X	X	X	X			VARIES
Oxabicyclo (2.2.1) heptane-2,3-dicarboxylic acid, 7- (aka: Endothall)	N/A	P088	X	X	X	X			VARIES
Phosphorothioic Acid, O,O-diethyl-O-(p-nitro-phenyl)-ester (aka: Parathion)	N/A	P089	X	X	X	X			VARIES
Mercury, (acetato-O) phenyl- (aka: Phenylmercury acetate)	N/A	P092	X	X	X	X			VARIES
Thiourea, phenyl- (aka: Phenylthiourea)	N/A	P093	X	X	X	X			VARIES
Phosphorodithioic acid,O,O-diethyl S-[ethylthio)methyl]ester (aka: Phorate)	N/A	P094	X	X	X	X			VARIES
Carbonic dichloride (aka: Phosgene)	N/A	P095	X	X	X	X	X		VARIES
Hydrogen Phosphide (aka: Phosphine)	N/A	P096	X	X	X	X	X	X	VARIES
Phosphorothioic acid, O-[4-[(dimethylamino) sulfonyl] phenyl] O,O-dimethyl ester (aka: Famphur)	N/A	P097	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Potassium cyanide K(CN) (aka: Potassium Cyanide)	N/A	P098	X	X	X	X			VARIES
Argentate (1-), bix(cyano-C), potassium (aka: Potassium Silver Cyanide)	N/A	P099	X	X	X	X			VARIES
Propanenitrile (aka: Ethyl cyanide)	N/A	P101	X	X	X	X			VARIES
Propyn-1-ol,2- (aka: Propargylalcohol)	N/A	P102	X	X	X	X			VARIES
Selenourea	N/A	P103	X	X	X	X			VARIES
Silver cyanide Ag(CN) (aka: Silver cyanide)	N/A	P104	X	X	X	X			VARIES
Sodium azide	N/A	P105	X	X	X	X			VARIES
Sodium cyanide Na(CN) (aka: Sodium cyanide)	N/A	P106	X	X	X	X			VARIES
Strychnidin-10-one, and salts (aka: Strychnine and salts)	N/A	P108	X	X	X	X			VARIES
Thiodiphosphoric acid, tetraethyl ester (aka: Tetraethyldithiopyrophosphate)	N/A	P109	X	X	X	X			VARIES
Plumbane, tetraethyl- (aka: Tetraethyl Lead)	N/A	P110	X	X	X	X			VARIES
Diphosphoric acid, tetraethyl ester (aka: Tetraethyl pyrophosphate	N/A	P111	X	X	X	X			VARIES
Methane, tetranitro (aka: Tetranitromethane)	N/A	P112	X	X	X	X			VARIES
Thallium oxide (aka: Thallic oxide)	N/A	P113	X	X	X	X			VARIES
Selenious acid, dithallium (1+) salt (aka: Thallium (I) selenide)	N/A	P114	X	X	X	X			VARIES
Sulfuric acid, dithallium (1+) salt (aka: Thallium (I) sulfate)	N/A	P115	X	X	X	X			VARIES
Hydrazinecarbothioamide (aka: Thiosemicarbazide)	N/A	P116	X	X	X	X			VARIES
Methanethiol, trichloro- (aka: Trichloromethanethiol)	N/A	P118	X	X	X	X			VARIES
Vanadic acid, ammonioum salt (aka: Ammonium vanadate)	N/A	P119	X	X	X	X			VARIES
Vanadium pentoxide (aka: Vanadium oxide)	N/A	P120	X	X	X	X			VARIES
Zinc Cyanide (aka: Zinc cyanide (CN)-Zn-(CN)	N/A	P121	X	X	X	X			VARIES
Zinc phosphide, when present at concentrations greater than 10%	N/A	P122	X	X	X	X			VARIES
Toxaphene	N/A	P123	X	X	X	X			VARIES
Carbofuran (aka: 7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate)	N/A	P127	X	X	X	X			VARIES
Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester)	N/A	P128	X	X	X	X			VARIES
Tirpate (aka: 1,3-Dithiolane-2-carboxaldehyde,2,4-dimethyl-,O-[(methylamino)-carbonyl] oxime)	N/A	P185	X	X	X	X			VARIES
Physostiamine salicylate (aka: Benzoic acid, 2-hydroxy-, compound with (3aS-cis)-1,2,3,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo [2,3-b] indol-5-yl methylcarbamate ester (1:1))	N/A	P188	X	X	X	X			VARIES
Carbosulfan (aka: Carbamic acid, [(dibutylamino)-thio] methyl-,2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester)	N/A	P189	X	X	X	X			VARIES
Metolcarb (aka: Carbamic acid, methyl-,3-methylphenyl ester)	N/A	P190	X	X	X	X			VARIES
Dimetilan (aka: Carbamic acid, dimethyl-, 1 [(dimethyl-amino)carbonyl] -5-methyl-1H-pyrazol-3-yl-ester	N/A	P191	X	X	X	X			VARIES
Isolan (aka: Carbamic acid, dimethyl-,3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester)	N/A	P192	X	X	X	X			VARIES
Oxamyl (aka: Ethanimidothioc acid,2-(dimethylamino)-N-{[(methylamino)carbonyl]oxy}-2-oxo-, methyl ester)	N/A	P194	X	X	X	X			VARIES
Manganese dimethyldithiocarbamate (aka: Manganese, bis(dimethylcarbamodithioato-S,S')-,)	N/A	P196	X	X	X	X			VARIES
Formparanate (aka: Methanimidamide,N,N-dimethyl-N'-[2-methyl-4-{[(methylamino)carbonyl]oxy}phenyl]-)	N/A	P197	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Formetanate hydrochloride (aka: Methanimidamide, N,N-dimethyl-N'-[3-[{(methylamino)-carbonyl}oxy}phenyl]-,monohydrochloride)	N/A	P198	X	X	X	X			VARIES
Methiocarb (aka: Mexacarbate) (aka: Phenol,(3,5-dimethyl-4-(methylthio)-,methylcarbamate)	N/A	P199	X	X	X	X			VARIES
Promecarb (aka: Phenol,3-methyl-5-(1-methylethyl)-, methyl carbamate)	N/A	P201	X	X	X	X			VARIES
m-Cumenyl methylcarbamate (aka: Phenol,3-(methylethyl)-, methyl carbamate) (aka: 3-Isopropylphenyl N-methylcarbamate	N/A	P202	X	X	X	X			VARIES
Aldicarb sulfone (aka: Propanal,2-methyl-2-(methyl-sulfonyl)-,O-[(methylamino)carbonyl]oxime)	N/A	P203	X	X	X	X			VARIES
Physostiamine (aka: Pyrrolo [2,3-b] indol-5-ol, 1,2,3,3a8, 8a-hexahydro-1,3a,8-trimethyl-, methylcarbamate (ester), (3aS-cis)-)	N/A	P204	X	X	X	X			VARIES
Ziram (aka: Zinc, bis (dimethylcarbamodithioato-S,S')-)	N/A	P205	X	X	X	X			VARIES
Acetaldehyde (aka: Ethanal)	N/A	U001	X	X	X	X			VARIES
Acetone (aka: Propanone,2-)	N/A	U002	X	X	X	X			VARIES
Acetonitrile	N/A	U003	X	X	X	X			VARIES
Acetophenone (aka: Ethanone, 1-phenyl-)	N/A	U004	X	X	X	X			VARIES
Acetylaminofluorene,2- (aka: Acetamide,N-9H-fluoren-2-yl-)	N/A	U005	X	X	X	X			VARIES
Acetyl chloride	N/A	U006	X	X	X	X	X		VARIES
Acrylamide (aka: Propenamide, 2-)	N/A	U007	X	X	X	X			VARIES
Acrylic Acid (aka: Propenoic acid, 2-)	N/A	U008	X	X	X	X			VARIES
Acrylonitrile (aka: Propenenitrile, 2-)	N/A	U009	X	X	X	X			VARIES
Mitomycin C (aka: Azirino [2',3':3,4] pyrrolo [1,2-a] indole-4,7-dione, 6-amino-8-[[amino-carbonyl) oxy] methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-, [1aS-1a alpha, 8 beta, 8a alpha, 8b alpha)]-)	N/A	U010	X	X	X	X			VARIES
Amitrole (aka: Triazol-3-amine, 1H-1,2,4-)	N/A	U011	X	X	X	X			VARIES
Aniline (aka: Benzenzmine)	N/A	U012	X	X	X	X			VARIES
Auramine (aka: Benzenamine,4,4',-carbonimidoylbis(n,N-dimethyl-)	N/A	U014	X	X	X	X			VARIES
Azaserine (aka: Serine, diazoacetate (ester), L-)	N/A	U015	X	X	X	X			VARIES
Benz[c]acridine	N/A	U016	X	X	X	X			VARIES
Benzal chloride (aka: Benzene, (dichloromethyl)-)	N/A	U017	X	X	X	X			VARIES
Benz[a]anthracene	N/A	U018	X	X	X	X			VARIES
Benzene	N/A	U019	X	X	X	X			VARIES
Benzenesulfonyl chloride (aka: Benzenesulfonic acid chloride)	N/A	U020	X	X	X	X			VARIES
Benzidine (aka: Biphenyl)-4,4'-diamine, (1,1'-)	N/A	U021	X	X	X	X			VARIES
Benzo[a]pyrene	N/A	U022	X	X	X	X			VARIES
Benzotrichloride (aka: Benzene, (trichloromethyl)-)	N/A	U023	X	X	X	X			VARIES
Dichloromethoxy ethane (aka: Ethane, 1,1'-[methylenebis(oxy)] bis [2-chloro-)	N/A	U024	X	X	X	X			VARIES
Dichloroethyl ether (aka: Ethane,1,1'-oxybis [2-chloro-)	N/A	U025	X	X	X	X			VARIES
Chlornaphazin (aka: Naphthalenamine,N,N'-bis (2-chloroethyl)-)	N/A	U026	X	X	X	X			VARIES
Dichloroisopropyl ether (aka: Propane,2,2'-oxybis [2-chloro-)	N/A	U027	X	X	X	X			VARIES
Diethylhexyl phthalate (aka: Benzenedicarboxylic acid, bis (2-ethylhexyl) ester, 1,2-)	N/A	U028	X	X	X	X			VARIES
Methyl bromide (aka: Methane, bromo-)	N/A	U029	X	X	X	X			VARIES
4-Bromophenyl phenyl ether (aka: Benzene, 1-bromo-4-phenoxy-)	N/A	U030	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
1-Butanol (aka: n-Butyl alcohol)	N/A	U031	X	X	X	X			VARIES
Calcium chromate (aka: Chromic acid, calcium salt)	N/A	U032	X	X	X	X			VARIES
Carbonic difluoride (aka: Carbon oxyfluoride)	N/A	U033	X	X	X	X	X		VARIES
Chloral (aka: Acetaldehyde, trichloro-)	N/A	U034	X	X	X	X			VARIES
Chlorambucil (aka: Benzenebutanoic acid, 4-[bis(2-chloroethyl) amino}-)	N/A	U035	X	X	X	X			VARIES
Chlordane, alpha, & gamma isomers (aka: 4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-)	N/A	U036	X	X	X	X			VARIES
Chlorobenzene (aka: Benzene, chloro-)	N/A	U037	X	X	X	X			VARIES
Chlorobenzilate (aka: Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy, ethyl ester)	N/A	U038	X	X	X	X			VARIES
p-Chloro-m-cresol (aka: Phenol, 4-chloro-3-methyl)	N/A	U039	X	X	X	X			VARIES
Epichlorohydrin (aka: Oxirane, (chloromethyl)-)	N/A	U041	X	X	X	X			VARIES
2-Chloroethyl vinyl ether (aka: Ethene, (2-chloroethoxy)-)	N/A	U042	X	X	X	X			VARIES
Vinyl chloride (aka: Ethene, chloro-)	N/A	U043	X	X	X	X	X	X	VARIES
Chloroform (aka: Methane, trichloro)	N/A	U044	X	X	X	X			VARIES
Methyl chloride (aka: Methane, chloro-)	N/A	U045	X	X	X	X			VARIES
Chloromethyl methyl ether (aka: Methane, chloromethoxy-)	N/A	U046	X	X	X	X			VARIES
Naphthalene, 2-chloro- (aka: beta-Chloronaphthalene)	N/A	U047	X	X	X	X			VARIES
o-Chlorophenol (aka: Phenol, 2-chloro-)	N/A	U048	X	X	X	X			VARIES
4-Chloro-o-toluidine, hydrochloride (aka: Benzenamine, 4-chloro-2-methyl-, hydrochloride)	N/A	U049	X	X	X	X			VARIES
Chrysene	N/A	U050	X	X	X	X			VARIES
Creosote	N/A	U051	X	X	X	X			VARIES
Phenol, methyl- (aka: Cresol (Cresylic acid))	N/A	U052	X	X	X	X			VARIES
2-Butenal (aka: Crotonaldehyde)	N/A	U053	X	X	X	X			VARIES
Cumene (aka: Benzene, (1-methylethyl)-)	N/A	U055	X	X	X	X			VARIES
Cyclohexane (aka: Benzene, hexahydro-)	N/A	U056	X	X	X	X			VARIES
Cyclohexanone	N/A	U057	X	X	X	X			VARIES
Cyclophosphamide (aka: 2H-1,3,2-Oxazaphosphorin-2-amine,N,N-bis (2-chloroethyl) tetrahydro-, 2-oxide)	N/A	U058	X	X	X	X			VARIES
Daunomycin (aka: 5,12-Naphthacenedione, 8-acetyl-10-[(3-amino-2,3,6-trideoxy)-alpha-L-lyxo-hexopyranosyl) oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-, (8S-cis)-	N/A	U059	X	X	X	X			VARIES
DDD (aka: Benzene, 1,1',-(2,2-dichloroethylidene) bis [4-chloro-)	N/A	U060	X	X	X	X			VARIES
DDT (aka: Benzene, 1,1'-(2,2,2-trichloroethylidene) bis [4-chloro-)	N/A	U061	X	X	X	X			VARIES
Diallate (aka: Carbamothioic acid, bis (1-methyl-ethyl)-,S-(2,3-dichloro-2-propenyl) ester)	N/A	U062	X	X	X	X			VARIES
Dibenz [a,h] anthracene	N/A	U063	X	X	X	X			VARIES
Dibenzo [a,i] pyrene (aka: Benzo [rst] pentaphrene)	N/A	U064	X	X	X	X			VARIES
1,2-Dibromo-3-chloropropane (aka: Propane, 1,2-dibromo-3-chloro-)	N/A	U066	X	X	X	X			VARIES
Ethylene dibromide (aka: Ethane, 1,2-dibromo-	N/A	U067	X	X	X	X			VARIES
Methylene bromide (aka: Methane, dibromo-)	N/A	U068	X	X	X	X			VARIES
Dibutyl phthalate (aka: 1,2-Benzenedicarboxylic acid, dibutyl ester)	N/A	U069	X	X	X	X			VARIES
o-Dichlorobenzene (aka: Benzene, 1,2-dichloro-)	N/A	U070	X	X	X	X			VARIES
m-Dichlorobenzene (aka: Benzene, 1,3-dichloro-)	N/A	U071	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
p-Dichlorobenzene (aka: Benzene, 1,4-dichloro)	N/A	U072	X	X	X	X			VARIES
3,3'-Dichlorobenzidine (aka: (1,1'-Biphenyl)-4,4'-diamine,3,3'-dichloro-)	N/A	U073	X	X	X	X			VARIES
1,4-Dichloro-2-butene (aka: 2-Butene, 1,4-dichloro-)	N/A	U074	X	X	X	X			VARIES
Dichlorodifluoromethane (aka: Methane, dichlorodifluoro-)	N/A	U075	X	X	X	X			VARIES
Ethylidene dichloride (aka: Ethane, 1,1-dichloro-)	N/A	U076	X	X	X	X			VARIES
Ethylene dichloride (aka: Ethane, 1,2-dichloro-)	N/A	U077	X	X	X	X			VARIES
1,1-Dichloroethylene (aka: Ethene, 1,1-dichloro-)	N/A	U078	X	X	X	X			VARIES
1,2-Dichloroethylene (aka: Ethene, 1,2-dichloro-)	N/A	U079	X	X	X	X			VARIES
Methylene chloride (aka: Methane, dichloro-)	N/A	U080	X	X	X	X			VARIES
2,4-Dichlorophenol (aka: Phenol,2,4-dichloro-)	N/A	U081	X	X	X	X			VARIES
2,6-Dichlorophenol (aka: Phenol, 2,6-dichloro-)	N/A	U082	X	X	X	X			VARIES
Propylene dichloride (aka: Propane, 1,2-dichloro-)	N/A	U083	X	X	X	X			VARIES
1,3-Dichloropropene (aka: 1-Propene, 1,3-dichloro-)	N/A	U084	X	X	X	X			VARIES
1,2:3,4-Diepoxybutane (aka: 2,2'-Bioxirane)	N/A	U085	X	X	X	X			VARIES
N,N'-Diethylhydrazine (aka: Hydrazine,1,2-diethyl-)	N/A	U086	X	X	X	X			VARIES
O,O-Diethyl S-methyl dithiophosphate (aka: Phosphorodithioic acid, O,O-diethyl S-methyl ester)	N/A	U087	X	X	X	X			VARIES
Diethyl phthalate (aka: 1,2-Benzenedicarboxylic acid, diethyl ester)	N/A	U088	X	X	X	X			VARIES
Diethylstibestrol (aka: Phenol,4,4'-(1,2-diethyl-1,2-ethenediyl)bis-,(E)-)	N/A	U089	X	X	X	X			VARIES
Dihydrosafrole (aka: 1,3-Benzodixole, 5-propyl-)	N/A	U090	X	X	X	X			VARIES
3,3'-Dimethoxybenzidine (aka: (1,1'-Biphenyl)-4,4'-diamine,3,3'-dimethoxy-)	N/A	U091	X	X	X	X			VARIES
Dimethylamine (aka: Methanamine,N-methyl-)	N/A	U092	X	X	X	X	X		VARIES
P-Dimethylaminoazobenzene (aka: Benzenamine,N,N-dimethyl-4-(phenylazo)-)	N/A	U093	X	X	X	X			VARIES
7,12-Dimethylbenz[a]anthracene (aka: Benz[a]anthracene, 7,12-dimethyl-)	N/A	U094	X	X	X	X			VARIES
3,3'-Dimethylbenzidine (aka: (1,1'-Biphenyl)-4,4'-diamine,3,3'-dimethyl)	N/A	U095	X	X	X	X			VARIES
alpha, alpha-Dimethylbenzylhydroperoxide (aka: Hydroperoxide, 1-methyl-1-phenylethyl-)	N/A	U096	X	X	X	X			VARIES
Dimethylcarbamoxy chloride (aka: Carbamic chloride, dimtethyl-)	N/A	U097	X	X	X	X			VARIES
1,1-Dimethylhydrazine (aka: Hydrazine, 1,1-dimethyl)	N/A	U098	X	X	X	X			VARIES
1,2-Dimethylhydrazine (aka: Hydrazine, 1,2-dimethyl-)	N/A	U099	X	X	X	X			VARIES
2,4-Dimethylphenol (aka: Phenol, 2,4-dimethyl)	N/A	U101	X	X	X	X			VARIES
Dimethyl phthalate (aka: 1,2-Benzenedicarboxylic acid, dimethyl ester)	N/A	U102	X	X	X	X			VARIES
Dimethyl sulfate (aka: Sulfuric acid, dimethyl ester)	N/A	U103	X	X	X	X			VARIES
2,4-Dinitrotoluene (aka: Benzene, 1-methyl-2,4-dinitro-)	N/A	U105	X	X	X	X			VARIES
2,6-Dinitrotoluene (aka: Benzene,2-methyl-1,3-dinitro-)	N/A	U106	X	X	X	X			VARIES
Di-n-octyl-phthalate (aka: 1,2-Benzenedicarboxylic acid, dioctyl ester)	N/A	U107	X	X	X	X			VARIES
1,4-Dioxane (aka: 1,4-Diethylene oxide)	N/A	U108	X	X	X	X			VARIES
1,2-Diphenylhydrazine (aka: Hydrazine, 1,2-diphenyl-)	N/A	U109	X	X	X	X			VARIES
Dipropylamine (aka: 1-Propanamine, N-propyl-)	N/A	U110	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Di-n-propylnitroamine (aka: 1-Propanamine, N-nitroso-N-propyl)	N/A	U111	X	X	X	X			VARIES
Ethyl acetate (aka: Acetic acid, ethyl ester)	N/A	U112	X	X	X	X			VARIES
Ethyl acrylate (aka: 2-Propenoic acid, ethyl ester)	N/A	U113	X	X	X	X			VARIES
Ethylenebisdithiocarbamic acid, salts & esters (aka: Carbamodithioic acid, 1,2-ethanediyl-bis-, salts and esters	N/A	U114	X	X	X	X			VARIES
Ethylene oxide (aka: Oxirane)	N/A	U115	X	X	X	X	X	X	VARIES
Ethylenethiourea (aka: 2-Imidazolidinethione)	N/A	U116	X	X	X	X			VARIES
Ethyl ether (aka: Ethane, 1,1'-oxybis-)	N/A	U117	X	X	X	X			VARIES
Ethyl methacrylate (aka: 2-Propenoic acid, 2-methyl-, ethyl ester)	N/A	U118	X	X	X	X			VARIES
Ethyl methanesulfonate (aka: Methanesulfonic acid, ethyl ester)	N/A	U119	X	X	X	X			VARIES
Fluoranthene	N/A	U120	X	X	X	X			VARIES
Trichloromonofluoromethane (aka: Methane, trichlorofluoro-)	N/A	U121	X	X	X	X			VARIES
Formaldehyde	N/A	U122	X	X	X	X			VARIES
Formic acid	N/A	U123	X	X	X	X			VARIES
Furan (aka: Furfuran)	N/A	U124	X	X	X	X			VARIES
Furfural (aka: 2-Furancarboxaldehyde)	N/A	U125	X	X	X	X			VARIES
Glycidylaldehyde (aka: Oxiranecarboxyaldehyde)	N/A	U126	X	X	X	X			VARIES
Hexachlorobenzene (aka: Benzene, hexachloro-)	N/A	U127	X	X	X	X			VARIES
Hexachlorobutadiene (aka: 1,3-Butadiene, 1,1,2,3,4,4-hexachloro-)	N/A	U128	X	X	X	X			VARIES
Lindane (aka: Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1 alpha, 2 alpha, 3 beta, 4 alpha, 5 alpha, 6 beta)-)	N/A	U129	X	X	X	X			VARIES
Hexachlorocyclopentadiene (aka: 1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro)	N/A	U130	X	X	X	X			VARIES
Hexachloroethane (aka: Ethane, hexachloro-)	N/A	U131	X	X	X	X			VARIES
Hexachlorophene (aka: Phenol, 2,2'-methylenebis (3,4,6-trichloro-)	N/A	U132	X	X	X	X			VARIES
Hydrazine	N/A	U133	X	X	X	X	X	X	VARIES
Hydrogen fluoride (aka: Hydrofluoric acid)	N/A	U134	X	X	X	X	X	X	VARIES
Hydrogen sulfide (aka: Hydrogen sulfide H-S-H)	N/A	U135	X	X	X	X	X	X	VARIES
Cacodylic acid (aka: Arsinic acid, dimethyl-)	N/A	U136	X	X	X	X			VARIES
Indeno [1,2,3-cd]pyrene	N/A	U137	X	X	X	X			VARIES
Methyl iodide (aka: Methane, iodo-)	N/A	U138	X	X	X	X	X		VARIES
Isobutyl alcohol (aka: 1-Propanol, 2-methyl)	N/A	U140	X	X	X	X			VARIES
Isosafrole (aka: 1,3-Benzodioxole, 5-(1-propenyl)-)	N/A	U141	X	X	X	X			VARIES
Kepone (aka: 1,3,4-Metheno-2H-cyclobuta[cd] pentalen-2-one, 1,1a,3a,4,5,5,5a,5b,6-decachloroctahydro-)	N/A	U142	X	X	X	X			VARIES
Lasiocarpine (aka: 2-Butenoic acid, 2-methyl-, 7-[[(2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy] methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl ester [1S-[1 alpha(z'), 7 (2S*,3R*), 7a alpha]]-)	N/A	U143	X	X	X	X			VARIES
Lead acetate (aka: Acetic acid, lead (2+) salt)	N/A	U144	X	X	X	X			VARIES
Lead phosphate (aka: Phosphoric acid, lead (2+) salt (2:3))	N/A	U145	X	X	X	X			VARIES
Lead subacetate (aka: Lead bis (acetato-O) tetrahydroxytri-)	N/A	U146	X	X	X	X			VARIES
Maleic anhydride (aka: 2,5-Furandione)	N/A	U147	X	X	X	X			VARIES
Maleic hydrazine (aka: 3,6-Pyridazinedione, 1,2-dihydro-)	N/A	U148	X	X	X	X			VARIES
Malononitrile (aka: Propanedinitrile)	N/A	U149	X	X	X	X			VARIES
Melphalan (aka: L-Phenylalanine, 4-[bis (2-chloroethyl) amino]-)	N/A	U150	X	X	X	X			VARIES
Mercury	N/A	U151	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Methacrylonitrile (aka: 2-Propenenitrile, 2-methyl)	N/A	U152	X	X	X	X			VARIES
Methanethiol (aka: Thiomethanol)	N/A	U153	X	X	X	X			VARIES
Methanol (aka: Methyl alcohol)	N/A	U154	X	X	X	X	X	X	VARIES
Methapyrilene (aka: 1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-)	N/A	U155	X	X	X	X			VARIES
Methyl chlorocarbonate (aka: Carbonochloric acid, methyl ester)	N/A	U156	X	X	X	X			VARIES
3-Methylchloanthrene (aka: Benz [i] aceanthrylene, 1,2-dihydro-3-methyl-)	N/A	U157	X	X	X	X			VARIES
4,4'-Methylenebis (2-chloroaniline) (aka: Benzenamine, 4,4'-methylenebis [2-chloro-)	N/A	U158	X	X	X	X			VARIES
Methyl ethyl ketone (aka: 2-Butanone)	N/A	U159	X	X	X	X			VARIES
Methyl ethyl ketone peroxide (aka: 2-Butanone Peroxide)	N/A	U160	X	X	X	X			VARIES
Methyl isobutyl ketone (aka: Pentanol, 4-metyl) (aka: 4-Methyl-2-pentanone)	N/A	U161	X	X	X	X			VARIES
Methyl methacrylate (aka: 2-Propenoic acid, 2-methyl-, methyl ester)	N/A	U162	X	X	X	X			VARIES
MNNG (aka: Guanidine, N-methyl-N'-nitro-N-nitroso-)	N/A	U163	X	X	X	X			VARIES
Methylthiouracil (aka: 4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-)	N/A	U164	X	X	X	X			VARIES
Naphthalene	N/A	U165	X	X	X	X			VARIES
1,4-Naphthalenedione (aka: 1,4-Naphthoquinone)	N/A	U166	X	X	X	X			VARIES
1-Naphthalenamine (aka: alpha-Naphthylamine)	N/A	U167	X	X	X	X			VARIES
2-Naphthalenamine (aka: beta-Naphthylamine)	N/A	U168	X	X	X	X			VARIES
Nitrobenzene (aka: Benzene, nitro-)	N/A	U169	X	X	X	X			VARIES
p-Nitrophenol (aka: Phenol, 4-nitro-)	N/A	U170	X	X	X	X			VARIES
2-Nitropropane (aka: Propane, 2-nitro-)	N/A	U171	X	X	X	X			VARIES
N-Nitrosodi-n-butylamine (aka: 1-Butanamine, N-butyl-N-nitroso-)	N/A	U172	X	X	X	X			VARIES
N-Nitrosodiethanolamine (aka: Ethanol,2,2'-(nitrosoimino)bis-)	N/A	U173	X	X	X	X			VARIES
N-Nitrosodiethylamine (aka: Ethanamine, N-ethyl-N-nitroso-)	N/A	U174	X	X	X	X			VARIES
N-nitroso-N-ethylurea (aka: Urea, N-ethyl-N-nitroso-)	N/A	U176	X	X	X	X			VARIES
N-Nitroso-N-methylurea (aka: Urea, N-methyl-N-nitroso-)	N/A	U177	X	X	X	X			VARIES
N-Nitroso-N-methylurethane (aka: Carbamic acid, methylnitroso-ethyl ester)	N/A	U178	X	X	X	X			VARIES
N-Nitrosopiperidine (aka: Piperidine, 1-nitroso-)	N/A	U179	X	X	X	X			VARIES
N-Nitrosopyrrolidine (aka: Pyrrolidine, 1-nitroso)	N/A	U180	X	X	X	X			VARIES
5-Nitro-o-toluidine (aka: Benzenamine, 2-methyl-5-nitro)	N/A	U181	X	X	X	X			VARIES
Paraldehyde (aka: 1,3,5-Trioxane, 2,4,6-trimethyl-)	N/A	U182	X	X	X	X			VARIES
Pentachlorobenzene (aka: Benzene, pentachloro-)	N/A	U183	X	X	X	X			VARIES
Pentachloroethane (aka: Ethane, pentachloro-)	N/A	U184	X	X	X	X			VARIES
Pentachloronitrobenzene (PCNB) (aka: Benzene, pentachloro-nitro-)	N/A	U185	X	X	X	X			VARIES
1,3-Pentadiene (aka: 1-Methylbutadiene)	N/A	U186	X	X	X	X			VARIES
Phenacetin (aka: Acetamide, N-(4-ethoxyphenyl)-)	N/A	U187	X	X	X	X			VARIES
Phenol	N/A	U188	X	X	X	X			VARIES
Phosphorus sulfide (aka: Sulfur phosphide)	N/A	U189	X	X	X	X			VARIES
Phthalic anhydride (aka: 1,3-Isobenzofurandione)	N/A	U190	X	X	X	X			VARIES
2-Picoline (aka: Pyridine, 2-methyl)	N/A	U191	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Pronamide (aka: Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-)	N/A	U192	X	X	X	X			VARIES
1,3-Propane sultone (aka: 1,2-Oxathiolane, 2,2-dioxide)	N/A	U193	X	X	X	X			VARIES
n-Propylamine (aka: 1-Propanamine)	N/A	U194	X	X	X	X			VARIES
Pyridine	N/A	U196	X	X	X	X			VARIES
p-Benzoquinone (aka: 2,5-Cyclohexadiene-1,4-dione)	N/A	U197	X	X	X	X			VARIES
Reserpine (aka: Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxy-benzoyl)oxy]-, methyl ester, (3 beta, 16 beta, 17 alpha, 18 beta, 20 alpha)-)	N/A	U200	X	X	X	X			VARIES
1,3-Benzenediol (aka: Resorcinol)	N/A	U201	X	X	X	X			VARIES
1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide, and salts (aka: Saccharin, and salts)	N/A	U202	X	X	X	X			VARIES
Safrole (aka: 1,3-Benzodioxole, 5-(2-propenyl)-)	N/A	U203	X	X	X	X			VARIES
Selenious acid (aka: Selenium dioxide)	N/A	U204	X	X	X	X			VARIES
Selenium sulfide	N/A	U205	X	X	X	X			VARIES
Streptozotocin (aka: Glucopyranose, 2-deoxy-2-(3-methyl-3-nitroureido)-,D-) (aka: D-Glucose, 2-deoxy-2-[[methylnitrosoamino)-carbonyl)amino]-)	N/A	U206	X	X	X	X			VARIES
1,2,4,5-Tetrachlorobenzene (aka: Benzene, 1,2,4,5-tetrachloro-)	N/A	U207	X	X	X	X			VARIES
1,1,1,2-Tetrachloroethane (aka: Ethane,1,1,1,2-tetrachloro-)	N/A	U208	X	X	X	X			VARIES
1,1,2,2-Tetrachloroethane (aka: Ethane,1,1,2,2-tetrachloro-)	N/A	U209	X	X	X	X			VARIES
Tetrachloroethylene (aka: Ethene, tetrachloro-)	N/A	U210	X	X	X	X			VARIES
Carbon tetrachloride (aka: Methane, tetrachloro)	N/A	U211	X	X	X	X			VARIES
Tetrahydrofuran (aka: Furan, tetrahydro-)	N/A	U213	X	X	X	X			VARIES
Thallium (1) acetate (aka: Acetic acid, thallium (1+) salt)	N/A	U214	X	X	X	X			VARIES
Thallium (1) carbonate (aka: Carbonic acid, dithallium (1) salt)	N/A	U215	X	X	X	X			VARIES
Thallium chloride (aka: Thallium (1) chloride TICI)	N/A	U216	X	X	X	X			VARIES
Thallium (1) nitrate (aka: Nitric acid, thallium (1+) salt)	N/A	U217	X	X	X	X			VARIES
Thioacetamide (aka: Ethanethioamide)	N/A	U218	X	X	X	X			VARIES
Thiourea	N/A	U219	X	X	X	X			VARIES
Toluene (aka: Benzene, methyl-)	N/A	U220	X	X	X	X	X	X	VARIES
Toluenediamine (aka: Benzenediamine, ar-methyl-)	N/A	U221	X	X	X	X			VARIES
o-Toluidine hydrochloride (aka: Benzenamine, 2-methyl-, hydrochloride)	N/A	U222	X	X	X	X			VARIES
Toluene diisocyanate (aka: Benzene, 1,3-diisocyanatomethyl-)	N/A	U223	X	X	X	X			VARIES
Bromoform (aka: Methane, tribromo-)	N/A	U225	X	X	X	X			VARIES
Methyl chloroform (aka: Ethane, 1,1,1-trichloro-)	N/A	U226	X	X	X	X			VARIES
1,1,2-Trichloroethane (aka: Ethane, 1,1,2-trichloro-)	N/A	U227	X	X	X	X			VARIES
Trichloroethylene (aka: Ethene, trichloro-)	N/A	U228	X	X	X	X			VARIES
1,3,5-Trinitrobenzene (aka: Benzene, 1,3,5-trinitro-)	N/A	U234	X	X	X	X			VARIES
Tris (2,3-dibromopropyl) phosphate (aka: 1-Propanol, 2,3-dibromo-, phosphate 3:1))	N/A	U235	X	X	X	X			VARIES
Trypan Blue (aka: 2,7-Naphalenedisulfonic acid, 3,3'-[(3,3'-dimethyl [1,1'-biphenyl]-4.4'-diyl) bis (azo) bis-[5-amino-4-hydroxy]-tetrasodium salt)	N/A	U236	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Uracil mustard (aka: 2,4-(1H,3H)-Pyrimidinedione, 5-[bis(20chloroethyl)amino]-)	N/A	U237	X	X	X	X			VARIES
Ethyl carbamate (urethane) (aka: Carbamic acid, ethyl ester)	N/A	U238	X	X	X	X			VARIES
Xylene (aka: Benzene, dimethyl-)	N/A	U239	X	X	X	X			VARIES
2,4-D, salts and esters (aka: Acetic acid, (2,4-dichlorophenoxy)-, salts and esters)	N/A	U240	X	X	X	X			VARIES
Hexachloropropene (aka: 1-Propene, 1,1,2,3,3,3-hexachloro-)	N/A	U243	X	X	X	X			VARIES
Thiram (aka: Thioperoxydicarbonic diamide, tetramethyl-)	N/A	U244	X	X	X	X			VARIES
Cyanogen bromide	N/A	U246	X	X	X	X			VARIES
Methoxychlor (aka: Benzene, 1,1'-(2,2,2-trichloroethylidene) bis [4-methoxy-)	N/A	U247	X	X	X	X			VARIES
Warfarin, and salts, concentration < 0.3% (aka: 2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, and salts, concentration < 03.%)	N/A	U248	X	X	X	X			VARIES
Zinc phosphide, 10% or less	N/A	U249	X	X	X	X			VARIES
Benomyl (aka: Carbamic acid, [1-[(butylamino)carbonyl]-1H-benzimidazol-2-yl]-, methyl ester)	N/A	U271	X	X	X	X			VARIES
Bendiocarb (aka: 1,3-Benzodioxol-4-ol, 2,2-dimethyl-, methyl carbamate)	N/A	U278	X	X	X	X			VARIES
Carbaryl (aka: 1-Naphthalenol, methylcarbamate)	N/A	U279	X	X	X	X			VARIES
Barban (aka: Carbamic acid, (3-chlorophenyl)-, 4-chloro-2-butynyl ester)	N/A	U280	X	X	X	X			VARIES
o-Toluidine (aka: Benzenamine, 2-methyl-)	N/A	U328	X	X	X	X			VARIES
p-Toluidine (aka: Benzenamine, 4-methyl-)	N/A	U353	X	X	X	X			VARIES
Ethylene glycol monoethyl ether (aka: Ethanol, 2-ethoxy-)	N/A	U359	X	X	X	X			VARIES
Bendiocarb phenol (aka: 1,3-Benzodioxol-4-ol, 2,2-dimethyl-,)	N/A	U364	X	X	X	X			VARIES
Carbofuran phenol (aka: 7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-)	N/A	U367	X	X	X	X			VARIES
Carbendazim (aka: Carbamic acid, IH-benzimidazol-2-yl, methyl ester)	N/A	U372	X	X	X	X			VARIES
Propham (aka: Carbamic acid, phenyl-, 1-methylethyl ester)	N/A	U373	X	X	X	X			VARIES
Prosulfocarb (aka: Carbamothioic acid, dipropyl-, S-(phenylmethyl) ester)	N/A	U387	X	X	X	X			VARIES
Triallate (aka: Carbamothioic acid, bis ((1-methylethyl)-, S-(2,3,3-trichloro-2-propenyl) ester)	N/A	U389	X	X	X	X			VARIES
A2213 (aka: Ethanimidothioic acid, 2-(dimethylamino)-N-hydroxy-2-oxo-, methyl ester)	N/A	U394	X	X	X	X			VARIES
Diethylene glycol, dicarbamate (aka: Ethanol, 2,2'-oxybis-, dicarbamate)	N/A	U395	X	X	X	X			VARIES
Triethylamine (aka: Ethanamine, N,N-diethyl-)	N/A	U404	X	X	X	X			VARIES
Thiophanate-methyl (aka: Carbamic acid, [1,2-phenylenebis (iminocarbonothioyl)] bis-, dimethyl ester)	N/A	U409	X	X	X	X			VARIES
Thiodicarb (aka: Ethanimidothioic acid, N,N'-[thiobis [(methylimino) carbonyloxy]] bis-, dimethyl ester)	N/A	U410	X	X	X	X			VARIES
Propoxur (aka: Phenol, 2-(1-methylethoxy)-, methylcarbamate)	N/A	U411	X	X	X	X			VARIES
Wastes listed in 40 CFR 261.31	N/A	N/A	X	X	X	X			VARIES
Wastes listed in 40 CFR 261.32	N/A	N/A	X	X	X	X			VARIES

Table III-1A - Hazardous Wastes and Management Activities (Off Site Generated)

Verbal Description Of Waste (Off Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Waste Management Activities						Annual Quantity Generated and/or Received
			Off-site			On-site			
			Storage[1]	Processing [2]	Disposal	Storage[1]	Processing[2, 3]	Disposal [3,4]	
Class I wastes	N/A	N/A	X	X	X	X	X		VARIES
Class II wastes	N/A	N/A	X	X	X	X	X		VARIES
Municipal solid wastes	N/A	N/A	X	X	X	X			VARIES
Lab Packs	N/A	N/A	X	X	X	X	X[5]		VARIES
Organic gases	N/A	N/A	X	X	X	X	X[5]	X[5]	VARIES
Inorganic gases	N/A	N/A	X	X	X	X	X[5]	X[5]	VARIES
Organic liquids	N/A	N/A	X	X	X	X	X[5]		VARIES
Organic solids	N/A	N/A	X	X	X	X	X[5]		VARIES
Organic sludge	N/A	N/A	X	X	X	X	X[5]		VARIES
Aqueous inorganics	N/A	N/A	X	X	X	X	X[5]		VARIES
Inorganic sludges	N/A	N/A	X	X	X	X	X[5]		VARIES
Inorganic solids	N/A	N/A	X	X	X	X	X[5]		VARIES
Inorganic liquids	N/A	N/A	X	X	X	X	X[5]		VARIES
Class II regulated medical waste	N/A	N/A	X	X	X	X			VARIES

Notes:

[1] "Storage" means the holding of solid waste for a temporary period, at the end of which the waste is processed, disposed of, or stored elsewhere.

[2] "Processing" means the extraction of materials, transfer, volume reduction, conversion to energy, or other separation and preparation of solid waste for reuse or disposal, including the treatment or neutralization of hazardous waste, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material from the waste or so as to render such waste non-hazardous or less hazardous; safer for transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. The "transfer" of solid waste for reuse or disposal as used above, does not include the actions of a transporter in conveying or transporting solid waste by truck, ship, pipeline, or other means. Unless the Executive Director determines that regulation of such activity is necessary to protect human health or the environment, the definition of "processing" does not include activities relating to those materials exempted by the Resource Conservation and Recovery Act, 42 U.S.C. 6901 et seq., as amended.

[3] Represents wastes that are allowed to be managed in the Facility's treatment units.

[4] Disposal of oxygen only.

[5] For wastes without EPA codes that have an 'X' in their processing and/or disposal onsite box.

CFR - Code of Federal Regulations
EPA - Environmental Protection Agency
% - percent
lbs - pounds
TCEQ - Texas Commission of Environmental Quality

Table III-1B - Hazardous Wastes and Management Activities (On Site Generated)

			Waste Management Activities						
			Off-site				On-site		
Verbal Description Of Waste (On Site Generated)	TCEQ Waste For Code and Classification Code	EPA Hazardous Waste Number	Storage[1]	Processing[2]	Disposal	Storage[1]	Processing[2]	Disposal	Annual Quantity Generated (lbs) In 2019
Discarded wooden pallets	00164881	None			X	X			0
Activated carbon and filters from sampling vent hood (ha	0200404H	F001, F002, F003, F004, F005	X	X	X	X			1500
Mop water from roof leaks (hazardous)	0301114H	F001, F002, F003, F004, F005	X	X	X	X			6500
Floor sweepings	03023191	None			X				400
Personal protective equipment and debris (hazardous)	0550403H	F001, F002, F003, F004, F005	X	X	X	X			440
Mixed Lab Packs (hazardous)	0600003H	D001, D004, D005, D006, D007, D008, D009, D010, D011, D012, D013, D014, D015, D016, D017, D018, D019, D020, D021, D022, D023, D024, D025, D026, D027, D028 ,D029, D030, D031, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, D042, D043, F001, F002, F003 ,F004, F005, F006, F007, F008, F009, F010, F011, F012, F019, F024, F025, F026, F027, K019, K020, K022, K048, K049, K050, K051, K086, P004, P005, P012, P016, P020, P028, P029, P030, P037, P039, P044, P047, P048, P051, P059, P060, P069, P071, P089, P094, P098, P102, P105, P106, P108, P110, P118, P123, U001, U002, U003, U005, U006, U007, U008, U009, U012, U019, U020, U021, U022, U024, U028, U031, U034, U035, U036, U037, U038, U041, U043, U044, U051, U052, U055, U057, U067, U068, U070, U071, U072, U076, U077, U078, U080, U088, U092, U096, U108, U112, U113, U115, U117, U118, U119, U121, U122, U123, U125, U127, U128, U129, U131, U134, U140, U147 U151, U154, U159, U161, U162, U165, U170, U185, U188, U190, U196, U208, U210, U211, U213, U217, U220, U221, U223, U226, U227, U228, U239, U240, U244, U359	X	X	X	X			2672
Mixed Lab Packs (Non hazardous)	06500031	None			X	X			1300
Solid debris (glass, metal, stones, soil) / facility maintenance and cleanup.	0803319H	D001, D004, D005, D006, D007, D008, D009, D010, D011, D012, D013, D014, D015, D016, D017, D018, D019, D020, D021, D022, D023, D024, D025, D026, D027, D028 ,D029, D030, D031, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, D042, D043, F001, F002, F003 ,F004, F005	X	X	X	X			0
Liquid soaked debris / facility maintenance and cleanup.	0804319H	D001, D004, D005, D006, D007, D008, D009, D010, D011, D012, D013, D014, D015, D016, D017, D018, D019, D020, D021, D022, D023, D024, D025, D026, D027, D028 ,D029, D030, D031, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, D042, D043, F001, F002, F003 ,F004, F005	X	X	X	X			0
Solid Lab Waste including Flooe Sweepings (hazardous)	0900407H	D001, D002,D003, D004, D005, D006, D007, D008, D009, D010, D011, D012, D013, D014, D015, D016, D017, D018, D019, D020, D021, D022, D023, D024, D025, D026, D027, D028, D029, D030, D031, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, D042, D043, F001, F002, F003, F004, F005, P065, P092, P098, U151	X	X	X	X			0

Table III-1B - Hazardous Wastes and Management Activities (On Site Generated)

			Waste Management Activities						
			Off-site				On-site		
Verbal Description Of Waste (On Site Generated)	**TCEQ Waste For Code and Classification Code**	**EPA Hazardous Waste Number**	**Storage[1]**	**Processing[2]**	**Disposal**	**Storage[1]**	**Processing[2]**	**Disposal**	**Annual Quantity Generated (lbs) In 2019**
Empty fiber / plastic containers (Non hazardous)	11004061	None			X	X			0
Empty metal containers (Non hazardous)	12003081	None			X	X			0
Discarded aerosol cans, last contained paint (hazardous)	1300801H	D001, D035	X	X	X	X			200
Crushed metal, plastic paint cans and contaminated debris containing reesidual ro unusable paint from painting of warehouse floors.	1500403H	D001, D007, D008	X	X	X	X			0
Contaminated PPE and debris with PCB	18003941	None	X	X	X	X			0
Acidic Solution from treatment of basic wastes	2006110H	D002, U092	X	X	X	X			9000
Basic Solution from Hydrolysis	2007110H	D001,D002, D004, D010, P095, U006, U033, U138	X	X	X	X			25000
Cleanout of hydrolysis unit	2008113H	D001,D002, D004, D010, P095, U006, U033, U138	X	X	X	X			4000
Solvent Flush	2014204H	D001 D003, F003 F005	X	X	X	X			600
Class 1 waste / trash	20153191	None	X	X	X	X			80000
Non Hazardous Rinse from cylinders	20201191	None	X	X	X	X			400
Cylinders Inorganic non hazardous waste	20227011	None	X	X	X	X			50
Cylinders containing hazardous waste	2023801H	D001 D002 D003 D004 D010 D043 P031 P033 P056 P063 P076 P078 P095 P096 U006 U033 U043 U092 U098 U099 U115 U133 U134 U135 U154 U220	X	X	X	X			400
Cylinders containing non hazardous waste	20248011	None	X	X	X	X			5
Aerosols generated from commodity progrqm	2025801H	D001, D003	X	X	X	X			0
Sump water ontaminated with F032	2026101H	F032	X	X	X	X			0
Carbon from transfer of tanker load of RVFOR101B	2027310H	D018, D021, D027	X	X	X	X			0
Ballast from flourensent light tubes	20304971	None	X	X	X	X			0
Diesel from old fire tank	2031219H	D018	X	X	X	X			0
Dillution of reactives with solvent	2032219H	D001, P073	X	X	X	X			0
Inorganic hazardous waste gas	2033701H	D001 D002 D003 D004 D010 P031 P033 P056 P063 P076 P078 P095 P096 U006 U033 U092 U098 U099 U115 U133 U134 U135	X	X	X	X			1

Notes:

[1] "Storage" means the holding of solid waste for a temporary period, at the end of which the waste is processed, disposed of, or stored elsewhere.

[2] "Processing" means the extraction of materials, transfer, volume reduction, conversion to energy, or other separation and preparation of solid waste for reuse or disposal, including the treatment or neutralization of hazardous waste, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material from the waste or so as to render such waste non-hazardous or less hazardous; safer for transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. The "transfer" of solid waste for reuse or disposal as used above, does not include the actions of a transporter in conveying or transporting solid waste by truck, ship, pipeline, or other means. Unless the Executive Director determines that regulation of such activity is necessary to protect human health or the environment, the definition of "processing" does not include activities relating to those materials exempted by the Resource Conservation and Recovery Act, 42 U.S.C. 6901 et seq., as amended.

EPA - Environmental Protection Agency
lbs - pounds
TCEQ - Texas Commission of Environmental Quality

Table III-2 - Hazardous Waste Management Unit Checklist

Waste Management Unit	TCEQ N.O.R. Unit Number	Status[1]	Design Capacity (gallons)	Number of Years Utilized	Date in Service
Warehouse I Container Storage Area	1	Active	403,960	32	4/6/1988
Warehouse II Container Storage Area	3	Active	264,970	30	8/29/1989
Warehouse III Container Storage Area	4	Active	395,340	30	7/12/1990
Chemical Reactor Tank: R-1	26	Active	200	13	6/4/2007
Chemical Reactor Tank: R-1A	27	Active	500 / 1,500 (Proposed)	15	4/18/05
Cylinder Release Unit 1	28	Active	*	15	3/25/2005
Cylinder Release Unit 2	32	Proposed	*	NA	NA
Bulk Container Storage Area	33	Proposed	181,777	NA	NA

Notes:

[1] Indicate only one of the following: Active, Inactive, Closed, or Proposed
 Unit is a series of tubing, piping and valves from the cylinder connection to the atmosphere with no capacity to measure regarding storage or possessing – it is direct a release unit.

TCEQ - Texas Commission of Environmental Quality
NA - not applicable
N.O.R. - Notice of Registration

III.C.1

Attachment C

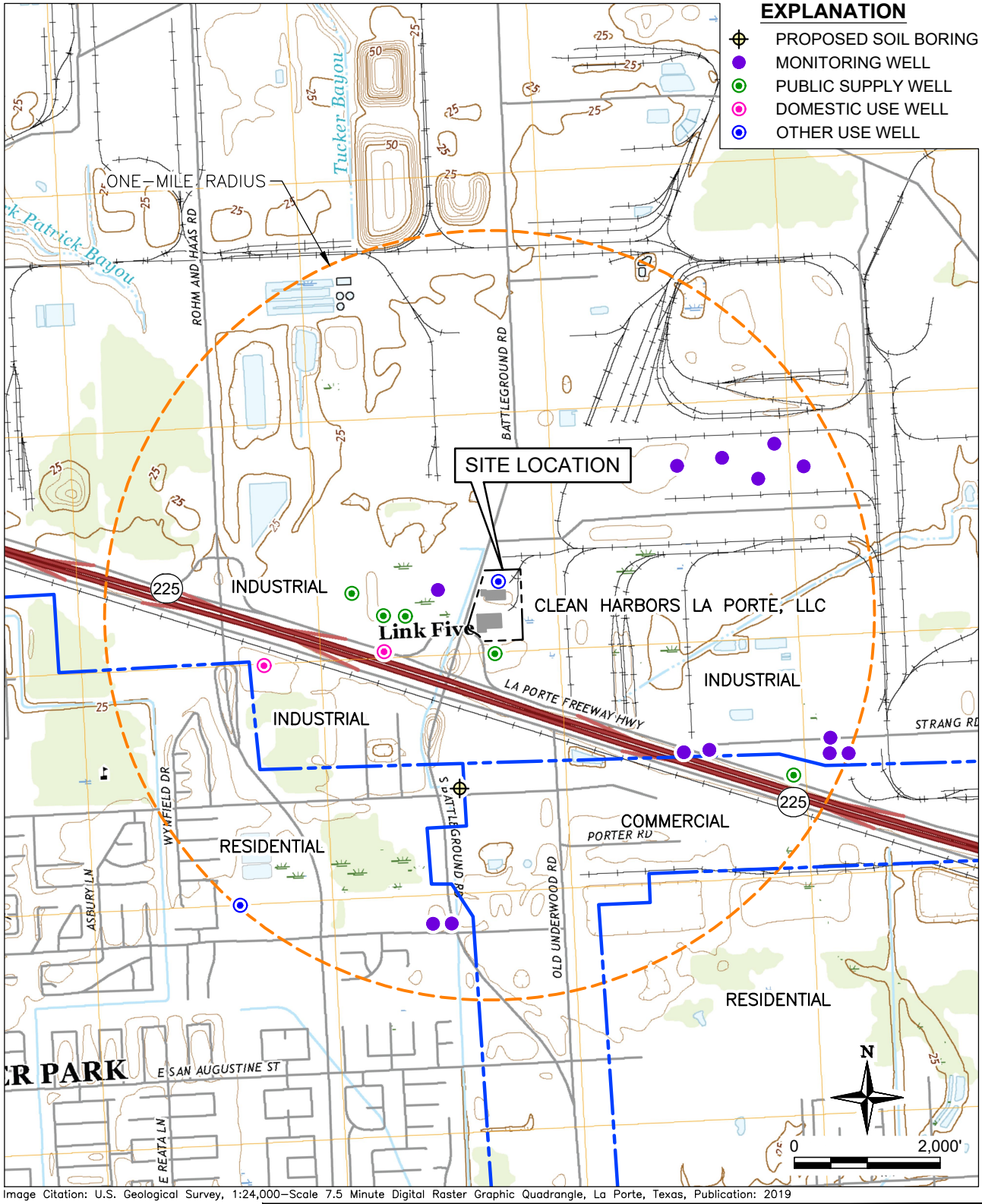
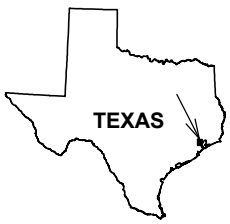


Image Citation: U.S. Geological Survey, 1:24,000–Scale 7.5 Minute Digital Raster Graphic Quadrangle, La Porte, Texas, Publication: 2019



QUADRANGLE LOCATION

Trihydro CORPORATION
1252 Commerce Drive
Laramie, Wyoming 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

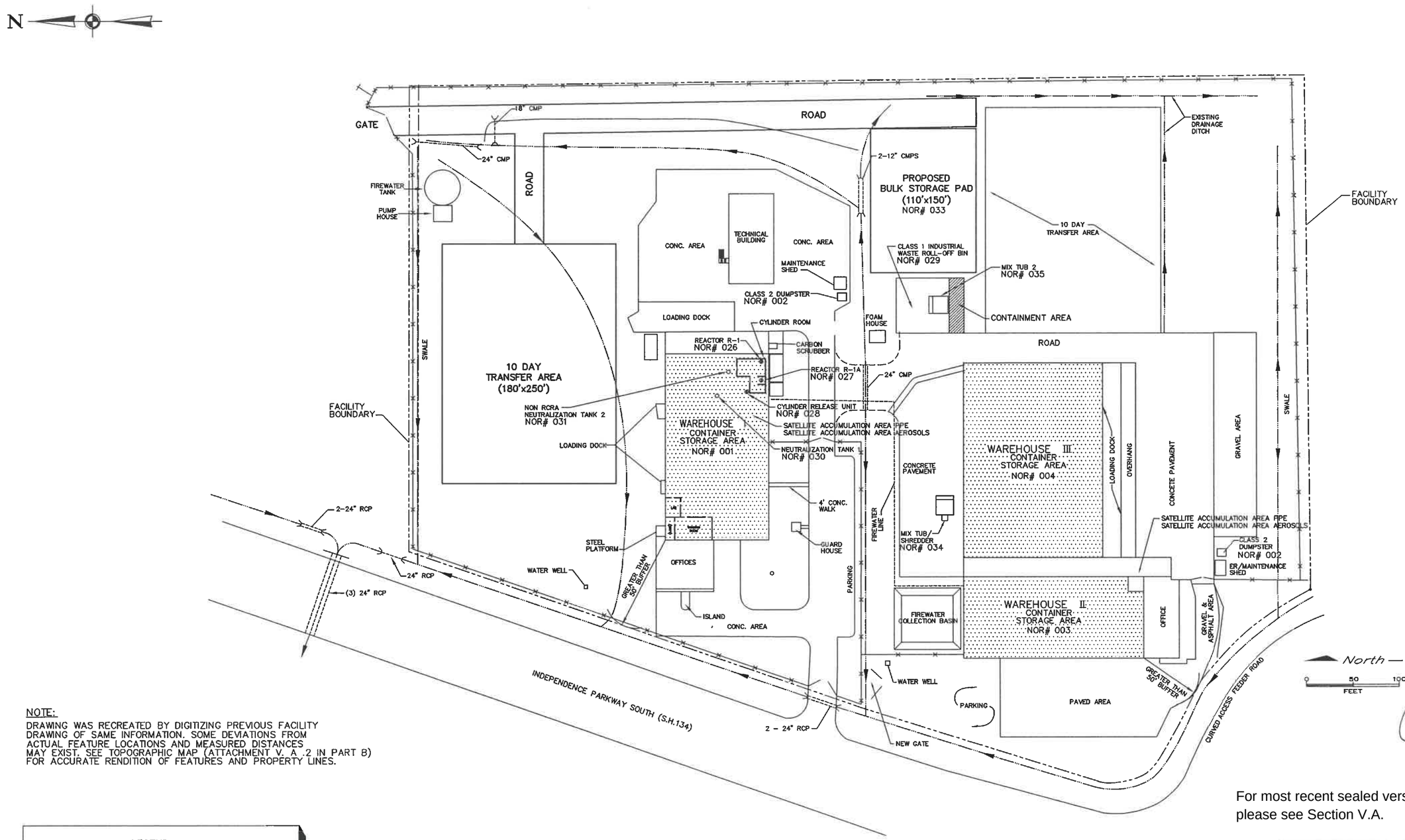
FIGURE 1

SITE LOCATION MAP

CLEAN HARBORS LA PORTE, LLC
500 INDEPENDENCE PKWY S, LA PORTE, TEXAS

Drawn By: PAC	Checked By: DC	Scale: 1" = 2,000'	Date: 5/19/2020	File: 69V-SITE-WELLS-LOCATON

M:\CTOF\CLEANHARBORS\LAPORTE\CADD_COREFILES\69V-SITE-WELLS-LOCATON



NOTE:

DRAWING WAS RECREATED BY DIGITIZING PREVIOUS FACILITY DRAWING OF SAME INFORMATION. SOME DEVIATIONS FROM ACTUAL FEATURE LOCATIONS AND MEASURED DISTANCES MAY EXIST. SEE TOPOGRAPHIC MAP (ATTACHMENT V. A .2 IN PART B) FOR ACCURATE RENDITION OF FEATURES AND PROPERTY LINES.

LEGEND

- FACILITY PROPERTY BOUNDARY
- CHAIN LINK FENCE
- BOUNDARY OF EXISTING CONTAINER STORAGE AREAS
- DRAINAGE CHANNEL FLOWLINE AND FLOW DIRECTION

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

For most recent sealed version please see Section V.A.

REFERENCE DRAWINGS

TITLE	DRAWING NO.

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
12	PERMIT RENEWAL 2020	KMC			D.A.D.	5/7/20	
11	ADDED NOR#34 & NOR#35	KMC		S.J.V.	D.A.D.	2/20/17	
10	CLASS I MODIFICATION	KMC			BR	3/21/14	
9	FENCE LINE MODIFICATION	KMC			BR	10/8/13	
8	CLASS II MODIFICATION	KMC			B.R.	2/15/13	
7	REMOVED "PROPOSED NOR# 032"	KMC			BR	8/10/12	
6	REMOVED "PROPOSED" FROM NOR# 030, ADDED NOR# 029 & NOR# 031	KMC			MC	12/29/09	

CleanHarbors
LAPORTE
500 Independence Parkway South
LaPorte, Texas 77571
Phone: (281) 727-7600

TITLE: OVERALL FACILITY PLAN

FILE: 30701101

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1 = 50	403-01A	12

III.C.2

Attachment D

Clean Harbors La Porte, LLC
RCRA Permit Application PART A
ATTACHMENT D - FACILITY PHOTOS

1. WAREHOUSE I NORTH
2. WAREHOUSE I WEST
3. WAREHOUSE I CYLINDER RELEASE UNIT
4. WAREHOUSE I R1 REACTOR TANK
5. WAREHOUSE I R1A REACTOR TANK
6. WAREHOUSE II NORTH
7. WAREHOUSE II SOUTH
8. WAREHOUSE II WEST
9. WAREHOUSE II BIOMED WASTE PROCESSING AREA
10. WAREHOUSE III EAST
11. WAREHOUSE III SOUTH
12. WAREHOUSE III HIGH HAZARD VAULT
13. PROPOSED LOCATION IN WAREHOUSE III FOR ADDITIONAL CYLINDER RELEASE UNIT
14. WAREHOUSE III LOADING DOCK
15. OUTDOOR STORAGE AREA (for 28 roll-off box storage - permitted; not constructed)

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

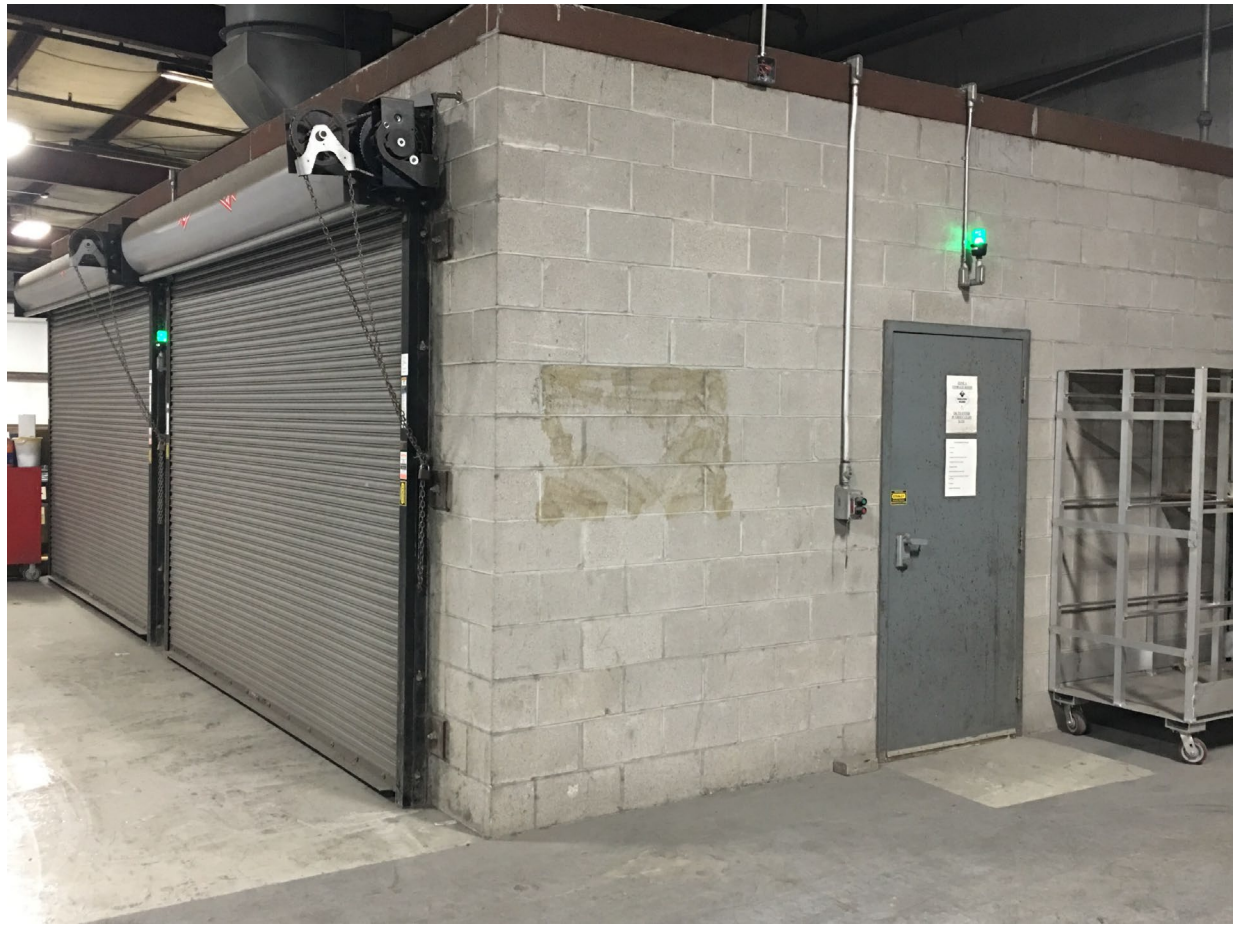


Photo 13

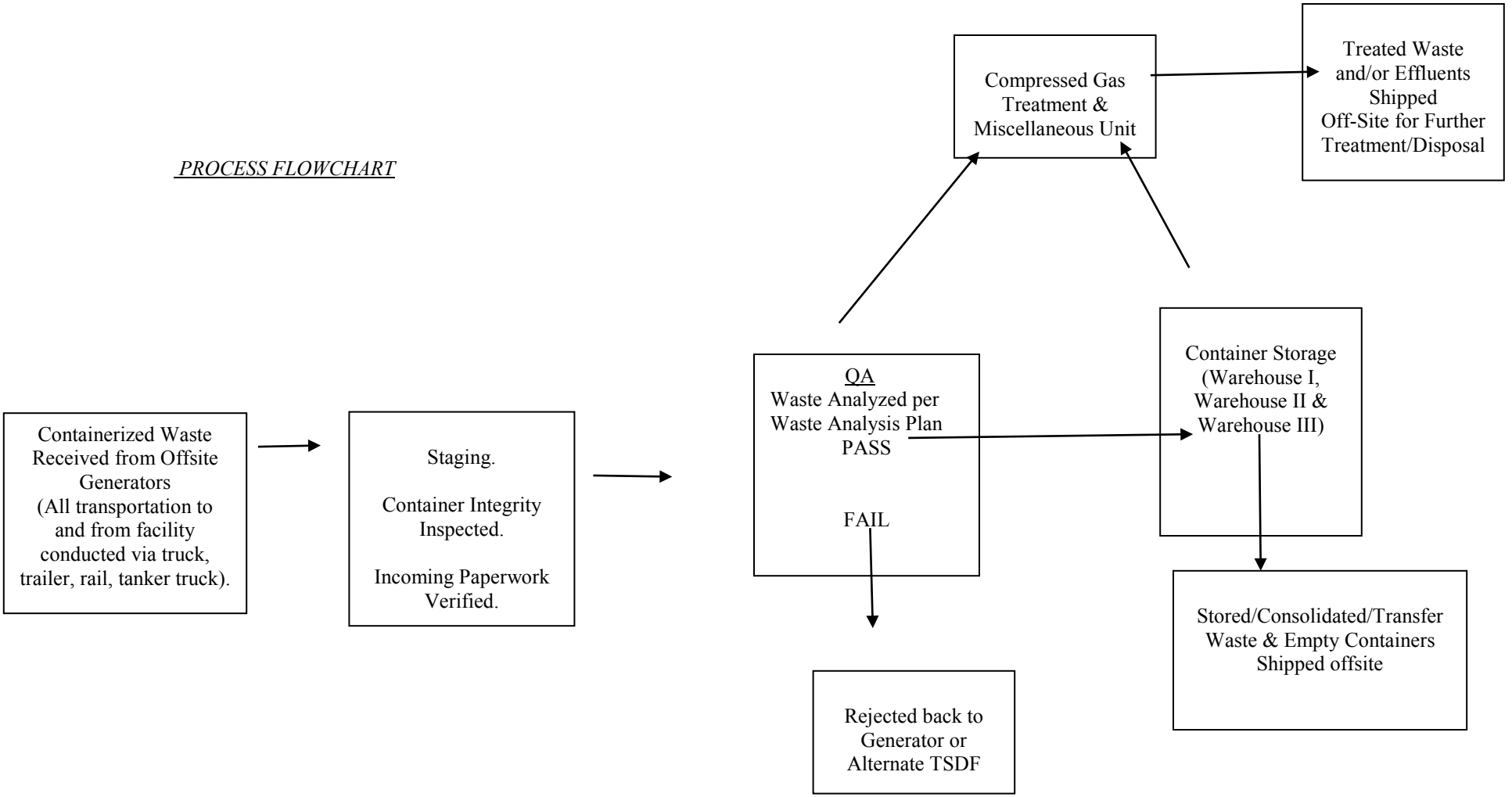
Photo 14

Photo 15

III.D

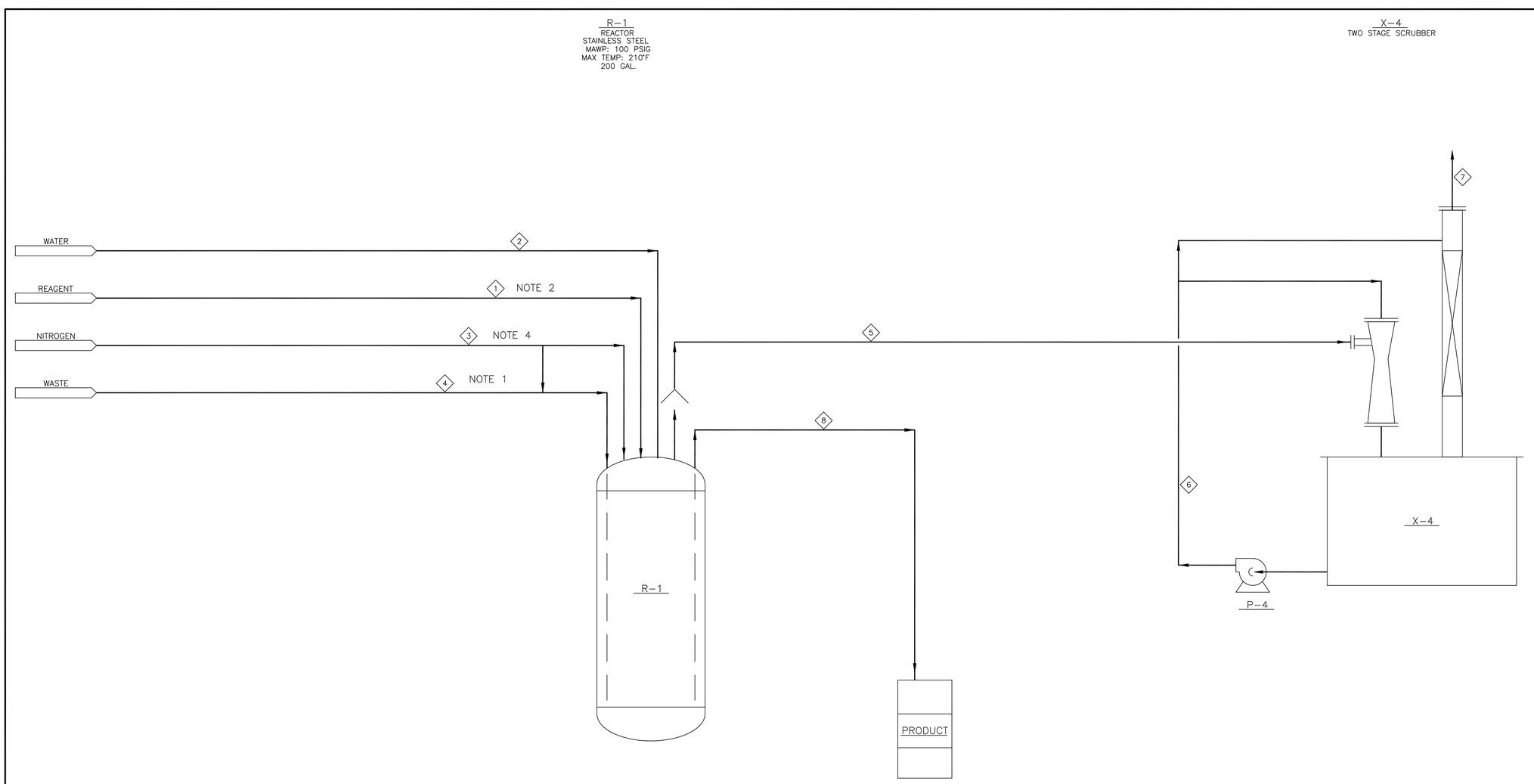
Attachment E

PROCESS FLOWCHART



Clean Harbors La Porte, LLC
500 Independence Parkway South
La Porte, TX 77571
Phone: (281) 884-5500

TITLE: PROCESS FLOWCHART FOR CONTAINERIZED WASTES RECEIVED, STORED, TREATED & TRANSFERRED OFFSITE



STREAM NO.	1	2	3	4	5	6	7	8
STREAM NAME	REAGENT NaOH SOLUTION	WATER	NITROGEN	WASTE NITROSYL FLUORIDE	VENT GAS	SCRUBBER LIQUID	VENT GAS	PRODUCT
MOLECULAR WEIGHT	40	18	28	49	28	18	28	–
SPECIFIC GRAVITY	1.50	–	–	–	–	1.3	–	1.20
LIQUID (USGPM)	5.0	100	–	–	–	[50]	–	105
GAS/VAPOR (SCFM)	–	–	20	5.7	200	–	200	–
MASS FLOW (LBS/BATCH)	63	834	–	38	–	417	750	897
TEMPERATURE (°F)	68	60	60	–	140	70	80	120
PRESSURE (PSIA)	14.7	25.0	24.7	–	14.6	29.7	14.7	14.7
(IN.WC)	–	–	–	–	–2	–	2	–

FIGURE V.C.–17

NOTES:
1. INORGANIC GASES, LIQUIDS OR SOLIDS WILL BE PROCESSED IN R–1. EXAMPLES INCLUDE, HYDRIDE GASES, CYANIDE BEARING WASTE, CORROSIVE GASES AND LIQUIDS, CORROSIVE OXIDIZERS AND FLAMMABLE GASES.
2. TREATMENT REAGENT VARIES BASED ON MATERIAL BEING TREATED. PFD SHOWS TREATMENT FOR NITROSYL FLUORIDE AS AN EXAMPLE.
3. WASTE IS TREATED BATCHWISE.
4. NITROGEN IS USED FOR PURGING THE LINES AND VESSEL PRIOR TO AND AFTER PROCESSING.

REFERENCE DRAWINGS

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
E	RCRA PART B PERMIT RENEWAL	KMC	3/26/20	D.A.D.
D	REVISED TITLE BLOCK	KMC	7/30/09	MAR
C	FOR APPROVAL	WDS	9/25/03	

CleanHarbors® LAPORTE

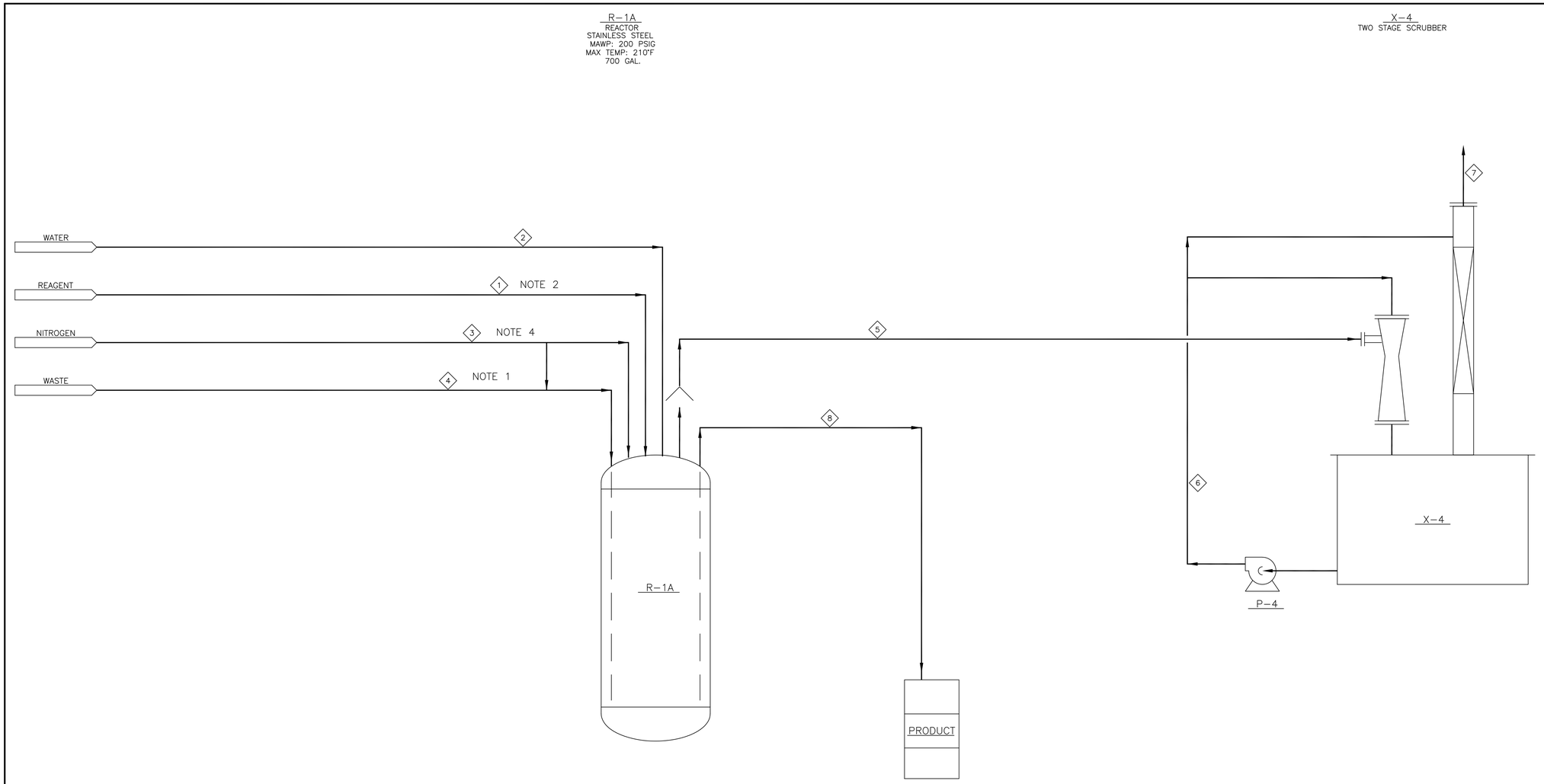
DRAWN	CHECKED	SCALE	DATE
WDS		NTS	8/8/03

TITLE L201PF001

CLEAN HARBORS LAPORTE PROCESS FLOW DIAGRAM CHEMICAL TREATMENT

DRAWING NO. L–201–PF–001–D

REV. E



STREAM NO.	1	2	3	4	5	6	7	8
STREAM NAME	REAGENT NaOH SOLUTION	WATER	NITROGEN	WASTE NITROSYL FLUORIDE	VENT GAS	SCRUBBER LIQUID	VENT GAS	PRODUCT
MOLECULAR WEIGHT	40	18	28	49	28	18	28	–
SPECIFIC GRAVITY	1.50	–	–	–	–	1.3	–	1.20
LIQUID (USGPM)	15.0	300	–	–	–	[50]	–	315
GAS/VAPOR (SCFM)	–	–	20	17.2	200	–	200	–
MASS FLOW (LBS/BATCH)	188	2502	14	115	–	417	750	2690
TEMPERATURE (°F)	68	60	60	–	140	70	80	120
PRESSURE (PSIA)	14.7	25.0	24.7	–	14.6	29.7	14.7	14.7
(IN.WC)	–	–	–	–	–2	–	2	–

FIGURE V.C.–18

NOTES:
1. INORGANIC GASES, LIQUIDS OR SOLIDS WILL BE PROCESSED IN R–1. EXAMPLES INCLUDE, HYDRIDE GASES, CYANIDE BEARING WASTE, CORROSIVE GASES AND LIQUIDS, CORROSIVE OXIDIZERS AND FLAMMABLE GASES.
2. TREATMENT REAGENT VARIES BASED ON MATERIAL BEING TREATED. PFD SHOWS TREATMENT FOR NITROSYL FLUORIDE AS AN EXAMPLE.
3. WASTE IS TREATED BATCHWISE.
4. NITROGEN IS USED FOR PURGING THE LINES AND VESSEL PRIOR TO AND AFTER PROCESSING.

REFERENCE DRAWINGS

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
E	RCRA PART B PERMIT RENEWAL	KMC	3/26/20	D.A.D.
D	REVISED TITLE BLOCK	KMC	7/30/09	MAR
C	FOR APPROVAL	WDS	9/25/03	

CleanHarbors® LAPORTE

DRAWN	CHECKED	SCALE	DATE
WDS		NTS	8/8/03

TITLE L201APF001

CLEAN HARBORS LAPORTE
PROCESS FLOW DIAGRAM
CHEMICAL TREATMENT

DRAWING NO. L–201A–PF–001–D

REV. E

IV. Index Of Attachments

List and index below all attachments to this application and indicate if included or not included:

Item	Attachments	Attachment	Included	Not Included
I.D.2.a	Lease/Option to buy	A		X*
I.H	Core Data Form	Appendix 1	X	
II.B	Site legal description	B	X	
III.C.1	Facility boundaries and adjacent waters map	C	X	
III.C.2	Photographs	D	X	
III.D	Process flow diagram/description	E	X	
III.A.2	Hazardous Wastes and Management Activities	Tables III-1A and III-1B	X	
III.B.2	Hazardous Wastes Management Unit Checklist	Table III-2	X	

*Attachment A is not included because Clean Harbors owns the facility.

Table III-1A and III-B – Hazardous Wastes and Management Activities

As required, TABLE III-1 lists all hazardous wastes, all mixtures containing any hazardous wastes and hazardous debris, which were, are, or proposed to be handled at this site. For clarification purposes, the table is being broken into two sections, TABLE III-1A and TABLE III-1B. This will better reflect the operations occurring at this site.

TABLE III-1A: (Off site generated)

This table represents all containerized wastes received from off-site generators for storage and then shipment off-site for treatment and/or disposal. Due to the infinite types and mixtures of wastes that Clean Harbors LaPorte may receive and the fact that all wastes could be managed in any active waste management unit permitted for such codes, only the EPA waste codes are presented in this table. The TCEQ assigned sequence numbers and TX waste codes are not listed, as these are assigned by the generators who ship these materials and again occur in infinite varieties. Annual amount received varies but since all waste received from off site is reported monthly via WRS online entry via STEERS and accounted for with applicable TX waste codes, EPA waste codes and generator information – it was not provided on this table.

TABLE III-1B: (On site generated)

This table lists all of the wastes that are generated on-site. These wastes are generated as a result of operations occurring on-site and may or may not be related to the hazardous waste management activities occurring on-site. Annual amount generated varies but since these wastes are listed on the Notice of Registration (NOR) and reported on the Annual Waste Summary – it was not provided on this table.

Texas Commission on Environmental Quality
Permit Application for Industrial and Hazardous Waste Storage/Processing/Disposal Facility with Compliance Plan

Part B Application

The TCEQ is committed to accessibility. You may request an accessible version of these documents, by contacting the Industrial and Hazardous Waste permits section program at (512)-239-2335 or by email at ihwper@tceq.texas.gov.

Disclaimer:

This document is intended for use in the RCRA Part B application preparation and review process. It contains a screening sheet that will produce a customized Part B application outline that is based on a facility's specific operating characteristics. This screening sheet and application outline are not a substitute for required application materials. This document may omit requirements applicable to the facility and/or include requirements that are not applicable. Please use the knowledge about the facility's operational design and history to ensure that a complete application based on 40 Code of Federal Regulations Part 270 and 30 Texas Administrative Code (TAC) Chapter 305 and Chapter 335 is submitted. Please include any necessary information that may have been mistakenly screened out. If regulatory requirements change during the application process, the TCEQ may request additional information before a permit is issued.

Quick Start Instructions for Part B Application with Screening Tool

Go to screening sheet

View Entire Application

Screening Sheet for Industrial and Hazardous Waste Permitted Facilities.

Please provide a response to all items. **Note: depending on certain selections you make, answers to some questions will automatically default to "No" but some questions will remain to be answered by the user as "Yes" or "No", and if the user does not provide a "Yes" or "No" answer, the application will be generated as if answered "Yes".** It is critical that each response is accurate to ensure retrieval of all applicable application items. If you need to change any response after the initial answer, change the answer and the application will update the application. Print (electronic or physical) a copy of the application materials to create the physical appendix format of your application.

Please answer Questions 1 through 11 and DO NOT leave any questions) unanswered to ensure an complete application.

1.	Is this an application for a compliance plan only?	○	Yes	◉	No
2.	Is this permit for post-closure care only?[1]	○	Yes	◉	No
3.	Is this an application for a compliance plan and post-closure care only?	○	Yes	◉	No
4.	Is this an application for WMU(s) with a compliance plan?[2]	○	Yes	◉	No
5.	Is this an application for WMU(s) with post-closure care?	○	Yes	◉	No
6.	Is this an application for WMU(s), with compliance plan and post-closure care?	○	Yes	◉	No
7.	Is this an application for WMU(s) only?	◉	Yes	○	No
	Any Land Based Units?	○	Yes	◉	No
	Surface Impoundments	○	Yes	◉	No
	Waste Piles	○	Yes	◉	No
	Land Treatment Units	○	Yes	◉	No
	Landfills[3]	○	Yes	◉	No
	Container Storage Areas	◉	Yes	○	No
	Tank and Tank Systems	◉	Yes	○	No
	Incinerators	○	Yes	◉	No
	Boilers/Industrial Furnaces	○	Yes	◉	No
	Drip Pads	○	Yes	◉	No
	Containment Buildings	○	Yes	◉	No
	Miscellaneous Units[4]	◉	Yes	○	No
8.	Is this a new commercial facility?	○	Yes	◉	No
9.	Is this a "One-Stop" application with air provisions?	○	Yes	◉	No
10.	Is this facility military, federal, or state owned?	○	Yes	◉	No
11.	Does the application contain Confidential Materials?	○	Yes	◉	No

Reset All Screening Questions | Jump to Table of Content(s) / Applicable Tables | Generate Application and Save

1 - If "Yes" is indicated for Post-Closure Care only, then all non-land-based units above will default to "No". Additionally if "Yes" is indicated for Post-Closure Care only, then at least one Land-Based Unit must be "Yes."

2 - If "Yes" is indicated for Active Permit Unit(s) with a Compliance Plan, then at least one unit must be "Yes."

3 - Select "Landfills- Yes" for any land-based unit that was closed as a landfill. (Example Surface Impoundment closed s a landfill.)

4 - For Miscellaneous Units, select "yes" and also select "Yes for the appropriate unit types (s) shown above. Address all applicable engineering requirements (e.g., landfill requirements from Section V.G) in Section V.K.

WMU- Waste Management Unit

Texas Commission on Environmental Quality
Permit Application for Industrial and Hazardous Waste Storage/Processing/Disposal Facility with Compliance Plan

Customized Part B Application

Form Availability:

This form, as well as other Industrial and Hazardous Waste documents, Part B electronic checklist, and pertinent rules, is available on the Internet. The TCEQ Home Page is at: https://www.tceq.texas.gov. Once you have accessed the home page, select "Forms and Publications" and follow the system prompts. The number for this form is 00376. Questions may be e-mailed to ihwper@tceq.texas.gov.

Introduction:

This permit application is generally a reorganized summary of the Part B information requirements of 40 CFR Part 270 and 30 Texas Administrative Code (TAC) Chapter 305 Subchapters C and D and Chapter 335. The TCEQ may request additional information before a permit is issued, if regulatory requirements change.

The original application plus all copies for New, Renewals, Major Amendments and Class 3 Modifications should be submitted to:

Texas Commission on Environmental Quality
Attention: Waste Permits Division, MC 126
P. O. Box 13087
Austin, Texas 78711-3087

The original application plus all copies for Class 1, Class 1[1], Class 2 Modifications and Minor Amendments should be submitted to:

Texas Commission on Environmental Quality
Attention: Industrial and Hazardous Waste Permits Section, MC 130
Waste Permits Division
P. O. Box 13087
Austin, Texas 78711-3087

Telephone Inquiries:

(512) 239 - 2335 (For RCRA permit application) - Industrial & Hazardous Waste Permits Section, Waste Permits Division

(512) 239 - 6412 (For industrial and hazardous waste classification) - Technical Analysis Team, Industrial & Hazardous Waste Permits Section, Waste Permits Division

(512) 239 - 6413 (For solid waste registration number, EPA identification number, and notice of registration) - Registration and Reporting Section, Permitting and Registration Support Division

(512) 239 - 0272 (For non-combustion units) - Chemical New Source Review Permits

Section, Air Permits Division

(512) 239 - 1583 (For combustion units) - Energy/Combustion New Sources Review Permits Section, Air Permits Division

(512) 239 - 0600 (For legal) - Environmental Law Division

(512) 239 - 6150 (For financial assurance) - Financial Assurance Unit, Revenue Operations Section, Financial Administration Division

(512) 239 - 0300 (For payment of permit application fees) - Cashier's Office, Revenue Operations Section, Financial Administration Division

(512) 239 - 2201 (For compliance plan or corrective action) - Voluntary Cleanup Program/Corrective Action Section, Remediation Division

Application Review Prohibition:

The Texas Commission on Environmental Quality (TCEQ) shall not review an application for a new commercial hazardous waste facility, and the application shall be deemed not to have been received, until the emergency response information required by Section III.F. of the application has been reviewed and declared by TCEQ staff to be complete and satisfactory. [30 TAC 281.26, 30 TAC 305.50(a)(12)(C) and (D)]

Permit Issuance Prohibited [30 TAC 335.205]:

The TCEQ shall not issue a permit for:

1. a new hazardous waste management facility or an areal expansion of an existing facility if the facility or expansion does not meet the requirements of 30 TAC 335.204 (relating to Unsuitable Site Characteristics);
2. a new hazardous waste landfill or the areal expansion of an existing hazardous waste landfill if there is a practical, economic, and feasible alternative to such a landfill that is reasonably available to manage the types and classes of hazardous waste which might be disposed of at the landfill;
3. a new commercial hazardous waste management facility as defined in 30 TAC 335.202 (relating to Definitions) or the subsequent areal expansion of such a facility or unit of that facility if the owner/operator proposes to locate the boundary of the unit within 0.5 of a mile (2,640 feet) of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park;
4. a new commercial hazardous waste management facility that is proposed to be located at a distance greater than 0.5 mile (2,640 feet) from an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park unless the applicant demonstrates to the satisfaction of the commission that the facility will be operated so as to safeguard public health and welfare and protect physical property and the environment, at any distance beyond the facility's property boundaries;
5. a proposed hazardous waste management facility, or a capacity expansion of an existing hazardous waste management facility if a fault exists within 3,000 feet of the proposed hazardous waste management facility or of the capacity expansion of an existing hazardous waste management facility unless the applicant performs the demonstration found in 30 TAC 305.50(a)(4)(D) and 305.50(a)(10)(E) ; and

6. A proposed solid waste facility for the processing or disposal of municipal hazardous waste or industrial solid waste which is located within an area of a municipality or county in which the processing or disposal of municipal hazardous waste or industrial solid waste is prohibited by an ordinance or order. [Texas Health and Safety Code Section 363.112]

See 30 TAC 335 Subchapter G: Location Standards for Hazardous Waste Storage, Processing, or Disposal for additional details and information regarding items 1 through 5 above.

Completing The Application and Electronic Checklist:

Prior to submitting a new permit application, please contact the TCEQ Permitting and Registration Support Division to obtain a Solid Waste Registration Number and an EPA Identification Number for inclusion in Section I.A. of this application. The facility's Solid Waste Registration Number may be proposed in Section I.A. as the Permit Number

This permit application form has been designed to solicit specific information, with reports to be attached or inserted. A response must be made for each informational request in the application form. If an item is not applicable please state "not applicable" and explain. All information included in the application must be listed by the format of the application. For example, if an engineering report is attached to the application to fulfill the requirements of Section V, then each subsection of the engineering report must correlate with the corresponding subsection in the application form (e.g., Subsection V.A.3. of the report would be proposed construction schedules). If information is provided which does not correspond with the application form, the specific rule or regulation which requires submittal of the information must be cited. Each report should be attached behind the summary form or table for the report and submitted as one document with the pages sequentially numbered at the bottom. Maps, bluelines, and drawings that cannot be folded to 8-1/2" x 11" may be submitted as separate documents. Engineering plans and specifications submitted with an application must be approved and sealed by a licensed Professional Engineer, with current license and designating the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act. Geology reports, geologic maps, and geologic cross-sections submitted with an application must be approved and sealed by a licensed Professional Geologist, with current license required by the Texas Geoscience Practice Act. Complete the tables in this application rather than substituting.

Facilities which will receive industrial and hazardous wastes from off-site sources must also provide information on these wastes and associated waste management units in accordance with 30 TAC 335.2.

In addition, the electronic checklist has been designed to facilitate the application preparation and review process, and should be completed and submitted along with applicable applications (see “Submittal” below).

For those who pre-filed a Part A application, certain items may have been omitted. These omissions must be addressed at this time. Additionally, if hazardous waste management methods have changed since the filing of the Part A, please provide an updated Part A.

Pursuant to Section 361.067 of the Texas Health and Safety Code, the TCEQ is required to mail a copy of this application or a summary of its contents to other regulatory agencies. Section I may be considered a summary of the entire application provided that all questions are completely answered. Therefore, Section I responses must not rely solely on cross-references to other sections of the application.

Groundwater Contamination:

If groundwater monitoring has detected the presence of hazardous constituents in the facility groundwater, the owner or operator must submit a Compliance Plan Application that is included as Section XI of this application. For more detailed instructions concerning a Compliance Plan, please see Section XI.

Submittal:

The complete application should be prepared using PDF and word processing. The third copy in the submittal package should consist of paper copies or PDF files of all surveys, reports, plot plans, diagrams, P&IDs, maps, etc., and a Compact Disk (CD) of the completed application form document and tables included in this application attachments. Files may be compressed using PKZIP Ver. 2 or a 100% compatible program. For Renewal, Amendment, and Modification applications, the PDF files should include both a finalized version and, where available, a redline/strikeout version clearly identifying all proposed changes from the existing permit. For revised application sections and incorporated documents where redline/ strikeout versions are not available, submit a detailed listing of all proposed changes to the existing permit. In addition, the submitted electronic version of the application should be easily searchable during the review process by TCEQ staff.

For a new permit application or renewal, submit:

1. an original updated Part A permit application plus three (3) full copies;
2. the original Part B application plus three (3) full copies (including the electronic third copy);
3. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division;
4. Pre-printed mailing labels of the adjacent landowners or an electronic mailing list on Compact Disk (CD) in MS Word format; and
5. Completed RCRA Part B Administrative and Technical Evaluation Electronic Checklist (Form #00136) on CD, DVD, or USB drive.

For a new compliance plan or renewal of an existing compliance plan, please submit the following in addition to the above:

1. Sections I and XI.A. through XI.E., as applicable;
2. Tables XI.A.I., XI.E.1 through XI.E.III, and CP Tables I, II, V, VI through IX, are required; and CP Tables IIIA, IIIA, IV and IVA as applicable. The applicant should use the PDF formatted Tables provided in the Part B application to include site-specific information that will become part of the final draft permit; and
3. a Sampling and Analysis Plan (SAP) compliant with "Attachment A" requirements and evaluation of monitoring wells compliant with "Attachment B" well specification requirements.

For a post-closure care permit submit:

1. an original updated Part A permit application plus three (3) full copies;
2. the original Part B application (excluding Sections III B and F; IV A, C and D; VII A and B; VIII.B and C; and X) plus three (3) full copies;
3. a check for payment of permit application fees transmitted directly to the

TCEQ

Financial Administration Division;

4. pre-printed mailing labels of the adjacent landowners or an electronic mailing list on Compact Disk (CD) in MS Word format; and
5. Completed RCRA Part B Administrative and Technical Evaluation Electronic Checklist (Form #00136) on CD, DVD, or USB drive.

For major amendments to an issued hazardous waste permit, submit:

1. (if appropriate) an original updated Part A permit application plus three (3) full copies;
2. an original Part B application plus three (3) full copies, consisting of, at a minimum, Section I - Table I of the Part B plus replacement pages for the changed portions of the application that change as a result of the amendment;
3. an explanation of why the major amendment is needed;
4. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division;
5. pre-printed mailing labels of the adjacent landowners or an electronic mailing list on Compact Disk (CD) in MS Word format; and
6. Completed RCRA Part B Administrative and Technical Evaluation Electronic Checklist (Form #00136) on CD, DVD, or USB drive.

For minor amendments to an issued hazardous waste permit, submit:

1. (if appropriate) an original updated Part A permit application plus three (3) full copies;
2. an original Part B application plus three (3) full copies, consisting of, at a minimum, Section I-Table I of the Part B plus replacement pages for the changed portions of the application that change as a result of the amendment;
3. an explanation of why the minor amendment is needed;
4. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division; and
5. pre-printed mailing labels of the adjacent landowners or an electronic mailing list on diskette on Compact Disk (CD) in MS Word format.

For Class 3 modifications (including adding or revising a Compliance Plan) to an issued hazardous waste permit, submit:

1. (if appropriate) an original updated Part A permit application plus three (3) full copies;
2. an original Part B application plus three (3) full copies, consisting of, at a minimum, Section I - Table I of the Part B plus replacement pages for the changed portions of the application that change as a result of the modification;
3. a description of the exact changes to be made to the permit conditions and supporting documents referenced by the permit;
4. an explanation of why the Class 3 modification is needed;

5. evidence of the public notice mailing and publication (after the public meeting, please submit a statement that the public meeting was held within the required timeframes);

   a. Evidence of public notice mailing to Adjacent Landowners requires submittal of copies of mail.

6. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division;

7. pre-printed mailing labels of the adjacent landowners or an electronic mailing list on Compact Disk (CD) in MS Word format; and

8. Completed RCRA Part B Administrative and Technical Evaluation Electronic Checklist (Form #00136) on CD, DVD, or USB drive.

For Class 2 modifications to an issued hazardous waste permit, submit:

1. (if appropriate) an original updated Part A permit application plus three (3) full copies;

2. an original Part B application plus three (3) full copies, consisting of, at a minimum, Section I - Table I of the Part B plus replacement pages for the changed portions of the application that change as a result of the modification;

3. a description of the exact changes to be made to the permit conditions and supporting documents referenced by the permit;

4. an explanation of why the Class 2 modification is needed;

5. evidence of the public notice mailing and publication (after the public meeting, please submit a statement that the public meeting was held within the required timeframes);

6. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division; and

7. pre-printed mailing labels of the adjacent landowners or an electronic mailing list on diskette on Compact Disk (CD) in MS Word format.

For Class 1[1] modifications to an issued hazardous waste permit, submit:

1. (if appropriate) an original updated Part A permit application plus three (3) full copies;

2. an original Part B application plus three (3) full copies, consisting of, at a minimum, Section I - Table I of the Part B plus replacement pages for the changed portions of the application that change as a result of the modification;

3. a description of the exact changes to be made to the permit conditions and supporting documents referenced by the permit;

4. an explanation of why the Class 1[1] modification is needed;

5. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division; and

6. Completed RCRA Part B Administrative and Technical Evaluation Electronic Checklist (Form #00136) on CD, DVD, or USB drive, for applications involving the partial transfer of some permitted waste management units.

For Class 1 modifications to an issued hazardous waste permit, submit:

1. (if appropriate) an original updated Part A permit application plus three (3) full copies;
2. an original Part B application plus three (3) full copies, consisting of, at a minimum, Section I - Table I of the Part B plus replacement pages for the changed

   portions of the application that change as a result of the modification;
3. a description of the exact changes to be made to the permit conditions and supporting documents referenced by the permit;
4. an explanation of why the Class 1 modification is needed; and
5. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division.

If several modifications are submitted as one application, the application review will proceed at rate of the amendment or modification which has the longest timeframe.

Application Revisions:

Please submit any application revisions with a revised date and page numbers at the bottom of the page(s).

Waivers:

Any request for waiver of any of the applicable requirements of this permit application must be fully documented.

Designation of Material as Confidential:

The designation of material as confidential is frequently carried to excess. The Commission has a responsibility to provide a copy of each application to other review agencies and to interested persons upon request and to safeguard confidential material from becoming public knowledge. Thus, the Commission requests that the applicant (1) be prudent in the designation of material as confidential and (2) submit such material only when it might be essential to the staff in their development of a recommendation.

The Commission suggests that the applicant not submit confidential information as part of the permit application. However, if this cannot be avoided, the confidential information should be described in non-confidential terms throughout the application, cross-referenced to Section XIII: Confidential Material, and submitted as a separate Section XIII document or binder, and conspicuously marked "CONFIDENTIAL."

Reasons of confidentiality include the concept of trade secrecy and other related legal concepts which give a business the right to preserve confidentiality of business information to obtain or retain advantages from its right in the information. This includes authorizations under, 18 U.S.C. 1905 and special rules cited in 40 CFR Chapter I, Part 2, Subpart B. Section 361.037 of the Texas Health and Safety Code does not allow an applicant for an industrial solid waste permit to claim as confidential any record pertaining to the characteristics of the industrial solid waste.

The applicant may elect to withdraw any confidential material submitted with the application. However, the permit cannot be issued, amended, or modified if the application is incomplete.

Exposure Assessment:

In accordance with 30 TAC 305.50(a)(8) and 40 CFR 270.10(j), any Part B application submitted for a facility that stores, processes, or disposes of hazardous waste in a surface impoundment or a landfill (including post-closure) must be accompanied by exposure information of the potential for the public to be exposed to hazardous wastes or hazardous constituents through releases related to the unit. This exposure information is considered separate from the permit application, as stated in 40 CFR 270.10(c).

Pre-Application Meeting/Public Participation Activities [30 TAC 335.391 and 30 TAC 39.503]:

a. Applicant-held pre-application public meeting

In accordance with 30 TAC 335.503(b) and 40 CFR Part 124.31(b)-(d), an applicant-held pre-application public meeting is required for the following application types prior to submitting the application to allow the applicant and the public to identify potential issues:

- New applications;
- Renewal applications with Class 3 Permit Modifications or Major Amendments; and
- Major Amendment applications.

The pre-application public meeting is not required for an application submitted for the sole purpose of conducting post-closure activities or post-closure activities and corrective action at a facility unless:

- The application is also for an initial permit for hazardous waste management unit(s); or
- The application is also for renewal of the permit, where the renewal application is proposing a significant change (Class 3 Permit Modification or Major Amendment) in facility operations (Note: per preamble to the related federal rule, the facility operations referenced herein exclude post-closure and corrective action activities).

b. Pre-application meeting with TCEQ

Applicants are strongly encouraged to request a pre-application meeting with TCEQ Permits Section staff and to notify the Industrial and Hazardous Waste Permits Section, Waste Permits Division of intent to file new, renewal, Class 3 permit modification, major amendment, and other complex permit applications.

c. Pre-application local review

In accordance with 30 TAC 335.391, for a new hazardous waste management facility, if a local review committee has been established to facilitate communication between the applicant and the local host community, the applicant should summarize the activities of the committee and submit this summary with the application. Any report completed by a review committee must be submitted.

New industrial or hazardous waste facility that would accept municipal solid waste:

a. If an applicant proposes a new industrial or hazardous waste facility that would accept municipal solid waste, the applicant shall hold a public meeting in the county in which the facility is proposed to be located. This meeting must be held before the 45th day after the date the application is filed. In addition, the applicant shall publish notice of the public meeting in accordance with 30 TAC 39.503(e)(5).

Bilingual Notice Instructions:

For certain permit applications, public notice in an alternate language is required. If an elementary school or middle school nearest to the facility offers a bilingual program, notice may be required to be published in an alternative language. The Texas Education Code, upon which the TCEQ alternative language notice requirements are based, requires a bilingual education program for an entire school district should the requisite alternative language speaking student population exist. However, there may not be any bilingual-speaking students at a particular school within a district which is required to offer the bilingual education program. For this reason, the requirement to publish notice in an alternative language is triggered if the nearest elementary or middle school, as part of a larger school district, is required to make a bilingual education program available to qualifying students and either the school has students enrolled at such a program on-site, or has students who attend such a program at another location to satisfy the school's obligation to provide such a program.

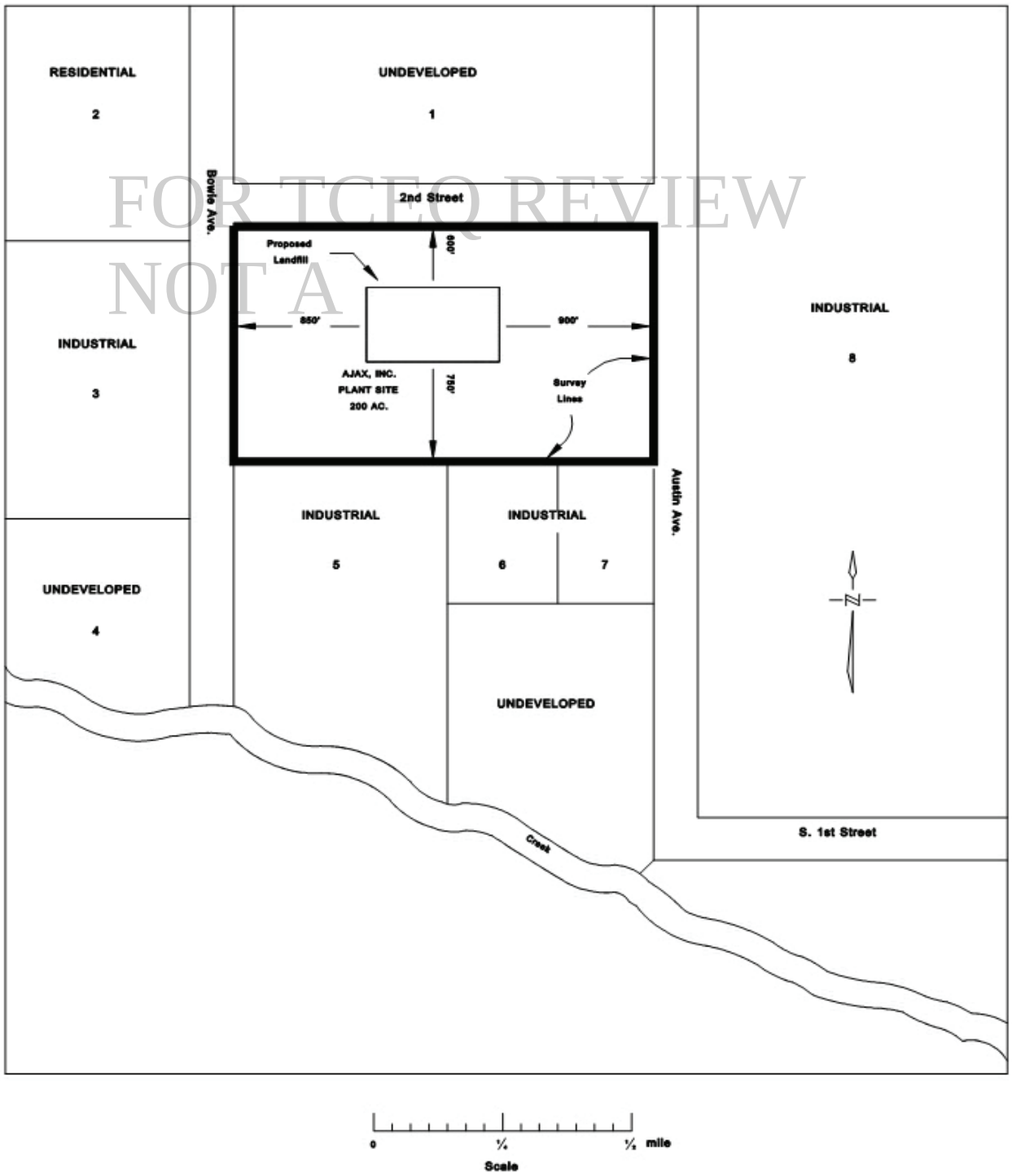
If it is determined that a bilingual notice is required, the applicant is responsible for ensuring that the publication in the alternate language is complete and accurate in that language. Electronic versions of the Spanish template examples are available from the TCEQ to help the applicant complete the publication in the alternative language.

Complete and submit the Bilingual notice confirmation for this application. The Bilingual notice confirmation can be downloaded from the Navigation Pane.

Landowners Cross-Referenced To Application Map

SAMPLE APPLICATION MAP

ALL ADJACENT LANDOWNERS SHALL BE IDENTIFIED



The persons identified below would be considered as affected persons.

1. MR & MRS SAMUEL L TEXANS
11901 STARTLE BLVD
ATOWN TX 78759

2. MR & MRS EDWARD CITIZENS
1405 LINEAR ROAD
LITTLE TOWN TX 76710

3. TEXAS LINKED CORP
8411 NNW HWY
BIG PLACE TX 77590

4. MR & MRS TED GOLDEN MUSTARD
3210 AVENUE BLVD
FISHINSPOT TX 76724

5. GENERIC BREWING CO
4240 KNIGHTS BRIDGE
OUTBACK TX 77640

6. PLAIN COMPANY
6647 CRAIGMOUT LANE
BIG PLACE TX 77590

7. ABC CHEMICALS INC
1212 ZIP STREET
BROADBANKS TX 77640

8. BIG LOCAL BOTTLE CO
10024 LOCAL BLVD
URSINUS TX 79402

Adjacent Landowners List

Submit a map indicating the boundaries of all adjacent parcels of land, and a list (see samples in the instructions) of the names and mailing addresses of all adjacent landowners and other nearby landowners who might consider themselves affected by the activities described by this application. Cross-reference this list to the map through the use of appropriate keying techniques. The map should be a USGS map, a city or county plat, or another map, sketch, or drawing with a scale adequate enough to show the cross-referenced affected landowners. The list should be updated prior to any required public notice. It is the applicant's responsibility to ensure that the list is up-to-date for any required public notice. For all applications (with the exception of Class 1 and Class 1^1 modifications) this mailing list should be submitted on:

1. a Compact Disk (CD) using software compatible with MS Word [30 TAC 39.5(b)]; or

2. four sets of printed labels.

If the adjacent landowners list is submitted on a compact disk (CD), please label the disk with the applicant's name and permit number. Within the file stored on the disk, type the permit number and applicant's name on the top line before typing the addresses. Names and addresses must be typed in the format indicated below. This is the format required by the U.S. Postal Service for machine readability. Each letter in the name and address must be capitalized, contain no punctuation, and the appropriate two-character abbreviation must be used for the state. Each entity listed must be blocked and spaced consecutively as shown below. The list is to be 30 names, addresses, etc. (10 per column) per page (MS WORD Avery Standard 5160 - ADDRESS template).

Example:

HEAVY METALS LP
PO BOX 85624
PUMPKIN PARK TX 79998-5624

MR AND MRS W R NEIGHBOURLY
1405 ACROSSTHE WAY
GREATER METRO CITY TX 79199

A list submitted on compact disk (CD) should be the only item on that disk. Please do not submit a list on a disk that includes maps or other materials submitted with your application.

If you wish to provide the list on printed labels, please use sheets of labels that have 30 labels to a page (10 labels per column) (for example: Avery® Easy Peel® White Address Labels for Laser Printers 5160). Please provide four complete sets of labels of the adjacent landowners list.

Note: The table of contents will update and be based on the questions answered at the beginning of the form.

Table of Contents

Instructions:
Open the File Attachments List in the Navigation Page to view all tables and attachments. (Or, click here to open List of Attachments Navigation Pane). Word versions of the tables are included in the Attachment Tab. Links below will only open the PDF versions of the tables. Select the applicable tables for your application and complete.

TCEQ Core Data Form (TCEQ-10400) [External weblink to download form]

Signature Page for Application

Table I - General Information

Table I.1 - Description of Proposed Application Changes

Adjacent Landowners List and Map (Go to instructions on page 11)

Table II - Facility Siting Criteria Information

Table III.D - Inspection Schedule

Table III.E.1 - Arrangement with Local Authorities

Table III.E.2 - Emergency Coordinators

Table III.E.3 - Emergency Equipment

Table IV.A - Waste Management Information

Table IV.B. – Wastes Managed In Permitted Units

Table IV.C. – Sampling and Analytical Methods

Table IV.D. – Waste Analysis Plan

Table V.A. - Facility Waste Management Handling Units

Table V.B. - Container Storage Area

Table V.C. - Tank and Tank System

Table V.K. - Miscellaneous Units

Table VI.A.1. - Major Geologic Formations

Table VI.A.4. - Waste Management Area Subsurface Conditions

Table VII.A. - Unit Closure

Table VII.B. - Unit Closure Cost Estimate

Table VII.E.1. - Permitted Unit Closure Cost Summary

Table VII.E.2. - Permitted Unit Post-Closure Cost Summary

Table VIII.B. - Estimated Capital Costs

Table X.A. - Process Vents

Table X.B. - Equipment Leaks

Table X.C. - Tanks, Surface Impoundments, and Containers Subject to Air

Table XII.A. – Hazardous Waste Units (For Application Fee Calculations)

Table XII.B. - Hazardous Waste Permit Application Fee Worksheet

Appendices List - NOTE: Provide all Part B responsive information, (e.g. engineering reports, attachments, drawings, tables, maps, etc.) in an Appendix for each section of the application. When preparing the physical format review the Format of Hazardous Waste permit Application and Instructions.

Appendix I - General Information

Appendix II - Facility Siting Information

Appendix III - Facility Management

Appendix III.A. - Compliance History and Applicant Experience

Appendix III.B. - Personnel Training Plan
Appendix III.C - Facility Security
Appendix III.D. - Inspection Schedule
Appendix III.E. - Contingency Plan
Appendix III.F. - Emergency Response Plan
Appendix IV - Waste and Waste Analysis
Appendix V - Engineering Reports
Appendix V.A. - General Engineering Report
Appendix V.B. - Container storage Areas Engineering Report
Appendix V.C. - Tank and Tank Systems Engineering Report
Appendix V.K. - Miscellaneous Units Engineering Report
Appendix VI.D. - Unsaturated Zone Monitoring
Appendix VII - Closure and Post-Closure Plan
Appendix VII.A. - Closure Plan
Appendix VII.B. - Closure Cost Estimate
Appendix VII.E. - Closure and Post-Closure Cost Summary Tables
Appendix VIII - Financial Assurance Infomation
Appendix IX - Releases from Solid Waste Units and Corrective Action
Appendix X - Air Emission Standards
Appendix XII - Hazardous Waste Permit Application Fee Tables

Texas Commission on Environmental Quality
Industrial & Hazardous Waste Part B Permit Application

I. General Information

Provide all Part B responsive information in Appendix I. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

Provide responsive information in Appendix I.

a. Complete Table I - General Information

b. For all incoming New, Renewal, Class 3 Permit Modification, and Major Amendment applications, the TCEQ requires that a Core Data Form (CDF) be submitted whether or not a change has occurred in the previously submitted form.

For Minor Amendment, Class 1, Class 1[1] , and Class 2 Permit Modification applications, the TCEQ requires that the CDF be only submitted if a change in any information in the previously submitted form has occurred at the time of the application submittal.

For more information regarding the Core Data Form, call (512) 239 1575 or go to the TCEQ Web site at https://www.tceq.texas.gov/permitting/central_registry/guidance.html

c. Signature on Application

It is the duty of the operator to submit an application for a permit. The person who signs the application form will often be the operator himself; when another person signs on behalf of the applicant, his title or relationship to the applicant will be shown. In all cases, the person signing the form must be authorized to do so by the applicant. An application submitted by a corporation must be signed by a responsible corporate officer such as a president, secretary, treasurer, vice president, or by his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the activity described in the form originates. In the case of a partnership or a sole proprietorship, the application must be signed by a general partner or the proprietor, respectively. In the case of a municipal, state, federal, or other public facility, the application must be signed by a principal executive officer, a ranking elected official, or another duly authorized employee. A person signing an application on behalf of an applicant must provide notarized proof of authorization.

d. Complete Interim Status Land Disposal Unit(s) Certification, as applicable

e. Submit List and Map of Adjacent Landowners List, as applicable.

II. Facility Siting Criteria

Provide all Part B responsive information in Appendix II. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

For all new hazardous waste management facilities or areal expansions of existing hazardous waste management facilities provide a report which includes all applicable information regarding Unsuitable Site Characteristics found in 30 TAC Chapter 335, Subchapter G. The report must address each requirement applicable to the type of activity submitted in the application. Reference specific rule numbers whenever possible. Supporting information may be cross-referenced to other parts of this application such as Section V - Engineering Report or Section VI - Geology Report, but information submitted in previous applications must be fully reproduced herein. In addition, provide the information in Table II, as applicable.

For permit renewals provide a report which includes all applicable information regarding Unsuitable Site Characteristics found in 30 TAC Chapter 335, Subchapter G. In addition, provide the information in Table II, as applicable. The applicant may resubmit the information submitted with the original permit application provided this information has not changed. For a renewal this information is necessary to ensure a complete application is received.

For capacity expansions of existing facilities, please provide information in Table II, as applicable. Please note however, that additional technical information may be requested to address any facility siting characteristics noted in Table I, under Facility Siting Summary.

> **NOTE:** The standards contained in §335.204(a)(6) - (9), (b)(7) - (12), (c)(6) - (11), (d)(6) - (11), and (e) (8) - (13) are not applicable to facilities that have submitted a notice of intent to file a permit application pursuant to §335.391 of this title (relating to Pre-Application Review) prior to May 3, 1988, or to facilities that have filed permit applications pursuant to §335.2(a) of this title which were submitted in accordance with Chapter 305 of this title and that were declared to be administratively complete pursuant to §281.3 of this title (relating to Initial Review) prior to May 3, 1988.[30 TAC 335.201(b)]

A. Requirements for Storage or Processing Facilities, Land Treatment Facilities, Waste Piles, Storage Surface Impoundments, and Landfills.

   Complete Table II.A-Requirements for Storage or Processing Facilities, Land Treatment Facilities, Waste Piles, Storage Surface Impoundments, and Landfills.

B. Additional Requirements for Land Treatment Facilities [30 TAC 335.204(b)]

   RESERVED

C. Additional Requirements for Waste Piles [30 TAC 335.204(c)]

   RESERVED

D. Additional Requirements for Storage Surface Impoundments [30 TAC 335.204(d)]

   RESERVED

E. Additional Requirements for Landfills (and Surface Impoundments Closed as Landfills with wastes in place)

RESERVED

F. Flooding

1. Identify whether the facility is located within a 100-year flood plain [40 CFR 270.14(b)(11)(iii)]. This identification must indicate the source of data for such determination and include a copy of relevant documentation (e.g., flood maps, if used and/or calculations). The boundaries of the hazardous waste management facility must be shown on the flood plain map. If the facility is not subject to inundation as a result of a 100-year flood event, indicate that the facility is not within the 100-year flood plain, and do not complete the remainder of the Flooding section in Table II. An applicant for a proposed hazardous waste landfill, areal expansion of a hazardous waste landfill, or a commercial hazardous waste land disposal unit may not rely solely on flood plain maps prepared by the Federal Emergency Management Agency (FEMA) or a successor agency for this determination.

2. If the facility is located within the 100-year flood plain the applicant must provide information detailing the specific flooding levels and other events (e.g., Design Hurricane projected by Corps of Engineers) which impact the flood protection of the facility. Information shall also be provided identifying the 100-year flood level and any other special flooding factors (e.g., wave action) which must be considered in designing, construction, operating, or maintaining the facility to withstand washout from a 100-year flood.

3. State whether any flood protection devices exist at the facility (e.g., flood walls, dikes, etc.), designed to prevent washout from the 100-year flood.

   a. If Yes: provide in Section V an engineering analysis to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)]

   Include structural or other engineering studies showing the design of operational units (e.g., tanks, incinerators) and flood protection devices (e.g., flood walls, dikes) at the facility and how these will prevent washout. [40 CFR 270.14(b)(11)(iv)(B)]

   b. If No: the applicant shall provide in Section V a plan for constructing flood protection devices and a schedule including specific time frames for completion. Provide engineering analyses to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)]

   Include structural or other engineering studies showing the design of operational units (e.g., tanks, incinerators) and flood protection devices (e.g., flood walls, dikes) at the facility and how these will prevent washout. [40 CFR 270.14(b)(11)(iv)(B)]

4. If applicable, and in lieu of the flood protection devices from above, provide a detailed description of the procedures to be followed to remove hazardous waste to safety before the facility is flooded. [40 CFR 270.14(b)(11)(iv)(c)] The procedures should include:

a. Timing of such movement relative of flood levels, including estimated time to move the waste, to show that such movement can be completed before flood waters reach the facility. Indicate which specific events shall be use to begin waste movement (e.g., Hurricane warning, Flash Flood watch, etc.);

b. A description of the location(s) to which the waste will be moved and a demonstration that these facilities will be eligible to receive hazardous waste in accordance with appropriate regulations (i.e., a permitted facility);

c. The planned procedures, equipment, and personnel to be used and the means to ensure that such resources will be available in time for use; and

d. The potential for accidental discharges of the waste during movement and precautions taken to preclude accidental discharges.

G. Additional Information Requirements

1. For a new hazardous waste management facility, include a map of relevant local land-use plans and descriptions of the major routes of travel in the vicinity of the facility to be used for the transportation of hazardous waste to and from the facility covering at least a five (5)-mile radius from the boundaries of the facility. [30 TAC 305.50(a)(10)(A)&(D)]

   RESERVED

2. For a new commercial hazardous waste management facility as defined in 30 TAC 335.202 or the subsequent areal expansion of such a facility or unit of that facility, indicate on the map the nearest established residence, church, school, day care center, surface water body used for a public drinking water supply, and dedicated public park.

   RESERVED

3. For new commercial hazardous waste management facilities, submit the following: [30 TAC 305.50(a)(12)(A)]

   a. the average number, gross weight, type, and size of vehicles used to transport hazardous waste;

   b. the major highways nearest the facility irrespective of distance; and

   c. the public roadways used by vehicles traveling to and from the facility within a minimum radius of 2.5 miles from the facility.

4. Include the names and locations of industrial and other waste-generating facilities within 0.5 miles for a new on-site hazardous waste management facility and the approximate quantity of hazardous waste generated or received annually at those facilities. [30 TAC 305.50(a)(10)(B)&(C)]

5. Include the names and locations of industrial and other waste-generating facilities within 1.0 miles for a new commercial hazardous waste management facility and the approximate quantity of hazardous waste generated or received annually at those facilities. [30 TAC 305.50(a)(10)(B)&(C)]

6. For existing land disposal facility units provide documentation that the information required by 30 TAC 335.5 has been placed in the county deed records. If previously submitted, please reference the submittal by date and registration number.

7. If a surface impoundment or landfill (including post-closure) is to be permitted,

provide exposure information to accompany this application and in accordance with 30 TAC 305.50(a)(8) and 40 CFR 270.10(j). This information will be considered separately from the TCEQ application completeness determination.

RESERVED

8. For a hazardous waste management facility requesting a capacity expansion of an existing hazardous waste management facility, please provide in Section VI.A.1.a the requested fault delineation information. [30 TAC 305.50(a)(4)(D)]

III. Facility Management

Provide all Part B responsive information in Appendix III. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

A. Compliance History and Applicant Experience

1. Provide listings of all solid waste management sites in Texas owned, operated, or controlled by the applicant as required by 30 TAC 305.50(a)(2).

2. For a new commercial hazardous waste management facility, provide a summary of the applicant's experience in hazardous waste management as required by 30 TAC 305.50(a)(12)(F).

RESERVED

B. Personnel Training Plan

Provide an outline of the facility training plan which includes all the information required by 40 CFR 264.16. Indicate which training will be repeated annually.

C. Security

Describe how the facility complies with the security requirements of 40 CFR 264.14 or submit a justification demonstrating the reasons for requesting a waiver of these requirements.

D. Inspection Schedule

Describe summary of inspection schedule and Table III.D in Appendix III.D in accordance with instructions below.

Provide an inspection schedule summary for the facility which reflects the requirements of 40 CFR 264.15(b), 264.33 and, where applicable, the specific requirements in 40 CFR 264.174, 264.193(i), 264.195, 264.226, 264.254, 264.273, 264.303, 264.347, 264.552, 264.574, 264.602, 264.1033(f), 264.1034, 264.1052, 264.1053(e), 264.1057, 264.1058, 264.1063, 264.1084, 264.1085, 264.1086, 264.1088, 264.1101(c)(4) and 270.14(b)(5). The inspection schedule should reflect the requirements described below. The schedule should encompass each type of hazardous waste management (HWM) unit (i.e., facility component) and its inspection requirements. For incorporation into a permit, complete Table III.D. - Inspection Schedule for all units to be permitted.

The owner or operator must inspect the facility for malfunctions and deterioration, operator errors, and discharges which may be causing or may lead to the release of hazardous waste constituents to the environment or which may pose a threat to human health. The owner or operator must conduct these inspections often enough to identify problems in time to correct them before they harm human health or the environment.

The owner or operator must develop and follow a written schedule for inspecting other basic elements such as monitoring equipment, safety and emergency equipment, security devices, the presence of liquids in leak detection systems, where installed, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards.

If the owner or operator of a facility which contains a waste pile wishes to pursue an exemption from the groundwater monitoring requirements for that waste management

unit, the inspection schedule must include examination of the base for cracking, deterioration, or other conditions that may result in leaks. The frequency of inspection must be based on the potential for the liner (base) to crack or otherwise deteriorate under the conditions of operation (e.g., waste type, rainfall, loading rates, and subsurface stability).

E. Contingency Plan (Not Applicable to Permits for Post-Closure Care Only)

If the owner or operator has already prepared a Spill Prevention, Control, and Countermeasures (SPCC) Plan or some other emergency or contingency plan, he need only amend that plan to incorporate hazardous waste management provisions that are sufficient to comply with the requirements of this section. Provide a Contingency Plan which includes all the information required by 40 CFR Part 264 Subparts C and D, except for 40 CFR 264.56(d)(1) and 30 TAC 335.153(2). This plan must also include a drawing of the facility which shows the location of all emergency equipment. In addition, complete the following tables to summarize information expressed in more detail in the plan.

1. Arrangements with Local Authorities

Complete Table III.E.1. - Arrangements With Local Authorities to indicate arrangements (if made) with local authorities to familiarize local fire and police departments, local hospitals, equipment suppliers, and local and State emergency response teams with the layout of the facility, properties of hazardous waste handled at the facility and associated hazards, places where facility personnel would normally be working, entrances to and roads inside the facility, and possible evacuation routes. Provide documentation of the attempts and any arrangements made with local authorities and emergency response teams.

2. Emergency Coordinator's List

For inclusion into a permit, list in Table III.E.2. - Emergency Coordinators the persons qualified to act as emergency coordinator. List the alternates in the order in which they will assume responsibility.

3. Emergency Equipment List

For inclusion into a permit, list in Table III.E.3. - Emergency Equipment all types of emergency equipment at the facility [such as fire-extinguishing systems, spill-control equipment, communications and alarm systems (internal and external), and decontamination equipment], if this equipment is required. Briefly outline the equipment capabilities.

4. Waiver from Preparedness and Prevention Requirements

If the owner or operator wishes to request a waiver from any of the preparedness and prevention requirements, he must submit a justification demonstrating the reasons for requesting the waiver, as discussed below.

F. Emergency Response Plan - RESERVED

IV. Wastes and Waste Analysis

Provide all Part B responsive information in Appendix IV. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

A. Waste Management Information

For a new hazardous waste management facility or for a facility hazardous waste management capacity expansion, complete Table IV.A. - Waste Management Information for each waste, source, and volume of waste to be stored, processed, or disposed of in the facility units to be permitted as required by 30 TAC 305.50(a)(9). For on-site facilities, list "on-site" for the waste source. For off-site facilities, list the source of the waste. If unknown, identify potential sources (e.g., industries/processes to be serviced).

B. Waste Managed In Permitted Units

For all hazardous waste management facilities and for inclusion into a permit, complete Table IV.B. - Wastes Managed In Permitted Units for each waste and debris to be managed in a permitted unit. Provide a description, EPA waste codes, and TCEQ waste form codes and classification codes. Guidelines for the Classification & Coding of Industrial Wastes and Hazardous Wastes, TCEQ publication RG-22, contains guidance for how to properly classify and code industrial waste and hazardous waste in accordance with 30 TAC 335.501-335.515 (Subchapter R).

Applicants need not specify the complete 8-digit waste code formulas for their wastes but must include the 3-digit form codes and 1-digit classification codes. This allows the applicant to specify major categories of wastes in an overall manner without having to list all the specific waste streams as generated.

C. Sampling and Analytical Methods

For inclusion into a permit, complete Table IV.C. - Sampling and Analytical Methods for each waste and debris proposed to be sampled and analyzed and include sampling location, sampling method, sample frequency, analytical method, and desired accuracy level for each waste and debris to be managed in a permitted, storage, processing, or disposal unit at the facility.

D. Waste Analysis Plan

The Waste Analysis Plan must address the requirements of 40 CFR §264.13 and §268.7. The Plan should include supplemental and coordinating information on how the facility will analyze wastes and debris (as listed in Table IV.B) to be managed in permitted units. The plan must address the determination of land disposal restrictions. Generators must determine and certify with the manifest the land disposal restriction status of a waste, even if the waste or debris is not intended for land disposal. Land disposal treatment facilities must identify the treatment process and analytical procedures to be used, and include them in the waste analysis plan. Land disposal restriction records must be maintained at the facility until closure of the facility [40 CFR §264.73(b)]. Landfill facilities must determine through the Paint Filter Liquids Test (SW-846 Method 9095) if there is free liquid in a bulk or containerized waste to be landfilled. If so, it must be stabilized; adding adsorbents alone is not acceptable, even for containerized waste.

For off-site facilities the waste analysis plan must specify procedures which will be used to inspect and, if necessary, analyze each movement of industrial and hazardous waste or hazardous debris received at the facility to ensure it matches the identity of

the waste designated on the accompanying shipping ticket. The plan must describe methods which will be used to determine the identity of each movement of waste and debris managed at the facility and sampling method used if the identification method includes sampling in order to store, process, or dispose of the wastes and debris in accordance with 40 CFR Parts 264 and 268 and any abnormal characteristics which may upset further treatment or processing operations. Include rejection criteria for shipments of waste and debris received at the facility

For on-site facilities the waste analysis plan must specify the normal characteristics of the waste (including EPA hazardous waste codes, EPA hazard codes, and 40 CFR Part 261, Appendix VIII Hazardous Constituents) which must be known to store, process, or dispose of the wastes and debris in accordance with 40 CFR Parts 264 and 268 and any abnormal characteristics which may upset further treatment or processing operations.

The methods and equipment used for sampling waste materials will vary with the form and consistency of the waste materials to be sampled. Those sampling methods listed in 40 CFR Part 261 Appendix I, for sampling waste with properties similar to the indicated materials, or equivalent sampling methods approved by EPA under 40 CFR §260.20 and §260.21, will be considered by the TCEQ to be acceptable.

V. Engineering Reports

Provide all Part B responsive information in Appendix V. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

For multiple units provide an include all Part B responsive information in a separate Appendix for each unit.

The engineering report represents the conceptual basis for the storage, processing, or disposal units at the hazardous waste management (HWM) facility. It should include calculations and other such engineering information as may be necessary to follow the logical development of the facility design. Plans and specifications are an integral part of the report. They should include construction procedures, materials specifications, dimensions, design capacities relative to the volume of wastes (as appropriate), and the information required by 40 CFR 270.14(b)(8), 270.14(b)(10). Since these reports may be incorporated into any issued permit, the report should not include trade names, manufacturers, or vendors of specific materials, equipment, or services unless such information is critical to the technical adequacy of the material. Technical specifications and required performance standards are sufficient to conduct a technical review. For landfills, surface impoundments, and waste piles, a Construction Quality Assurance Plan, which considers the guidance in EPA publication 530-SW-85-014, Minimum Technology Guidance on Double Liner Systems for Landfills and Surface Impoundments; Design, Construction, and Operation, and/or EPA/600/R-93/182, Quality Assurance And Quality Control For Waste Containment Facilities, should be submitted.

For facilities which will receive wastes from off-site sources, the engineering report must also contain information on the units which will manage these off-site wastes in accordance with 30 TAC 335.45(a).

Certain ancillary components or appurtenant devices must be addressed in the Part B application. These include but are not limited to sumps, pipelines, ditches, and canals. The technical information and the level of detail required will vary with the nature, scope, and location of the ancillary component. At a minimum they should be included in descriptions of piping and process flow. More information may be required. A single area containing a large number of ancillary components or a remote appurtenant device in an unusually sensitive location may warrant some specific permit requirements. All ancillary components must be included in calculating closure cost estimates.

In each of the unit-specific sections, describe precautions taken to prevent accidental commingling of incompatible wastes. If reactive or ignitable wastes are to be managed, or if incompatible wastes are deliberately commingled, provide information to ensure that precautions are taken to avoid danger due to:

- generation of extreme heat or pressure, fire, explosion, or violent reaction;
- production of uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health;
- production of uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion;
- damaging the structural integrity of the device or facility containing the waste; or
- threatening human health or the environment by any other means.

Comprehensive consideration should be given to ensure that the facility is designed in accordance with good public health and hazardous waste management practices. The application will be evaluated primarily for the aspects of design covered by the regulations. Nothing in any approval is intended to relieve the facility owner or operator of any liabilities or responsibilities with respect to the design, construction, or operation of the project.

A. General Engineering Reports

1. General Information

Complete Table V.A. - Facility Waste Management Handling Units listing all past, current or proposed units. *[Indicate units' status as* Active, Closed, Inactive *(built but not yet managing waste)*, Proposed *(not yet built)*, Never Built, Transferred, or Post-Closure*. Indicate appropriate units for Capacity information.]* **Note for renewals and modifications involving adding or dropping units from the permit:** List all TCEQ Permit Unit Numbers that have been assigned previously as in a current permit Attachment D -Authorized Facility Units table and do not reuse or reassign permit numbers for units that have been replaced, closed, removed from the permit, or transferred to other ownership. All Notice of Registration (NOR) Numbers must match the State of Texas Environmental Electronic Reporting System (STEERS) and may not be reused for replacement units.

Provide an overall plan view of the entire facility. Identify each hazardous or industrial solid waste management unit (container storage area, tank, incinerator, etc.) to be permitted in relation to its location and the type of waste managed in that unit. Also provide a plan view at an appropriate scale to clearly show the location of all hazardous waste management units to be permitted on one or more 8 1/2" x 14" sheets. Indicate on this plan view how the design or operation provides for buffer zones or waste segregation as appropriate for incompatible, ignitable, or reactive wastes.

Submit a topographic map or maps of the facility which clearly shows the information specified in 40 CFR 270.14(b)(19), 270.14(c)(3), and 270.14(d)(1)(i) (for large HWM facilities, the TCEQ will allow the use of other scales on a case-by-case basis). Please note that the term "facility" includes all contiguous land, structures, other appurtenances, and improvements on the land for storing, processing, or disposing of hazardous and industrial solid waste.

2. Features to Mitigate Unsuitable Site Characteristics

For all new hazardous waste management storage and/or processing facilities or areal expansions of existing hazardous waste management storage and/or processing facilities, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(a)(1) and (a)(3) through (9).

3. Construction Schedules

a. In order to meet the required design standards, extensive retrofitting of some facilities may be required. In the worst case, the applicant may elect to close certain operations rather than comply with the RCRA standards. Thus, the permit may specify a schedule of compliance requiring the accomplishment of given tasks within specific time frames. As required, indicate an appropriate schedule(s) of compliance in this application. The schedule should provide for facility compliance as soon as possible and in accordance with 40 CFR 270.33(a)(2) and 270.33(b).

b. For commercial hazardous waste management facilities, permit applications (new, renewal, or interim status applications), major amendments, and Class 3 modifications must include a construction schedule. A construction schedule must be submitted even if the application does not include an addition of units or a revision to permitted units. This schedule should comply with the requirements of 30 TAC 305.149.

4. Provide detailed plans and specifications which when, accompanied by the engineering report, will be sufficiently detailed and complete to allow the Executive Director to ascertain whether the facility will be constructed and operated in compliance with all pertinent permitting requirements. Engineering plans and specifications must be prepared under the supervision of and sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act. For some facilities, plans in the form of a standard piping and instrumentation diagram will be sufficient. Overall dimensions and materials of construction must be shown.

B. Container Storage Areas

1. Provide an engineering report which includes all of the information specified in 40 CFR 264.170-264.173, 264.175-264.177, and 270.15.

   Complete Table V.B - Container Storage Areas and list the container storage areas covered by this application to be permitted. List the N.O.R. unit number, the rated capacity or size of each unit (including the maximum number of each type of container to be stored at each unit and total maximum capacity of all types wastes stored in the unit), the areal dimensions, containment volume, aisle space requirements, whether ignitable, reactive, or incompatible waste will be stored in each unit, and whether processing will occur within the unit.

2. Container storage areas must have a containment system that is capable of collecting and holding spills, leaks, and precipitation. In addition to the requirements of 40 CFR 270.15, the design report should include the following:

   a. Capacity of the containment relative to the number and volume of containers to be stored; in addition, for unenclosed areas, the amount of rainfall collected prior to removal. The TCEQ recommends using a 25-year, 24-hour rainfall event for this extra capacity; and

   b. Run-on into the containment system must be prevented, or a collection system with sufficient excess capacity must be provided. If run-on is collected within the containment system, delineate the area(s) from which run-on is collected. The 25-year, 24-hour rainfall event should be used to calculate the excess capacity.

3. Wastes Containing No Free Liquids

   With the exception of 40 CFR 264.175(d), storage areas that hold only wastes that do not contain free liquids need not have a containment system, provided that compliance with 40 CFR 264.175(c) is demonstrated. This demonstration must be submitted as part of the application and must include:

   a. test procedures and results or other documentation or information to show that the wastes do not contain free liquids; and

   b. a description of how the storage area is designed or operated to drain and remove liquids or how containers are kept from contact with standing

liquids.

4. Managing Ignitable or Reactive Wastes

   If a container storage area will manage ignitable or reactive waste, as indicated on Table V.B, provide in the engineering report drawings demonstrating compliance with the buffer zone requirement of 40 CFR 264.17 and 264.176.

5. Managing Incompatible Wastes

   If a container storage area will manage incompatible waste, as indicated on Table V.B, provide in the engineering report a description of the procedures used to ensure compliance with 40 CFR 264.17 and 264.177.

6. Managing Nonhazardous Wastes and/or Universal Wastes

   If a container storage area will manage nonhazardous wastes, and/or universal wastes in addition to hazardous waste, provide a description of all types of wastes managed in the engineering report and procedures used to ensure compliance with 40 CFR 264 Subpart I.

C. Tanks and Tank Systems

Provide an engineering report which includes all of the information specified in 40 CFR 264.190-264.194, 264.196, 264.198-264.199, and 270.16.

1. For inclusion into a permit, complete Table V.C - Tanks and Tank Systems and list the tanks covered by this application to be permitted. List the N.O.R. unit number, whether the unit is for storage and/or processing, the waste managed in each unit, the rated capacity of each unit, overall dimensions of each unit, containment volume, and whether ignitable, reactive, or incompatible waste will be stored in each unit.

2. For inclusion into a permit, complete Table V.C - Tanks and Tank Systems and list the tanks covered by this application to be permitted. List the N.O.R. unit number, whether the unit is for storage and/or processing, the waste managed in each unit, the rated capacity of each unit, overall dimensions of each unit, containment volume, and whether ignitable, reactive, or incompatible waste will be stored in each unit.

3. If a tank will manage incompatible waste, as indicated on Table V.C, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.199.

4. Submit written assessments that were reviewed and certified by an independent, qualified licensed Professional Engineer that attests to the structural integrity and suitability of handling the hazardous waste for each tank system, as required under 40 CFR 264.191-264.192 for existing tanks which do not have secondary containment meeting the standards of 40 CFR 264.193. The engineer signing the written assessment must make the certification specified in 40 CFR 270.11(d). The certification must be sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act.

5. If a tank has been de-rated or if the permitted capacity is otherwise different from the design capacity, specify any such change(s) in the engineering report.

   Provide in the report any additional information for tanks and tank systems as specified in the above regulatory citations including: specifics of leak, spill, and unfit for use systems responses; assessments of tank systems; new tank systems or components; overfill control and prevention; special requirements for ignitable and/or reactive wastes; incompatible wastes; air emissions control; detection of leaks into secondary containment; ancillary equipment; and plans and specifications individually sealed by a licensed professional engineer with current Texas registration with the Registered Engineering Firm's name and Registration number.

D. Surface Impoundments - RESERVED
E. Waste Piles -RESERVED
F. Land Treatment Units -RESERVED
G. Landfills -RESERVED
H. Incinerators -RESERVED
I. Boilers and Industrial Furnaces -RESERVED
J. Drip Pads -RESERVED
K. Miscellaneous Units

A miscellaneous unit is a unit other than a container, tank, incinerator, boiler, industrial furnace, landfill, surface impoundment, waste pile, underground injection well, land treatment area, drip pad, or unit eligible for an R, D & D permit that is used to process, store, or dispose of hazardous waste.

For each miscellaneous unit for which an operating permit is sought, provide an engineering report which includes all of the information specified in 40 CFR 264.600-264.602, and 270.23.

1. Complete Table V.K - Miscellaneous Units and list the miscellaneous units covered by this application. List the waste managed in each unit and the rated capacity or size of the unit. If the information requested is not applicable, an explanation must be submitted.

2. Provide any other information which is descriptive of the relationship between the miscellaneous unit and the environment. Application information may include design requirements of 30 TAC 305 and 335, 40 CFR Part 264 Subparts I through O, and Part 270 that are appropriate for the miscellaneous unit or portions of the unit being permitted.

3. For a unit which involves combustion, please provide emissions data or a trial burn plan. Tables V.H.1-5 for incinerators or Tables V.I.1-5 for boilers and industrial furnaces may be adapted as appropriate to provide operation, monitoring, and emission information for a miscellaneous combustion unit.

L. Containment Buildings -RESERVED

VI. Geology Report

Provide all Part B responsive information in Appendix VI. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

This portion of the application applies to owners or operators of new hazardous waste management facilities; areal and/or capacity expansions of existing hazardous waste management facilities; and existing industrial solid waste facilities that store, process or dispose of hazardous waste in surface impoundments, landfills, land treatment units, waste piles (except those waste piles that meet the requirements of Section V.E.10.b. of this application), and tanks or drip pads which require a contingent post-closure plan.

For a new Compliance Plan or modification/amendment to an existing Compliance Plan of Section XI of this application, submit a Geology Report which contains updated site geologic information derived from on-going investigations since submittal of the last Permit modification/amendment application.

Submit a Geology Report which includes at a minimum the following information. This report and all specifications, details, calculations/estimates and each original sheet of plans, drawings, maps, cross-sections, other graphics, such as limits of contamination maps, etc. or any other geoscientific work must be signed and sealed by a Professional Geoscientist licensed in the State of Texas under the Professional Geoscientists Practice Act.

A. Geology and Topography

1. Active Geologic Processes

Provide a description and interpretation of the active geologic processes in the vicinity of the facility. This description should include:

a. An identification of any faults (active or otherwise) in the area of the facility. The preparer should determine which Holocene sediments or man-made structures have been displaced. The report should contain a description of the investigation techniques used to identify faults and should assess the degree, if any, to which a particular fault increases the long-term potential for waste migration. The clearance required from active faults to ensure that liner systems will not be disrupted will be based upon site specific factors such as the zone of significant surface deformation, uncertainty in locating the fault, activity of the fault, and a distance to provide a reasonable margin of safety. These issues should be addressed when discussing the offset of an industrial solid waste facility unit from an active fault.

To satisfy the requirements of 30 TAC 305.50(a)(4)(D) and 305.50(a)(10)(E), for a proposed hazardous waste management facility or a modification or amendment of a permit which includes a capacity expansion of an existing hazardous waste management facility, submit the following.

(1) A geologic literature review should be conducted, from which useful information on the possibility of faulting at a given site may be revealed. This includes, but is not limited to, maps of surface faults, subsurface structure, and field investigations by the author(s).

(2) Descriptions and maps of faulting, fracturing, and lineations in the area are necessary. An aerial photo with lineation interpretations is suggested.

(3) The maps and cross-sections are to be constructed using an amount of data necessary to adequately describe the geology of the area. Surface data, including data regarding known surface expressions, such as surface faults, gas seeps, lineations, etc., should be accounted for in the subsurface interpretations. A surface structure map should be prepared, incorporating all of the subsurface data as well as known surface features.

(4) A minimum of two structural cross-sections, utilizing available oil field and/or water well electric log data, shall be made perpendicular to each other, crossing at the proposed surface unit location. These cross-sections should define geologic units, indicating especially Holocene sediments and Underground Sources of Drinking Water (USDWs), as well as lithology. The cross-sections should be constructed from the surface, down through the shallowest major structure or the base of the Holocene, whichever is deeper. These cross-sections need to be on a scale necessary to depict the local geology (3000' radius from the site location minimum). If needed to adequately describe the local geology, then a larger radius or deeper area of review may be necessary.

(5) A minimum of two structural subsurface maps need to be prepared. One map should be made on the shallowest mappable subsurface marker, the other on a deeper horizon that shows the underlying major structure. Additional maps may be necessary.

(6) Field surveillance will be necessary to check the area of the facility for surface features, such as lineations, and to investigate potential surface faults as indicated by, but not limited to, aerial photos, topographic maps, and seismic and subsurface structural maps.

(7) The above requirements do not limit the use of any additional information, such as seismic data, isopach maps, or potentiometric maps, that may help in defining the geology of the area of review.

(8) If faulting exists within 3000 feet of the surface unit, it must be demonstrated that the fault has not had displacement within Holocene time. If such a fault does exist, it cannot pass within 200 feet of the surface unit.

(9) If a fault that has been active within the Holocene is located within 3000 feet of the surface unit, it must be demonstrated that, a.) the fault is not transmissive, i.e., it will not provide for groundwater movement that would result in endangerment to human health or the environment, and b.) there is no actual and/or potential problem of subsidence, which could endanger the stability of the surface unit.

b. A discussion of the extent of land surface subsidence in the vicinity of the facility including total recorded subsidence and past and projected rates of subsidence. For facilities located at low elevations along the coast which have experienced appreciable rates of subsidence, the potential for future submergence beneath Gulf water should be addressed.

c. A discussion of the degree to which the facility is subject to erosion. The potential for erosion due to surface water processes such as overland flow, channeling, gullying, and fluvial processes such as meandering streams and undercut banks should be evaluated. If the facility is located in a low-lying coastal area, historical rates of shoreline erosion should also be provided.

d. Complete Table VI.A.1. - Major Geologic Formations

2. **Applicable to Land Based Units Only.** Regional Physiography and Topography (applicable only to owners or operators of facilities that store, process, or dispose of hazardous waste in surface impoundments, landfills, land treatment units, waste piles, except waste piles exempt from groundwater monitoring requirements, and tanks which require a contingent post-closure plan)

a. Distance and direction to nearest surface water body
b. Slope of land surface
c. Direction of slope
d. Maximum elevation of facility
e. Minimum elevation of facility

3. **Applicable to Land Based Units Only.** Regional Geology (applicable only to owners or operators of facilities that store, process, or dispose of hazardous waste in surface impoundments, landfills, land treatment units, waste piles, except waste piles exempt from groundwater monitoring requirements, and tanks which require a contingent post-closure plan)

Provide a description of the regional geology of the area. This section should include:

a. A geologic map of the region with text describing the stratigraphic and lithologic properties of the map units. An appropriate section of a published map series such as the Geologic Atlas of Texas prepared by the Bureau of Economic Geology is acceptable.

b. A description of the generalized stratigraphic column in the facility area from the base of the lowermost aquifer capable of providing usable groundwater to the land surface. At least the uppermost 1,000 feet of section below the facility should be described. The geologic age, lithology, variation in lithology, thickness, depth, geometry, hydraulic conductivity, and depositional history of each geologic unit should be described based upon available geologic information. Regional stratigraphic cross sections should be provided, where available.

4. Subsurface Soils Investigation Report **(Applicable to land based units or units requiring contingent closure and post-closure).**

This section should contain the results of an investigation of subsurface conditions for each land based unit and/or unit which requires contingent closure and post-closure care. If several units are in close proximity, a single investigation for the area will suffice. This report should include:

a. The logs of borings performed at the waste management area. All borings must be conducted in accordance with established field exploration methods. Investigation procedures should be discussed in the report. A sufficient number of borings should be performed to establish subsurface stratigraphy and to identify and allow assessment of potential pathways for pollution migration. Borings must be sufficiently deep to allow identification of the uppermost aquifer and underlying hydraulically interconnected aquifers. Borings should penetrate through the uppermost aquifer and all deeper hydraulically interconnected aquifers, deep enough to identify the aquiclude at the lower boundary. Borings should be completed to a depth at least 30 feet below the deepest excavation planned at the waste management area.

b. A text which describes the investigator's interpretations of the subsurface stratigraphy based upon the field investigation. If appropriate, soils may be assigned to generalized strata to aid in the discussion.

c. A text which describes the investigator's interpretations of the subsurface stratigraphy based upon the field investigation. If appropriate, soils may be assigned to generalized strata to aid in the discussion.

d. Complete Table VI.A.4. - Waste Management Area Subsurface Conditions and provide in the report data which describes the geotechnical properties of the subsurface soil materials. All laboratory and field tests must be performed in accordance with recognized procedures. A brief discussion of test procedures should be included. All major strata encountered during the field investigation phase should be characterized with regard to: Unified Soil Classification, moisture content, percent less than number 200 sieve, Atterberg limits (liquid limit, plastic limit, and plasticity index), and coefficient of permeability. Field permeability tests should be used to determine the coefficient of permeability of sand or silt units and should also be used to supplement laboratory tests for more clay-rich soils. In addition, particle size distribution and relative density based upon penetration resistance should be determined for coarse-grained soils. For fine-grained soils the following parameters should also be determined: cohesive shear strength based upon either penetrometer or unconfined compression tests, dry unit weight, and degree of saturation(s). For the major soil strata encountered, the maximum, minimum, and average for each of these variables should be compiled.

e. For land treatment units, provide a description of the surficial soils at the site which includes:

(1) The name and description of the soil series at the site;
(2) Important physical properties of the series such as depth, permeability, available water capacity, soil pH, and erosion factors;
(3) Engineering properties and classifications such as USDA texture, Unified Soil Classification, size gradation, and Atterberg limits (liquid limit, plastic limit, and plasticity index); and
(4) The cation exchange capacity (CEC) of the soil(s) expressed in units of meq/100g.

Much of this information may be obtained by consulting the county soil survey published by the United States Department of Agriculture, Soil Conservation Service. If available, a copy of an aerial photograph showing soil series units on the land treatment area should be provided.

If an aerial photograph is not available, include a soil series map as an attachment to this subsurface soils investigation report.

B. Facility Groundwater -RESERVED

C. Exemption from Groundwater Monitoring for an Entire Facility -RESERVED

D. Unsaturated Zone Monitoring -RESERVED

VII. Closure and Post-Closure Plans

Provide all Part B responsive information in Appendix VII. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

For multiple units provide an include all Part B responsive information in a separate Appendix for each unit.

Submit a full closure plan and post-closure plan, if applicable, which contains all the information required by 30 TAC 335.8, 335.169, 335.172, 335.174, 335.177, 335.178, 335.551-335.569, 30 TAC Chapter 350, 40 CFR 264.112, 264.118, 264.178, 264.197, 264.228, 264.258, 264.280, 264.310, 264.351, 264.575, 264.601, 264.603, 264.1102, 270.14(b)(13), 270.17(f), 270.18(h), 270.20(f), 270.21(e), 270.23(a)(2) & (3), and 270.26(c)(16) where applicable. The owner of property on which an existing disposal facility is located must also submit documentation that a notation has been placed in the deed to the facility that will in perpetuity notify any potential purchasers of the property that the land has been used to manage hazardous wastes and its use is restricted (see 30 TAC 335.5). For hazardous waste disposal units that were closed before submission of the application, the applicant should submit documentation to show that plats and notices required under 40 CFR 264.116 and 264.119 have been filed.

A. Closure

This section applies to the owners and operators of all hazardous waste management facilities to be permitted. The applicant must close the facility in a manner that minimizes need for further maintenance and controls, or eliminates, to the extent necessary to protect human health and the environment, the post-closure release of hazardous waste, hazardous constituents, leachate, contaminated rainfall, or waste decomposition products to the groundwater, surface waters, or to the atmosphere.

The facility type and type of unit to be closed can determine the level of detail sufficient for a closure plan.

For each unit to be permitted, complete Table VII.A. - Unit Closure and list the facility components to be decontaminated, possible methods of decontamination, and possible methods of disposal of wastes and waste residues generated during unit closure. All ancillary components must be included in calculating closure cost estimates.

Additionally, if the applicant plans to close a surface impoundment in accordance with 30 TAC 335.169(a)(1) and the impoundment does not comply with the liner requirements of 30 TAC Section 335.168(a) then the closure plan for the impoundment must include both a plan for complying with 30 TAC 335.169(a)(1) and a contingent plan for complying with 30 TAC 335.169(a)(2).

Guidance on design of a closure cap and final cover for landfills is given in TCEQ Technical Guideline No. 3, and EPA publication 530-SW-85-014 presents guidance on construction quality assurance of liner construction.

If a waste pile does not comply with the liner requirements of 30 TAC Section 335.170(a)(1) then the closure plan for the waste pile must include both a plan for complying with 40 CFR 264.258(a) and a contingent plan for complying with 40 CFR 264.258(b).

The final certification of closure of a land treatment unit may be prepared by an independent licensed Professional Geoscientist in lieu of an independent licensed Professional Engineer. [30 TAC 335.172(b)]

B. Closure Cost Estimate (including contingent closure) [30 TAC 335.178, 40 CFR 264.142]

This section applies to owners or operators of all hazardous waste facilities, except state and federal agencies. A detailed estimate, in current dollars, of the cost of closing the facility should be included in the report. The cost estimate must include the cost of closure at the point in the facilities operating life when the extent and manner of its operation would make closure the most expensive. The TCEQ has published Technical Guideline No. 10, Closure and Post-Closure Cost Estimates, for calculating closure costs which should be consulted. Closure costs should be developed on the basis of abandonment of the site at full capacity and closure activities to be conducted by a third party with no operable on-site equipment. The costs for closing each unit must be detailed.

1. If closure costs are based on contractor bids, the applicant should submit a copy of the bid specification and each contractor's response.

2. If closure costs are based on a detailed analysis, the applicant should submit details of item costs and number of each item, and details of costs for equipment rental, third party labor and supervision, transportation, analytical costs, etc. Provide an itemized cost on Table VII.B. - Unit Closure Cost Estimate for a complete, third party permitted facility closure.

   As units are added or deleted from these tables through future permit amendments or modifications, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

3. The closure plan may propose on-site disposal of wastes, residues, etc. during closure of a unit, and this may be executed if on-site capacity exists in other units during closure of a unit. However, the cost estimate for closure must be based on off-site shipment and disposal during closure of all wastes, waste residues, wastes generated by decontamination, contaminated stormwater, and leachate.

4. For each surface impoundment, waste pile, or tank system required to have a contingent closure plan, the cost for closure under the contingent closure plan should be detailed, as well as the cost of proposed closure. The more expensive of the cost of the proposed closure of a unit versus the cost of the contingent closure of the unit should be used in the total facility closure cost estimate.

C. Post-closure -RESERVED

D. Post-closure Cost Estimate [40 CFR 264.144]-RESERVED

E. Closure and Post-Closure Cost Summary

Please Complete Table VII.E.1. - Permitted Unit Closure Cost Summary
Please Complete Table VII.E.2. - Permitted Unit Post-Closure Cost Summary

VIII. Financial Assurance

Provide all Part B responsive information in Appendix VI. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

A. Financial Assurance Information Requirements for all Applicants (30 TAC Chapter 37, Subchapter P, 305.50(a)(4)(A-E), 335.152(a)(6) and 335.179)

1. Financial Assurance for Closure

An owner or operator must establish financial assurance for the closure of the facility no later than 60 days prior to the first receipt of waste [30 TAC Section 37.31(a)]. Please refer to 30 TAC Chapter 37, Subchapter P, for the financial assurance requirements for closure and provide a signed statement from an authorized signatory per 30 TAC 305.44 regarding how the owner or operator will comply with this provision.

If a financial mechanism has been obtained, provide a copy of the mechanism.

For applications involving a permit transfer, the new owner or operator must provide a financial assurance mechanism (in original form) satisfactory to the TCEQ executive director. Prior to the executive director issuing the permit modification transferring the permit, the new owner or operator must provide proof of financial assurance in compliance with 30 TAC Section 305.64 (g) and Chapter 37, Subchapter P.

2. Financial Assurance for Post-Closure Care (applicable to disposal facilities and contingent post-closure care facilities only)

An owner or operator subject to post-closure monitoring or maintenance requirements must establish financial assurance for the post-closure care of the facility no later than 60 days prior to the first receipt of waste [30 TAC Section 37.31(a)]. Please refer to 30 TAC Chapter 37, Subchapter P for the financial assurance requirements for post-closure and provide a signed statement from an authorized signatory per 30 TAC 305.44 regarding how the owner or operator will comply with this provision.

If a financial mechanism has been obtained, provide a copy of the mechanism.

For applications involving a permit transfer, the new owner or operator must provide a financial assurance mechanism (in original form) satisfactory to the TCEQ executive director. Prior to the executive director issuing the permit modification transferring the permit, the new owner or operator must provide proof of financial assurance in compliance with 30 TAC Section 305.64 (g) and Chapter 37, Subchapter P.

3. Financial Assurance for Corrective Action

An owner or operator must establish financial assurance for corrective action of the facility no later than 60 days after the permit or order requiring the corrective action financial assurance is signed by the executive director or commission [30 TAC Section 37.31(b)]. Please refer to 30 TAC Chapter 37, Subchapter P, for the financial assurance requirements for closure and provide a signed statement from an authorized signatory per 30 TAC 305.44 regarding how the owner or operator will comply with this provision and indicate below the type of financial assurance mechanism to cover corrective action for the

facility.

If a financial mechanism has been obtained, provide a copy of the mechanism.

For applications involving permit transfers, the new owner or operator must provide a financial assurance mechanism (in original form) satisfactory to the TCEQ executive director. Prior to the executive director issuing the permit modification transferring the permit, the new owner or operator must provide proof of financial assurance in compliance with 30 TAC Section 305.64 (g) and Chapter 37, Subchapter P.

4. Liability Requirements (not required for post-closure care)

All owners or operators must establish financial assurance for third party sudden liability coverage of the facility no later than 60 days prior to the first receipt of waste [30 TAC Section 37.31(a)]. Owners or operators of disposal facilities must establish financial assurance for third party sudden and nonsudden liability coverage of the facility no later than 60 days prior to the first receipt of hazardous waste. Please refer to 30 TAC Chapter 37, Subchapter P, for the financial assurance requirements for liability coverage, and provide a signed statement from an authorized signatory per 30 TAC 305.44 regarding how the owner or operator will comply with this provision.

If a financial mechanism has been obtained, provide a copy of the mechanism.

For applications involving a permit transfer, the new owner or operator must provide a financial assurance mechanism (in original form) satisfactory to the TCEQ executive director. Prior to the executive director issuing the permit modification transferring the permit, the new owner or operator must provide proof of financial assurance in compliance with 30 TAC Section 305.64 (g) and Chapter 37, Subchapter P.

B. Applicant Financial Disclosure Statements for a new permit, permit amendment, or permit modification, or permit renewal (30 TAC 305.50(a)(4))

Refer to the Supplemental Technical Information Guidance for Applicants Subject to Financial Capability Requirements, included in Section VIII.B., and the requirements listed below as you complete this section.

1. Provide information required in 30 TAC 305.50(a)(4), as applicable to the application request.

2. Complete Table VIII.B. if requesting capacity expansion or new construction.

3. For new commercial hazardous waste management facility applications, a written statement signed by an authorized signatory per 30 TAC 305.44 explaining how the applicant intends to provide emergency response financial assurance per 30 TAC 305.50(a)(12)(C) or (D).

RESERVED

4. For renewal applications with no capacity expansion, please complete and submit the attached Financial Disclosure Letter.

Information for Applicants Subject to Financial Capability Requirements

Certain applications involving Hazardous Waste facilities are subject to review of the

applicant's financial ability to construct, operate, and/or close the facility, perform post-closure care and corrective action at the facility in accordance with State law as specified in Section 361.085 of the Texas Health and Safety Code. TCEQ refers to these reviews as financial capability reviews. This document summarizes and clarifies the information required in an application to meet the TCEQ requirements of 30 Texas Administrative Code (TAC) 305.50.

Information requirements vary depending on the type of financial information available to applicants, primarily whether audited financial statements are available as well as the type of application submitted. For each scenario described below, financial information must be provided for the specific applicant.

I. New Facilities, Facility Expansions and Permit Transfers

A. Publicly traded Entities

1. Securities and Exchange Commission (SEC) Form 10-Ks

   This portion of the requirement calls for the two most recent 10-K reports filed.

2. SEC Form 10-Q

   This portion of the requirement calls for a copy of the most recent quarterly report.

3. Explanation statement

   This portion of the requirement calls for a statement signed by an authorized signatory [as described in 30 TAC 305.44(a)] explaining in detail how the applicant demonstrates sufficient financial resources to construct, safely operate, properly close, perform post-closure care, perform corrective action and provide adequate liability coverage for the facility. This statement must also address how the closure, post-closure, corrective action, and liability coverage financial assurance requirements of Chapter 37, Subchapter P will be met. (ie. which financial assurance mechanism is or will be used).

4. Construction capital cost estimates

   This portion of the requirement calls for estimates of capital costs for expansion and/or initial construction if the application encompasses facility expansion, capacity expansion, or new construction.

B. Privately held entities with audited financial statements

1. Audited financial statements

   This portion of the requirement calls for complete copies of the audited financial statements for each of the most recent two fiscal years. If an audit has not been completed for one of the previous two years, a complete copy of the fiscal year end financial statement and federal tax return may be substituted in lieu of the audit not performed. The tax return must be certified by original signature of an authorized signatory as being a "true and correct copy of the return filed with the Internal Revenue Service." Financial statements must be prepared consistent with generally accepted accounting principles and include a balance sheet, income statement, cash flow statement, notes to the financial statement, and an accountant's opinion letter.

2. Quarterly financial statement

   This portion of the requirement calls for a complete copy of the most current quarterly financial statement prepared consistent with generally accepted accounting principles. Internally prepared statements are satisfactory.

3. Supplementary information statement

   This portion of the requirement calls for a written statement detailing the information that would normally be found in SEC's Form 10-K including descriptions of the business and its operations; identification of any affiliated relationships; credit agreements and terms; any legal proceedings involving the applicant; contingent liabilities; and significant accounting policies.

4. Construction capital cost estimates

   This portion of the requirement calls for estimates of capital costs for expansion and/or initial construction if the application encompasses facility expansion, capacity expansion, or new construction.

5. Explanation statement

   This portion of the requirement calls for a statement signed by an authorized signatory [as described in 30 TAC 305.44(a)] explaining in detail how the applicant demonstrates sufficient financial resources to construct, safely operate, properly close, perform post-closure care, perform corrective action and provide adequate liability coverage for the facility. This statement must also address how the closure, post-closure, corrective action, and liability coverage financial assurance requirements of Chapter 37, Subchapter P will be met (ie. which financial assurance mechanism is or will be used).

C. Entities without audited financial statements or entities choosing not to provide the information listed above

1. Financial Plan

   This portion of the requirement calls for a financial plan (including balance sheets listing assets, liabilities and capital accounts) sufficiently detailed to clearly demonstrate that the applicant will be in a position to readily secure financing for construction, operation, and closure, post-closure, and corrective action if the permit is issued. At least 3 balance sheets should be included as of: a) approximately the date of the permit application, b) 12 months after any construction is completed (or assumption of operational control for a permit transfer), and c) 24 months after any construction is completed (or assumption of operational control for a permit transfer).

2. Letters of opinion

   The submitted financial plan must be accompanied by original letters of opinion from two financial experts, not otherwise employed by the applicant, who have the demonstrated ability to either finance the facility or place the required financing. If the permit action sought involves construction of a new facility or expansion of an existing facility, the opinion letters must certify that financing is obtainable within 180 days of permit approval and include the time schedule contingent upon permit finality for securing the financing as well as certify the financial plan is reasonable. Even if the application does not involve a facility or capacity expansion, the opinion letters must certify that the financial plan is reasonable. Only one opinion letter from a financial expert, not otherwise employed by the applicant, is required if the letter renders a firm commitment to provide all the necessary financing.

   Letters of opinion are usually issued by investment or commercial bankers but there could be additional sources. Applicants are encouraged to verify the adequacy of the credentials of their chosen financial expert with TCEQ's financial assurance unit prior to a formal engagement. Financial experts should describe their qualifications and disclose their independence from the applicant and/or any entity or person affiliated with the applicant.

3. Operating and cash flow statement

   This portion of the requirement calls for a written detail of the annual operating costs of the facility and a projected cash flow statement including the period of construction and first two years of operation. The cash flow statement must demonstrate the financial resources to meet operating costs, debt service, and provide financial assurance for closure, post-closure care, and liability coverage requirements. A list of the assumptions made to forecast cash flow must also be provided.

4. Explanation statement

   This portion of the requirement calls for a statement addressing how the closure, post-closure, corrective action, and liability coverage financial assurance requirements of Chapter 37, Subchapter P will be met (ie. which financial assurance mechanism is or will be used).

5. Construction capital cost estimates

   This portion of the requirement calls for estimates of capital costs for expansion and/or initial construction if the application encompasses facility expansion, capacity expansion, or new construction.

D. Entities with a resolution from a governing body approving or agreeing to approve the issuance of bonds to satisfy financial assurance requirements (e.g. a city or county)

1. Explanation statement

   This portion of the requirement calls for a statement signed by an authorized signatory [as described in 30 TAC30 305.44(a)] explaining in detail how the applicant demonstrates sufficient financial resources to construct, safely operate, properly close, perform post-closure, perform corrective action and provide adequate liability coverage for the facility. This statement must also address how the closure, post-closure, corrective action, and liability coverage

financial assurance requirements of Chapter 37, Subchapter P will be met (ie. which financial assurance mechanism is or will be used).

2. Certified copy of the resolution from the governing body.

3. Certification by the governing body of passage of the resolution.

II. Permit Renewals

Complete the **Financial Disclosure Letter** letter with applicable information inserted into the parentheses. *Note that additional information must be provided if requested by TCEQ.*

IX. Releases from Solid Waste Units and Corrective Action

Provide all Part B responsive information in Appendix IX. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

The Texas Solid Waste Disposal Act, 30 TAC 335.167, 40 CFR 270.14(d) and Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984 (HSWA) *require that each hazardous waste management permit application review shall address corrective action for all releases of hazardous waste and hazardous constituents* listed in 40 CFR 261, Appendix VIII, 40 CFR Part 264, Appendix IX, and/or other constituents of concern from any solid waste management unit (SWMU) and/ or Areas of Concern (AOCs) at a facility, regardless of the time at which waste was placed in such unit[2]. For the purposes of HSWA Corrective Action, a SWMU may include, but is not limited to, any landfill, surface impoundment, land treatment unit, waste pile, underground injection well, incinerator, boiler, industrial furnace, tank, container storage area, drip pad, containment building, miscellaneous unit; any units exempt from hazardous waste permitting requirements, such as wastewater treatment units, elementary neutralization units, totally enclosed treatment units, waste recycle/reuse units, and 90-day accumulation time units; or process units or areas which may have routine and/or systematic releases to the environment (e.g., process drainage ditches or product storage tanks). Current EPA interpretation of this requirement has resulted in a Corrective Action process that begins with a RCRA Facility Assessment (RFA) to determine if corrective action is necessary.

[2]For the purposes of HSWA Corrective Action, a SWMU may include, but is not limited to, any landfill, surface impoundment, land treatment unit, waste pile, underground injection well, incinerator, boiler, industrial furnace, tank, container storage area, drip pad, containment building, miscellaneous unit; any units exempt from hazardous waste permitting requirements, such as wastewater treatment units, elementary neutralization units, totally enclosed treatment units, waste recycle/reuse units, and 90-day accumulation time units; or process units or areas which may have routine and/or systematic releases to the environment (e.g., process drainage ditches or product storage tanks).

The first step in the RFA is the development of a Preliminary Review (PR) from all available documentation for a facility (including but not limited to all facility documents, Part A, and Part B of the permit application, TCEQ correspondence files and inspection reports, etc.). The PR compiles available information on every SWMU and/or AOC that has ever existed at the facility. A unit checklist is completed for each SWMU and/ or AOC. On a unit-by-unit basis, the PR may recommend no further action for:

- well-designed and well-managed units
- units that have not managed hazardous wastes or wastes containing hazardous constituents;
- units already under corrective action by enforcement order; or
- units scheduled to be addressed in a compliance plan.

In addition, the unit checklists are summarized in a *Facility Checklist*. If there is a known release or potential for a release of hazardous waste or hazardous constituents from a unit/area, the PR may recommend a *RCRA Facility Investigation* (RFI), or an *Affected Property Assessment* (APA), if 30 TAC Chapter 350, Texas Risk Reduction Program (TRRP) applies, to determine the extent of the release for future corrective action, or stabilization as an appropriate and immediate corrective action.

The second step is a *Visual Site Inspection* (VSI) of the entire facility. The RFA is the combination of the PR and VSI documentation and any sample results. The RFA process should be scheduled so as to be completed during the latter stages of the Technical Review process or no later than one month in advance of the preparation of an initial draft permit for the facility. The RFA includes recommendations for whether further investigation or corrective action is warranted.

The requirements for an RFI or any other corrective action will be included in the permit, in the associated compliance plan which is mandatory for facilities with known groundwater contamination, or pursuant to 40 CFR 270.14(d)(3), the applicant may be required to start the RFI or other corrective action before the permit is issued. The RFI shall comply with all the applicable items contained in the U.S. EPA publication EPA/520-R-94-004, OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), May 1994, unless an alternate investigation approach is approved by the Executive Director. An RFI workplan may typically include a soil boring program, installation of monitoring wells, and sampling and analysis for 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX hazardous constituents for surface soils, subsurface strata, surface water, groundwater, and/or air.

The permittee shall perform the RFI or APA and report the results. Corrective Action under 30 TAC Chapter 350 consists of an APA, determination of protective concentration levels, selection of a remedy standard (if necessary), development and implementation of a response action (if necessary), and submittal of required report according to 30 TAC Chapter 350.

If the RFI report indicates releases of hazardous waste or hazardous constituents for SWMUs and/or AOCs that have been grandfathered under 30 TAC Chapter 335 Subchapters A and S, Corrective Action shall consists of, if necessary, Interim Corrective Measures, *Baseline Risk Assessment* (BLRA)/*Corrective Measures Study* (CMS) Report, and *Corrective Measures Implementation* (CMI).

For grandfathered SWMUs and/or AOCs, the permittee may continue to complete the Corrective Action requirements under 30 TAC Chapter 335, Subchapter A and S, provided the permittee complies with the notification and schedule requirements pursuant to 30 TAC 335.8 and 350.(2)(m).

This report shall evaluate the risk, identify and evaluate corrective measure alternatives, and recommend appropriate corrective measure(s) to protect human health and the environment. The BLRA/CMS Report shall address all of the applicable items in 30 TAC 350, 30 TAC 335 Subchapter S, and the U.S. EPA publication EPA/520-R-94-004, OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), May 1994.

Upon approval of the BLRA/CMS Report by the TCEQ, the permittee shall submit a CMI Workplan to address all of the items for CMI Workplan contained in the U.S. EPA publication EPA/520-R-94-004, OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), May 1994. For projects conducted under TRRP, the risk assessment process shall be addressed in the *Affected Property Assessment Report* (APAR), and the evaluation of corrective measures shall be

conducted as part of the remedy standard selection process provided in the *Response Action Plan* (RAP). If the CMI or RAP does not propose a permanent remedy, then a CMI Workplan or RAP shall be submitted as part of a new compliance plan application or as a modification/ amendment application to an existing compliance plan. The workplan or RAP shall contain detailed final engineering design, monitoring plans, and schedules necessary to implement the selected remedy. Implementation of the corrective measures shall be addressed through a new and/or a modified/amended compliance plan. Upon installation of a corrective action system based upon the approved CMI Workplan or RAP, the permittee shall submit a CMI Report or RAP which includes as-built drawings of the corrective action system. To report the progress of the corrective measures, the permittee shall submit periodic CMI Progress Reports or Response Action Effectiveness Reports to the TCEQ in accordance with the schedule specified in the compliance plan. Upon completion of the corrective action requirements, the permittee shall submit CMI Report or Response Action Completion Reports for review and approval.

Please note that the applicant/permittee may perform voluntary corrective action, stabilization, or "interim measures" at any time prior to or during the RFA/RFI/CMS/CMI or the APAR/RAP process without prior TCEQ approval. The TCEQ strongly supports these actions when undertaken to mitigate releases or reduce or minimize exposure and releases to human health and the environment.

A. Preliminary Review Checklists

For Applications for a New Hazardous Waste Permit:

- For all facility Solid Waste Management Units (SWMUs) and/or Areas of Concern (AOCs), complete the accompanying forms entitled "Preliminary Review Facility Checklist" and "Preliminary Review Unit Checklist". Make additional copies as necessary.

For Applications for a Renewal/Amendment/Modification of an Existing Hazardous Waste Permit:

- Update the Preliminary Review Facility Checklist to include any newly identified SWMUs and/or AOCs that were not incorporated into the previous permit issuance (new, amendment, modification, or renewal), and to update the status of all previously identified SWMUs or AOCs which are incorporated into the existing permit under either Section IX - Corrective Action for Solid Waste Management Units, or Section XI - Compliance Plan. Status updates should include notes regarding whether the SWMU or AOC has been incorporated into a compliance plan, has received approval of no further action (NFA), has had changes in its corrective action status, or has had other determinations issued by the TCEQ. Include the date of the status change in the updated checklist;
- Complete the Preliminary Review Unit Checklists for any newly identified SWMUs or AOCs that were not incorporated into the previous permit issuance (new, amendment, modification, or renewal);
- Update the status on the Preliminary Review Unit Checklists for all previously identified SWMUs or AOCs that had not yet received TCEQ approval of NFA at the time of the previous permit issuance;
- Provide copies of the letters from the TCEQ approving NFA or other determinations that were issued since the previous permit issuance;
- For previously identified SWMUs and/or AOCs which are incorporated into the existing permit and are included in Section XI - Compliance Plan of this application, you may forego filling out the Preliminary Review Unit Checklists for these units. Briefly note on the Preliminary Review Facility Checklist that the SWMUs or AOCs are addressed in

Section XI. Provide the location where the SWMU's and addressed in Section XI. ; or

- If all previously identified SWMUs and/or AOCs reached NFA status at or before the last permit issuance you may forego filling out the Preliminary Review Unit Checklists, indicate Not Applicable, and provide a brief explanation of the facts.

Complete Preliminary Review Facility Checklist (located in attachments)

Instructions for Preliminary Review Unit Checklist

Preliminary Review Facility Checklist

Preliminary Review Unit Checklist

X. Air Emission Standards

Provide all Part B responsive information in Appendix X. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

Section X.D. applies to Permittees with "one- stop" permits applying for an amendment, modification, or renewal of the Air Permits Division portions of their combined "one-stop" permit.

A. Process Vents

Does the facility have process vents and equipment subject to the requirements of 40 CFR Part 264, Subpart AA?

If Yes: please provide a report that includes all of the information required by 40 CFR §270.24. Indicate on a facility plot plan the approximate location of process vents.

1. For incorporation into the permit, complete Table X.A - Process Vents for all vents on waste management units that manage hazardous waste with an annual average total organics concentration of 10 ppmw or greater ("process vents"). Specifically include:

   a. process vents on distillation, fractionation, thin-film evaporation, solvent extraction, air or steam stripping operations, and vents on condensers serving these operations; and

   b. process vents on tanks (e.g., distillate receivers, bottom receivers, surge control tanks, separator tanks, and hot wells) associated with distillation, fractionation, thin-film evaporation, solvent extraction, and air or steam stripping processes if emissions from these process operations are vented through the tanks.

      Emissions caused by natural means such as daily temperature changes or by tank loading and unloading are not subject to control.

2. For process vents, include the following certification as part of the air emissions report:

   I,_____*[owner or operator]*___, certify that the operating parameters used in the design analysis reasonably represent the conditions that exist when the hazardous waste management unit is or would be operating at the highest load or capacity level reasonably expected to occur.

   I further certify that the control device is designed to operate at an efficiency of 95 weight percent or greater.

   OR

   I further certify that the total organic emission limits of 40 CFR §264.1032(a) for affected process vents at the facility can be attained by a control device involving vapor recovery at an efficiency less than 95 weight percent.

   [Signature] _____ *[Date]* _____.

B. Equipment Leaks

Does the facility have equipment subject to the requirements of 40 CFR Part 264, Subpart BB?

If No: please provide the regulatory exclusion/exemption(s):

If Yes: please provide a report that includes all of the information required by 40 CFR §270.25.

1. For incorporation into the permit, complete Table X.B. - Equipment Leaks for all valves, pumps, compressors, pressure relief devices, sampling connection systems, and open-ended valves or lines that contain or contacts hazardous waste streams with organic concentrations of 10% by weight or greater. Equipment in vacuum service is not subject to control if identified in the facility operating record.

2. For equipment, include the following statement as part of the air emissions report:

   I, *[owner or operator]*, certify that the operating parameters used in the design analysis reasonably represent the conditions that exist when the hazardous waste management unit is operating at the highest load or capacity level reasonably expected to occur.

   I further certify that the control device is designed to operate at an efficiency of 95 weight percent or greater.

   [Signature] _____ *[Date]* _____.

C. Tanks, Surface Impoundments, and Containers

Does the facility have tanks subject to the requirements of 40 CFR Part 264, Subpart CC?

☐ Yes ☐ No ☐ Not Applicable (no permitted tanks)

If No: provide the regulatory exception/exemption(s) for each tank subject to regulation under 40 CFR Part 264, Subpart J:

Does the facility have surface impoundments subject to the requirements of 40 CFR Part 264, Subpart CC?

☐ Yes ☐ No ☐ Not Applicable (no permitted surface impoundments)

If No: provide the regulatory exception/exemption(s) for each permitted surface impoundment subject to regulation under 40 CFR Part 264, Subpart K:

Does the facility have containers subject to the requirements of 40 CFR Part 264, Subpart CC?

☐ Yes ☐ No ☐ Not Applicable (no permitted container storage areas)

If No: provide the regulatory exception/exemption(s) applicable to the authorized containers subject to regulation under 40 CFR Part 264, Subpart I:

If the facility contains tanks, surface impoundments, and containers subject to the requirements of 40 CFR Part 264 Subpart CC, please provide a report that includes all of the information required by 40 CFR §270.27.

1. For incorporation into the permit, complete Table X.C.

2. As applicable, include the following floating roof cover certification as part of the air emissions report for tanks:

   I,_____*[owner or operator]*___, certify that the floating roof cover meets the applicable design specifications as listed in 40 CFR §264.1084(e)(1) or 40 CFR §264.1084(f)(1).

   [Signature] _____ *[Date]* _____.

3. As applicable, include the following floating membrane cover certification as part of the air emissions report for surface impoundments:

   I,_____*[owner or operator]*___, certify that the floating membrane cover meets the applicable design specifications listed in 40 CFR §264.1085(c)(1).

   [Signature] _____ *[Date]* _____.

4. As applicable, include the following container certification as part of the air emissions report for containers:

   I,_____*[owner or operator]*___, certify that the requirements of 40 CFR Part §264, Subpart CC, are met for all containers subject to control.

   [Signature] _____ *[Date]* _____.

5. As applicable, include the following control device certification as part of the air emissions report:

   I,_____*[owner or operator]*___, certify that the control device is designed to operate at the performance level documented by a design analysis as specified in 40 CFR 264.1089 (e)(1)(ii) or by performance tests as specified in 40 CFR §264.1089(e)(1)(iii) when the tank, surface impoundment, or container is or would be operating at capacity or the highest level reasonably expected to occur.

   [Signature] _____ *[Date]* _____.

D. "One-Stop" Permits: - RESERVED

XI. Compliance Plan -RESERVED

XII. Hazardous Waste Permit Application Fee

Provide all Part B responsive information in Appendix XII. When preparing the physical format organize your submittal using the Format of Hazardous Waste permit Application and Instructions.

In accordance with 30 TAC 305.53, complete Tables XII.A. - Hazardous Waste Units (For Application Fee Calculations) and XII.B. - Hazardous Waste Permit Application Fee Worksheet. Use the following information in calculating your fee. The application fee will be non-refundable once an initial review of the application has been completed. The applicant's fees are subject to evaluation by the technical staff of the Texas Commission on Environmental Quality (TCEQ). However, the TCEQ reserves the right to assess further fees as may be necessary.

A. The minimum permit application fee for a permit or a permit renewal for each hazardous waste facility to be used for Storage, Processing, Disposal, or Closure/Post-Closure Care (disposal has already occurred) of hazardous waste shall be $2,000, plus notice fee, and the maximum shall be $50,000, calculated according to these instructions:

1. Process Analysis - $1,000.00.

2. Management/Facility Analysis - $500.00.

3. A facility unit(s) analysis of $500 per unit is charged for the following:

   a. each cell of a landfill (note that multiple cells that are identical in type and use are subject to a single $500 fee);

   b. tanks and container storage areas (note that multiple tanks and container storage areas that are identical in type and use are subject to a single $500 fee)

   c. identical in type and use means the following:
      (1) made of the same material and same design;
      (2) the same size/capacity within + 10%;
      (3) store the same waste (as identified by USEPA hazardous waste number - 40 CFR 261 Subparts C & D); and
      (4) have the same management characteristics (e.g., storage only).

   d. Each incinerator, boiler/industrial furnace unit, surface impoundment, waste pile, land treatment unit, drip pad, miscellaneous unit, or containment building.

4. Site Evaluation - $100 per acre of surface used for hazardous waste management up to 300 acres. No additional fee thereafter. This shall be calculated as any acreage which will be permitted to manage hazardous waste. This shall include, for example, the entire area within the secondary containment of a tank farm, the area within a fence that surrounds individual units (other than the facility fence), or the area defined by the toe of the dike surrounding a landfill or impoundment, etc.

5. An applicant shall also include with each initial application a fee of $50 to be applied toward the cost of providing the required notice. An additional notice

fee of $15 is required with each application for renewal.

B. The application fee for a major amendment or a Class 2 or 3 modification to a hazardous waste permit for operation, closure, or post-closure care is subject to the fees listed below:

1. A management/facility analysis fee of $500.

2. The notice fee is $50.

3. If a unit is added or a unit area is expanded for any purpose, $100 per additional acre is assessed, until the total additional acreage reaches 300 acres.

4. If one or more of the following reports are added or are significantly revised, the process analysis fee of $1000 is assessed:

   a. waste analysis plan;

   b. site-specific or regional geology report;

   c. site-specific or regional geohydrology report;

   d. groundwater and/or unsaturated zone monitoring;

   e. closure and/or post-closure care plan; or

   f. RCRA Facility Assessments (RFAs), or corrective action reports;

   g. Alternate Concentration Limit (ACL) demonstration or Development of Protective Concentration Limits (PCLs);

   h. Regulated Unit Facility Assessment, Corrective Action (CA) work plans or reports for Regulated Units; and/or

   i. RCRA Facility Investigation (RFI)/Affected Property Assessment (APA), Remedy Selection, Corrective Measure Implementation (CMI)/Remedial Action Plan for solid waste management units, and/or areas of concern;

   j. Facility Operations Area (FOA).

5. A unit analysis fee of $500 per unit is assessed if any of the following occur:

   a. if a unit is added (even if identical to units already in place, using the criteria discussed in A.3 above);

   b. if there are design changes in an existing unit; or

   c. if a unit status changes from closure to post-closure care;

   d. Changes in the number, location, depth, or design of wells approved in compliance plan or a permit (unless it is a replacement well);

   e. Changes in point of compliance and compliance monitoring program;

   f. Changes in Groundwater Protection Standards, indicator parameters, Alternate Concentration Limits or Protective Concentration Limits; and/or

   g. Changes in corrective action program.

C. The application fee for a minor amendment, a Class 1, or a Class 1^1 modification of a

hazardous waste permit is $100 plus the notice fee of $50.

XIII. Confidential Material-RESERVED

Table I: General Information

Applicant: Facility Operator (or Facility Owner & Operator, if same)

Name[1]	Clean Harbors La Porte, LLC
Address	500 Independence Parkway South
City, State	La Porte, Texas
Zip Code	77571
Telephone Number	(281) 884-5500 ext 5519
Alternate Telephone Number	
TCEQ Solid Waste Registration No.	50225
EPA I.D. No.	TXD982290140
Permit No.	50225
County	Harris
Regulated Entity Name	Clean Harbors LaPorte, LLC
Regulated Entity Reference Number (RN)	102949021
Customer Name	Clean Harbors LaPorte, LLC
Customer Reference Number:	603661844
Charter Number[2]	800102165
Previous or Former Names of the Facility (if applicable)	

Facility Owner: Identify the Facility Owner if different than the Facility Operator[3]

Name	Same as Facility Operator
Address	
City, State	
Zip Code	
Telephone Number	
Alternate Telephone Number	
Fax:	

Facility Contact

Persons or firms who will act as primary contact:

Name, Title:	Steve Venti, General Manager
Address	500 Independence Parkway South
City, State:	LaPorte, Texas
Zip Code	77571
Telephone Number	(281) 884-5500 ext 5519
Alternate Telephone Number	
E-mail	ventis@cleanharbors.com
Fax:	

Persons or firms who will act as primary contact (if more than one):

Name, Title:	Same as above
Address	
City, State:	
Zip Code	
Telephone Number	
Alternate Telephone Number	
E-mail	
Fax:	

Agent in Service or Agent of Service (if you are an out-of-state company)[4]:

Name, Title:	CT Corporation System
Address	350 North St. Paul Street
City, State:	Dallas, TX
Zip Code	75201

Individual responsible for causing notice to be published:

Name:	Steve Venti
Address	500 Independence Parkway South
City, State:	LaPorte, Texas
Zip Code	77571
Telephone Number	(281) 884-5519

Alternate Telephone Number	
E-mail	ventis@cleanharbors.com
Fax:	

Public place in county where application will be made available[5]:

Name	La Porte Branch Library
Address	600 South Broadway Street
City, State	La Porte, TX
Zip Code	77571

Application Type and Facility Status

- ☐ Permit
- ☐ new
- ☐ interim status
- ☒ renewal
- ☐ RD&D
- ☐ Compliance Plan
- ☒ Amendment
- ☐ major
- ☒ minor
- ☐ Modification
- ☐ Class 3
- ☐ Class 2
- ☐ Class 1[1]
- ☐ Class 1

Application Type

Part of a Consolidated Permit Processing request? [30 TAC Chapter 33]	No
Does the application contain confidential material?[6]	No

Facility Status

- ○ Proposed
- ◉ Existing

- ☒ On-Site
- ☐ Off-Site
- ☒ Commercial
- ☐ Recycle
- ☐ Land Disposal
- ☐ Areal or capacity expansion
- ☐ Compliance plan

Is the facility within the Coastal Management Program boundary? **Yes**

Description of Application Changes

Complete Table I.1 - Description of Proposed Application Changes.

Note: List all changes requested in Table I.1. Unlisted requests risk remaining unaddressed or possibly denied if brought to the permit application reviewer's attention at a later time.

Total acreage of the facility being permitted:	**15**
Identify the name of the drainage basin and segment where the facility is located:	Jacinto River Basin #10, Segment #10

Facility Siting Summary:

Is the facility located or proposed to be located:

Within a 100-year floodplain?	No
In the critical habitat of an endangered species of plant or animal?	No
On the recharge zone of a sole-source aquifer?	No
In an area overlying a regional aquifer?	No
Within 0.5 mile (2,640 feet) of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park?[7] [30 TAC 335.202] If Yes: the TCEQ shall not issue a permit for this facility.	No
In an area in which the governing body of the county or municipality has prohibited the processing or disposal of municipal hazardous waste or industrial solid waste? If Yes: provide a copy of the ordinance or order.	No

Wastewater and Stormwater Disposition

Is the disposal of any waste to be accomplished by a waste disposal well at this facility?	No
If Yes: List WDW Permit No(s):	

Will any point source discharge of effluent or rainfall runoff occur as a result of the proposed activities?	
If Yes, is this discharge regulated by a TPDES or TCEQ permit? ☒ Yes	
TCEQ Permit No.	
TPDES Permit No.	TXR05U063
☐ No	
Date TCEQ discharge permit application filed	
Date TPDES discharge permit application filed:	10/25/2016

Information Required to Provide Notice

State Officials List [30 TAC 39.103(b)]

State Senator	The Honorable Carol Alvarado P.O. Box 12068 Capitol Station Austin, TX 78711
State Representative	Texas State House Representative District 144 Representative Mary Perez P.O. Box 2910 Austin, TX 78768

Local Officials List [30 TAC 39.103(c)]

Mayor	The Honorable Mayor Louis R Rigby 604 W Fairmont Parkway La Porte, TX 77571
Health Authority	Members of the City of LaPorte Health Authority: Oscar Boultinghouse, M.D. Abdul R. Moosa, M.D. Robert D. Johnston, M.D. 604 W Fairmont Parkway La Porte, TX 77571

Based on the questions in the Bilingual Notice Instructions for this form, are you required to make alternate (Bilingual) notice for this application?	Yes
Bilingual Language(s):	Spanish
TCEQ Core Data Form Submitted? (see Section I Instructions, Item b.)	Yes

Has any information changed on the TCEQ Core Data Form since the last submittal?	Yes
Signature on Application Submitted? (see Section I Instructions, Item c)	Yes

Table I.1-Description of Proposed Application Changes

Permit/Compliance Plan Application Appendix/Section	Brief Description of Proposed Change	Modification or Amendment Type	Supporting Regulatory Citation
Application Parts A and B as well as supporting documentation	Updates and corrections only for renewal application - i.e., no changes to permitted hazardous waste management units	Renewal/Minor Amendment	30 TAC §305.42, 305 Subchapter D

TCEQ Core Data Form

TCEQ Use Only

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (*If other is checked please describe in space provided.*)

☐ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.*)

☒ Renewal (*Core Data Form should be submitted with the renewal form*) ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN 603661844		RN 102949021

SECTION II: Customer Information

4. General Customer Information	5. Effective Date for Customer Information Updates (mm/dd/yyyy)	05/29/2020

☐ New Customer ☒ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)*	*If new Customer, enter previous Customer below:*
Clean Harbors La Porte, LLC	

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
0010068906	10426989991	481263744	1577936

11. Type of Customer: ☒ Corporation ☐ Individual Partnership: ☐ General ☐ Limited

Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☒ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?
☐ Yes ☒ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☐ Owner ☐ Operator ☒ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:	500 Independence Parkway South							
	City	La Porte	State	TX	ZIP	77571	ZIP + 4	9768

16. Country Mailing Information *(if outside USA)*	17. E-Mail Address *(if applicable)*

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(281) 884-5500	5519	( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information (*If 'New Regulated Entity" is selected below this form should be accompanied by a permit application*)

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☒ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name (*Enter name of the site where the regulated action is taking place.*)

Clean Harbors La Porte, LLC

23. Street Address of the Regulated Entity: *(No PO Boxes)*	500 Independence Parkway South							
	City	La Porte	**State**	TX	**ZIP**	77571	**ZIP + 4**	9768
24. County	Harris							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	500 Independence Parkway South				
26. Nearest City			**State**	**Nearest ZIP Code**	
La Porte			TX	77571	
27. Latitude (N) In Decimal:		**28. Longitude (W) In Decimal:**			
Degrees	**Minutes**	**Seconds**	**Degrees**	**Minutes**	**Seconds**
29	42	24.30	95	05	28.70

29. Primary SIC Code (4 digits)	**30. Secondary SIC Code** (4 digits)	**31. Primary NAICS Code** (5 or 6 digits)	**32. Secondary NAICS Code** (5 or 6 digits)
4953	4226	562211	493110

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

Hazardous/non-hazardous/biomedical waste transfer/consolidation/storage/treatment & distribution center

34. Mailing Address:	**500 Independence Parkway South**							
	City	**La Porte**	**State**	**TX**	**ZIP**	**77571**	**ZIP + 4**	**9768**
35. E-Mail Address:								

36. Telephone Number	**37. Extension or Code**	**38. Fax Number** *(if applicable)*
(281) 884-5500	**5519**	**( ) -**

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☒ Industrial Hazardous Waste
				50225
☒ Municipal Solid Waste	☒ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☒ PWS
50225	PRB - Multiple			1012759
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☒ Used Oil
				A85635
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☒ Other:
				TXD982290140

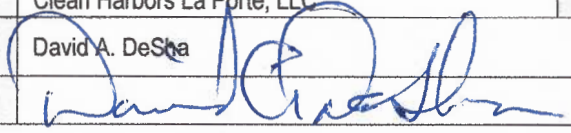
SECTION IV: Preparer Information

40. Name:	David DeSha	**41. Title:**	Sr. Environmental Compliance Mgr

42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(423) 413-1218		( ) -	desha.david@cleanharbors.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Clean Harbors La Porte, LLC	**Job Title:**	Sr. Environmental Compliance Manager
Name *(In Print):*	David A. DeSha	**Phone:**	(423) 413- 1218
Signature:		**Date:**	5/21/2020

Signature Page

I, James Childress, V.P. Environmental Compliance,

(Operator) *(Title)*

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: 5/21/2020

To be completed by the Operator if the application is signed by an Authorized Representative for the Operator

I, _____, hereby designate _____

[Print or Type Name] *[Print or Type Name]*

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____

Printed or Typed Name of Operator or Principal Executive Officer

_____

Signature

SUBSCRIBED AND SWORN to before me by the said

On this 21st day of May, 2020

My commission expires on the 28th day of March, 2023

Notary Public in and for Robertson County, ~~Texas~~ Tennessee

*[**Note**: Application Must Bear Signature & Seal of Notary Public]*

SHARON L HART
STATE OF TENNESSEE
NOTARY PUBLIC
COUNTY OF ROBERTSON

I.D Interim Status Land Disposal Unit(s) Certification

This section is not applicable, no interim status land disposal units are on-site.

The person identified below would be considered as affected persons.

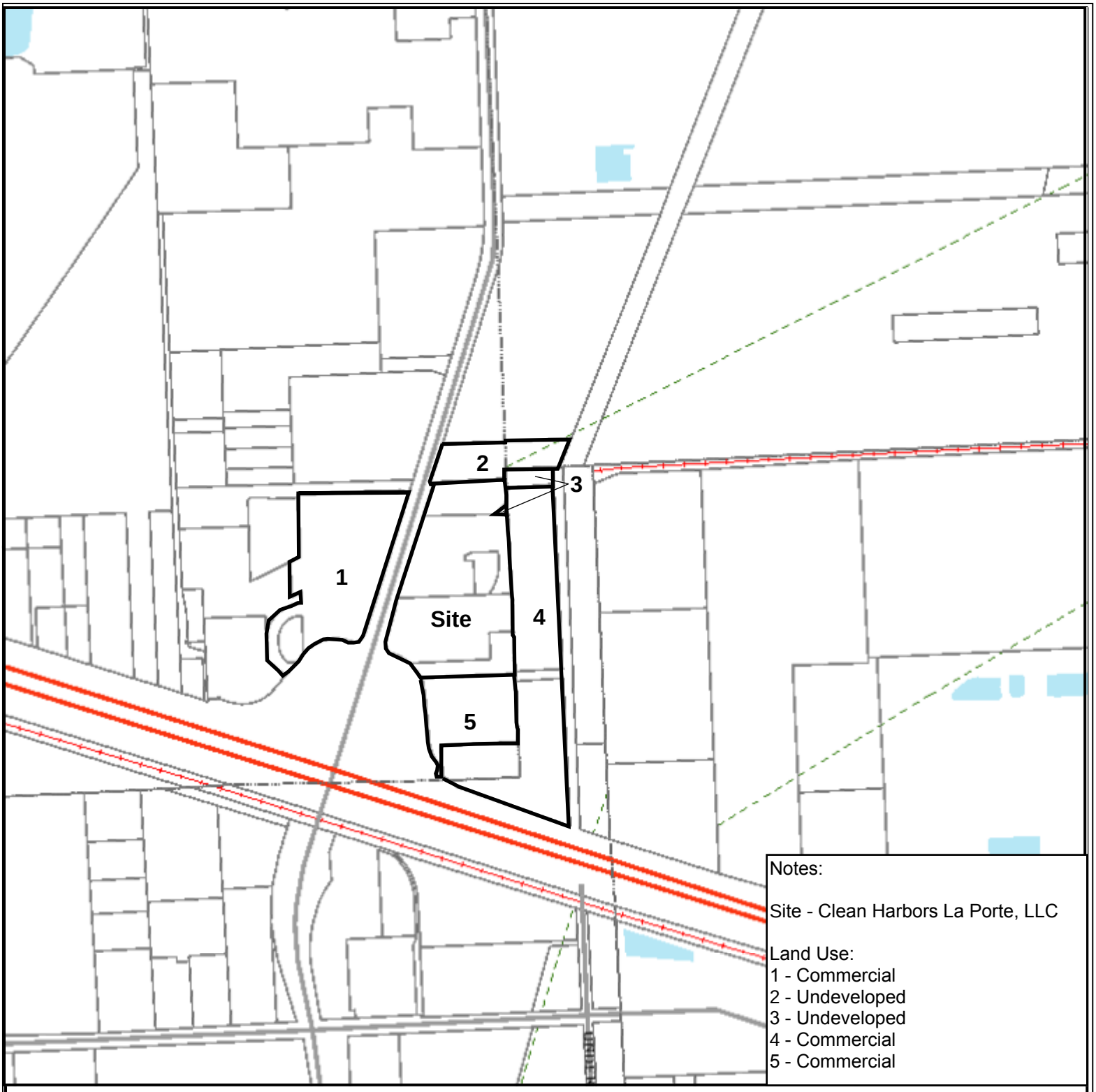
1. LOVES TRAVEL STOP & COUNTRY STORE INC
   PO BOX 26210
   OKLAHOMA CITY OK 73126

2. DOW CHEMICAL
   332 SH 332 EAST TAX DEPT APB BLDG FL 4A
   LAKE JACKSON TX 77566

3. SOUTHERN PACIFIC RAILROAD COMPANY
   UNION PACIFIC RAILROAD CO
   1400 DOUGLAS ST STOP 1640
   OMAHA NE 68179

4. RAPID ENVIRONMENTAL SERVICES
   PO BOX 687
   DEER PARK TX 77536

5. BATTLEGROUND INVESTMENTS
   4222 VISTA RD
   PASADENA TX 77504

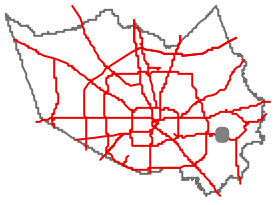


Notes:

Site - Clean Harbors La Porte, LLC

Land Use:
1 - Commercial
2 - Undeveloped
3 - Undeveloped
4 - Commercial
5 - Commercial

Clean Harbors La Porte, LLC
500 Independence Parkway
La Porte, TX 77571
Adjacent Landowners Map



Harris County Appraisal District

0 390 780 1,560 Feet

Date: 3/18/2020

Geospatial or map data maintained by the Harris County Appraisal District is for informational purposes and may **not** have been prepared for or be suitable for legal, engineering, or surveying purposes. It does **not** represent an on-the-ground survey and only represents the approximate location of property boundaries.

N W E S

Table II Facility Siting Criteria Information

Requirements for Storage or Processing Facilities, Land Treatment Facilities, Waste Piles, Storage Surface Impoundments, and Landfills

Is the facility located or proposed to be located[1]:

In wetlands? [as applicable: 30 TAC 335.204(a)(2), (b)(2), (c)(2), (d)(2), and/or (e)(2)	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste management facility or areal expansion of an existing facility into wetlands, pursuant to 30 TAC 335.205(a)(1).	
In the critical habitat of an endangered species of plant or animal?[6] [as applicable: 30 TAC 335.204(a)(8), (b)(10), (c)(9), (d)(9), and/or (e)(11)]	No
If Yes: submit in Section V information demonstrating that design, construction, and operational features will prevent adverse effects on such critical habitat.	
On the recharge zone of a sole-source aquifer?2 [30 TAC 335.204(a)(3), (b)(3), (c)(3), (d)(3), and/or (e)(3)]	No
If Yes: then for storage and processing facilities (excluding storage surface impoundments), submit in Section V information demonstrating that secondary containment is provided to preclude migration to groundwater from spills, leaks, or discharges.	
In an area overlying a regional aquifer? [as applicable: 30 TAC 335.204(a)(4), (b)(4), (c)(4), (d)(4), and/or (e)(4)]	No
If Yes: submit site-specific information in Section V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1).	
In areas where soil unit(s) are within five feet of the containment structure, or treatment zone, as applicable, that have a Unified Soil Classification of GW, GP, GM, GC, SW, SP, or SM, or a hydraulic conductivity greater than 10-5 cm/sec? [as applicable: 30 TAC 335.204(a)(5), (b)(5), (c)(5), (d)(5), and/or (e)(5)]	No
If Yes: provide additional information in Sections V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1)	
In areas of direct drainage within one mile of a lake at its maximum conservation pool level, if the lake is used to supply public drinking water through a public water system?[6] [as applicable: 30 TAC 335.204 (a)(6), (b)(7), (c)(6), and/or (e)(8)].	No
If Yes: provide information in Section V demonstrating compliance with 30 TAC 335.205(a)(1).	

In areas of active geologic processes, including but not limited to erosion, submergence, subsidence, faulting, karst formation, flooding in alluvial flood wash zones, meandering river bank cuttings, or earthquakes?[6] [as applicable: 30 TAC 335.204(a)(7), (b)(8) ,(c)(7), (d)(7), and/ or (e)(9)]	No
Within 30 feet of the upthrown side or 50 feet of the downthrown side of the actual or inferred surface expression of a fault that has reasonably been shown to have caused displacement of shallow Quaternary sediments or of man-made structures?[6] [as applicable: 30 TAC 335.204(a)(9), (b)(12) ,(c)(11), (d)(11), and/or (e)(13)]	No
If Yes: specify in Section V the design, construction, and operational features that will prevent adverse effects resulting from any fault movement. If a fault is found to be present, the width and location of the actual or inferred surface expression of the fault, including both the identified zone of deformation and the combined uncertainties in locating a fault trace, must be determined by a qualified geologist or geotechnical engineer and reported in Section VI.	

Table II.B. - Additional Requirements for Land Treatment Facilities [30 TAC 335.204(b)]:

Is the land treatment facility located or proposed to be located: N/A - not a land treatment facility

Within 1000 feet of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park which is in use at the time the notice of intent to file a permit application is filed with the commission, or which is in use at the time the permit application is filed with the commission?
If Yes: the TCEQ shall not issue a permit for a new hazardous waste land treatment unit or an areal expansion of an existing land treatment unit, pursuant to 30 TAC 335.204(b)(6) and 335.205(a).
Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?
If Yes: submit in Section V.F design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.
If Yes: submit Section V.F design, construction and operational features, which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
On a barrier island or peninsula?
If Yes: the TCEQ shall not issue a permit for a new hazardous waste land treatment unit or an areal expansion of an existing land treatment unit, pursuant to 30 TAC 335.204(b)(11) and 335.205(a)(1).

Table II.C. - Additional Requirements for Waste Piles [30 TAC 335.204(c)]

Is the waste pile located or proposed to be located: N/A - no waste piles

Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?
If Yes: submit in Section V.E design, construction, and operational features on the facility which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.
If Yes: submit Section V.E design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
On a barrier island or peninsula?[6]
If Yes: the TCEQ shall not issue a permit for a new hazardous waste pile or an areal expansion of an existing waste pile, pursuant to 30 TAC 335.204(c)(10) and 335.205(a)(1).

Table II.D. - Additional Requirements for Storage Surface Impoundments [30 TAC 335.204(d)]

Is the land treatment facility located or proposed to be located: N/A - no storage surface impoundments

Within 1000 feet of an area of active coastal shoreline erosion even though the area is protected by a barrier island or peninsula
If Yes: submit in Section V.D design, construction, and operational features of the facility which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.
If Yes: then submit in Section V.D design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
On a barrier island or peninsula?[6]
If Yes: the TCEQ shall not issue a permit for a new hazardous waste storage surface impoundment or an areal expansion of an existing storage surface impoundment, pursuant to 30 TAC 335.204(d)(10) and 335.205(a)(1).

Table II.E. - Additional Requirements for Landfills (and Surface Impoundments Closed as Landfills with wastes in place)

Is the landfill located or proposed to be located: N/A - No landfills (and surface impoundments closed as landfills)

Within 1000 feet of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park which is in use at the time the notice of intent to file a permit application is filed with the commission, or which is in use at the time the permit application is filed with the commission?
If Yes: the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(6) and 335.205(a)(1).
(For commercial hazardous waste landfills) in the 100-year flood plain of a perennial stream that is delineated on a flood map adopted by the Federal Emergency Management Agency after September 1, 1985, as zone A1-99, VO, or V1-30?
If Yes: the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(7) and 335.205(a)(1).
Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?
If Yes: then submit in Section V.G design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barriers island or peninsula.
If Yes: then submit in Section V.G design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
On a barrier island or peninsula?
If Yes: the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(12) and 335.205(a)(1).

Flooding (see Section II Instructions, Item F)

Is the facility within a 100-year flood plain?	No
Has a flood plain map been provided?	Yes
Has information about flooding levels and events, and other special flooding factors, been provided?[3]	
Do any flood protection devices exist at the facility (e.g., flood walls, dikes, etc.) designed to prevent washout from the 100-year flood?[3]	
If Yes: provide in Section V an engineering analysis to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)][4]	
If No: the applicant shall provide in Section V a plan for constructing flood protection devices and a schedule including specific time frames for completion. Provide engineering analyses to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)][5]	
If applicable, and in lieu of the flood protection devices from above, was a detailed description of the procedures to be followed to remove hazardous waste to safety before the facility is flooded provided?[3, 6]	
Additional Information Requirements (see Section II instructions, Item G): Submitted?	

Appendix II.B

RESERVED

Appendix II.C

RESERVED

Appendix II.D

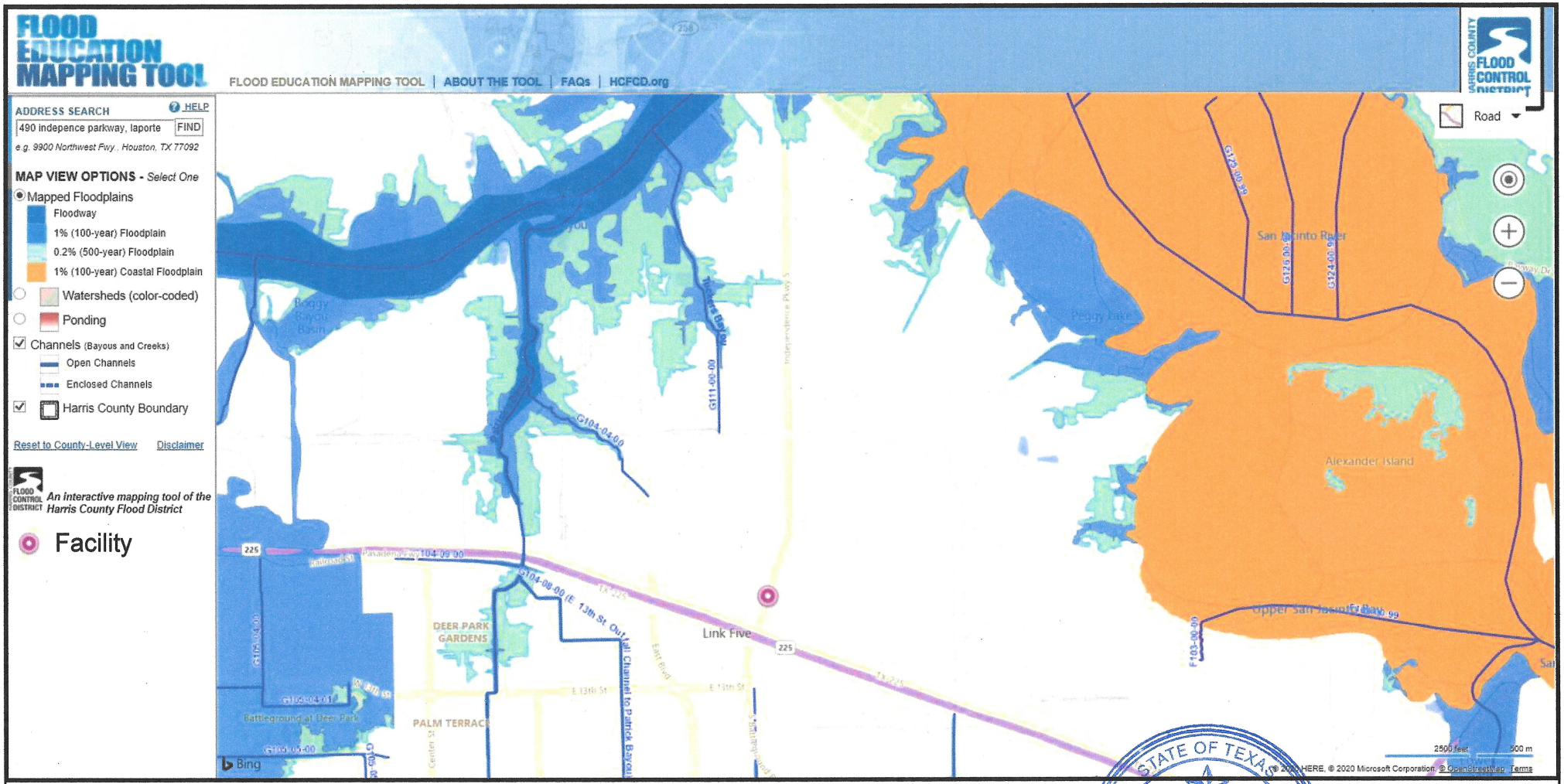
RESERVED

Appendix II.E

RESERVED

II.F Flooding

This facility is not located within a 100-year flood plain [40 CFR 270.14(b)(11)(iii)] based on the flood map provided by the Harris County Flood Control District.



Clean Harbors La Porte, LLC
Flood Plain Map

STATE OF TEXAS
FRIEDRICH KREMBS
GEOLOGY
12067
LICENSED
PROFESSIONAL GEOSCIENTIST
5.20.2020

Firm # 50023

N

Harris County Flood Control District
Obtained from https://www.harriscountyfemt.org/
3/18/2020

II.G Additional Information Requirements

No additional information requirements were identified.

III.A Compliance History and Applicant Experience

This section is not applicable by 30 TAC 305.50(a)(2) the applicant does not own, operate, or control any solid waste management sites in Texas other than the facility in this application.

Section III. – Appendix B (TRAINING PLAN)

Clean Harbors La Porte, LLC has developed this Training Plan to document compliance with the requirements of 40 CFR 264.16.

1.1 INTRODUCTION

This plan outlines the introductory and continuing training programs implemented by facility management to prepare employees to operate and maintain the facility in a safe and environmentally sound manner, and describes how this training is tailored to actual job tasks assigned to the employees.

This plan describes the training program as it applies to the existing facility. As the facility updates and expands, the program will be expanded, if necessary, to encompass these changes. This plan has been designed to provide a general outline of the training program and is not intended to provide a complete list of all job titles, positions, and employees at the facility, but rather provide information of the training provided to the various categories of employees. Detailed information on employees, training records, and job descriptions is maintained in the facility records.

1.2 OUTLINE OF THE TRAINING PLAN

Employees at the facility receive both on-the-job and classroom training. This training is designed to educate the employees about the specific facility operations for which he/she will be responsible, health and safety requirements of the facility, and the general aspects of a hazardous waste management program.

In accordance with 40 CFR 264.16, new employees receive on-the-job training and/or classroom training within six months of their employment, and do not work unsupervised until required regulatory training is completed. Employees who are transferred or promoted to a new position receive the necessary training within 6 months. New employees and employees who are transferred or promoted do not work in unsupervised positions until they have completed the training.

1.2.1 Job Titles and Duties

The facility currently classifies employees into different positions based on skills and responsibilities. The facility classifies employees in six general groups:

1. Supervisor
2. Operator
3. Material Handler
4. Mechanic

5. Laboratory
6. Office - Clerical

A written job description for each of these positions subject to training under hazardous waste regulations has been prepared that identifies the duties, requisite skill, and qualifications for each different position. Each job description identifies the following; a) function/scope, b) principal duties/responsibilities, and c) position requirements/skills. Only personnel with the job descriptions provided that are directly involved in the management of hazardous waste will be given the training outlined in this plan. An example job description (including job title) is included as **Attachment 1** to this Training Plan. The most current job descriptions are maintained at the facility. The names of employees and current job assignments within these categories are subject to change as plant operational and personnel needs change. This information is maintained current and is available in the employee records as described in Section 7.3.3.

1.2.2 Classroom Training

Classroom training consists of an experienced person presenting information, leading a discussion, answering questions, and/or conducting a study in a classroom situation away from the job area. Experienced supervisors, Divisional and Corporate personnel, and qualified third-party vendors may conduct classroom training. The facility is subject to many regulations and therefore provides many different types of training programs. The training may consist of reviewing training software on personal computers, using training software made available through an internet connection, or other alternative means available. The classroom training is not intended to be limited to the use of instructors being present in the room to provide the training.

Provided for informational purposes only, are copies of different outlines that may be used to conduct the RCRA Update training. As permits, regulations and operations change, the outline of items covered will change. Therefore, the information provided in **Attachment 2** is not intended to be a permanent outline of the training provided to employees.

1.2.3 On-The-Job Training

On-the-job training typically consists of an experienced employee supervising, observing, counseling, and teaching a new or less experienced employee the fundamentals of particular job tasks assigned to that employee. This training starts at the time the employee begins work at the facility. Due to the wide variety of tasks each employee may be responsible for, it is impossible to provide a list of on-the-job training elements provided for each job title. However, each employee must be certified as able to adequately perform required job tasks before the employee is allowed to work unsupervised.

Employees have available a chemical description and Safety Data Sheet (SDS) for the materials they are handling. The information on these sheets is important for safe routine handling of chemicals as well as for deciding on an appropriate response in an emergency. The employees are taught how to read on SDS and where they are available at the facility.

The materials handled at the facility include a wide variety of chemicals and associated wastes for storage prior to transfer offsite to final disposal sites. The individual wastes managed at the facility are represented by the EPA hazardous waste codes identified in **Table IV.B.**

1.2.4 Training Content

The training program is designed to provide employees with the knowledge and experience necessary to safely and efficiently conduct the tasks assigned to them, and to provide instruction and guidance regarding the equipment, procedures, and systems utilized during an emergency response situation. Therefore, while prevention of accidents involving hazardous materials is foremost, timely and appropriate response to an accident is also an important aspect of the training program.

The classroom courses and on-the-job training programs include, where applicable:

- Location of and procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment;
- Key parameters and controls for waste-feed and transfer cut-off system;
- Communication and alarm systems;
- Response to fires or explosions, as described below;
- Response to spills or other potential groundwater contamination incidents; and
- Shutdown of operations.

The Facility General Manager delegates authority to conduct training to appropriate personnel at the facility. All training utilizes experienced site employees to assist in presenting this training program to the employees, or is provided online via the corporate training department. These people are the most experienced personnel on-site as well as the most knowledgeable of overall plant activities, and/or are educated and highly trained in associated matters. The instructor used in each component will have had prior hazardous waste material management training and detailed training in the particular subject area.

The training at a minimum will include the following topics:

1. Regulatory background, including the intent and purpose of RCRA, as well as local, state, and federal regulations regarding the generation, treatment, recovery, storage, and handling of hazardous wastes.
2. Implementation of the Facility Emergency Response / Contingency Plan, including emergency response to fires, explosions, and releases of hazardous wastes or hazardous waste constituents.
3. Emergency notification procedures.
4. Hands-on experience in the use of emergency response equipment.
5. Operational risk avoidance, including work procedures and precautions, which will ensure that accident occurrences are minimized.
6. Properties of materials handled at the facility.
7. General safety rules and regulations, including first-aid, alarm station locations, safety shower and eye wash locations, personal protective equipment use and maintenance, etc.
8. Response to natural emergencies such as hurricanes, floods, etc.
9. Evacuation plan detailing primary and alternate routes.
10. Compliance with Preparedness and Prevention requirements.
11. Recordkeeping: manifests, inspection logs, and operating records.
12. Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment.
13. Key parameters for automatic waste feed cut-off systems.
14. How to use emergency communications and alarm systems.
15. Response to groundwater contamination incidents.
16. Shutdown of operations.
17. Proper sampling procedures for personnel who conduct sampling.
18. Proper clean-up procedures for personnel who are involved in clean-up activities after a spill, fire or explosion.
19. Guidelines for Bloodborne Pathogens per Clean Harbors Health and Safety document, “HS 1.83” – Attached as Appendix A.

1.2.5 Emergency Response Training

The training program is designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency equipment, systems, and procedures. These items, taught by facility personnel, emphasize the equipment, systems, and procedures available and utilized on-site prior to the arrival of outside emergency response agencies.

This training is provided during the 24-hour OSHA HAZWOPER and 8-hour refresher training courses. Facility personnel (i.e., supervisors) also teach applicable employees on-the-job training. Emphasizes is placed on the type of equipment, systems, and procedures available to be utilized prior to the arrival of outside emergency response agencies.

Employees of the facility are not trained to be first responders. Rather, they are trained to secure the area to prevent further complications as a result of the incident.

1.3 IMPLEMENTATION OF THE TRAINING PLAN

The training program described in this plan emphasizes classroom instruction and on-the-job training. Records are maintained in the facility's files that describe the training received by employees (see Section 7.3.3).

1.3.1 Initial and Refresher Training

Initial training at the facility involves both classroom and on-the-job training. Applicable employees receive initial 24-hour OSHA HAZWOPER training prior to being allowed to work in any area where hazardous waste is being managed.

On-the-job training begins immediately upon completion of the initial 24-hour training session. An experienced employee supervises the new employee at all times until they are certified to perform the assigned tasks unsupervised. A list of the classroom training courses available to facility personnel are identified in Attachment 2. The most current list of training courses is maintained at the facility. Each position at the facility, and person filling that position, is reviewed with regard to the training and experience necessary to perform each job function. Based on this review, the appropriate training courses are assigned to the position (and person filling that position) as necessary to prepare personnel to operate and maintain the facility in a safe manner.

Refresher training is provided annually. This refresher training is a subset of the training identified above and is assigned in a similar manner to the initial training. Modification of the facility, new techniques, and experience gained (both positive and negative) are highlighted for discussion. Examples of refresher training include a review of the facility contingency plan, RCRA permits maintained, and container management issues. Refresher training in on-the-job activities is deemed unnecessary due to the constant repetition of these skills during daily job performance. However, on-the-job training is provided to experienced employees performing new or advanced tasks.

Facility management keeps abreast of new regulatory developments by attending seminars, reviewing publications, searching government information systems, trade organizations, etc. These new regulatory requirements are incorporated into the in-house training program. The in-house training program is developed to insure plant supervisors and workers are properly trained. Applicable regulatory information and requirements for hazardous waste handling, processing, and storage are explained to personnel.

1.3.2 Training Evaluation

Following each of the classroom lessons included in the initial training program, each employee is documented as having completed the required lesson. An example of the training completion report is presented in **Attachment 3**. The most current version of the training completion report is maintained at the facility.

Following certain segments of the classroom training, employees are required to participate in an examination on the material included in the training segment. Upon completion of the examination, the exams are reviewed and each question and corresponding answer is reviewed with all employees participating in the exam.

The supervisor overseeing the training evaluates an employee's on-the-job training performance. Once the supervisor determines that an employee can safely and efficiently perform a task, the employee is considered able to perform that task unsupervised.

1.3.3 Documentation of Training

The facility maintains training records that include:

- The job title for each position at the facility related to hazardous waste management and the name of the employee filling each job;
- A written job description, including job duties and requisite skills, education, or other qualifications for each position; and
- A description of the initial and refresher training to be given to each employee filling the position.

Training records are maintained for all employees at the facility to document that the employee filling each position has the education, experience, and training required for the job title. These records include documentation of completion of the classroom lessons, on-the-job training, and annual refresher training. The records are kept in facility files for at least three years beyond each employee's final date of employment or until facility closure, whichever is earlier.

ATTACHMENT 1
JOB DESCRIPTIONS

Section III. - Attachment 1

Job Descriptions

FACILITY GENERAL MANAGER

SCOPE:

Directs the facility to achieve established goals; participates in establishing goals; responsible for facility performance.

SKILLS:

Experienced manager who can establish through leadership the standards for the facility. Should have BS in Chemical Engineering or Mechanical Engineering or equivalent experience.

RESPONSIBILITIES:

Establish safety attitudes throughout the facility by inspections, reviews, audits and investigations.

Ensure that the facility complies with all regulatory rules and that a commitment of timely training is maintained.

Build a team of people to achieve results showing trends of improvement.

To ensure that processes handle company products in a safe, timely and efficient manner.

Trouble shoot all problem areas.

Make appropriate and timely decisions.

Planning activities to overcome potential problems.

Assign priorities to develop and improve operational processes.

Build good team spirit and a system for discipline.

Communicate plans and needs to avoid union-type activities.

Establish budgets, cost controls and appropriate reviews and action plans.

Communicate with EPA and regulatory bodies, as well as local fire and police departments.

Select, hire, and develop employees. Ensure all required training is performed.

Control plant image, i.e.; communication with outside bodies.

Develop team to improve productivity with short- and long-term goals.

Establish preventive maintenance and excellent housekeeping programs.

Appoint a deputy in any time of absence so that the experience is shared by immediate developing staff.

OPERATIONS MANAGER

SCOPE:

Efficiently coordinate all day-to-day production activities to meet plant and corporate goals while ensuring safe and environmentally sound procedures are strictly adhered to. Is regarded as number two position on site and acts in absence of Facility General Manager.

SKILLS:

Strong, people-oriented manager with ability to plan, decide and act to overcome potential problems in a prudent manner. A B.S. in Chemical Engineering and other technical background is preferred or equivalent experience.

RESPONSIBILITIES:

In charge of day to day facility operations. Develop people/equipment to increase productivity, fostering a sense of urgency in getting things done.

Coordinate shift schedule planning including time off for vacations or sickness in a financially sound and fair manner.

Manage lost time/recordable accidents by directing with safety high in priority.

Ensure EPA/OSHA permit standards are upheld.

Ensure all workers are properly trained on RCRA and their job responsibilities.

Plan production schedule.

Ensures Facility complies with all Regulations and Rules.

Ensure process equipment is kept running and products are within specifications.

Calculate production daily and copy the Facility Manager.

Monitor and record the facility equipment usage and copy the Facility Manager.

Maintain an updated inventory system daily.

MAINTENANCE SUPERVISOR

SCOPE:

Complete facility maintenance activities and housekeeping in a safe and timely manner.

SKILLS:

Experienced, prudent person; usually will have served apprenticeship to develop special mechanical skills. Normally with more than ten years experience.

RESPONSIBILITIES:

Directs and monitors maintenance operations and personnel.

Maintain, clean and repair boilers and process equipment.

Install and repair process piping.

Advise plant personnel on maintenance/equipment related concerns.

Perform miscellaneous maintenance on instrumentation.

Initiate purchase orders for maintenance equipment and supplies through the purchase order program with the facility budget in mind.

Maintains proper spare parts inventory.

Monitor maintenance activities.

Operate all maintenance equipment.

Develop preventive maintenance programs throughout the facility.

always Maintain housekeeping standard during maintenance repairs and in maintenance work areas.

FACILITY OPERATIONS SUPERVISOR/SHIFT SUPERVISOR

SCOPE:

Responsible for the efficient operation of the shift resources available to this position.

SKILLS:

Strong, people-oriented manager with ability to plan, decide and act to overcome potential problems in a prudent manner. A B.S. in a technical background is preferred, equivalent experience is required.

RESPONSIBILITIES:

Direct and monitor the total production activities and correct the operation or process equipment as appropriate.

Direct loading, unloading, inspection, weighing, spotting and sampling inbound and outbound trucks.

Check approve and complete inbound and outbound paperwork.

Direct transferring of materials throughout the plant.

Maintain production records.

Direct operation of forklifts and ensure appropriate maintenance in completed.

Supervise daily inventory recordings and calculations.

Direct activities for the preparation and drumming of materials.

Maintain housekeeping standards.

Training new and present employees

Develop new programs.

Approve/schedule in-bound and out-bound loads.

Supervise and organize a shift team to achieve agreed objectives.

Ensure safety procedures and rules are strictly adhered to.

FACILITY TECHNICIAN

SCOPE:

Responsible for performing in-bound and out-bound bulk and drum warehouse activities and transfer activities of material throughout the facility.

SKILLS:

Trained person knowledgeable in regulatory procedures, preferably High School Diploma.

RESPONSIBILITIES:

Handle all in-bound traffic concerns including loading, unloading, inspection, weighing, spotting and sampling all trucks when needed.

Unload/load waste drums and complete required paperwork.

Receive containers including checking labels, sampling, checking, approving and completing paperwork and updating drum receipt logs.

Sample containers as needed and complete corresponding paperwork.

Store drums in designated areas according to compatibility.

Operate a forklift, safely.

Perform drum pumping operations.

Prepare drums for disposal.

Monitor drum activities.

Obtain drum storage inventory readings.

Maintain an organized warehouse with clearly identified rows.

Maintain a turn around system of drum processing in strict order of receipt as much as possible.

Maintain preventive maintenance checks on warehouse equipment such as the vac truck and drum room forklift.

Maintain housekeeping standards.

Pump contained areas as directed by Shift Supervisor.

Comply with safety rules and regulations.

RECEIVING/SHIPPING COORDINATOR

SCOPE:

Responsible for inspecting and correcting incoming manifest and attached paperwork. Balancing quantities on manifest to inventory order documents. Works with General Manager, Operations Manager and Shift Supervisor on inventory and production records.

SKILLS:

Strong organizational abilities, self-starter, data entry, computer knowledge, able to communicate and mesh with other personnel and company locations.

RESPONSIBILITIES:

Responsible for inspecting manifests and attached paperwork. Balancing quantities on manifests to inventory order documents.

Responsible for incoming inventory order document entries and balancing.

Responsible for balancing warehouse logs to inventory.

Data entry for production of inventory, working with General Manager, Operations Manager, and Operations Supervisor to balance Month-End inventory.

Miscellaneous data entry.

Filing all finished paperwork.

Responsible for coordinating material receipts.

Responsible for maintaining pre-ship and notification files.

Other duties as assigned.

RECEIVING CHEMIST

SCOPE:

Responsible for performing in-bound and out-bound bulk and drum warehouse activities and transfer activities of material throughout the facility.

SKILLS:

Trained person knowledgeable in regulatory procedures, preferably High School Diploma.

RESPONSIBILITIES:

Handle all in-bound traffic concerns including loading, unloading, inspection, weighing, spotting and sampling all trucks when needed.

Unload/load waste drums and complete required paperwork.

Receive containers including checking labels, sampling, checking, approving and completing paperwork and updating drum receipt logs.

Sample containers as needed and complete corresponding paperwork.

Store drums in designated areas according to compatibility.

Operate a forklift, safely.

Prepare drums for disposal.

Monitor drum activities.

Obtain drum storage inventory readings.

Maintain an organized warehouse with clearly identified rows.

Maintain a turnaround system of drum processing in strict order of receipt as much as possible.

Maintain preventive maintenance checks on warehouse equipment such as the vac truck and drum room forklift.

Maintain housekeeping standards.

Pump contained areas as directed by Shift Supervisor.

Comply with safety rules and regulations.

ATTACHMENT 2 - CLASSROOM TRAINING
Hazardous Waste Operations & Emergency Response (HAZWOPER)
24 Hour Agenda

SECTION TITLE	Module Number	Time allotted	IG	PG	PP
DAY ONE					
Introduction to HAZWOPER Training	INT-001	30 min	**X**		
Regulatory Compliance	COM-010	60 min	**X**	**X**	**X**
Hazard Recognition	CON-005	90 min	**X**	**X**	**X**
Hazard Communication	SAF-010	60 min	**X**	**X**	**X**
LUNCH					
Toxicology	IHY-010	90 min	**X**	**X**	**X**
Exposure Monitoring - Basic	IHY-020	30 min	**X**	**X**	**X**
Medical Surveillance	MED-010	30 min	**X**	**X**	**X**
Hearing Conservation	SAF-110	30 min	**X**	**X**	**X**
Ergonomics	SAF-090	30 min	**X**	**X**	**X**
Fire Protection	SAF-060	30 min	**X**	**X**	**X**
Total Time		**8 Hours**			

DAY TWO			IG	PG	PP
Electrical Safety	SAF-030	30 min	**X**	**X**	**X**
Lockout/Tagout	SAF-040	30 min	**X**	**X**	**X**
Equipment Guarding	SAF-050	30 min	**X**	**X**	**X**
Confined Space	SAF-080	60 min	**X**	**X**	**X**
Fall Protection & Walking/Working Surfaces	SAF-070	60 min	**X**	**X**	**X**
LUNCH					
Container Handling	SAF-140	90 min	**X**	**X**	**X**
Container Handling Practical		30 min			
Personal Protective Equipment	CON-020	60 min	**X**	**X**	**X**
Personal Protective Equipment Practical		90 min			
Total Time		**8 Hours**			

DAY THREE			IG	PG	PP
Respiratory Protection	CON-030	60 min	**X**	**X**	**X**
Respiratory Protection Practical		60 min			
Decontamination	CON-040	60 min	**X**	**X**	**X**
Decontamination Practical		60 min			
LUNCH					
Work Practices that Minimize Risk	CON-010	90 min	**X**	**X**	**X**
Sampling Hazardous Materials and Wastes	ET-143	60 min	**X**	**X**	**X**
Site Health and Safety Plans	IHY-030	30 min	**X**	**X**	**X**
Selected Practical Exercises		60 min			
Total Time		**8 hours**			

ATTACHMENT 3 - TRAINING DOCUMENTATION (EXAMPLE)

Clean Harbors La Porte, LLC
EXAMPLE TRAINING ATTENDANCE /CERTIFICATION SHEET

Course Name:
Topics Covered:
Location: Date:
City, State: Time: Duration: hour(s)

	PRINTED NAME	SIGNATURE	EMPLOYEE #	FACILITY NAME
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
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13.				
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18.				
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20.				
21.				
22.				
23.				
24.				
25.				
26.				

Trainer:_____Trainer's Signature:
_____

APPENDIX 1

Guidelines for Bloodborne Pathogens per Clean Harbors Health and Safety document, “HS 1.83”

HS 1.83 BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN

HS 1.83 BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN

Table of Contents

HS 1.83 GUIDELINES FOR BLOODBORNE PATHOGENS

1. PURPOSE

This Guideline describes techniques available for personnel to follow when there is potential exposure to waste containing blood or other potentially infectious material (OPIM). If pathological waste is suspected of being present or is identified during the handling of other materials, operations shall cease and these guidelines shall be implemented. For the purpose of this Guideline, pathological waste and bloodborne pathogens are synonymous.

These guidelines also address procedures to be followed by personnel providing first aid assistance for reporting, training, and follow-up.

2. SCOPE

This Exposure Control Program applies to all Clean Harbors activities, which involve a potential exposure to blood or body fluids. Guidelines for employees providing first aid assistance are listed in Sections 7 and 8.

3. APPLICABILITY

3.1. Hazards

The hazards associated with blood and body fluids involve contact with microorganisms contained in the fluids. Microorganisms that may be contained in pathological waste include, but are not limited to, the following: Hepatitis Virus; AIDS Virus; Tetanus; etc.

3.2. Route of Entry

3.2.1. The primary route of entry of the microorganisms into the body is direct injection into the bloodstream. This may occur if sharps (sharp objects) puncture the skin or if contaminated waste cuts the skin and contacts the blood. A secondary route of entry is contact of bodily fluids or OPIM with open wounds, or mucous membranes (eyes, nose, mouth, etc.) such as in First Aid situations.

3.2.2. Because there are no direct reading monitoring instruments available to detect or determine if a waste contaminated with body fluids contains microorganisms, it is best to avoid any skin contact with a pathological waste. Likewise, there is limited data available on the amount of blood and the duration of contact time needed to result in infection.

3.3. Identification

Observing the presence of hospital or laboratory materials may identify waste contaminated with body fluids, such as: syringes; needles; instruments (scalpels, clips, and prescription containers); blood-bags, bags used during the collection of blood; gauze pads; tubing; hospital glassware; human tissue samples; etc. Obviously, any observation of blood indicates body fluids may be present.

3.4. Exposure Determination

3.4.1. Job Classes Where All Employees are Exposed

A. OSHA requires employers to perform a determination of those employees who may incur an occupational exposure to blood or other potentially infectious materials. This exposure determination is made without regard to the use of personal protective equipment.

B. All employees in the following job classification may incur an exposure to blood or body fluids, regardless of frequency. Pathological (Regulated) Waste Handlers

3.4.2. Job Classes and Tasks Where Some Employees are Exposed

OSHA also requires listing of job classes where some employees may have exposure to blood or other potentially infectious materials (OPIM). Since all employees in these categories are not expected to incur exposure to blood or OPIM, the specific tasks and procedures, or groups of closely related task and procedures where exposure may occur, are listed below.

Job Class	Task/Procedure
Foreman/Supervisor (Site Supervisor)	**Emergency Response to Bloodborne Operations** Gathering contaminated material Transporting disposal material Disinfecting - Equipment, Structural Decontamination (Decon) Personnel Response Operations Accidental Contact (7) Handling of disposal container Supervise crews performing responses Other activities as part of the response **Hospital Neutralization Tank Cleaning** Infrequently, syringes have been observed during this activity. If syringes are observed, work shall cease and will not resume until BBP training, vaccination and are implemented. **Manhole Cleaning** Infrequently, syringes have observed in manholes. If syringes observed, work shall cease and will not resume until bloodborne pathogen training, vaccination and guidelines are implemented.
Environmental Technician	**Same as Foreman/Supervisor**
Facility Technician	**Handling of Regulated Waste** Labeling and Handling regulated waste containers. Loading vehicles w/regulated waste containers.
Labpack Chemist	**Disposal of Regulated Waste** Packaging blood contaminated material Handling regulated waste containers. Transporting regulated waste.
Receiving Chemist	**Receiving waste into facility** Counting number of boxes and compare against number assigned on manifest.

3.5. Sewage Handling

3.5.1. OSHA does not include urine, feces, vomit, spit, sweat or tears within the scope of the Bloodborne Pathogen Standard unless they are visibly contaminated with blood.

3.5.2. However, OSHA does recommend and CHES requires, impervious PPE and remote handling methods to prevent infection by other bacteriological hazards, which are present in sewage.

3.5.3. The hepatitis immunization series is recommended for all Clean Harbors employees responding to a sewage project. Unvaccinated employees may conduct sewage work as long as there is no visible blood present. Work must stop immediately, and only vaccinated workers may continue, if sewage is visibly red with blood. See Appendix 1 for additional information on sewage handling.

3.5.4. Vaccination Recommended: All sewage projects

3.5.5. Vaccination Required: Sewage is visible red with blood

4. DEFINITIONS

Blood: Human blood, human blood components are products made from human blood.

Bloodborne Pathogens: Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Body Fluids: Blood and other body fluids containing visible blood; semen and vaginal secretions; tissues and the following fluids: cerebrospinal (CSF), synovial, pleural, peritoneal, pericardial, and amniotic;

Any unfixed tissue or organ (other than intact skin) from a human (living or dead); HIV-containing cell or tissue cultures, organ cultures, and Human immunodeficiency virus (HIV) or Hepatitis B virus (HBV) - containing culture medium or other solutions; and blood, organs, or other tissue from experimental animals infected with HIV or HBV.

NOTE: the following are not considered "Body Fluids": feces, nasal secretions, sputum, sweat, tears, urine, and vomit unless they contain visible blood.

Contaminated: The presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

Decontamination: The use of physical or chemical means to remove, inactivate or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use or disposal.

Exposure Incident: A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Hand washing Facilities: A facility providing an adequate supply of running potable water, soap and single use towels or hot air drying machines.

HBV: Hepatitis B virus.

HIV: Human immunodeficiency virus.

Medical Consultant: The Clean Harbors' current Medical Program Provider. As of 1/1/99, Continuum Healthcare, Atlanta, GA, (800-229-3674) is that provider. Contact the Health and Safety Department if there is any question as to who the current provider is.

Other Potentially Infectious Materials: (1) The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids; (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead); (3) HIV-containing cell or tissue cultures, organ cultures and HIV or HBV-containing culture medium or other solutions; and, blood, organs or other tissues from experimental animals infected with HIV or HBV.

Parenteral: Piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts and abrasions.

Universal Precautions: That all patients, blood and OPIM is considered infectious for HIV and other bloodborne pathogens. Appropriate PPE and work practices will be implemented.

Work Practice Controls: Controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., decon material prior to removal).

5. EXPOSURE CONTROL METHODS

To prevent contact with blood or other potentially infectious material, CHES has developed this Exposure Control Plan. Engineering, work practice controls and personal protective equipment will be utilized to eliminate or minimize exposure to employees. See Appendix 2 for Supervisor's Program Checklist.

5.1. Universal Precautions

All blood or other potentially infectious material will be considered infectious regardless of the source.

5.2. Engineering Controls

5.2.1. Remote Handling Equipment - This includes shovels, rakes, Bobcat, front-end loaders, etc.

The above controls will be examined and maintained in an operable condition through examination of equipment before and after a Pathwaste operation is performed.

5.2.2. Lock-out/Tag-out

Immediately lockout all contaminated equipment, any equipment that requires handling or disinfecting, or any equipment which has moving parts which may startle or injure a person in the vicinity. Equipment should be evaluated for control of electrical, hydraulic, pressure, thermal, pneumatic, mechanical or physical energy.

5.2.3. Waste Containment

Waste contaminated with blood will be placed in a container designed to prevent contact with the contaminated material, puncture through the container, or leakage. **NOTE**: Also check specific requirements of disposal facility to whom waste is to be sent

CHES has chosen to use one or more of the following:

A. BioHazard ("Red") Bags (Labeled with the Bio-Hazard Marking);

B. BioHazard Boxes (Labeled with the BioHazard Marking);

C. Secondary Containment, i.e., Doubled bagging placed inside a 55-gallon "poly-drum".

5.2.4. Work Area Restrictions

To control the migration or accidental spread of contaminated material from the contaminated areas to clean areas, CHES employees will utilize the site work zone method.

Prior to commencing a bloodborne response operation, the on-site supervisor will establish and delineate the following work locations:

A. Hot Zone (Exclusion Zone)- the contaminated area.

The following guide will be used to establish the Hot Zone:

1. Visually survey the immediate site;

2. Determine the locations of: blood or other potentially infectious waste; drainage, leachate and spilled material; visible discoloration, etc.;

3. Consider the distances needed to prevent the spread of contaminant from affecting personnel outside the Hot Zone;

4. Consider the distances that personnel must travel to and from the Hot Zone;

5. Consider the physical area necessary for site operations;

6. Secure or mark the Hotline;

7. Modify its location, if necessary, as more information becomes available.

   a. This area will be clearly marked using "Caution" tape and BioHazard placards.

   b. Access control points should be established at the periphery of the Hot Zone to regulate the flow of personnel and equipment into and out of the zone and help verify that proper procedures for entering and exiting the area are followed.

B. Contamination Reduction Zone

1. The Contamination Reduction Zone (CRZ) is the transition area between the contaminated area and the clean area. This zone is designed to reduce the probability that the Support Zone will become contaminated or affected by other site hazards. The distance between the Exclusion and Support Zones provided by the CRZ, together with decontamination workers and equipment, limits the physical transfer of hazardous substances into clean areas.

2. Decontamination procedures take place in a designated area within the CRZ called the Contamination Reduction Corridor (CRC). Decontamination stations should be set up within the CRZ; one for personnel and one for equipment. If appropriate, these stations may be combined. Access into and out of the CRZ from the Hot Zone is through Access Control Points.

3. The CRZ must be large enough to facilitate:

   a. Decontamination of equipment, personnel, etc.;

   b. Equipment resupply;

   c. Temporary rest area.

4. Personnel in the CRZ are required to maintain communication, monitoring for heat stress, etc. with those in the Hot Zone. They should be in the same level of protection as those in the Hot Zone and must be in the Bloodborne Pathogen program.

C. Support Zone

1. The Support Zone is the location of the administrative and other support functions needed to keep the operations running smoothly. Any function that need not or cannot be performed in a hazardous or potentially hazardous area is performed here. The supervisor should be present in the Support Zone. Other personnel present will depend on the functions being performed, and may include the client and CHES personnel who are preparing to enter or who have returned from the Exclusion Zone.

2. Personnel may wear normal work clothes within this zone. Any potentially contaminated clothing, equipment and samples must remain in the CRZ until decontaminated.

3. Support Zone personnel are responsible for alerting the proper agency in the event of an emergency. All emergency telephone numbers, change for the telephone (if necessary), evacuation route maps and vehicle keys should be kept in the Support Zone.

5.3. Work Practice Controls

5.3.1. Physical Contact Avoidance

To minimize the potential that an exposure to blood or OPIM will occur, employees engaged in Pathwaste operations are prohibited from manually handling equipment, materials, spills, etc.

A. Implementation Schedule:

The on-site supervisor is responsible for assuring this practice is enforced. This provision will be enforced through periodic observation and enforcement by the on-site supervisor.

5.3.2. Disinfecting

Prior to removing, manipulating or handling material contaminated or suspected of contaminated with blood or OPIM, it will be thoroughly soaked with a disinfecting solution. (For a description of the solution, see Section 6 Response Methods.) Each operation, material, must be evaluated independently to identify the most effective disinfecting method. This must be noted in the Emergency Response Plan. In general, however, the blood or OPIM should be sprayed with a low-pressure sprayer (hand pump, bug sprayer, etc.) initially and periodically throughout the operation to assure that disinfecting agent thoroughly soaks the material.

A. When Complete Disinfecting is Not Possible

Occasionally, effectiveness of disinfecting may be limited due to the equipment configuration, location, size, function, etc. In these circumstances, specific methods must be devised and documented (using the SSP) to assure effective disinfecting. Contact the Regional Health and Safety Manager, Health and Safety Rep or Corporate Manager of Health and Safety for guidance.

1. If upon examination (prior to returning the site to the client) disinfecting is not feasible or potentially not effective- e.g., highly technical equipment with inaccessible parts, sensitive equipment, limited access to contaminated areas, locations, inability or limited penetration of the disinfectant, etc., disinfecting should nonetheless be performed to the extent possible.

2. The site supervisor will attach a readily observable BioHazard Label to the equipment stating which portion remains or potentially remains contaminated. A sign should be affixed if it is a location or material.

3. The site supervisor shall communicate the impracticability or ineffectiveness of the disinfecting to the client or other appropriate parties verbally, and in writing, prior to leaving the site. Verbal communication will be documented to include the following: Individual's name; company; date; time; and the equipment or material that could not be effectively disinfected.

Appendix 3, Impractical Disinfection, should be used to communicate the information in writing. It should be thoroughly completed by the site supervisor and provided to the appropriate parties, prior to releasing the site to the client.

5.3.3. Decontamination

Equipment and personnel will be decontaminated upon leaving the Hot Zone.

A. Implementation Schedule

1. The on-site supervisor is responsible for assuring the Decontamination Station for personnel and equipment is established in the CRZ and that equipment and personnel are properly decontaminated upon exiting the Hot Zone. This will be done for each operation involving blood or OPIM.

2. Occasionally, a piece of equipment will be difficult or, in the opinion of the supervisor, cannot be decontaminated. An alternative method must be devised to address this issue. The supervisor should contact the Regional Health and Safety Manager, Health and Safety Rep or Corporate Health and Safety Manager for assistance on this issue.

3. The alternate method for decontaminating the equipment shall be documented as a separate task on the Site Safety Plan.

5.3.4. Hand Washing

A. Although exposure prevention measures utilized by CHES are designed to avoid the likelihood of contact with blood or OPIM, hand washing is nonetheless required by OSHA regulation. Employees will be instructed to wash their hands and any other areas with non-abrasive soap and running water or as indicated below:

1. Immediately, or as soon as feasible, after decontamination and doffing of PPE;

2. Immediately, or as soon as feasible, following bodily contact with blood or OPIM;

3. Immediately, or as soon as feasible, flush mucous membranes with water, should mucous membranes contact occur.

4. Hand washing must be conducted even if gloves appear uncontaminated.

B. Unavailability of Washing Facilities

When provisions of hand washing facilities are not feasible, i.e., no running water is available in the immediate vicinity of the operation (see below for explanation of immediate vicinity), then an antiseptic hand cleaner in conjunction with clean cloths/paper towels or antiseptic towelettes may be used.

C. Immediate vicinity is considered the same room.

The following materials may be used if running water is not available in the same room. If this Technique is used, hand washing using running water must be performed as soon as feasible, i.e. before leaving the site and prior to smoking, eating, drinking, etc.

Towelettes: Contact local H&S Representative or the corporate supply catalog for availability of Towelettes.

D. Implementation Schedule

The site supervisor is responsible for assuring:

1. Running water is available;

2. The alternative method, antiseptic hand cleaner/towelettes are available;

3. Hand washing performed immediately or as soon as feasible after using alternative method, but prior to eating, drinking, smoking, etc.;

4. Employees wash their hands immediately or as soon as feasible after decontamination and PPE removal;

5. Employees wash their hands immediately or as soon as feasible after bodily contact with blood or OPIM;

6. Flush mucous membranes with water immediately or as soon as feasible should mucous membrane contact occur.

5.3.5. Consumables

Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in the work area. Storage of these materials is also prohibited in the work area.

A. Implementation Schedule

The site supervisor is responsible for assuring that consumables are neither available, stored nor consumed in the work area. Additionally, as indicated in this section, the site supervisor is responsible for assuring hand washing or the alternative occurs prior to consumption of consumables.

5.4. Personal Protective Equipment (PPE)

5.4.1. Introduction

All personal protective equipment will be provided without cost to employees. The PPE ensemble (as described in Section 5.4.2) (Level C) was chosen based on the anticipated exposure to blood or other potentially infectious materials. The degree protection provides ease of ensemble understanding and a significant margin of safety. The protective equipment will be considered appropriate only if it does not permit blood or other infectious materials to pass through or reach the employees' clothing, skin, eyes, mouth or other mucous membranes under normal conditions of use.

5.4.2. PPE Ensemble

As described previously, physical contact with the waste is avoided. However, as an additional measure of protection, the following equipment shall be utilized by Field Service Personnel or other responders removing waste containing or potentially containing bloodborne pathogens or OPIM:

A. Inner Surgical Latex Gloves;

B. PVC Outer Gloves;

C. DuPont Tyvek QC or Kappler CPFI with Hood and Feet or Other Appropriate Protection Coveralls;

D. PVC Rain Gear (where appropriate);

E. Taping (wrist and ankles);

F. Sleeve over outer gloves when hands will be below shoulder.

G. Gloves over sleeve when hands will be above shoulders.

H. Full Face Air Purifying Respirator;

I. Particulate Filter (MSA P100 or GME-P100);

J. Steel-Toe/Steel Shank Workboots;

K. Disposable shoe covers (Chicken boots);

L. Decontamination Solution;

M. Metal Foot & Shin Coverings, to Protect from Puncture Wounds, Where Appropriate;

N. Other Equipment, as Appropriate.

NOTE: (Consider other area atmospheric hazards and choose appropriate respirator and other PPE.)

5.4.3. PPE Ensemble for other tasks

A. Vehicle Operator

1. Steel toe, steel shank work boots

2. Steelgrip outer gloves or other substantially constructed leather glove with gauntlet

3. Safety glasses with permanently attached side shields

4. Work uniform

B. Receiving Chemists

1. Steel toe steel shank work boots

2. PVC outer gloves, latex or nitrile inner gloves

3. Safety glasses with permanently attached side shields

4. Work uniform

5. Hard Hat

C. Facility Technicians - These employees may move containers of Pathological waste and OPIM out of transportation vehicles and perform other material handling operations associated with material. Direct handling of the pathological waste and OPIM is strictly prohibited.

1. Steel toe, steel shank work boots

2. Cut resistant glove (e.g. Steelgrip, Kevlar, etc.)

3. Safety glasses with permanently attached side shields

4. work uniform

5.4.4. PPE Provision and Use

The site supervisor will be responsible for assuring that all appropriate PPE described in Section 5.4. is brought to the site and utilized by the crew. All operations where blood or OPIM is suspected or known to be present require the use of the PPE described in this section.

5.4.5. Equipment Cleaning/Disposal

Prior to doffing PPE, a thorough decontamination shall be performed. Disposable PPE, i.e., gloves (inner and outer), coveralls, etc. shall not be reissued, but disposed with other debris generated on- site in approved, regulated, waste receptacles. All other PPE shall be thoroughly decontaminated using the steps in Section 6.3 upon completion of site operations upon leaving the Hot Zone. Any piece of equipment that could have become contaminated, but will be reused, i.e., respirators, PVC rain gear, etc. shall be thoroughly decontaminated and inspected to assure the effectiveness of disinfecting. Any suspect piece of equipment (cannot be thoroughly, effectively decontaminated) should be discarded with other contaminated site debris.

5.4.6. Repair and Replacement

Should PPE integrity be breached, e.g., coveralls split, booties torn, etc., the employees shall stop what they are doing, thoroughly/completely decontaminate and replace the breached PPE.

5.4.7. Implementation Schedule

The employee, crew and Site Supervisor are responsible for periodically assessing the integrity of the PPE ensemble. If the integrity is breached or this is anticipated, action identified in this section should be implemented immediately.

5.5. Materials

The following is a list of materials that should be available in each designated branch in preparation for a Bloodborne Pathogens response. The responding crews must also be trained in pathwaste handling, packing, and decontamination procedures.

5.5.1. Minimum items to be kept available include:

A. Approved biohazard waste bags (Red);

B. Approved bio-hazard boxes;

C. Puncture resistant container for "Sharps";

D. 5-10 gallons of hypochlorite solution (5.25%);

E. Isopropyl Alcohol (70%) and/or Betadyne Solution;

F. 2-3 pairs of tongs (To pick up material);

G. Long handled rakes, shovels, etc.;

H. 2-3 pump spray bottles (To aid in decontamination and to spray hypochlorite solution onto debris) (Bug Sprayers);

I. 1-2 Boxes of inner surgical latex gloves;

J. Tape (for wrists & ankles);

K. Several medical waste manifests;

L. Bio-hazard labels and placards;

M. Hand Washing Capabilities;

N. See Section 5.4. for Personal Protective Equipment;

O. Towelettes described in this guideline.

5.5.2. A copy of the Clean Harbors' "Guidelines for Bloodborne Pathogens Exposure Control Plan" should be available and reviewed as part of the safety meeting prior to the commencement of work. These guidelines should be followed during all biohazard cleanups.

6. RESPONSE METHODS

6.1. Site Plan Development

6.1.1. Complete a Site Specific Plan Chapter 13, Form CHI-160, for the tasks that will be performed. Site Specific information, such as unique characteristics of the response, materials, equipment, physical location, decontamination techniques, methods, etc. will need to be identified and an appropriate response developed to assure that employees are adequately informed and protected.

6.1.2. If multiple tasks are required, each task must be documented on the Site Plan. Additional Form CHI-160s may be used to assure complete documentation of all tasks.

6.2. Procedure Scope

6.2.1. Scope

All equipment, materials, locations, etc. and environmental and working surfaces will require disinfecting/decontamination after contact with blood or OPIM.

6.2.2. Disinfecting/Decontamination Schedule and Methods

A. Due to the wide scope of CHES' response to bloodborne operations, the site supervisor must determine and implement an appropriate method of assuring the effectiveness of disinfecting/decontamination The determination of appropriate methods will be site, situation, location, equipment, etc. specific.

B. Considerations include:

1. Location;

2. Surface Type--Absorbent, Resilient, Hard, etc.;

3. Penetrability of Disinfecting Solution;

4. Degree of Contamination.

C. With due consideration to these and other factors influencing the ability to disinfect/decontaminate, practicability, effectiveness, etc., the Site Supervisor must design a site-specific method or methods to effectively perform the disinfecting in the situation (s) encountered.

D. The chosen technique must be written, in detail on a Site-Specific Plan (CHI 160).

6.3. Response Techniques

6.3.1. Don Personal Protective Equipment as described above.

6.3.2. Establish Hot, CRZ, and Support zones.

6.3.3. Establish decontamination stations.

6.3.4. Place two heavy gauge approved bio-hazard waste bags into a poly drum, or approved boxes for waste collection.

NOTE: Sharps must be packaged in puncture resistant packaging. **Also Note:** Check specific requirements of disposal facility to which waste is to be sent.

6.3.5. Spray and soak the waste with the decontamination solution. See 6.4.1. of this guideline.

6.3.6. Use remote methods to move or distribute contaminated material. UNDER NO CIRCUMSTANCES SHALL THE WASTE BE MANUALLY HANDLED.

A. If appropriate, use a Bobcat or front-end loader, rakes, shovels, etc.

B. If necessary, use long handled instruments to sift through waste.

6.3.7. Attempt to spread material to a depth that permits observation of all material.

6.3.8. Resoak the material with the decontamination solution.

6.3.9. Avoid driving over or stepping on waste.

6.3.10. Using a shovel or other implement, lift one shovel load. Avoid creating airborne dust. If visual observation must be performed, place the implement down and squat adjacent to the load.

6.3.11. Discharge each load into the bagged drum or box being careful to avoid long drop distance, which can generate biological aerosols (dust).

6.3.12. Return to Step 8 and continue until all suspect material is collected.

6.3.13. After all contaminated or suspected material is removed, soak entire area with the decontamination solution.

6.3.14. Decontaminate equipment and protective clothing prior to dress down. (See below).

NOTE: Be aware that boredom and complacency may cause deviation from these procedures. Be alert for guideline deviations and take prompt action to assure compliance.

6.4. Decontamination Procedures

6.4.1. Solution - Clorox (or other household bleach that contains 5.25% available chlorine). Dilute with water to 10:1 (ten parts water to each part Clorox). Other decontamination solutions are available and may be used with the approval of Health and Safety: must state that they effectively kill HBV and HIV viruses. Some examples are available from the National Antimicrobial Information Network, 800-447-6349, http://ace.orst.edu/info/rain/lists.htm

6.4.2. Decontamination Steps

Based on the potential hazards associated with biologically contaminated waste and the levels of protection utilized, the following steps shall be used to decontaminate equipment, personal protective equipment and personnel immediately upon leaving the Hot Zone.

Step 1 - Place implements used to sift through waste into a designated receptacle containing decontamination solution.

Step 2 - Step into a tub containing the decontamination solution and wash down using a long handled brush. Others dressed in the same level of protection may provide assistance.

Step 3 - Step into second tub for rinse.

Step 4 - Wash boot cover, outer gloves, and Tyvek suits. Remove tape from boots and outer handled brush. Others dressed in the same level of protection may provide assistance.

Step 5 - Chemical resistance suit removal. Remove chemical resistance suit and deposit in appropriate waste container.

Step 6 - Respirator removal. Remove respirator and place in appropriate decontamination waste container. Wash with decontamination solution.

Step 7 - Inner glove removal. Remove inner gloves and place in appropriate waste container.

Step 8 - Hand Washing. Immediately after inner glove removal, employees shall wash their hands. This must be done on-site, using traditional sink facilities or acceptable hand-wipe towelettes provided for this purpose. (See 5.3.4)

7. FIRST AID PROCEDURES - WORKER CONTACT WITH BLOOD

(See Appendix 4 for Flow Chart.)

7.1. Injury Assessment

A rapid but thorough assessment of the victim's injury will be conducted to determine the potential exposure of the first aid responder to potentially infectious blood or body fluid.

7.1.1. Visually survey the immediate site.

7.1.2. Visually inspect victim for presence of blood or other body fluids.

7.1.3. Consider first aid actions that may expose responder to blood/body fluids.

7.1.4. Call for emergency assistance, if necessary.

7.1.5. Obtain first aid kit.

7.1.6. Obtain appropriate PPE (gloves, respirator shield, etc.).

7.1.7. Obtain appropriate equipment (compresses, impervious barrier materials, etc.).

7.2. Physical Contact Avoidance

7.2.1. To minimize the potential that an exposure to blood or other potentially infectious material will occur, employees engaged in first aid operations must avoid any contact with the victim's blood and body fluids which is not necessary for the preservation of the patient's health.

7.2.2. First aid responders must utilize PPE and work practices, which prevent contact of the victim's blood with the responder’s eyes, nose, mouth and skin. Responders should be particularly aware of any broken skin (cuts, scratches, acne) they may have which could provide a route of entry for bloodborne diseases.

7.2.3. The following equipment may be used to create a barrier between the responder and victim:

A. sterile compresses;

B. latex, PVC or other industrial gloves;

C. chemical protective coveralls, aluminum foil, or other impervious material;

D. chemical ice pack.

7.3. Personal Protective Equipment (PPE)

7.3.1. Recommended PPE

Physical contact with a victim's blood or body fluids should be avoided. However, when such contact is necessary in order to provide adequate care, the following equipment should be utilized:

A. Surgical latex gloves, PVC gloves, or equivalent;

B. CPR mouth and nose shield;

C. Safety glasses with side shields;

D. Face shield (if splattering or splashes can occur);

E. Clean Harbors uniform.

7.3.2. Declination of PPE

A. First aid responders must use PPE and other controls to prevent contact with blood and body fluids. An employee may temporarily and briefly decline the use of PPE, under rare and extenuating circumstances, when it is the employee's professional judgment that the use of PPE would have prevented the delivery of health care, or posed an increased hazard to the safety of the responder or victim.

B. An example of such extenuating circumstances includes: a patient begins to bleed profusely, putting their life in immediate jeopardy; or blood-contaminated equipment must be shut off to prevent further injury to the victim or a co-worker.

C. The following situations are not extenuating circumstances: assisting patient with compress or band- aid; elevating limb to minimize bleeding; or providing unshielded CPR when first aid kit containing a mouth shield is immediately available.

D. PPE should be obtained and implemented as soon as possible, even if its use has been temporarily postponed.

7.4. First Aid Materials

7.4.1. The following materials should be available in each office and facility.

First Aid Kit with Medical Supplies

Latex gloves	CPR mouth and nose shield
Isopropyl Alcohol (70%)	Antiseptic towelettes
and/or Povodone Capsules	Ice pack
Sterile compress	Knuckle bandage
Gauze pads	2-inch wide gauze roll
Medical tape	Sling
Eye Wash Solution	Scissors
Tweezers	Bodily Fluid Clean Up Kit

Other Materials:
Household bleach;
Labeled pathological waste (red) disposal bag.

7.5. Employee Contact with Blood or Body Fluid

7.5.1. Accidental Contact

A. If accidental contact with a suspected contaminated material occurs, immediately flood the area with a 70% solution of isopropyl alcohol or a Betadyne solution. (Except if contact with the eyes, nose or mouth. In this case, flush with water.) Then, wash the entire area with soap and water.

B. Do not discard the material that caused the wound.

C. Carefully place the materials in a rigid container.

D. Transport the victim and material to the hospital specified in the Site Specific Plan. The Supervisor must assure that the hospital contacts the CHES Medical Consultant for additional instructions on appropriate action.

7.5.2. Follow-up

Contact the Health and Safety Department. They will assure the CHES Medical Consultant is aware of the incident and assure post-exposure evaluation and follow-up procedures are implemented. See Section 8. Also see Appendix 7.

7.6. Post First Aid Procedures

The following guidelines are provided for a situation where equipment, material or surfaces have been contaminated with blood or body fluids. The determination of appropriate methods will be site, situation, location, etc. specific.

7.6.1. Site Decontamination Schedule

After the first aid response is complete, equipment or materials which have become contaminated with blood or body fluids should be disposed, or cleaned and disinfected immediately or as soon as feasible according to the following schedule:

A. Immediately isolate all areas of contamination by setting up a hot zone with caution tape;

B. Immediately lockout all contaminated equipment without contacting bloody surfaces using CHES' Lock-out/Tag-out guidelines;

C. Soak contaminated items with disinfecting solution as soon as feasible;

D. Clean all surfaces according to CHES' exposure control plan for pathological waste.

7.6.2. Disinfecting

Prior to removing, manipulating or handling contaminated material, thoroughly soak with a disinfecting solution using the following procedures:

A. Spray surfaces evenly and thoroughly with solution;

B. Minimize splashing, bounce-back, etc.

7.6.3. Disinfecting Solution

Make adequate quantities of disinfecting solution composed of household bleach (5.25% concentrated) mixed 1:10 with water (one part bleach to 10 parts water).

A. 12 oz. (1.5 cup) bleach per 1 gallon water; or

B. 64 oz. (8 cups) bleach per 5 gallons water.

7.6.4. Contaminated Clothing Handling

All contaminated clothing shall be removed immediately upon completion of the first aid response, or upon relief of the responder by professional health care personnel. Instructions are provided below for disposable, and non-disposable clothing.

7.6.5. Disposable Clothing

Contaminated disposable clothing, including chemical protective coveralls, boots, and gloves, should be decontaminated with a disinfecting bleach solution prior to removal. Dispose of these materials according to appropriate disposal procedures.

7.6.6. Non-Disposable Clothing

Personal clothing or CHES uniforms, which have become contaminated, may be laundered or disposed. Boots may be brush-scrubbed with soap and hot water to remove contamination. Clothing which will be laundered should be placed in a bag and soaked with disinfecting bleach solution. All employees who handle contaminated laundry must utilize PPE to prevent contact with blood or OPIM. If laundry is sent off site for cleaning, the contaminated laundry must be placed in bags or containers which are labeled or color-coded in accordance with labeling requirements.

7.7. Labeling and Packaging of Contaminated Items

7.7.1. Warning labels should be affixed to containers used to store, transport or dispose contaminated materials. The labels must state:

A. The word "BIOHAZARD";

B. The universal biohazard symbol in the color black;

C. Any other appropriate designations, e.g. Infectious Waste.

7.7.2. Contaminated materials must be packaged in leak-proof containers. In addition, any sharp items must be packaged in puncture-proof containers. If the exterior of a primary container becomes contaminated, place it in a second container, which prevents leaks. CHES has chosen to use one or more of the following:

A. Prelabeled Biohazard "red" bags;

B. Double bagged poly bags placed inside a 55-gallon drum with adhesive labels;

C. Prelabeled Biohazard boxes.

7.8. Hand Washing

7.8.1. Although exposure prevention measures utilized by CHES are designed to avoid the likelihood of contact with blood or OPIM, hand washing is nonetheless required by OSHA regulation. Employees shall wash their hands and any other areas with non-abrasive soap and running water immediately, or as soon as feasible whenever:

A. Disposable latex gloves are removed;

B. First aid response is complete;

C. First aid responder is relieved by professional health care provider (EMT, nurse, etc.);

D. Following bodily contact with blood or OPIM;

E. Following contact with mucous membranes or broken skin;

F. After cleaning hands/skin with antiseptic towelettes.

7.8.2. Hand washing must be conducted even if gloves appear uncontaminated.

7.8.3. If running water is not available in the same room, then an antiseptic hand cleaner must be used in conjunction with clean cloths/paper towels or antiseptic towelettes. If this alternative is used, hand washing using running water must be performed as soon as feasible, i.e., before leaving the site and prior to smoking, eating, drinking, etc.

7.8.4. The following materials may be used if running water is not initially available.

A. Sanidex Wipe

B. Alcohol Gel

C. Sani-Cloth

D. Medicated Liquid Soap

E. Other products might be appropriate. Please contact your Health and Safety Rep.

7.9. First Aid Kit Replenishment

First aid kits should be replenished with new supplies immediately to ensure effective response to future emergencies.

8. POST EXPOSURE AND FOLLOW-UP

8.1. Introduction

In the event CHES is informed of an exposure incident or first aid assistance (See Section 4 Definitions), a post- Exposure evaluation and follow-up will be provided. The extent of the follow-up will be based on the incident and the Medical Consultant's recommendations, following these guidelines, and the OSHA Standard.

8.2. Reporting and Scheduling

8.2.1. An exposure incident must be reported immediately to the on-site Supervisor. He/she must initiate the following action:

A. Remove the exposed individual;

B. Initiate First Aid procedures (see Section 7);

C. Contact Health and Safety;

D. Initiate an accident investigation.

8.2.2. Health and Safety will notify CHES' Medical Consultant to coordinate a medical follow-up evaluation with your local medical provider.

A. A log of injuries from contaminated sharps (as defined by the OSHA standard) will be maintained either through the existing CHES occupational injury and illness recording system and database (e.g. PeopleSoft or equivalent) or separately using the log located in Appendix 11. The following information must be included in the log or database:

1. Type and brand of instrument involved;

2. Work area where the incident occurred;

3. Explanation of how the incident occurred.

8.2.3. Persons who must be offered medical follow-up:

A. Unvaccinated first aid responder who touched a bleeding victim. Follow-up must be offered regardless of whether or not the first aid provider had actual contact with blood, and regardless of whether PPE was used.

B. Vaccinated, or unvaccinated persons, who have actual, unprotected contact with blood, body fluids or "sharps". Unprotected contact means splash to eye, mouth, mucous membranes, splash to broken skin or puncture through skin.

C. Vaccinated employees who contact blood or body fluids with intact skin (no cuts, open sores, etc.).Contact H&S and Medical Provider for guidance and recommendations.

8.2.4. Time schedule for Medical follow-up

The follow-up evaluation must be initiated immediately after the exposure incident, as follows:

A. Unvaccinated Employee: within 24 hours.

B. Vaccinated Employee: as soon as possible.

C. For vaccinated employee, obtaining a follow-up evaluation on the next business day is permissible, as long as the employee is not injured or exposed to a known HIV-positive source.

8.3. Incident Investigation

8.3.1. Contents

Initiate an accident investigation to include documentation of the following information (can use form included in Appendix 7, (Bloodborne Pathogen Medical Follow-Up):

A. Route of exposure;

B. Description of the incident;

C. The source of the blood or body fluid (e.g., individual person, sharp object, etc.);

D. If possible, the identification of the source individual and, if possible, the status (HIV/HBV) of the source individual. The blood of the source individual will be tested (after consent is obtained) for HIV/HBV infection. This information must be provided to CHES' Medical Consultant and, as indicated in this section.

8.3.2. Documentation

The information described above will be documented on an Occupational Injury and Illness Report (CHI-l57) if appropriate (e.g. OSHA Recordable Injury) and in an Incident Investigation Report following reporting guidelines.

8.4. Information Provided to Health Care Professional

8.4.1. Health Care Professionals includes any medical institution asked to provide Post Exposure Response and follow-up.

8.4.2. Materials Provided to the Health Care Professional

A. Copy of OSHA Bloodborne Pathogen Standard;

B. A description of the exposed employee's duties as they relate to the exposure incident;

C. Documentation of the route (s) of exposure and circumstances under which exposure occurred;

D. Results of the source individual's blood testing, if available; and

E. All medical records relevant to the appropriate treatment of the employee including vaccination status, which are the employer's responsibility to maintain.

8.5. Contents of Follow-Up Medical Evaluation

The Medical Consultant will attempt to verify the HBV/HIV status of the source individual following the steps and forms outlined in these guidelines. In addition, the Medical Consultant will conduct other employee follow-up action as outlined below.

8.5.1. Results of testing of the source individual will be made available to the exposed employee and exposed employee will be informed about the applicable laws and regulations concerning disclosure of the identity and infection of the source individual.

8.5.2. The exposed employee will be offered the option of having his/her blood collected for testing HIV/HBV serological status. This decision does not have to be made immediately. The blood sample can be preserved for up to 90 days to allow the employee to decide if the blood should be tested for HIV serological status. However, if the employee decides prior to that time that testing will or will not be conducted, then the appropriate action can be taken and the blood sample analyzed or discarded.

8.5.3. The employee will be offered the Hepatitis B vaccination series and/or post-exposure when medically indicated in accordance with the current recommendations of the U.S. Public Health Service. Contact CHES' Medical Consultant for the latest recommendations. A tetanus booster may also be offered.

8.5.4. The employee will be given appropriate counseling concerning precautions to take during the period after the exposure incident. This may be provided by CHES' Medical Consultant or other entities. The employee will also be given information on what potential illnesses to be alert for and to report any related experiences to appropriate personnel.

8.5.5. Responsibility

The Health and Safety Staff is responsible for assuring that all steps outlined above are followed and a complete post-exposure and follow-up are conducted.

8.6. Health Care Professional's Written Opinion

8.6.1. Scope

A written opinion shall be obtained from the Medical Consultant in the following instances:

A. When the employee is sent to obtain the Hepatitis B vaccine;

B. Whenever the employee is sent to a health care professional following an exposure incident.

8.6.2. Written Opinion Contents and Confidentiality

The Medical Consultant has been instructed to limit their opinions to:

A. Whether the Hepatitis B vaccine is indicated and if the employee has received the vaccine, or for evaluation following an incident;

B. That the employee has been informed of the evaluation; and

C. That the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials. The written opinion provided to Clean Harbors Environmental Services, Inc. will not reference any personal medical information.

9. HEPATITIS B VACCINATION

9.1. Vaccine Provision

9.1.1. All employees who have been identified as having exposure to or the potential for exposure to blood or other potentially infectious materials will be offered the Hepatitis B vaccine, at no cost to the employee. (See Section 3.5 of these guidelines regarding Sewage Handling.) The vaccine will be offered after training described in this guideline is conducted and within ten working days of their initial assignment to work involving the potential for occupational exposure to blood or other potentially infectious materials.

NOTE: Projects or tasks involving known or potential contact with blood or OPIM shall be staffed only by employees who have started the vaccination series and who have completed the training described in this guideline.

9.1.2. All unvaccinated personnel who have rendered first aid assistance in any situation involving the presence of blood or OPIM, regardless of whether or not a specific "exposure incident" has occurred, will be offered the full immunization series. If such vaccination is desired, the first shot of the series shall be initiated within 24 hours. Once an employee begins the injections, he/she must complete the series and this must be done within the six-month period.

9.1.3. Employees cannot be compelled to submit to the vaccination and, therefore, may decline. Should this occur, the employee must sign a Hepatitis B Vaccine Declination Form (Appendix 8). This form shall be kept in the employee's personnel file.

9.1.4. Employees who can provide documentation that they have already received the vaccine series prior to their employment with Clean Harbors need not be offered the vaccine.

9.2. Hepatitis B Prophylaxis

9.2.1. Vaccination

A. The vaccination is a series of three injections by an antibody test to assure the vaccinations have produced immunization against Hepatitis B Virus. The vaccine is given over a six-(6) month period at the following intervals: Initial; one (l) month later; six (6) months after the first dose.

B. Once an employee begins the injections, he/she must complete the series and this must be done within the six-month period. If the employee fails to complete the injections within the established time schedule, contact the Health and Safety Representative for further guidance.

9.3. Vaccine Administration

Vaccines will be administered by the local clinic designated by the Medical Consultant. The Medical Consultant will maintain all records of vaccinations.

10. HAZARD COMMUNICATION

10.1. Labels And Signs

10.1.1. Labels

Warning labels should be affixed to containers of infectious waste and other containers used to store or transport blood or infectious materials. The labels must state:

A. The word "BIOHAZARD";

B. The universal bio-hazard symbol in the color black;

C. Any other appropriate designations e.g., Infectious Waste, etc.

10.1.2. Signs

Warning signs must be posted at all entrances to the biohazard areas. All employees must be properly trained and must meet all appropriate entrance requirements listed on the sign. Warning signs must be readable at a minimum distance of five feet and must state:

A. The word "BIOHAZARD";

B. The universal bio-hazard symbol in the color black;

C. Identity of the infectious agent;

D. Specify any special requirements for entering the area or handling the material e.g., personal protective equipment is required, etc.;

E. The name and telephone number of the responsible person, e.g., laboratory director, etc.

10.2. Training

10.2.1. Only employees who have attended the training module presentation on Bloodborne Pathogens can participate in operations where path waste is encountered. All employees who receive aid training shall receive the training noted in this section.

10.2.2. Module training developed by CHES' Training Department shall be conducted at the following times:

A. At the time of initial assignment for designated Blood/OPIM responsibilities (prior to vaccination);

B. Annually for designated responders.

10.2.3. Site Specific Information

Site Specific training shall review the following information:

A. Specific materials, equipment, etc. contaminated with Blood/OPIM waste (if known);

B. Warning, "never to physically handle contaminated waste";

C. Site Specific exposure control methods that will be utilized during the response, including Engineering, Work Practice and PPE. (See 5.4.);

D. Requirement that Supervision/foreman be notified immediately should puncture wound or bodily contact with Blood/OPIM occur;

E. Information on the appropriate actions to take and persons to contact in an emergency involving contact with blood or other potentially infectious materials;

F. An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;

G. Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident;

H. Biological Hazard Symbol Configuration.

10.2.4. Basic Training on Bloodborne Pathogens (Module)

The following information will be discussed during initial and annual Bloodborne Pathogens training.

Training for all employees will be conducted prior to initial assignment to tasks where occupational exposure may occur. Training will include an explanation of the following:

A. The OSHA standard for Bloodborne Pathogens;

B. Epidemiology and symptomatology of bloodborne diseases;

C. Modes of transmission of bloodborne pathogens;

D. This Exposure Control Plan--i.e., points of the plan, lines of responsibility, how the plan will be implemented, etc.;

E. Procedures, which might cause exposure to blood or other potentially infectious materials;

F. Control methods, which will be used to control exposure to blood or other potentially infectious materials;

G. Personal protective equipment selection;

H. Post-exposure evaluation and follow-up;

I. Signs and labels;

J. Hepatitis B vaccine program.

Please refer to the current training module on this topic.

11. RECORD KEEPING

11.1. Medical Records

11.1.1. Content of Medical Records: Medical records kept as part of this program will include the following information:

A. Employee's name and social security number;

B. A copy of the employee's Hepatitis B vaccination status, including the dates of all Hepatitis B vaccinations and any medical records relative to the employee's ability to receive the Hepatitis B vaccination;

C. A copy of all results of examinations, medical testing and follow-up procedures that result from an exposure incident (see Section 8);

D. A copy of the Medical Consultant's written opinion, as specified in this guideline;

E. A copy of the information provided to the Healthcare professional, as specified in 8.4.

F. Clean Harbors will transfer employee medical records, upon request and approval, to someone else (e.g. an acquiring company) if Clean Harbors ceases to do business.

11.1.2. Records Maintenance

A. Medical Consultant

Clean Harbors' Medical Consultant will maintain all medical records specified in Section 11.l above.

B. Clean Harbors Service Center and Facility

1. Records indicating that employees have either received the vaccination series or signed declination form must be maintained at the CHES offices. These should be kept on file and available for appropriate operations and Health and Safety personnel.

2. Medical records, as specified in this section, must be kept through the employee's date of termination from the company, plus 30 years.

C. The Sharps Injury Log must be kept for 5 years following the end of the year in which they relate (29CFR 1904.6).

11.1.3. Confidentiality

All medical records shall be considered confidential and cannot be released or disclosed without the employees' written consent except as required by regulation or law.

11.2. Training Records

11.2.1. Contents (using standard training documentation form)

A. Training date(s).

B. An agenda summary of the training sessions (reference to documents is sufficient so long as specified documents are accessible within CHES).

C. Names and job titles of trainers.

D. Names and job titles of attendees.

11.2.2. Records Maintenance

Training records must be maintained for three years from the date of training. Records will be retained by CHES' training department and at the local service center or facility.

APPENDIX 1: Sewage Hazards

Sewage can contain bacteria and viruses, which can cause illness if eaten or ingested. Illness rarely occurs through skin contact. Studies conducted on sewage workers have not shown any increased incidence of infection for the illnesses listed below.

Sewage is NOT a bloodborne pathogen unless it is visibly contaminated with blood.

WORK PRACTICES TO PREVENT INFECTION

PPE: Level C or Level B, to minimize odor
Poly-tyvek and chicken boots, taped
PVC outer gloves, latex inner gloves

HANDS MUST BE WASHED AFTER TOUCHING SEWAGE OR POTENTIALLY CONTAMINATED MATERIAL.

Use remote methods to move material. Avoid touching sewage.

Decontaminate equipment and personnel with 1:10 bleach in water.

Do not contaminate drinking water, water fountains, coolers or cups.

Decon personnel and Wash hands before eating, drinking or smoking.

Hepatitis-B vaccination is NOT required since sewage does not contain an increased risk for Hepatitis B.

TYPES OF INFECTIONS THAT CAN BE TRANSMITTED BY SEWAGE

Route of Exposure: Ingestion of sewage, or contaminated food or water.

Illness:	**Typical Symptoms:**
Amebic dysentery	Chills, Fever, Diarrhea, Nausea, Headache
Campylobacteria	Chills, Fever, Diarrhea, Nausea, Headache
Coxsackievirus disease	Chills, Fever, Diarrhea, Nausea, Headache
Cryptosporidium bacteria	Chills, Fever, Diarrhea, Nausea, Headache
E. coli bacteria	Urinary infection, Meningitis, Pneumonia
Giardia lamblia bacteria	Chills, Fever, Diarrhea, Nausea, Headache
Hepatitis-A	Fever, Nausea, Jaundice, Dark Urine
Meningitis, viral	Fever, Meningitis
Salmonella bacteria	Chills, Backache, Constipation, Headache
Shigella bacteria	Chills, Fever, Diarrhea, Nausea, Headache

TREATMENT:

A blood, urine or stool test may be collected to determine the exact cause of symptoms. Treatment will vary with the infectious agent.

NOTE ON HEPATITIS-B: The CDC states that Fecal-oral transmission of the Hepatitis-B virus does not occur. Since Hepatitis-B is not transmitted by sewage, Hepatitis-B vaccination is not required.

APPENDIX 2: Supervisor's Program Checklist

ENGINEERING METHODS CONSIDERED AND UTILIZED

_____ LO/TO all contaminated equipment, and any energized equipment, which may cause injury if, activated.
_____ Remote Handling Equipment
_____ Contamination Containment: Indicate Observation Times

_____
_____ Work Area Restrictions Established and Maintained Hot Zone
_____ Caution Tape and Biohazard Placards Used to Mark the Area CRZ
_____ Equipment and Personnel Decontamination Established and Maintained Support Zone
_____ All Other Personnel, Equipment, Stored Here

WORK PRACTICE METHODS CONSIDERED, UTILIZED AND EFFECTIVENESS VERIFIED

_____ Physical Contact Avoided
_____ Disinfecting Performed
- _____ Before Handling
- _____ Periodically Throughout the Operation
- _____ When Not Feasible
  - _____ Nonetheless Performed
- _____ Labels Affixed
- _____ Communicated to the Client
- _____ Communication Documented

_____ Decontamination Area Established and Decon Performed at Appropriate Times
_____ Hand Washing
- _____ Running Water Available in the Same Room
- _____ Alternative to Immediately Available Running Water--Antiseptic Hand Cleaners
- _____ Hand Washing Using Running Water Performed as Soon as Feasible, but Always Prior to Eating,Drinking or Smoking.

_____ Consumables
- _____ Eating, Drinking, Smoking, etc. Prohibited in the Work Area
- _____ Storage of Consumables in the Work Area Prohibited

MATERIALS - ALL APPROPRIATE MATERIALS AS SPECIFIED IN SECTION 3.3 AVAILABLE

_____ PPE Provided and Used
_____ Equipment Cleaned
_____ Replaced When Necessary

RESPONSE METHODS

_____ Site Plan Developed
_____ Response Techniques Specified and Utilized
_____ Decontamination
- _____ Solution Prepared According to 6.4.l
- _____ Stations Established

Appendix 2 Cont'd. Supervisor's Program Checklist

FIRST AID PROCEDURES

_____ Discussed
_____ Followed

POST-EXPOSURE AND FOLLOW-UP

_____ All Incidents Reported to the Site Supervisor
_____ Site Supervisor Follows Section 8.2
_____ Site Supervisor Notifies
_____ Health and Safety
_____ CHES Medical Consultant

VACCINATION

_____ Documentation of employee Hepatitis B vaccinations on file
OR
_____ Signed Vaccination Declination form.

TRAINING

_____ BBP Module Completed by Entire Crew.
_____ Site Safety Meeting Held

APPENDIX 3: Notice of Impractical Disinfection

Contact _____ Company _____

Title _____

As the result of the impracticability of disinfecting the following equipment, materials, locations, etc., due to sensitive equipment limited access, location, material, inability or limited of the disinfectant, heavily laden contamination, etc., Clean Harbors Environmental Services, Inc. and its affiliates wish to notify you that:

The equipment, materials, locations, etc. was disinfected to the extent feasible utilizing a suitable disinfectant;

A Bio-Hazard Label was attached to the equipment where applicable or a sign was affixed if a location or material, indicating the suspect portion that potentially remains contaminated;

The equipment, materials, locations, etc. may still be contaminated with bloodborne pathogens; therefore, appropriate precautions should be taken in accordance with OSHA's Bloodborne Pathogens standard, 29 CFR l9l0.l30.

Indicate Equipment, Materials, Locations, etc.:

_____

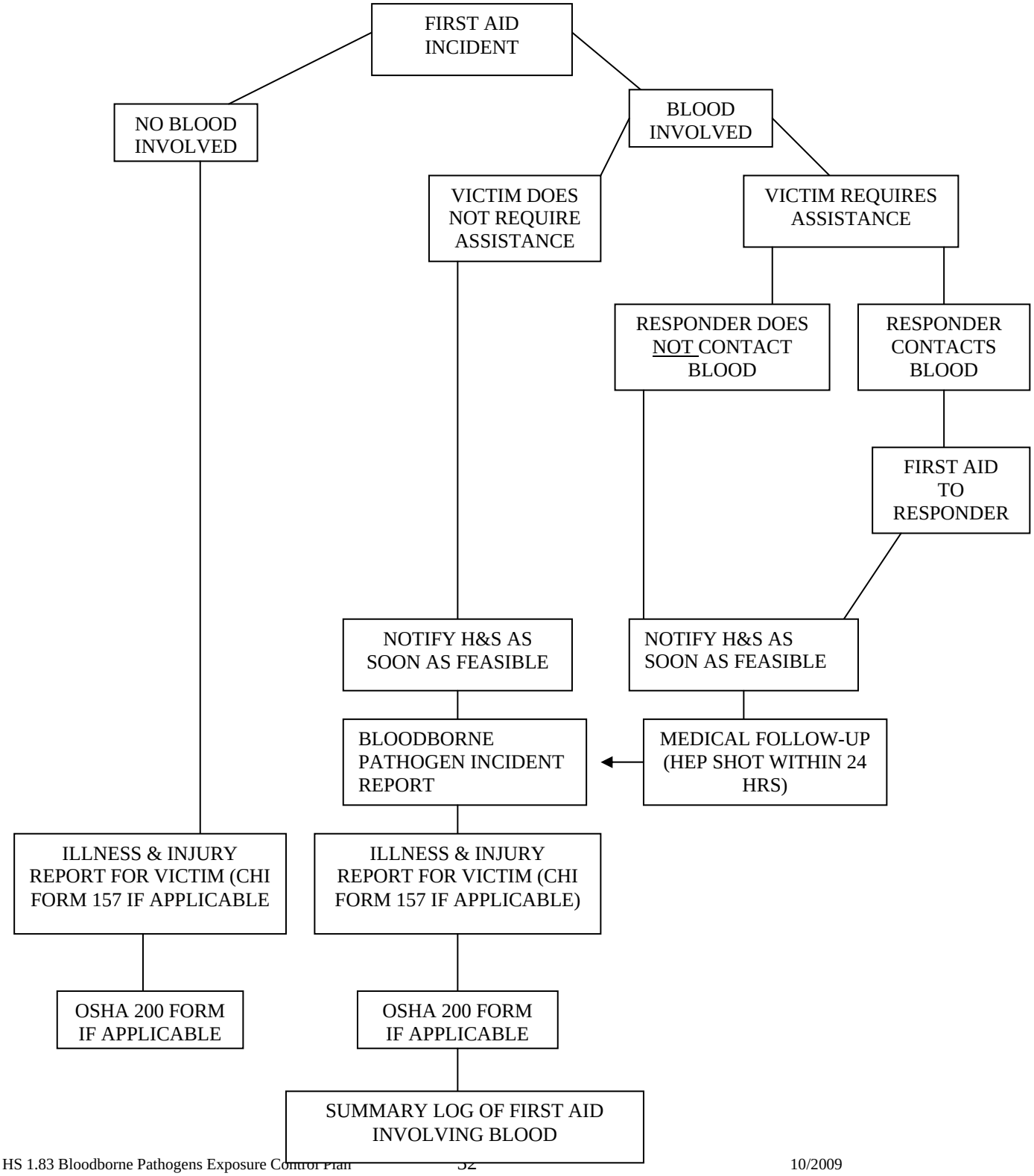
_____

_____

_____ _____ _____

Site Supervisor's Name Date Time

APPENDIX 4: Decision Making for First Aid Incidents



APPENDIX 5: First Aid Incident Investigation Form

INCIDENT

1.0 Name and title of injured person:

1.1 Description of injury involving blood or body fluids:

1.2 Time and date of injury

1.3 Location/Site:

1.4 Did injured person require assistance?

If yes, answer the following questions:

FIRST AID PROVIDED

2.0 Description of first aid provided:

2.1 Name employees who touched bleeding person:

2.2 Description of PPE and equipment used by first aid responders:

Appendix 5 (Cont'd) .First Aid Incident Investigation Form-Page 2

2.3 Was this equipment utilized during the entire response?

If no, answer the following questions:

2.4 What PPE was not utilized and why?

2.5 When was PPE obtained and used?

2.6 Did any employee sustain contact with victim's blood because PPE was not used (if so, who)?

CONTACT OF FIRST AID RESPONDERS

3.0 Did any employee have an "exposure incident"?

If yes, answer the following questions:

3.1 List names:

3.2 Type of contact (puncture; mouth, nose or eyes; open cut, etc):

3.3 Discuss recommendation for preventing contact in future responses:

H&S Rep or Comp. Manager (PRINT/SIGN/DATE):

APPENDIX 6: Bloodborne Pathogen Medical Follow-Up

EXPOSURE INCIDENT INFORMATION SHEET

The following information must be provided to the Medical Provider presenting the bloodborne pathogen medical follow-up evaluation.

This form may be used, if you find it helpful. (Not Mandatory)

EXPOSED EMPLOYEE NAME: _____

Date of last physical, if available: _____

Location of last physical, if available: _____

EMPLOYEE'S HEPATIS B VACCINE STATUS:

Received vaccine: _____ Yes _____ No

Completed all three segments of vaccine: _____ Yes _____ No

EMPLOYEE'S JOB TITLE:

EMPLOYEE'S ACTIVITIES WHEN EXPOSED TO BLOOD:

_____

_____

TYPE OF EXPOSURE (Check all that apply):

_____ Skin Puncture
_____ Splash to Eyes _____ Nose _____ Mouth _____
_____ Splash to broken skin
_____ Unvaccinated First Aid Responder:
_____ Contact with bleeding person using gloves, PPE
_____ Contact with bleeding person, without gloves or PPE

SOURCE OF BLOOD OR BODY FLUID CAUSING EXPOSURE:

_____ Path Waste _____ "Sharps" _____ First Aid Assistance

Please provide detailed information: i.e. Generator of path waste; Generator's type of business (hospital, research); name of source individual, source individuals Hepatitis or HIV status, if known.

_____

_____

APPENDIX 7: Hepatitis B Vaccine-Declination

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
HEPATITIS B VACCINE

DECLINATION

BRANCH: _____

I understand that, due to my occupational exposure to blood or other potentially infectious materials, I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis B vaccination at THIS time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If, in the future, I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Print Employee's Name	Print Witness' Name
Employee's Signature	Witness' Signature
Date	Date

APPENDIX 8: Immunization Record

BRANCH: _____

IMMUNIZATION RECORD

List the names and job titles of all individuals included in CHES' immunization program and, therefore, may have an occupational exposure to bloodborne pathogens.

Only those individuals who have begun the immunization series (and will complete it within six months) or who have signed declination form are permitted to respond to Pathwaste operations (see Section 8.0).

NAME:	**JOB TITLE**	**INJECTION DATES**

APPENDIX 9: Summary of First Aid Incidents involving Bloodborne Pathogen Exposure

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.

SUMMARY OF FIRST AID INCIDENTS
INVOLVING BLOODBORNE PATHOGEN EXPOSURE

INCIDENT[1] EXPOSURE[3] NUMBER INCIDENT i.e.	FACILITY DATE	DESCRIPTION	ASSISTANCE[2] REQUIRED?	
NA-93-01Natick	7/4/93	Assist employee with nosebleed	Yes	No

NOTES:

1. Incident Number from line item on OSHA 200 accident reporting form and Clean Harbors Injury/Illness reporting form (CHI-158), if applicable.
2. Assistance Required indicates if injured employee was not able to treat the injury himself or herself.
3. Exposure Incident indicates if first aid provider contacted the injured person's blood. Contact refers to specific eye, mouth, other mucous membrane, non-intact skin, or puncture contact with blood or other potentially infectious materials.

APPENDIX 10: Sharps Injury Log

SHARPS INJURY LOG

OFFICE LOCATION: _____

DATE	BRAND/TYPE OF INSTRUMENT	WORK AREA	HOW INCIDENT OCCURRED

III.C Security

A description of how the facility complies with the security requirements of 40 CFR 264.14 is included in the Inspection Plan in Appendix III.D.

Section III. – Appendix D (Inspection Plan)

This section describes the measures that Clean Harbors La Porte, LLC has taken and will continue to implement in order to minimize the possibility of an accident or emergency within the existing and proposed facility. The measures include procedures implemented by the facility to adequately secure the site, prevent hazards, and inspect the facility to identify problems in time to correct them before they harm human health or the environment. Security provisions, safe operating practices and inspection requirements are described herein.

1.1 FACILITY SECURITY

The facility has both an artificial barrier and a 24-hour surveillance system to provide site security. The active portions of the facility are all secured within a six-foot high chain link fence topped with three strands of barbed wire. Entry to the facility is controlled by gates that are locked at all times. In addition to the security fence, warning signs with the recommended legend "DANGER - UNAUTHORIZED PERSONNEL KEEP OUT", are posted at each entrance to the facility and at sufficient other locations so as to be seen from any approach. These signs should adequately warn unknowing persons that unauthorized entry is prohibited and can be dangerous.

The facility also has a 24-hour surveillance system using television monitors that continuously monitor and control entry onto the facility. All entrance gates to the facility are electronically operated by facility personnel to control entry into the facility.

1.2 GENERAL FACILITY INSPECTIONS

RCRA regulation 40 CFR 264.15 requires the owner or operator of a hazardous waste facility to inspect the facility for malfunctions and deterioration, operator errors, and discharges that may be causing - or may lead to - (1) release of hazardous waste to the environment, or (2) a threat to human health. The following describes the inspections conducted for the facility's hazardous waste management units. These inspections are designed to monitor the condition of equipment, safety and emergency equipment, operating procedures, and security measures.

The Facility Manager is responsible for making sure the inspections are carried out in accordance with the requirements described herein and according to the schedules outlined. The Facility Manager may designate other persons to conduct the inspections.

The facility records inspections electronically using standardized forms provided to all designated inspectors for use while conducting the inspections. The forms provide information concerning the units to be inspected, important items to look for, and the required frequency of inspection. In addition, space is provided on the forms for special observations and comments. If equipment is found to need repair, a work order is written and transferred to the maintenance department. This information is also added to the inspection form.

Example inspection reports are included in **Attachment 1**. A sample daily, weekly, monthly, etc., inspection report forms are included therein. Completed inspection reports are entered into the company's electronic inspection management system which tracks what problems exist or what observations warrant any correction. The Facility Manager (or designee), is responsible for ensuring that the necessary corrections, repairs, or modifications are made. When the corrective work is completed, an entry of the date and nature of the action taken is made on the same inspection report that was used to record the work to be done. All inspection reports are kept on file for at least three years after the initial inspection.

The units or areas inspected at the facility include:

(a) Security Systems;
(b) Emergency Response Equipment;
(c) Safety Equipment, Internal and External Communication Systems;
(d) Tanks;
(e) Container Storage Areas;
(f) Miscellaneous Unit;
(g) Truck Stations;
(h) Fuels Blending Process;
(i) Debris Bulking Process; and
(j) Process Equipment.

Frequency of Inspections

The facility has developed inspection frequencies based on the rate of possible deterioration, malfunction and past experiences in the operations. At a minimum, the inspection schedules meet the requirements of the regulations in 40 CFR 264.15. See **Attachment 2** and **Table III.D. - Inspection Schedule**

1.2.1 Inspection of Site Security Systems

Once each week, usually at the beginning of the week, the facility's security systems are inspected as follows:

(a) Perimeter Fence - Inspect fence for integrity; check for excessive deterioration, damage or corrosion, gaps under fence, and broken tie wires.
(b) Gates and Locks - Inspect for operability; check for damage to mechanism or fabric, corrosion of locks, and sticking locks.

Once each month the facility lighting is inspected as follows:

(a) Exterior yard lighting - Inspect for damage to fixtures, supports or mountings, check for broken or missing lamps, and test for operation.

(b) Interior emergency lighting - Inspect for damage to units, supports or mountings, check for broken or missing lamps, and test for operation.
(c) Warning Signs and No Smoking Signs - Check for presence and legibility of warning signs and no Smoking signs on perimeter fence, at entrances, and on the premises.

1.2.2 Inspection of Emergency Equipment

Once each week, usually at the beginning of the week, the emergency equipment is inspected as follows:

(a) Emergency Shower/Eye Wash Stations - Inspect for unobstructed access and operation; if eye wash squeeze bottles are provided, be sure bottles are full; check for presence and legibility of location signs.
(b) Spill Response Equipment - Inspect for proper equipment and supplies; check for low supply of absorbent and lack of equipment (e.g. hand tools and personal protective equipment), check for unobstructed access.

Once each month, usually at the beginning of the month, the following systems are inspected:

(a) Fire Extinguishers - Inspect for unobstructed access; check for expired inspection tags or inadequate charge; check for presence and legibility of extinguisher location signs.
(b) Plant Water Supply - Check for operability and sufficient flow of fire hydrants; test fire hoses and connections.
(c) Fire Alarm Pull Stations - Check for operability, accessibility.

1.2.3 Inspection of Safety Equipment and Communications Systems

Once each month, usually at the beginning of the month, the following are inspected:

(a) Personal Protective Equipment - Check for adequate supply of protective glasses, hard hats, coveralls, aprons, face shields, coated gloves, and respirators.
(b) Respirator or Self-contained Breathing Apparatus – Check for adequate supply and/or air charge and unobstructed access.
(c) Internal and External Communications - Test facility paging, telephone/intercom system, and wireless radios for operability; check external phone system and speed dialing system for operability, signal problems, abnormal line noise, or broken components.

1.2.4 Inspection of Tank Farms

Once each day, the permitted waste tank farms are inspected for the following:

(a) Tanks - Record level in tanks with gauge; observe any signs of leaks, spills, or excess corrosion of tank. Check operability of level gauges. Waste tanks are operated at atmospheric conditions and do not have temperature or pressure gauges.
(b) Tank Areas - Inspect areas immediately surrounding the tank systems to detect any wet Spots, discoloration or dead vegetation that would indicate release or spills of hazardous wastes.
(c) Tanks - Inspect tank shells, flanges, connections, and appurtenant pumps, piping, valves and other ancillary equipment for corrosion or leaks.

Once each week, the permitted waste tank farms are inspected as follows:

(a) Secondary Containment System Dikes - Inspect for cracks, spilling, or deterioration.
(b) Secondary Containment System Base and Sump Areas - Inspect for cracks, erosion, or concrete spalling; check for liquid in sumps, or evidence of stains or residuals.
(c) Secondary Containment Coatings - Inspection for condition of the impervious coating in the tank dike with no cracks, lifting of the coatings or void spaces.
(d) Tanks - Check tank foundations or structural supports for excess corrosion, deterioration, or damage.
(e) High Level Alarms - Test the operability of the high-level alarms weekly to ensure that overfill warning equipment are operating properly without any malfunctions.

1.2.4.1 Tank Integrity Assessment

The hazardous waste storage tanks at the facility included in this application for RCRA permitting have concrete secondary containment. Therefore, the facility will conduct appropriate testing/inspections (e.g., STI or API) for its tanks at the necessary interval as determined by applicable STI or API requirements.

The waste tanks at the facility are aboveground. Ultrasonic thickness testing devices may be used for assessment of the external shell thickness of the tanks. The ultrasonic tester will be used by a qualified inspector (e.g., pursuant to STI or API) to check randomly the thickness of various locations on the tank (e.g. top, sides, seams). The location of each check and the measured thickness will be recorded. A testing report will be prepared after the testing has been completed. This report will indicate if any excessive corrosion was detected and whether tank repair or tank replacement is required to remedy the situation.

All existing tank systems used for the storage of hazardous wastes have been assessed pursuant to the requirements of the 40 CFR 264.191. New tanks will be tested and inspected prior to use pursuant to the requirement of 40 CFR 264.192. The interval check for new tanks will also follow STI or API standards.

1.2.5 Inspection of Container Storage Areas

Once each operating day, the permitted waste container storage areas are inspected as follows:

(a) Containers - Inspect for any leaking containers; check for missing bungs, tops, and labels, unstable stacks of drums, and inadequate aisle space, container arrangement or over capacity (required aisle space is two feet to allow personnel access to containers at all times).
(b) Secondary Containment Systems - Inspect containment systems for spills or evidence of leaks; check for excess liquid in sumps.
(c) Containers - Inspect containers for proper segregation based on chemical compatibility.
(d) Storage Volume - Determine container storage inventory to ensure that the storage volume is less than the permitted storage capacity in each container storage area.
(e) Aisle Space - Inspect the container storage areas daily to ensure adequate aisle space of a minimum of 24-inches between double rows of containers for inspection purposes is maintained.

Once each week, usually at the beginning of the week, the permitted waste container storage areas are inspected as follows:

(a) Secondary Containment System Base and Sump Areas - Inspect bases and curbs for cracks, spelling, or deterioration.

1.3 Personnel

1. Process operators/facility technicians are trained operators familiar with facility operations.
2. Process operators/facility technicians are aware of the necessity for spill prevention and have been trained in containment and retrieval methods applicable to the operation and site.
3. No pumping, loading, or unloading operations are performed unattended.
4. Hardhats and safety glasses are required throughout the facility except in office, lounge, and areas designated as “safe” by the facility manager.
5. Employees are required to wear steel-toed shoes.
6. Employees wear respirators while taking samples for drums and tankers as needed.
7. Process operators/facility technicians are trained in and knowledgeable about process shutdown and emergency procedures.
8. Employees are familiar with the Safety Data Sheets for materials handled at the facility and know where to obtain them.
9. Smoking is not allowed in any area of the facility with the exception designated smoking area(s). No Smoking signs are conspicuously placed throughout the facility.

1.4 Internal Communications System

The facility's internal communications system consists of a telephone intercom system and facility paging system. Wireless radios are also available, and the facility is equipped with an emergency alarm system. The internal communications system is tested each month to ensure its operability in the event of an emergency. Specific items tested are listed in Section 1.2.3, Inspection of Safety Equipment and Communication Systems. On-site personnel will be notified of any emergencies through the paging system and alarm system.

1.5 External Communications System

The facility's external communications system consists of a telephone system capable of dialing the local fire departments, police departments and the corporate office in the event of an emergency. The external communications system is tested each month to ensure its operability in the event of an emergency. Specific items tested are listed in Section 1.2.3, Inspection of Safety Equipment and Communications Systems. In addition, the facility maintains an automatic fire alarm system to notify the fire Department.

1.6 Emergency Equipment

The facility maintains a significant amount of safety and emergency equipment. This equipment includes fire extinguishers, personal protective equipment, eye wash/emergency shower stations, first aid kits, portable pumps, absorbent materials and hand tools. The Contingency Plan provides a detailed list of the emergency equipment at the facility and their location. This equipment is inspected as described in Section 1.2.3, Inspection of Safety Equipment and Communications Systems.

1.7 Fire Suppression Systems

One of the key elements of overall risk minimization strategy is the fire suppression system. The resultant system meets or exceeds any currently effective NFPA guideline. The fire suppression system is designed to operate both automatically and manually. The fire suppression system is supplied to all container storage buildings including where tanks and the miscellaneous unit are located. Facility personnel are trained and equipped to act as at the awareness level and have ability to sound the order to evacuate areas and allow the automatic system to activate prior to the arrival of the fire department. The spacing of aisle ways maintained within container storage areas are all planned to allow ready access by emergency personnel to all areas of the facility.
A pump is housed in a fire water tank pump house to supply sufficient pressure for the fire suppression system. A fire detection and enunciator system (alarm) is monitored by an offsite contractor and is designed to alert the fire department. Employees have been trained in the proper use of the fire extinguishers placed throughout the facility.

The facility maintains ABC fire extinguishers, as well as other types of extinguishers located in areas around the site. An ABC extinguisher universal system is effective on paper, wood, electric and solvent fires. All extinguishers are maintained full and each carries a current inspection tag. Fire extinguishers are maintained at the facility in accordance with local fire codes, and standard company practice.

1.8 Aisle Space Requirements

Adequate aisle space is maintained between rows of containers in the container storage areas to allow personnel access to containers at all times. The container storage areas are inspected daily to ensure that the required aisle spacing is maintained and that the aisles are not blocked by containers or other objects. Specific items inspected are listed in Section 1.2.5, Inspection of Container Storage Areas.

1.9 Unloading Operations

The facility takes precautionary measures to prevent hazards during loading and unloading of containers and tank trucks. The truck stations have ramps for load/unload operations and fork lift trucks are used for safe movement of containers. Tanker trucks are grounded and trailer brakes are set or wheels chocked. Loading and unloading are performed in containment areas and are observed by trained personnel.

1.10 Procedures to Prevent Run-Off

The facility manages all hazardous waste activities in areas that have adequate secondary containment to prevent run-off. The truck stations, container storage areas and tank systems are all located within concrete secondary containment areas. The process units also are located inside contained areas. These design features prevent run-off of any spills or leaks and prevents run-on.

1.11 Prevention of Contamination of Water Supplies

The facility has installed back flow preventing devices on the water supply lines connected to process areas. The back flow preventing devices ensure that the water supply lines are not contaminated by the operations at the site.

The facility conducts load/unload operations only in certain areas to prevent run-off in the event of a spill. The container storage areas have a sufficiently impervious base to prevent migration of wastes in case of spills or leaks. The indoor aboveground tanks have adequate secondary containment capacity to contain volume of the largest tanks to prevent contamination of soils, groundwater and surface water.

1.12 Procedures During Power Failures

The facility has full time maintenance staff present during the operations of the facility to maintain the equipment during power failures. In the event of any failures, the

operations personnel are trained to turn off pumps and valves to prevent any materials from overflowing the equipment. No chemicals will be managed in the unit until it is fixed-and tested for use by the maintenance staff. The facility operators are trained on start up and shut down procedures for safe operations of the units.

1.13 Procedures to Prevent Ignition or Reaction of Ignitable or Reactive Wastes

The facility accepts ignitable wastes and has implemented procedures to prevent the ignition of ignitable wastes. Equipment and procedures in place to prevent ignition of ignitable wastes include the following:

(1) Tanks and container storage areas are located away from the property lines and public ways. Existing tanks at the facility are indoors in Warehouse I, are less than 5,000 gallons in storage capacity and are located greater than 50 feet from the property line or any nearest public way in compliance with the requirements of NFPA-30 (tank storage) for flammable and combustible liquids.
(2) The facility segregates incompatible wastes stored at the facility.
(3) The facility receives reactive wastes and these wastes are segregated from incompatible wastes by means of a dike, berm, wall, or other device (e.g., portable secondary containment pallets).
(4) Smoking is allowed only in the designated smoking area, and open flames are strictly prohibited in all areas. NO SMOKING signs are placed conspicuously throughout the facility, and the No Smoking policy is strictly enforced and followed by personnel and visitors.
(5) Flammable materials are labeled and segregated into defined areas of the container storage areas, tank and miscellaneous unit system, and load/unload areas of the facility.
(6) Tanks are electrically grounded when constructed and conform to UL standards.
(7) Only non-spark tools and equipment are used in flammable liquid storage and handling areas.
(8) Tank trailers are electrically grounded before they are loaded or unloaded.
(9) Water-based and chemical foam-based fire suppression systems are inspected and tested each month to ensure their operability in the event of an emergency.
(10) Employees are familiar with the Safety Data Sheets for materials handled at the facility.

The inspection and testing procedures described in Section 1.2, ensure that equipment to prevent ignition of ignitable waste is in place and operable and that procedures to prevent ignition of ignitable waste are strictly followed by employees.

1.14 Management of Ignitable or Reactive Wastes in Containers

The facility accepts and handles ignitable wastes in containers and has implemented procedures to prevent their ignition. The facility receives reactive wastes (RCRA waste code D003). Reactive wastes are segregated from incompatible wastes by means of a dike, berm, wall, or other device. The following equipment and procedures are in place to prevent ignition of ignitable wastes in containers:

(1) The container storage areas are located greater than 50 feet from the property lines.
(2) Adequate aisle space is maintained between rows of containers in the container storage areas.
(3) Containers are handled by forklifts using pallets or container-handling attachments to prevent the accidental puncturing of containers.
(4) Only containers transporting hazardous materials meeting applicable DOT requirements are accepted by the facility.
(5) The container storage areas are inspected daily to identify leaking or damaged containers.
(6) Bungs and tops are secured before moving containers
(7) The container storage areas are equipped with foam/water fire protection system.

The inspection and testing procedures described in Section 1.2, ensure that procedures to prevent ignition of ignitable waste containers are strictly followed by employees.

1.15 Segregation of Reactive and Incompatible Wastes

The facility accepts reactive wastes (RCRA waste code D003) and restricts wastes that are incompatible with other wastes or materials at the facility. Waste acceptance and analysis procedures discussed in the Waste Analysis Plan ensure that incompatible wastes are separately managed at the facility. Waste that are incompatible with other wastes or materials at the facility are segregated according to DOT compatibility. Containers with incompatible wastes will be separated by means of dikes, berms, walls, or other means.

1.16 Personnel Protective Equipment

When engineering and administrative controls are not feasible, the facility provides employees with Personnel Protection Equipment (PPE) to prevent the undue exposure of personnel to hazardous waste on an ongoing basis. PPE is also provided for responses to spills and emergencies. PPE is selected based on the materials to be handled, environmental conditions, and personnel as set forth in the health and safety policy for the facility.

All employees working within hazardous waste operations are provided with safety glasses, hard hats, personal respirators, safety shoes and work clothes. All personnel, including visitors, are required to wear hard hats and safety glasses.

Employees working in the areas of waste processing operations wear appropriate and proper protective clothing and may be required to wear face respirators. Personnel involved in sampling of chemicals use respirators while collecting samples when needed. The facility maintains several safety features for the personnel to ensure safe working environment.

ATTACHMENT 1
(EXAMPLE INSPECTION LOGS)

Compliance Header	
Inspector Name	
Area of Inspection	Warehouse 1, 2 & 3
Inspection Date and Time	
CO CSA Inspection Instructions	
Note condition of inspection items. If item does not apply to an area, mark N/A. All unsatisfactory findings must be explained below. Include any repairs, changes or other remedial actions required or performed.	
LT Daily Inspection Items	
Container Placement and Stacking - Check for evidence of failure (e.g., containers on pallets, pallets too high, unstable, other).	Pass
Sealing of Containers - Check for evidence of failure (e.g., containers not closed or sealed, open).	Pass
Labeling of Containers - Check for evidence of failure (e.g., no label, improper label, content, other).	Pass
Container Integrity - Check for evidence of failure (e.g., condition, bulging, leaks, rust, corrosion, other). Containers do not have waste/staining on the outside which would require cleaning or overpacking.	Pass
Pallets - Check for evidence of failure (e.g., broken, loose, condition).	Pass
Doors - Check for evidence of failure (e.g., indoor area, broken or not working as intended).	Pass
Base/ Foundation/ Roof - Check for evidence of failure (e.g., cracked, gaps, other).	Pass
Berms/ Racks - Check for evidence of failure (e.g., cracks, gaps, broken, other).	Pass
Debris and Refuse - Check for evidence of failure (e.g., proper storage, location, container type, other).	Pass

Exit Signs - Check for evidence of failure (e.g. missing, lamps, battery backup, other).	Pass
Aisle Space - Check for evidence of failure (e.g., minimum 2 ft required, other).	Pass
Containment Area - Check for evidence of failure (e.g., secondary containment, curbing, floor, cracks, deterioration, ponding or wet spots, other).	Pass
Sumps - Check for evidence of failure (e.g., cracks, ponding or wet spots, pitting or deterioration, other).	Pass
Loading/ Unloading Areas - Check condition of area (e.g., available equipment, spill response, containment, pad condition, valve access box, ponding or wet spots, other).	Pass
Communication and Alarm System - Check for evidence of failure (e.g., test function, siren, strobe, other).	Pass
Storage Capacity - Check for acceptable limit (e.g., area or permit retrictions, type restriction, volume limit, other).	Pass
Bonding and Grounding - Check for evidence of failure (e.g., loose, broken, corrosion or deterioration, other).	Pass
Pumps - Check for evidence of failure (e.g., deterioration or broken, leaks, other).	Pass
Inventory Age - Check for acceptable limit (e.g., within area limits, permit restrictions, other).	Pass
Satellite Accumulation Containers - Check for condition and appropriate for area (e.g., filter/basket, solids, label and marking, other).	Pass
Fire Extinguishers - Check for evidence of failure (e.g., overdue inspection, not charged, inaccessible, other).	Pass
Compliance Footer	
Inspector Signature	

Inspection Overall Assessment	Inspection Passed

Compliance Header	
Inspector Name	
Area of Inspection	
Inspection Date and Time	
CO Tank Systems Inspection Instructions	
Note condition of inspection items. If item does not apply to an area, mark N/A. All unsatisfactory findings must be explained below. Include any repairs, changes or other remedial actions required or performed.	
CO Tank Systems Inspection Items	
Tanks - Check for evidence of failure (e.g., rusty or loose anchoring, distortion, paint failure, other).	
Pipes/Piping Supports - Check for evidence of failure (e.g., distortion, corrosion, paint failure, other).	
Valves - Check for evidence of failure (e.g., disconnected, corrosion, sticking, leaks, other).	
Fittings/Hose Connections - Check for evidence of failure (e.g., loose, disconnected, corrosion, other).	
Liquid Level - Check for acceptable level. (e.g., high level max, permitted volume, other).	
Secondary Containment - Check for evidence of failure (e.g., cracks, ponding or wet spots, pitting or deterioration, other).	
Sumps - Check for evidence of failure (e.g., cracks, ponding or wet spots, pitting or deterioration, other).	
Bonding and Grounding - Check for evidence of failure (e.g., loose, broken, corrosion or deterioration, other).	

Transfer Equipment/Pump and Pump Motors - Check for availability and condition (e.g., pumps, filters, strainers, hoses, leaks, overheating, other).	
Communication and Alarm System - Check for evidence of failure (e.g., test function, siren, strobe, other).	
Satellite Accumulation Containers - Check for condition and appropriate for area (e.g., filter/basket, solids, label and marking, other).	
Manways, Hatches, Other Openings - Check for evidence of failure (e.g., condition, corrosion, closure, other).	
Pressure Relief Valves (PRV)/ Flame Arrestors - Check for evidence of failure (e.g., condition, corrosion, other).	
Tanks marked with the words "Hazardous Waste" - Check for appropriate markings.	
Tanks not used marked as "Out of Service" - Check for appropriate markings.	
Tanks marked as to the contents - Check for appropriate markings (e.g., Non-Haz Only).	
Monitoring Equipment/Level Indicators - Check for evidence of failure (e.g., pressure and temperature gauges, level indicators, sticking, condensation, disconnected, other).	
Loading/ Unloading Areas - Check condition of area (e.g., available equipment, spill response, containment, pad condition, valve access box, ponding or wet spots, other).	
Compliance Footer	
Inspector Signature	
Attach Photo	
Inspection Overall Assessment	

Compliance Header	
Inspector Name	
Area of Inspection	La Porte Facility
Inspection Date and Time	
LT - Daily Cylinder Release Unit - Remedial Actions Table Instructions	
Instructions: Inspection must be conducted daily while facility is in operation. All unsatisfactory findings must be explained below. Include any repairs, changes,or other remedial actions required or performed.	
LT - Daily Cylinder Release Unit - Remedial Actions Table Inspection Items	
In Use?	Pass
Do the Piping/Hoses have sufficient integrity to continue operational activities?	Pass
Do the valves have sufficient integrity to continue operational activities?	Pass
Do pressure regulators have sufficient intergrity to continue operational activities?	Pass
Do the fittings have sufficient integrity to continue operational activities?	Pass
Is all instrumentation, including but not limited to, flow indicators and pressure gauges, fully functional?	Pass
Is there any standing water or spills?	Pass
Is the secondary containment system free of cracks/gaps, chips, gouges, or deterioration?	Pass
On-Demand Work Ticket (please describe reason below)	Pass
Compliance Footer	
Inspector Signature	
Inspection Overall Assessment	Inspection Passed

Compliance Header	
Inspector Name	
Area of Inspection	
Inspection Date and Time	
CO Safety Security Inspection Instructions	
Note condition of inspection items. If item does not apply to an area, mark N/A. All unsatisfactory findings must be explained below. Include any repairs, changes or other remedial actions required or performed.	
CO Safety Security Inspection Items	
Perimeter Fences - Check for evidence of failure (e.g., broken ties, corrosion, holes, distortion, other).	
Gates/External Warehouse Doors - Check for evidence of failure (e.g., locking mechanism, broken ties, corrosion, holes, distortion, direct access doors working properly, other).	
Warning Signs - Check for evidence of failure (e.g., missing, faded, other).	
Exit Signs - Check for evidence of failure (e.g., missing sign, illumination, lamp bulbs, battery backup, other).	
Exits/Firelanes/Evacuation Routes - Check that all routes are clear or unobstucted.	
Lighting System - Check for evidence of failure (e.g. expired lamps, effectiveness, location, other).	
Emergency Lighting System - Check for evidence of failure (e.g., expired lamps, battery backup, effectiveness, other).	
Accessibility of Safety Equipment/Protective Gear - Check for evidence of availability (e.g.,	

hardhats, faceshields, goggles, safety glasses, boots, gloves, aprons, uniforms, duct tape, absorbents, other).	
Adequate Supply of Safety Equipment/Protective Gear - Check for evidence of availability (e.g., cleanliness, inventory available, other).	
Condition of Safety Equipment - Check for evidence of failure (e.g., review PPE for damage or excessive wear, other).	
Breathing Apparatus Accessibility - Check for evidence of availability (e.g. SCBA respirators, equipment, other).	
Breathing Apparatus Adequate Supply/Full Charge - Check for evidence of availability (e.g., SCBA tanks, charged, other).	
Breathing Apparatus Condition - Check for evidence of failure (e.g., SCBA damage, other).	
First Aid Kits - Check for evidence of availability (e.g., adequate inventory, other).	
Bloodborne Pathogen Kits - Check for evidence of availability (e.g., adequate inventory, other).	
Emergency Eyewashes - Check for evidence of failure (e.g., disconnected or malfunctioning valves, inadequate pressure, inaccessible, malfunctioning drain, leaking, other).	
Emergency Showers - Check for evidence of failure (e.g., disconnected or malfunctioning valves, inadequate pressure, inaccessible, leaking, other).	
Internal/External Communication - Check for evidence of failure (e.g., inadequate supply of phones or radios, malfunctioning intercom, telephones not working properly, emergency alarm does not work, phone moved from proper location, other).	
Fire Extinguishers - Check for evidence of failure (e.g., overdue inspection, not charged,	

inaccessible, other).	
Absorbent Supply - Check for evidence of availability (e.g., adequate inventory, other).	
Recovery Drum Supply - Check for evidence of availability (e.g., adequate inventory, other).	
Respirators and Cartridges - Check for evidence of availability (e.g., adequate APR inventory, other).	
Fire Suppression System Accessibility - Check for evidence of failure (e.g., monitors, pull stations, alarms, other).	
Fire Suppression System Operable - Check for evidence of failure (e.g., test, other).	
Water Lines/Hydrants - Check for evidence of failure (e.g., blocked, broken, other).	
Alarm Systems - Check for evidence of failure (e.g., test, other).	
Fire Blankets - Check for evidence of availability (e.g., adequate inventory, other).	
Strainer on Fire Suppression System - Check for evidence of failure (e.g., functioning as intended, other).	
Surveillance System/Guard Service - Check for evidence of failure (e.g., equipment or service provided and functioning properly, other).	
Supplied Air Delivery System and Reserve - Check for evidence of failure (e.g., system operational, epuipment functioning, other).	
Decontamination Equipment/Spill Clean-up Equipment - Check for evidence of availability (e.g., adequate supply of shovels, mops, cleaning solvents, available inventory, other).	
Portable Sump Pumps - Check for evidence of availability (e.g., adequate inventory, functioning properly, other).	
Gasoline Pumps - Check for evidence of failure (e.g., broken parts, leaks, other).	

Loud Speakers - Check for evidence of failure (e.g., test, other).	
Chocked Wheels on Parked Vehicles - Check for evidence of failure (e.g., chocks not used, missing, deteriorated, other).	
Cylinders Secure - Check for evidence of failure (e.g., properly stored, secured, chained, other).	
Ventilation Operable - Check for evidence of failure (e.g., system working as intended, other).	
Fall Protection - Check for evidence of availability (e.g., adequate inventory, integrity of equipment, other).	
Electrical Boxes - Check for evidence of failure (e.g., closed, not blocked, marked properly, other).	
Emergency Contact Info Posted - Check for evidence of availability (e.g., up-to-date postings, location requirement, other).	
Hearing Protection Available - Check for evidence of availability (e.g., type appropriate per location, other).	
Housekeeping - Check for evidence of failure (e.g., blocked egress, proper storage, procedure followed, other).	
Portable Compressor - Check for evidence of availability (e.g., adequate inventory, functioning properly, other).	
Lime Supply - Check for evidence of availability (e.g., adequate inventory, other).	
QC Lab Hood - Check for evidence of failure (e.g., functioning properly, other).	
Rolloff Parking Area - Check for evidence of failure (e.g., housekeeping, staging, other).	
Dumpster/Outside Containers - Check for evidence of failure (e.g., housekeeping, condition, appropriate use and storage, other)	

Stormwater Collection System - Check for evidence of failure (e.g., functioning properly, damaged equipment, integrity, other).	
Rally Point - Check for evidence of failure (e.g., location identified, communication, other).	
Visitor Log - Check for evidence of failure (e.g., available, communication, proper use, other).	
Contingency Plan - Check for evidence of failure (e.g., available, up-to-date, communication, other).	
Wind Instrument/Wind Sock - Check for evidence of failure (e.g., operational, functioning properly, not broken, other).	
Compliance Footer	
Inspector Signature	
Attach Photo	
Inspection Overall Assessment	

Compliance Header	
Inspector Name	
Area of Inspection	
Inspection Date and Time	
CO - Subpart CC Visual Tank Inspection Instruction	
Complete the visual tank inspection to satisfy the annual inspection required under Subpart CC.	
CO - Subpart CC Visual Tank Inspection Items	
Condition of tank (fixed roof and closure devices): (Check "Pass" if the condition of the tank is acceptable; Check "Fail" if the condition of the tank is not acceptable.) If "Fail", select appropriate reason: not closed under normal operation, other.	
These tanks are designed so that all cover openings can be closed with no visible gaps, holes, cracks, or other open spaces into the interior of the tank. The cover and all cover openings operate with no detectable emissions when in a closed position. Cover openings are maintained in a closed position at all times except when waste is being added to or removed from the tank, or when necessary sampling or repair/maintenance is performed on the tanks.	
Compliance Footer	
Inspector Signature	
Attach Photo	
Inpsection Overall Assessment	

ATTACHMENT 2
(EXAMPLE INSPECTION TYPES & FREQUENCIES)

FACILITY INSPECTION TYPES & FREQUENCIES

General Inspection Requirements

Clean Harbors LaPorte will conduct regularly scheduled inspections to detect malfunctions, deterioration, operator errors, or discharges, which may lead to a release of hazardous waste to the environment or cause a threat to human health. The schedule for inspections as well as all equipment, structures and devices to be inspected is described below. The frequency of inspections is based on the rate of possible deterioration of the equipment and the probability of an environmental or human health incident. Unless otherwise indicated, all inspection records (which include the remedial actions) will be maintained for at least three years as part of the facility operating record. See Table III.D below for inspection schedule details.

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
CONTAINER STORAGE AREAS/STAGING AREAS	• Curbs, floor and floor coatings have no cracks, chips and gouges. • Container racks in good condition and structurally sound. • Pallets holding containers in good condition and structurally sound. • No spills, collected liquids, or standing liquids. • No emergency equipment or emergency exits blocked. • Fire extinguishers in place and full charged. • Safety showers and eyewash stations operating properly. • Area clear of debris and trash. • All lights illuminated. • Aisles unobstructed and two foot spacing maintained. • Trailer and truck wheels chocked. • Satellite drums closed, properly labeled/marked, not full and no clutter/ debris around area.	Daily (except weekends and holidays)

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
CONTAINERS	• Proper approved container used. • No leaking or waste on the outside of drums or containers. • No spills or standing liquids. • No damaged, corroded, or rusted containers. • Lids, Rings, Bungs, Valves, Ties, Flaps, etc. closed per US DOT standards. • Containers properly secured on pallets or by other means. • Labels/Markings correct, legible and facing out. • Containers not stacked more than three (3) high. • Bulk containers have proper markings. • Exempt packages follow all requirements. • Incompatible wastes are properly segregated and placed in properly designated Storage Units.	Daily (except weekends and holidays)

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
TANKS AND ANCILLARY COMPONENTS	• Overfill prevention equipment fully functional. This includes, but is not limited to, high-level alarms, automatic feed shut-offs, and emergency relief valves. • Tanks, piping, valves, fittings, pumps, and foundations/supports have sufficient integrity to continue operational activities. • Instrumentation, including but not limited to, flow indicators and temperature/pressure gauges, are fully functional and not transmitting abnormal information. • Secondary containment system is free of cracks, gouges, chips or deterioration that could cause a physical release. • Secondary containment system lining is not deteriorated such that a release could be possible. • Sump system is functional with no excess accumulations. • No standing water or spills. • Waste loading/unloading areas are free of cracks or deterioration that could cause a possible release. • Waste loading/unloading areas are free of standing liquids or spills.	Daily

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
SAFETY EQUIPMENT	• All signs are in specified locations, clearly visible and in good condition. • All spill cabinets and spill kits are fully stocked and in specified locations. • Emergency monitoring equipment is operational and calibrated. • SCBAs and egress bottles are functional, fully charged and in specified locations. • First Aid and Blood Borne Pathogen kits are stocked and in specified locations. • Phones, intercoms, horns and fire alarms are operating and in specified locations. • Shelter-In-Place signs and kits all fully stocked and in specified locations. • Fire pump and foam house inspections completed. • Monthly eye wash stations and fire extinguisher inspections complete. • Fire hydrants are not blocked and are clearly visible.	Weekly
SECURITY	• Fence and barbed wire in place, no gaps and in good condition. • All perimeter signs in place and visible from 25 feet. • Gates operating, locked (if appropriate) and in good condition. • Perimeter and parking lot lights all operational. • Visitor orientation, check in procedures and safety rules being followed.	Weekly

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
FIRE AND EVACUATION ROUTES	• Evacuation signs posted, legible, not obstructed and in designated locations. • All wind socks are visible and in good condition. • Updated emergency phone list in designated locations. • Emergency procedures by phones in warehouses. • Contingency plan in designated locations. • Emergency exit routes are marked, unobstructed and exit signs lit. • Rally points unobstructed and accessible with locks and keys working. • Emergency lighting operating and in good condition. • Buildings free of clutter and accumulated flammable materials. • Fire lanes visible, unobstructed and in good condition.	Weekly

Section III. – Appendix E (Contingency Plan)

500 Independence Parkway South
LaPorte, Texas 77571

CLEAN HARBORS LA PORTE LLC
IHW 50225

CONTINGENCY PLAN

June 2020

RCRA Part B Permit Application
SECTION III - APPENDIX E

CONTINGENCY PLAN

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Tables

INTRODUCTION

According to 40 CFR 264.51, a contingency / emergency response plan: **"must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or nonsudden release of hazardous waste or hazardous waste constituents...".** The two goals, protecting human health and protecting the environment, are stated in their correct order and are the themes running through the entire Clean Harbors (La Porte) (Facility) operation. In any situation, emergency or routine, the overwhelming priority is protecting both the health and safety of facility personnel and the general public. With this achieved, attention turns to protecting the environment from any hazards which may be associated with materials the Facility handles.

Although the Facility handles a wide variety and fairly large total quantity of materials, the probability of fire, explosion, or release of hazardous materials at the facility is very low. It is anticipated that most releases could be handled by facility personnel without assistance. However, in the event of a major release, outside assistance will be sought. In these situations, the Facility recognizes that emergency response personnel are in command at the incident scene. The Facility Emergency Coordinator and other facility personnel will assist the fire or police official in charge with technical assistance and suggestions but will acknowledge that official's authority.

This plan cannot state in specific detail every action that must take place during and after an emergency. Instead, it outlines key points and activities suitable for various situations. The exact actions and their sequence must be based on judgment developed by prior planning, drills, and training sessions. When it comes to an actual incident, personnel must be trained and prepared to take action in any emergency.

1.0 GENERAL INFORMATION

This plan has been prepared for Clean Harbors La Porte, LLC located at 500 Independence Parkway South, La Porte, Texas 77571. The facility is operated by Clean Harbors and is located in Harris County. Facility is a commercial hazardous waste management facility engaged in the storing and bulking of hazardous waste. Hazardous waste will be stored in containers.

The provisions of this plan are to be implemented immediately, whenever there is a fire, explosion or release of hazardous waste constituents which could threaten human health or the environment. The contingency plan describes actions to be taken in response to fires, explosions or any unplanned release of hazardous waste or hazardous waste constituents to air, soil, or surface water. The actions to be taken are fully described in Emergency Response Procedures **(Section 4.0)** of this plan.

1.1 Site Geology

The Facility lies in a region identified geologically as the Beaumont formation, which typically consist of clays of high plasticity. The upper soils consist mainly of clay which appears to have low permeability. Below this layer are interspersed layers of silty and sandy clays. Water is encountered at all depths, but appears to be confined to each strata.

The topography of the area is mainly flat, with very little variation in elevations (between three and six feet). Given the site's geology and topography, spills would tend to spread laterally and evenly and be confined mostly to surface soils. Thus, geological conditions would pose no known adverse effects on emergency response activities.

1.2 Facility Drainage Patterns

Runoff from the Facility site flows via grassy swales towards Independence Parkway South, except for runoff from the rear of the site, which flows through grassy swales towards the southeast corner of the property. The grassy swales provide sufficient amount of percolation and minimize the amount of runoff reaching surface waters. Given the site's flat topography, the risk of accidental discharge of wastes through drainage areas is low. Given the distance to the nearest surface water, the Houston Ship Channel which is approximately five miles to the north of the site, the risk of contamination to surface waters from on-site releases is minimal.

More detailed information on site topography and site drainage and a topographic map are provided in Section V of the Part B permit renewal application.

1.3 Prevailing Winds and Weather Patterns

Wind rose data for the area in which the Facility lies indicates that prevailing winds are from the south southeast. Thus, releases to the air would likely be taken away from the residential areas which lie to the south of the site. To monitor wind direction, the facility uses wind socks located at various points within the facility. More information on wind rose and a wind rose map are provided in Section V for the Part B permit renewal application.

The Facility site lies in an area subject to heavy rains. The average annual rainfall for the area is 46.07 inches and the 100-year, 24-hour maximum rainfall event is expected to be 13 inches. As the site may be inundated with heavy rains and the site's topography is mostly flat, there is the possibility for accumulation of stormwater in low-lying areas on-site. Because of this possibility, active waste management areas are contained in buildings and floors to the active areas are raised at least one to four feet above the surrounding ground. This prevents any significant amounts of stormwater run-on into the active areas.

In the event of inclement weather, areas of shelter are provided for site employees and spill equipment is provided in active areas for quick response. The site is provided with emergency lighting and telephone service in the event of disruption of power or normal phone service.

2.0 EMERGENCY COORDINATORS

The on-site coordinators are fully familiar with the contents of this contingency plan and have received training regarding its implementation. These individuals are fully familiar with all operations, equipment, and activities on the site. They are knowledgeable regarding the location and characteristics of the wastes, the plant layout, and the location of required records.

In the event of an emergency requiring the implementation of this plan, the Emergency Coordinator is authorized to shut down operations when necessary and to commit the resources to carry out this contingency plan. The duties of the Emergency Coordinator are given in detail in **Section 2.1** of this plan.

Management will ensure that at least one of the individuals listed as an Emergency Coordinator will be either on the premises, or on call at all times. The responsible coordinator is charged with the responsibility of coordinating and delegating all emergency response measures in the absence of other emergency response personnel (e.g., fire and police officials). The individuals listed as Emergency Coordinators are included in the following table.

Clean Harbors La Porte, LLC

EMERGENCY CONTACT / COORDINATOR TELEPHONE NUMBERS

Primary Emergency Coordinator/Facility Security Officer (FSO):

→ Stephen Venti
7018 Jordan Rd — Work Phone: (281)884-5519
Manvel, TX 77578 — Cell Phone: (713)594-9038

Alternate Emergency Coordinators:

→ Angel Cano
3614 Tanglebriar — Work Phone: (281) 884-5536
Pasadena, TX 77503 — Cell Phone: (832) 347-6808

→ Ed Isom
920 Azalea Pointe — Work Phone: (281) 884-5518
League City, TX 77573 — Cell Phone: (832) 256-0921

→ John Walker (Alternate FSO)
906 E. Hampton — Work Phone: (281) 884-5500
Pearland, TX 77584 — Cell Phone: (281) 542-1646

Community	**Hours**	**Telephone**
Harris County Sheriff Department	24 hour	(713) 221-6000 (911)
La Porte Fire Department	24 hour	(281) 471-3607 (911)
La Porte Emergency Medical Services	24 hour	(281) 471-3607 (911)
Deer Park Fire Department	24 hour	(281) 478-7298
La Porte LEPC	24 hour	(713) 471-3811 ext. 721

Medical	**Hours**	**Telephone**
Bayshore Medical Center	24 hour	(713) 359-2000 or (713) 359-1440
San Augustine Clinic	NWH	(281) 476-4616
Life Flight Helicopter	24 hour	(713) 704-4357
Bayport Occupational Medical Center	NWH	(281) 470-0543

Roadblock, Law Enforcement	**Hours**	**Telephone**
Harris County Sheriff Department	24 hour	(713) 221-6000 (911)
Neighboring Industries	**Hours**	**Telephone**
Dow Chemical	24 hour	(713) 246-0240
AKZO Nobel	24 hour	(281) 479-8411

Regulatory	**Hours**	**Telephone**
National Response Center (NRC)	24 hour	(800) 424-8802
Texas Commission on Environmental Quality, Local (TCEQ)	NWH	(713) 767-3500 or (713) 767-3563
Texas Commission on Environmental Quality, Austin (TCEQ)	24 hour	(512) 239-2507 or (512) 463-7727
Harris County Pollution Control (HCPC)	24 hour	(713) 920-2831
Texas Parks & Wildlife (TP&WL)	24 hour	(800) 792-1112
Texas Department of Public Safety, Division of Emergency Management (TDPS)	NWH	(512) 424-2138
Texas Department of Health (TDH) - Bureau of Epidemiology	NWH	(512) 458-7268
Environmental Protection Agency (EPA) - NPDES Hotline	NWH	(214) 665-6595
Department of Homeland Security (DHS) National Infrastructure Coordinating Center (NICC)*	24 hour	(202) 282-9201

Information & ER Response	**Hours**	**Telephone**
Clean Harbors Environmental Services, Inc. Emergency Response	24 hour	(800) 645-8265
Poison Control	24 hour	(800) 764-7661
Fire Alarms/Zone A Intrusion	**Hours**	**Telephone**
Stanley Security	24 hour	(877) 899-0001
Spill Clean-up	**Hours**	**Telephone**
Clean Harbors La Porte, LLC	24 hour	(281) 884-5500

NWH - Normal Working Hours

*If the facility identifies a significant security incident or significant cyber security incident, that incident should be reported to DHS. Significant noncyber incidents should be immediately reported to local law enforcement (911) and reported to NICC via email (nicc@dhs.gov) or phone (1-202-282-9201). Significant cyber security incidents should be reported to DHS's US-CERT online (www.us-cert.gov) or via phone (1-888-282-0870).

2.1 Emergency Coordinator Responsibilities

The specific responsibilities of the Emergency Coordinator are as follows:

1. Whenever an imminent or actual emergency occurs, the Emergency Coordinator, or authorized designed, will perform the following:

   a. Activate communications systems that will alert all facility personnel.

   b. Notify appropriate State and local agencies that have designated response roles, if it is deemed that their advice or help is required. The Emergency Coordinator will assist the agencies with their response efforts.

2. If a release, fire, or explosion occurs, the Emergency Coordinator will identify the character, exact sources, and the area affected by any released materials by reviewing facility records or manifests.

3. The Emergency Coordinator also will assess possible hazards to human health or the environment that may have been caused by the emergency. This evaluation will consider both the direct and indirect consequences such as the effects of toxic, irritating, or asphyxiating agents generated by the emergency, any chemical agents used in fire control, and/or heat-induced reactions or explosions.

4. If the Emergency Coordinator concludes that an emergency has occurred that could threaten human health or the environment outside the facility property boundaries, the following procedures will be implemented:

   a. Immediately notify either the Texas Commission on Environmental Quality and the National Response Center (NRC) and report the following:

      (1) Name and telephone number.
      (2) Name and address of the facility.
      (3) Time and type of incident.
      (4) Name and approximate quantity of material(s) involved, to the extent known.
      (5) Extent of injuries, if any.
      (6) Possible off-site hazards to human health or the environment outside the facility.

   b. Notify the Texas Commission on Environmental Quality within 24 hours or by noon of the next working day (in the event of a holiday or weekend) that the contingency plan was implemented.

5. During the emergency, the Emergency Coordinator will take all reasonable measures to minimize the potential for occurrence and spread of fires, explosions, and releases at other facility areas. These measures may include stopping operations, collecting and containing released wastes, and removing or isolating materials.

6. After the emergency has been controlled, the Emergency Coordinator will provide for the storage, or disposal of recovered wastes and/or contaminated materials.

3.0 IMPLEMENTATION

Once informed of an emergency situation, the on-site Emergency Coordinator will decide whether to implement the contingency plan. The contingency plan will be implemented each time there is a fire, explosion, or spill greater than one pound which cannot be immediately cleaned up. Situations where the contingency plan may be implemented include:

1. Fire and/or Explosion

    a. A fire that causes the release of toxic fumes.
    b. A fire that spreads and could possibly ignite materials at other locations on-site or could cause heat induced explosions.
    c. The fire could possibly spread to off-site areas.
    d. Use of water or water and chemical fire suppressants that could result in contaminated runoff.
    e. An imminent danger exists such that an explosion could occur, causing a safety hazard.
    f. An imminent danger exists such that an explosion could ignite other hazardous waste at the facility.
    g. An imminent danger exists such that an explosion could result in the release of toxic material.
    h. An explosion has occurred.

2. Spills with Material Release

    a. The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard.
    b. The spill could cause the release of toxic liquids or fumes.
    c. The spill can be contained on-site, but the potential exists for groundwater contamination.
    d. The spill cannot be contained on-site, resulting in off-site soil contamination and/or ground or surface water pollution.

3. Floods

    a. The potential exists for surface water contamination.

4. Toxic Vapor/Mist Production

    a. Toxic vapors or mists have been formed following improper blending/mixing of wastes.
    b. Incompatible materials have contacted to form toxic vapors or mists.
    c. Toxic vapors/mists have been formed or may be formed as a result of a fire, explosion or spill.

3.1 Definition of Worst-Case Emergencies

In accordance with 30 TAC §305.50(12)(C)(i)(IV), Facility must define what would constitute a worst-case emergency scenario for the facility. Given operations at the site, the most reasonable cause for a worst-case scenario would be a large fire or explosion. Such an event could lead to the rapid spread of flames to other parts of the site and would cause the release of toxic materials to the air, affecting off-site areas. The area prone to a worst-case emergency includes the container storage area designated for ignitable wastes (Warehouse III).

4.0 EMERGENCY RESPONSE PROCEDURES

Response activities begin the moment someone becomes aware that there is problem. The primary response will attempt to ensure the safety of those individuals in the immediate affected area and notify the Emergency Coordinator. Response activities can be roughly divided into the following actions. (Not all of these actions will be necessary for every situation.)

1. Recognition of the incident by an employee.
2. Notification of the Emergency Coordinator.
3. Activation of internal communications systems.
4. Evacuation of the facility or immediate area of incident by all non-involved personnel.
5. Evaluation of the incident - what is happening, to how much of what material, and what are the possible consequences.
6. Notification of appropriate outside agencies, from the local fire department to the National Response Center.
7. Assist the emergency response personnel in containment or control of the spill, fire, or explosion.
8. Cleanup of the debris and equipment, including disposal of hazardous wastes.
9. Incident Evaluation, including written reports to the state and/or Federal EPA, to include a critique of the contingency plan.

In these situations, the Facility recognizes that outside or non-company emergency response personnel are in command at the incident scene. The Facility Emergency Coordinator and other personnel will assist the fire or police official in charge with technical assistance and suggestions, but will acknowledge that official's authority.

4.1 Notification

If an emergency situation occurs, the person who first notices the emergency will immediately contact the Emergency Coordinator by telephone or by pager. Exceptions to this rule would occur in the following situations:

1. If personnel are in imminent danger, they shall be promptly evacuated from the dangerous area.

2. If serious injuries have occurred, the ambulance (air or land) service shall be immediately contacted and first aid response implemented as appropriate.

In either of these situations, the person first noticing the emergency event is responsible for verifying that the proper response is safely initiated. Immediately after the response is initiated the Emergency Coordinator will be notified. The senior management person at the scene will act as the Interim Emergency Coordinator until the first Emergency Coordinator arrives. Upon notification of an emergency event, this Emergency Coordinator will begin performing the duties of the Emergency Coordinator described in **Section 2.1**.

4.2 Identification of Hazardous Materials

This facility handles many materials which may be considered hazardous if involved in a flood, fire or release to the environment, under various regulatory agencies. It is not practical to list each material which is, or may be, potentially handled at this facility. However, such materials include liquids, solids and compressed gases. All incoming waste materials, stored materials, and outgoing materials will be clearly marked and identified to provide for proper storage and handling. Storage areas will be separated into specific/compatible waste types, which also allows for rapid general

characteristic identification. The operating log and other files may be used to determine the type of hazardous waste involved in the emergency event.

4.3 Assessment

The Emergency Coordinator will assess the possible hazards to human health or the environment that may result from the emergency. This assessment will include the determination of the nature of the emergency (fire, explosion, spill, etc.) and its potential for off-site effects as well as on-site effects. It is important to identify the character, source, amount, and extent of any released materials. Observation of the source will usually be of greatest assistance in determining the character of the release. An attempt will be made to determine the approximate quantity released and the extent of migration. The Emergency Coordinator will then notify appropriate authorities and help them to determine if nearby areas should be evacuated. If warranted, the coordinator should contact the National Response Center and other authorities located in **Section 2.0**.

4.4 Control Procedures

a. Fires and Explosions

Fire and explosion control procedures are as follows:

1. Personnel at the scene should immediately clear the area and report to a designated location.

2. The fire department (911) should be summoned whenever there is a fire or explosion, in case the incident spreads and their assistance is required. Provide the fire department with the following information:

   (a) Name and telephone number of caller.
   (b) Name and location of facility.
   (c) Time and type of incident.
   (d) Name and approximate quantity of material(s) involved, if known.
   (e) Extent of any injuries, if any.
   (f) Possible hazards to human health, or the environment outside the facility.

3. The Emergency Coordinator should be informed immediately and given the following information; report caller's name, exact location of the incident, type and approximate quantity of materials involved, if known, and a brief description of the incident and hazards involved. The Emergency Coordinator will assess the situation and confirm as much as possible the exact identity, source, and amount of materials involved and determine the procedure for removal and isolation of a container during an emergency situation involving a fire or explosion:

   (a) If it is determined safe to do so by the Emergency Coordinator, any burning drum(s) will be moved to the nearest area free of drums.

   (b) If a burning drum is determined not to be safe to move, then, if possible, any non-involved drums will be removed from the area to a safe distance from the burning drum(s).

4. If the Emergency Coordinator determines that the fire or explosion and any subsequent release of hazardous materials could threaten human health or the environment, outside the facility, he must immediately notify local authorities and help them determine whether surrounding areas should be evacuated.

5. ONLY if a fire is small and well contained will facility personnel don protective clothing and attempt suppression with hand fire extinguishers.

6. Facility personnel will assist fire fighters with information, i.e., nature of materials and associated hazards. Only under the direction of the fire department will facility personnel become involved in fire suppression of major fires.

7. Run-off water or released wastes must be controlled (as for any other discharge) by use of dikes, berms, or adsorbents. These activities should be concurrent with the activities of fire suppression, if possible.

8. When the immediate problem of fire or explosion is controlled, clean-up and decontamination activities shall be conducted as for a discharge.

9. Written reports must be prepared, as described in the follow-up section in the contingency plan.

b. Releases

The release control procedures are as follows:

1. The Emergency Coordinator must be informed immediately. This initial report should include caller's name, exact location of the incident, type and approximate quantity of material(s) involved, if known, and a brief description of the incident.

2. If appropriate, the Emergency Coordinator should order the area around the release (or even the entire facility) evacuated of non-involved personnel.

3. The Emergency Coordinator must assess the situation, confirming as much as possible, the exact identity, source and amount of material(s) involved, and determine the hazards associated with the incident.

   (a) Determine the container contents via the Waste Profile Record (WPR) and/or the shipping manifest and location of release.

   (b) Determine chemical hazards present and the type of protective equipment required for responding personnel, including choice of glove type, respiratory protection and protective clothing/material.

   (c) The Emergency Coordinator will halt all routine operations in the area of a release and, if necessary, erect barriers around the affected area. Wastes are routinely segregated and stored according to compatible hazard characteristics, however, the Emergency Coordinator will review, via container labels, WPR's and manifests, etc. the drums

located in the vicinity of the release and supervise removal of any incompatible wastes before clean-up operations are undertaken.

(d) Under the direction of the Emergency Coordinator, normal work operations will not be resumed in the release area until clean-up and decontamination operations are completed, and the barrier removed.

4. As directed by the actual chemical hazard(s) presented, the following precautions may be taken:

   (a) Response personnel don appropriate protective clothing.

   (b) Impervious material such as plastic sheeting spread under the trailer to prevent ground contamination.

   (c) Isolation of the leaking container from uninvolved personnel and other chemical containers and/or immediate transfer of contents from leaking drums to a safe container.

   (d) If ignitable materials are involved, appropriate fire extinguishers brought to the scene and the fire department informed that they may be needed.

   (e) Cordoning off of the work area via ropes and/or warning signs.

   (f) For flammable and combustible materials, prevention of smoking, sparks, and open flames in the vicinity of the container.

5. If the Emergency Coordinator determines that the incident could threaten human health or the environment outside the facility, he/she must immediately notify local authorities and help them determine whether surrounding areas should be evacuated. The Emergency Coordinator must contact the National Response Center - 800/424-8802 and report:

   (a) Name and telephone number of caller.
   (b) Name and address of facility.
   (c) Time and type of incident.
   (d) Name and approximate quantity of material(s) involved, if known.
   (e) Extent of any injuries.
   (f) Possible hazards to human health or the environment outside the facility.

6. Containment of discharge material not collected in secondary containment provided, should be accomplished by:

   (a) Diking or berming on firm or impervious surfaces, using vermiculite, oil dry, soil and/or absorbent pillows.

   (b) Ditching around discharges onto soil using shovels.

   (c) Attempting to stop the leak in the container via plugs, bolts, duct tape, or harnesses as appropriate. The container also may be rotated so leak is uppermost.

(d) Contents of leaking containers may be transferred to sound containers, or the damaged container may be overpacked. Small containers can be placed in open head drums, larger ones in Recovery Drums. Overpacks may be lined with 4 mil polyethylene liners and all void spaces in the overpack filled with inert absorbent.

(e) The unreleased drum contents may be transferred via a spark free pump into a compatible DOT shipping container.

7. Clean-up operations may include the following steps:

(a) Free standing liquids pumped into suitable containers.

(b) Non-pumpable liquids absorbed with vermiculite, Oil Dri, Hazorb pillows or other absorbent.

(c) Solids, semisolids, adsorbents, etc. shoveled or swept up should be placed in appropriate containers and properly disposed.

(d) Residual materials on the ground may be removed by:

(1) Appropriate solvents if the surface is hard and impenetrable.
(2) Digging up contaminated soil, or even concrete, if necessary.
(3) Neutralization - For example, acids or bases, as appropriate.

8. Decontamination of area:

(a) The Emergency Coordinator may choose to determine the extent of any potential pollution or contamination by sampling and analysis of soil, water, vegetation, etc. The sampling necessity may be determined by:

(1) Nature of incident.
(2) Quantities involved.
(3) Types of surfaces exposed.
(4) Hazards associated with materials including such factors as toxicity and environmental persistence.

(b) All disposable contaminated items such as gloves, clothing, respirators, and hand tools are placed in appropriate shipping containers.

(c) Non-disposable equipment is decontaminated on site using appropriate cleaning methods and procedures.

9. The contaminated vehicle or area is checked for any damage which may have been caused by the leak, such as corrosion, etc.

10. All drums are manifested, sealed, and labeled per state, EPA and DOT guidelines for transport to an EPA permitted TSD facility (or one with interim status) for final disposition (i.e., secure landfill, incineration, etc.)

11. All appropriate notifications/reports are filed as required (i.e., Hazardous Substance Discharge notification (EPA), Hazardous Materials Incident Report (DOT), etc.).

12. Medical evaluation of the responding personnel as dictated by the material(s) involved.

4.5 Prevention of Recurrence

During the emergency, the coordinator must take measures to ensure that emergencies do not recur or spread to other hazardous waste at the site. These actions, depending on the situation, could include collecting and containing wastes **(see Section 4.4)**, and removing or isolating containers to which the emergency may spread. If operations are not already discontinued, this action may be taken to ensure containment of the emergency **(see Section 4.4)**.

The Facility has an established accident/incident investigation format where the contributing factors of an event are analyzed. Policies are put into place to prevent future incidents. Relevant issues are discussed during training programs and safety meetings.

4.6 Removal, Storage, and Treatment of Release Material

Immediately following an emergency, the coordinator will make arrangements for disposal of the waste resulting from the emergency, handling the contaminated material as hazardous until a determination of the degree of hazard can be made. This determination will be made according to 40 CFR 261 and the facility waste analysis plan. The released material will be analyzed for parameters which are based on the type of waste involved in the release with particular emphasis on the hazardous constituents. The coordinator will determine if in the affected area of the facility, all other waste activities need to be stopped until the released material is properly managed. If this determination is made then all operations in the immediate area will cease. The released material will be properly cleaned up and temporarily stored in recovery drums, roll-offs, or containers until final disposition can be determined.

4.7 Incompatible Waste

The facility has procedures and structures in place to prevent the accidental mixing of incompatible wastes. Container storage areas are subdivided into smaller areas by curbs and berms. Each of these smaller areas is provided with sufficient secondary containment to contain at least 10% of the volume of wastes stored there. Containers are grouped within these areas based on chemical compatibility, which is determined by the hazardous waste manifest and the waste profile record upon receipt of each container. Storage and process tanks are also grouped by chemical compatibility and are diked and bermed to prevent mixing of incompatible materials. Prior to placing the waste into tanks, the waste is tested per the Waste Analysis Plan to ensure it is compatible with other wastes contained within that tank.

Procedures for prevention of mixing of incompatible wastes during emergency situations are given in **Section 4.4** of this plan.

4.8 Post-Emergency Equipment Maintenance

The coordinator will ensure that, in the affected area of the facility, all emergency equipment listed in this plan is cleaned and fit for its intended use or is replaced before operations are resumed. **(See Section 4.4)**

4.9 Container Spills and Leakage

See Section 4.4.

4.10 Pre-Disaster Planning

According to 30 TAC 305.50(12)(C)(i)(VIII), Facility must develop a pre-disaster plan as part of its emergency response planning. The pre-disaster plan should address emergency assistance contacts, emergency response functions, spill containment and cleanup procedures and practice drills. The information provided within this contingency plan is sufficient to address any pre-disaster planning needs at the facility. Information on emergency response contacts is provided in **Section 2.0** of this plan. Emergency response functions and spill containment and cleanup procedures are provided in **Section 4.0**. Information on practice drills is provided in **Section 10.0**.

5.0 EMERGENCY EQUIPMENT

An inventory and location of all emergency equipment can be found in **Table III.E.3**.

5.1 Communications and Alarm Systems

Telephones with intercom access are located at key locations in the offices and throughout the operation areas. These can be used to communicate both within the facility and with outside agencies, such as fire and police departments.

Emergency evacuation alarms consist of an automated alarm system of electronic horns and strobe lights located throughout the facility. The alarms can be activated automatically, through the activation of heat or smoke sensors or through the activation of the automated sprinkler system located in the designated ignitable storage areas or manually, through one of the manual pull stations. The alarm system is continuously monitored remotely by ADT Security Systems in Houston, Texas. Activation of the alarm signals that a state of emergency exists and facility evacuation of all non-essential personnel has been ordered. This also will signal all emergency coordinators and emergency response personnel to meet at the designated assembly area. It will be their responsibility to ensure that everyone has evacuated the facility and to implement the contingency plan. In the event that the alarm system fails or cannot be activated, the intercoms or manual hand held pressurized air horns will be deployed. The intercoms can be accessed through the telephones, as described above, and voice commands will be given to signal an evacuation. Manual air horns also can be used to signal evacuation. The Emergency Coordinator or on-site supervisor can sound the horn by depressing the top button. One uninterrupted blast will be used to signal an evacuation emergency.

5.2 Fire Suppression Systems and Fire Extinguishers

An automated sprinkler system is in place in the designated ignitable waste storage areas. The system is heat activated and is supervised by the facility alarm system. Water is supplied to this system by a 280,000 gallon water tank equipped with a 1300 gallon per minute pump. Foam is supplied by a 1500 gallon foam tank filled with 3% aqueous film-forming foam (AFFF). Passive protection consists of a two hour fire wall used to separate the ignitable storage area from the inhabitable parts of facility. There are also fire hydrants in place at various locations on-site to provide remote access to the on-site fire water supply.

Portable dry chemical extinguishers are positioned throughout the facility as reflected in exhibit #1. Smaller extinguishers are located in the cab of each truck or tractor. These are ABC and D type extinguishers for use with combustibles such as wood and paper, electrical fires, flammable liquids, and metals.

5.3 Personal Protective Equipment

Personal protective equipment will be kept on hand at the facility and be readily accessible to facility personnel in the event of an emergency. This equipment will include, but not be limited to, the following items:

1. Boots
   a. Rubber
   b. Polyurethane

2. Gloves
   a. Mechanical protection: cotton or rugged leather
   b. Chemical protection: neoprene/latex or nitrile; PCB's use viton elastomer or "Silver Shield"

3. Eye Protection
   a. Goggles
   b. Face Shields

4. Respirators
   a. Nontoxic particle masks
   b. Dust respirators for toxic materials
   c. Cartridge respirators
   d. Positive pressure units for self-contained air

5. Tyvek Suits
   a. Plain porous
   b. Polyethylene coated
   c. Saranex coated

5.4 Spill Control Equipment

Spill control equipment will be kept on hand at the facility and be readily available to facility personnel in the event of an emergency. This equipment will include, but not be limited to, the following items:

1. Adsorbents:

   a. Vermiculite and Clay Adsorbents - useful in absorbing spilled liquids, oils, etc., also useful in smothering small fires and for diking.

   b. Hazorb pillows - absorb most liquids with the exceptions of very viscous materials (the consistency of cold molasses) or very reactive liquids (concentrated hydrofluoric acid). Also useful for dikes or berms.

   c. Industrial adsorbents.

2. Various Equipment:

   a. Squeegees, Pumps, Brooms, Shovels, Containers, (5 gallon buckets or other DOT approved containers), Wet/Dry Vacuum

Spill containment stations are staged in the waste storage and management areas.

5.5 Emergency Showers and Eyewash Stations

Emergency showers and eyewash stations are positioned throughout the facility as reflected in exhibit #1.

5.6 Decontamination of Equipment

Decontamination usually refers to removing soil, debris, or chemical contamination with an aqueous cleanser or organic solvent. The equipment will be inspected prior to being returned for use. Small expendable items will be placed in drums and sent for disposal. Liquids will either be pumped into drums or solidified and placed in drums and sent for disposal. This may require no more equipment than shovels or brooms. These may be disposed of with the waste or properly decontaminated. If a trailer, floor or impervious base is contaminated, decontamination will be accomplished by using a suitable detergent or solvent.

5.7 Maintenance of Equipment

The emergency equipment described in this plan is routinely tested and serviced to ensure that it is in working order. Alarm systems, fire suppression systems and fire extinguishers are tested and serviced annually by trained technicians. Emergency showers and eyewash stations, emergency breathing apparatus and portable fire extinguishers are routinely checked by facility personnel to ensure they are in place and functioning properly. Inspection of emergency equipment is detailed in the facility's Inspection Schedule.

6.0 EMERGENCY MEDICAL CAPABILITIES

In the event an injury should occur, first aid will be administered by on-site personnel trained in appropriate first aid procedures. There shall be at least two persons on-site at all times trained in first aid procedures. The injured personnel will be taken to the nearest medical clinic as soon as possible. Facility vehicles will be used for patients who are not in a life-threatening mode. The patient should never be allowed to drive himself.

In the event of more serious injuries the Emergency coordinator or his designee will summon the La Porte Emergency Medical Services (EMS). The EMS response will normally be an ambulance with 2 trained technicians. The approximate response time is 15 minutes. The ambulance should be used when the patient's condition is life threatening or requires paramedic level medical intervention procedures such as I.V.s, tracheal intubation, cardiac monitoring or defribulation. Bayshore Hospital is approximately 20 minutes away and is the primary destination for injury care.

For extreme trauma cases, Lifeflight helicopter may be summoned. Lifeflight is best coordinated through the La Porte EMS.

7.0 COORDINATION AGREEMENTS

Copies of the contingency plan and service arrangements requests have been sent to the following organizations and agencies which may provide services in the event of an emergency:

1. City of La Porte Fire Department
   124 South 2nd Street
   La Porte, Texas 77571
   281.471.2211

The La Porte Fire Department may provide the primary fire response capabilities for the site. The nearest station is approximately 8 minutes away and is located at 1505 Lomax School Road in La Porte, TX. In the event of a very large fire, the La Porte Fire Department may coordinate its efforts with the Deer Park Fire Department and with Channel Industries Mutual Aid (CIMA), a collection of emergency response teams provided by the chemical industries located in the area.

2. City of La Porte Medical Services
   10428 Spencer Highway
   La Porte, Texas 77571
   281.471.2211

The La Porte Emergency Medical Services may provide emergency first aid for the site and transportation of injured personnel off-site. Its capabilities are described in **Section 6.0** of this plan.

3. Harris County Sheriff Department
   1301 Franklin Street
   Houston, Texas 77002
   713.221.6000

The Harris County Sheriff Department may provide for security and traffic control for emergencies occurring at the site.

4. Columbia Bayshore Medical Center
   4000 Spencer Highway
   Pasadena, Texas 77504
   713.944.6666

Columbia Bayshore Medical Center may provide triage and emergency medical treatment for personnel removed from the site. The hospital is located approximately 20 minutes from the site.

Copies of this plan have been distributed to the emergency coordinators and one will be on file in the Facility General Manager's office. Additionally, copies have been sent to the following agencies for informational use only:

1. Texas Commission on Environmental Quality
2. La Porte Local Emergency Planning Committee
3. La Porte Fire Department

A copy of the letter sent to the above agencies is included as **Exhibit #2**.

8.0 EVACUATION PLAN

In the event that evacuation of the facility or a portion of the facility is required, the alarm system, telephone paging systems or compressed air horns (by one uninterrupted blast) will be utilized to signal an alarm. These signals can be heard by all personnel within the operation areas. The signals will indicate that the facility should be evacuated. Upon evacuation, personnel will proceed to the primary assembly area which is located at the main entrance gate on the western portion of the facility or to the secondary assembly area which is located in the northeastern portion of the site. Assembling at these locations, away from the hazard, will allow attendance reconciliation by supervisory personnel. The evacuation routes from operations areas and the assembly areas are shown in **Exhibit #1**. Evacuation Routes will be posted in all administrative and operation areas. This evacuation plan will be modified as conditions require its change.

9.0 REQUIRED REPORTS

A notation in the operating record will be made indicating the time, date, and details of any incident that requires implementing this plan. Within 15 days of the incident, a written report on the incident will be submitted to:

Texas Commission on Environmental Quality
PO Box 13087
Austin, TX 78711-3087

This report will include:

1. The company name, address, and phone number.
2. The date, time and type of incident.
3. The name and quantities of material involved.
4. The extent of injuries, if any.
5. As assessment of actual or potential hazards to human health or the environment, if applicable.
6. The estimated quantity and disposition of recovered material that resulted from the incident.

10.0 TRAINING AND DRILLS

Training for the implementation of the contingency/emergency response plan will be combined with other facility training required for all Facility personnel at the site. This training is described in the site's Training Plan.

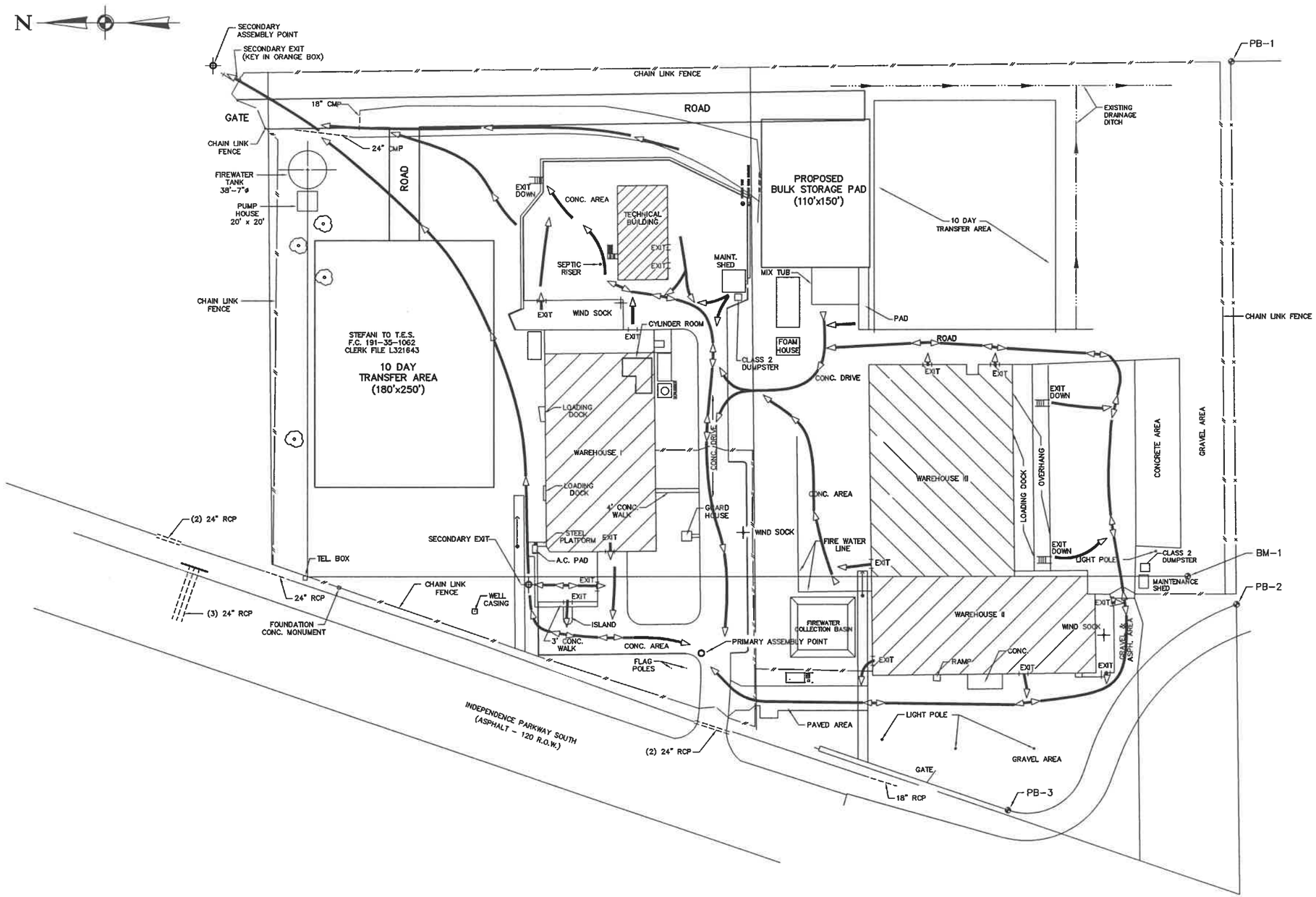
Drills involving facility personnel will be conducted on-site at least annually. The purpose of these drills is two-fold. They allow facility personnel to receive "hands-on" experience in dealing with emergencies and are used by facility management to assess the effectiveness of the emergency procedures and equipment listed in this plan. The drills may consist of "table-top" drills involving facility management or outside agencies, functional drills or full-scale drills involving all site personnel.

11.0 AMENDMENTS TO THE CONTINGENCY PLAN

Amendments and/or any modification or change required to ensure plan is updated will be submitted as required and redistributed. The plan will be amended if any of the following occurs:

1. Governing regulations change.
2. This plan (or a portion of it) fails in an emergency.
3. The list of emergency coordinators changes.
4. The list of emergency equipment changes.
5. The facility changes - in its design, construction, operation, maintenance or other circumstances in a way that materially increases the potential for fires, explosions or releases of hazardous waste or hazardous waste constituents or changes the response necessary in an emergency.

Exhibit #1
(Facility Evacuation Routes)



STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

LEGEND:
- EVACUATION ROUTE
- WIND SOCK
- PRIMARY ASSEMBLY POINT
- SECONDARY ASSEMBLY POINT

REFERENCE DRAWINGS	
TITLE	DRAWING NO.
EVACUATION PLAN; WAREHOUSE II & III EVACUATION PLAN; ADMIN. & WAREHOUSE I EVACUATION PLAN; TECH. & BRANCH TRAILERS	307-01-202 307-01-203 307-01-204

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
10	PERMIT RENEWAL 2020	KMC				DAD 4/6/20	
9	CLASS B PERMIT MODIFICATION	KMC					
8	CLASS I MODIFICATION	KMC				BR 3/21/14	
7	FENCE LINE MODIFICATION	KMC				BR 10/8/13	
6	REVISED ADDRESS & REMOVED ADJACENT PROPERTY INFORMATION	KMC				MAR 7/30/09	
5	GENERAL REVISION	WDS				2/25/08	
4	ADDED POUR-OFF ROOM	WDS				1/5/04	

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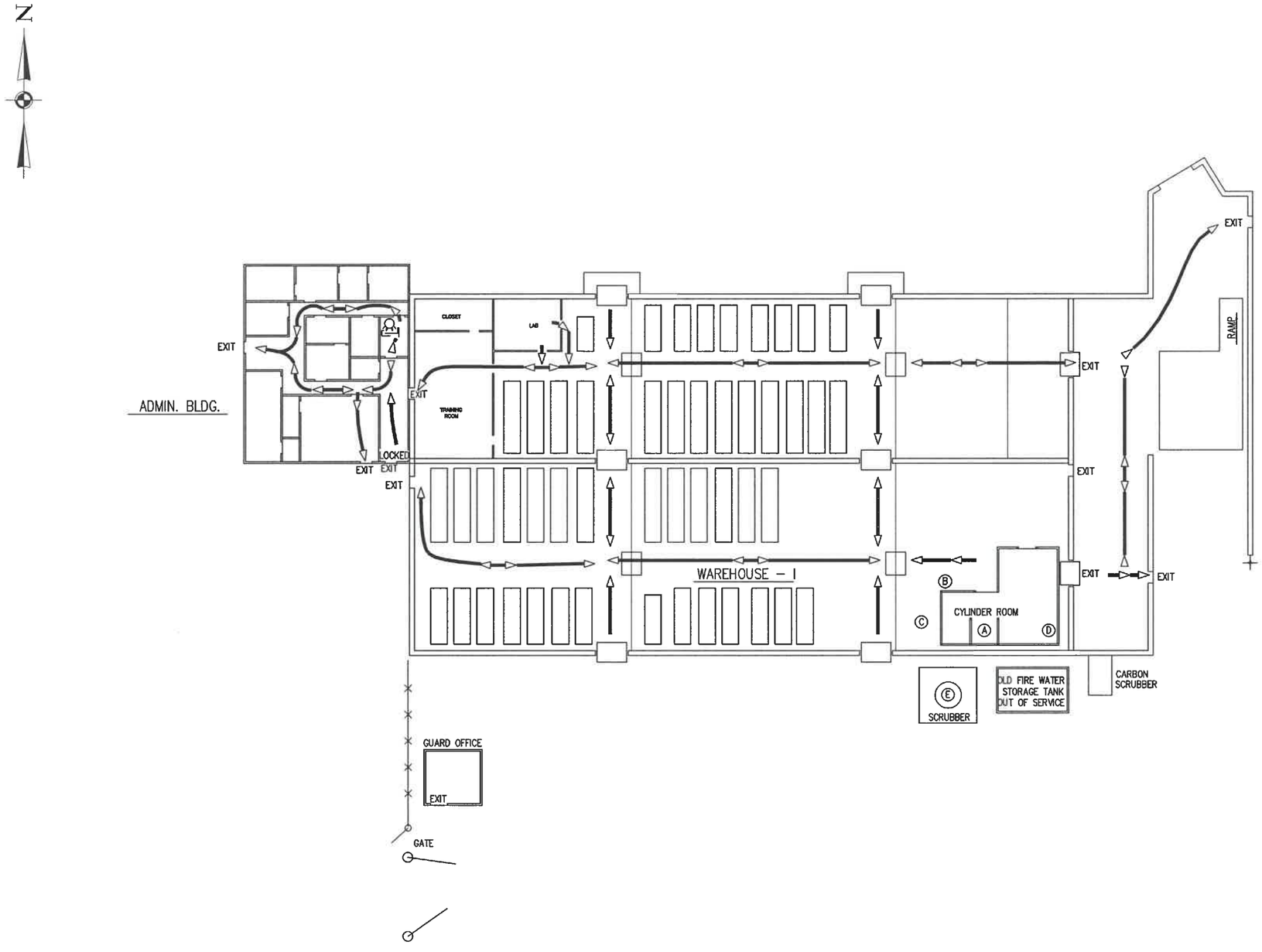
TITLE:
EVACUATION PLAN
GENERAL PLAN

FILE: 30701101

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1 = 50	307-01-101	10



STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

LEGEND:

- EVACUATION ROUTE
- WIND SOCK
- SHELTER IN PLACE
- (A) PROCESS TANK
- (B) CYLINDER RELEASE UNIT
- (C) PROCESS TANK SCRUBBER
- (D) PROCESS TANK
- (E) PROCESS ROOM SCRUBBER

REFERENCE DRAWINGS	
TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT FIRE ALARM & MONITIORING PLAN EMERGENCY EQUIPMENT LOCATION PLAN	307-01-101 307-03-303 307-02-203

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
8	PERMIT RENEWAL 2020	KMC			DAD	3/31/20	
7	CLASS II MODIFICATION	KMC			B.R.	2/15/13	
6	REVISED ADDRESS & LEGEND	KMC			MAR	7/30/09	
5	GENERAL REVISION	WDS				2/25/08	
4	GENERAL REVISION	WDS				4/28/05	
3	RELOCATE REACTOR TANK	WDS				4/6/05	
2	ADDED CHEMICAL TREATMENT ROOM	WDS				10/14/03	

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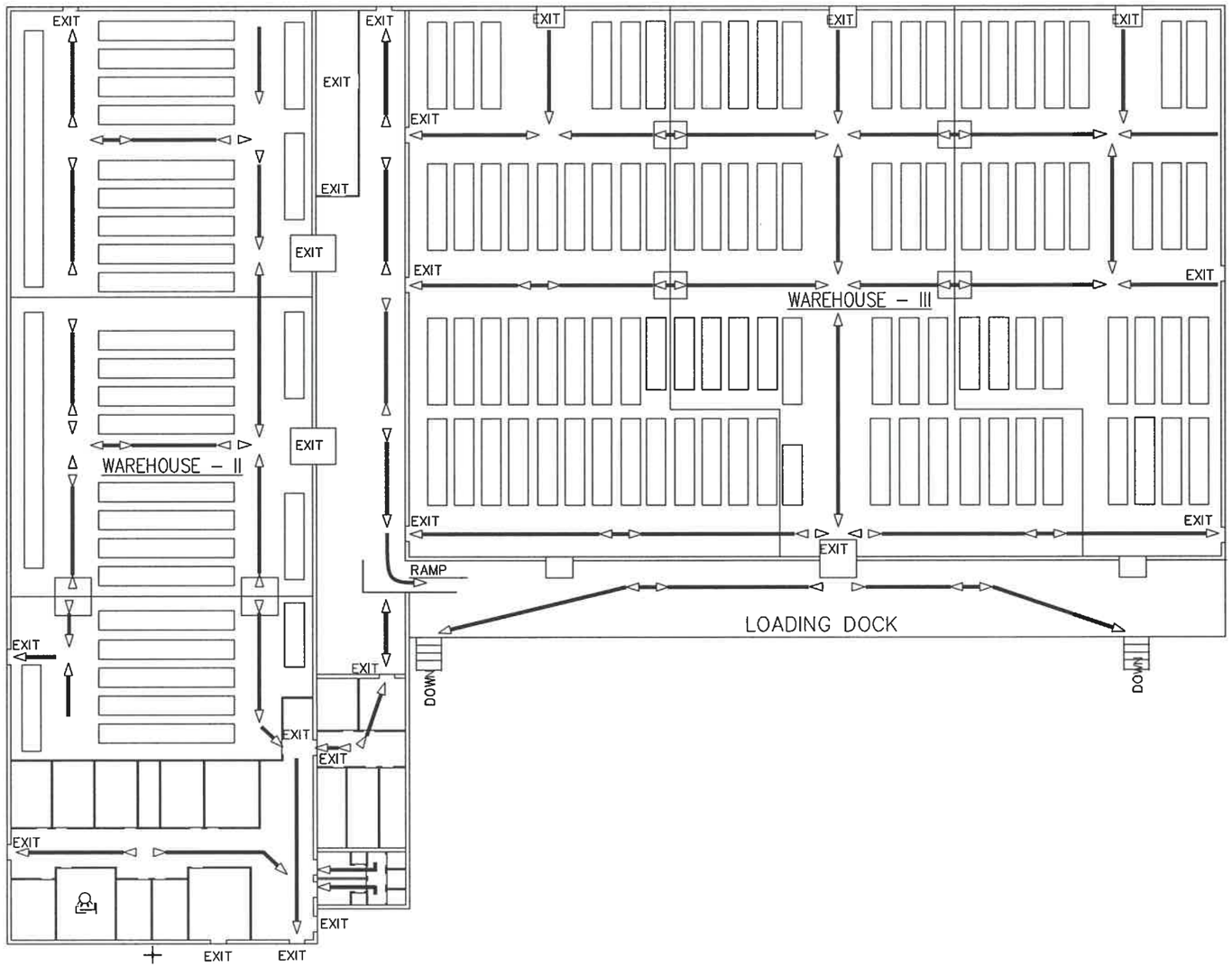
TITLE:
EVACUATION PLAN
ADMIN. & WAREHOUSE I

FILE: 30701203

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'-0"	307-01-203	8

N



ER/MAINT. SHED

REFERENCE DRAWINGS	
TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT FIRE ALARM & MONITORING PLAN EMERGENCY EQUIPMENT LOCATION PLAN	307-01-101 307-03-303 307-02-203

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
4	PERMIT RENEWAL 2020	KMC			DAD	3/31/20	
3	REVISED ADDRESS & LEGEND	KMC			MAR	7/30/09	
2	ADDED POUR-OFF ROOM & SCRUBBERS	WDS				2/5/04	
1	ADDED BRANCH TRAILERS	JCM				11/10/99	
0	FINAL ISSUE	D.R.			R.H.	02/01/96	

STATE OF TEXAS
J. W. CALDWELL
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05/13/20

LEGEND:
- EVACUATION ROUTE
- WIND SOCK
- SHELTER IN PLACE

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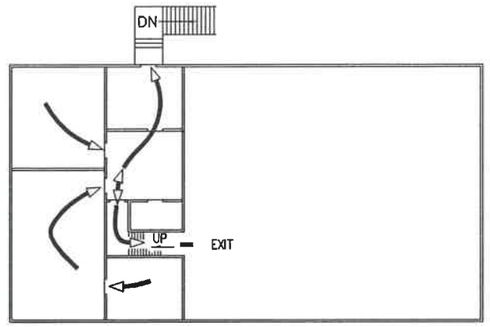
TITLE:
EVACUATION PLAN
WAREHOUSE II & III

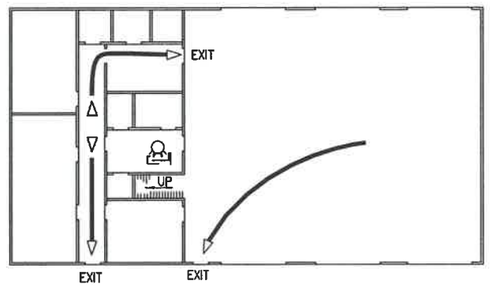
FILE: 30701202

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'-0"	307-01-202	4

N



TECHNICAL BUILDING
2ND. FLOOR PLAN



TECHNICAL BUILDING
1ST. FLOOR PLAN

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

LEGEND:
EVACUATION ROUTE
SHELTER IN PLACE

REFERENCE DRAWINGS	
TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT FIRE ALARM & MONITORING PLAN EMERGENCY EQUIPMENT LOCATION PLAN	307-01-101 307-03-303 307-02-203

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
4	PERMIT RENEWAL 2020	KMC				DAD 3/31/20	
3	REVISED ADDRESS & LEGEND, MOVED EQUIPMENT, ADDED STAIRS & WALL	KMC				MAR 7/30/09	
2	ADDED CHEMICAL TREATMENT ROOM	WDS				10/14/03	
1	ADDED BRANCH TRAILERS	JCM				11/10/99	
0	FINAL ISSUE	D.R.			R.H.	02/01/96	

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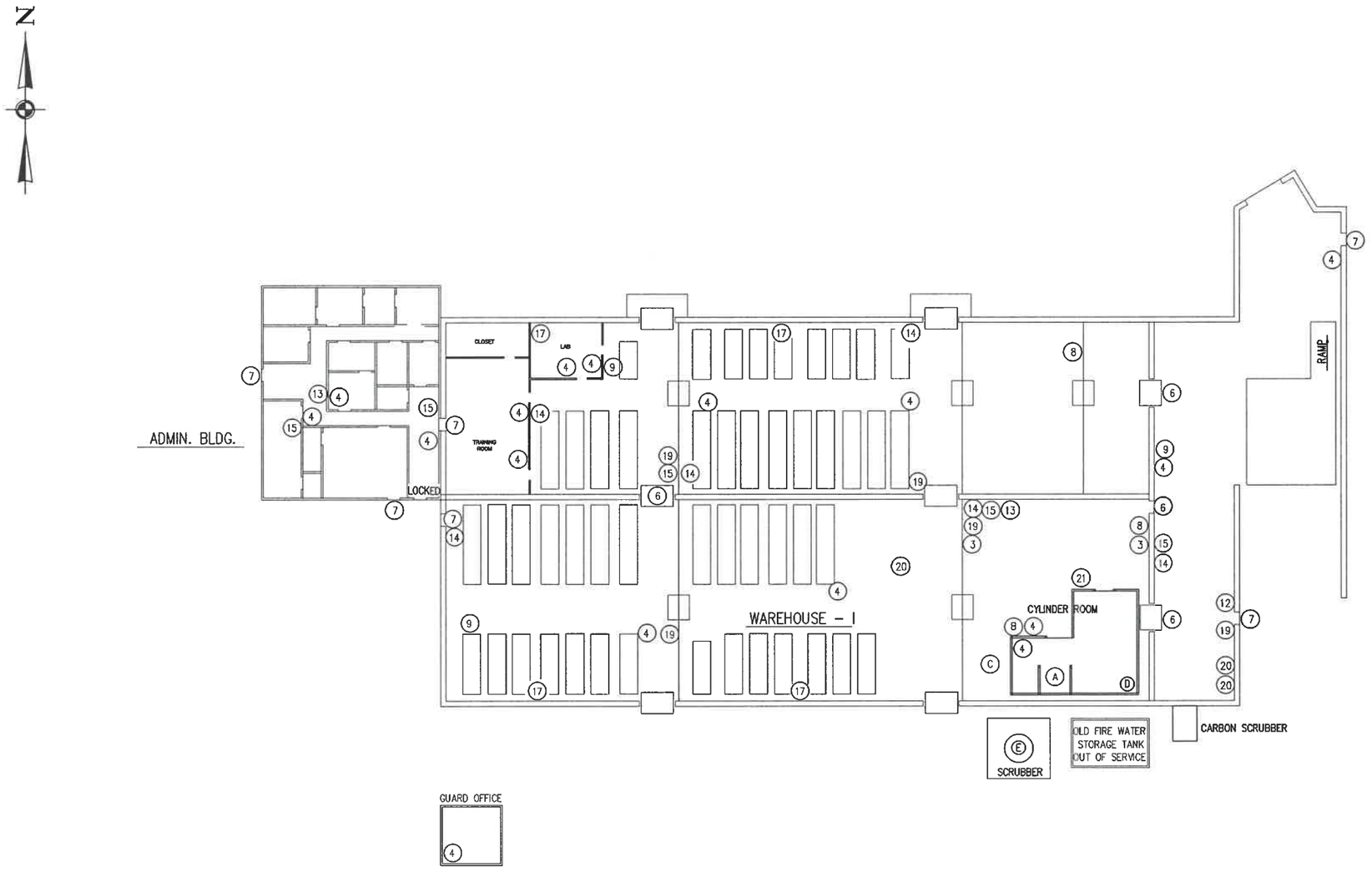
TITLE:
EVACUATION PLAN
TECHNICAL BUILDING AND BRANCH

FILE: 30701204

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'-0"	307-01-204	4



STATE OF TEXAS
J. W. CALDWELL
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PROFESSIONAL ENGINEER
05/13/20

LEGEND:

	DESIGNATION
3	WHEELED FIRE EXTINGUISHER (LAREG)
4	FIRE EXTINGUISHER (SMALL)
6	EXIT
7	EMERGENCY EXIT
8	EYE WASH STATION
9	EMERGENCY SHOWER / EYE WASH STATION
11	RESPIRATOR
12	SUPPLIED AIR TANK & MASK
13	FIRST AID KIT
14	EMERGENCY HORNS (HAND HELD)
15	PHONE FOR SPEAKER SYSTEM
16	CONTAINER REPAIR KIT
17	SPILL CONTAINMENT EQUIPMENT
18	ELECTRICAL EQUIPMENT ROOM
19	PERSONAL EYE & SKIN IRRIGATION STATION
20	SATELLITE ACCUMULATION AREAS
21	FIRE BLANKET

A	PROCESS TANK
B	CYLINDER RELEASE UNIT
C	PROCESS TANK SCRUBBER
D	PROCESS TANK
E	PROCESS ROOM SCRUBBER

REFERENCE DRAWINGS	
TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT	307-01-101
EVACUATION PLAN: WARE HOUSE - I	307-01-203
FIRE ALARM & MONITIORING SYSTEM	307-03-303

REV.	DESCRIPTION OF ISSUE	BY/M.	CHECKED	CONSULTED	APPROVED	DATE	EXT. NO.
8	PERMIT RENEWAL 2020	KMC			DAD	3/31/20	
7	CLASS II MODIFICATION	KMC			B.R.	2/15/13	
6	REVISED ADDRESS & DESCRIPTION TABLE	KMC			MAR	7/30/09	
5	GENERAL REVISION	WDS				2/25/08	
4	GENERAL REVISION	WDS				4/28/05	
3	RELOCATED REACTOR TANK	WDS				4/6/05	
2	GENERAL REVISION	WDS				2/4/04	

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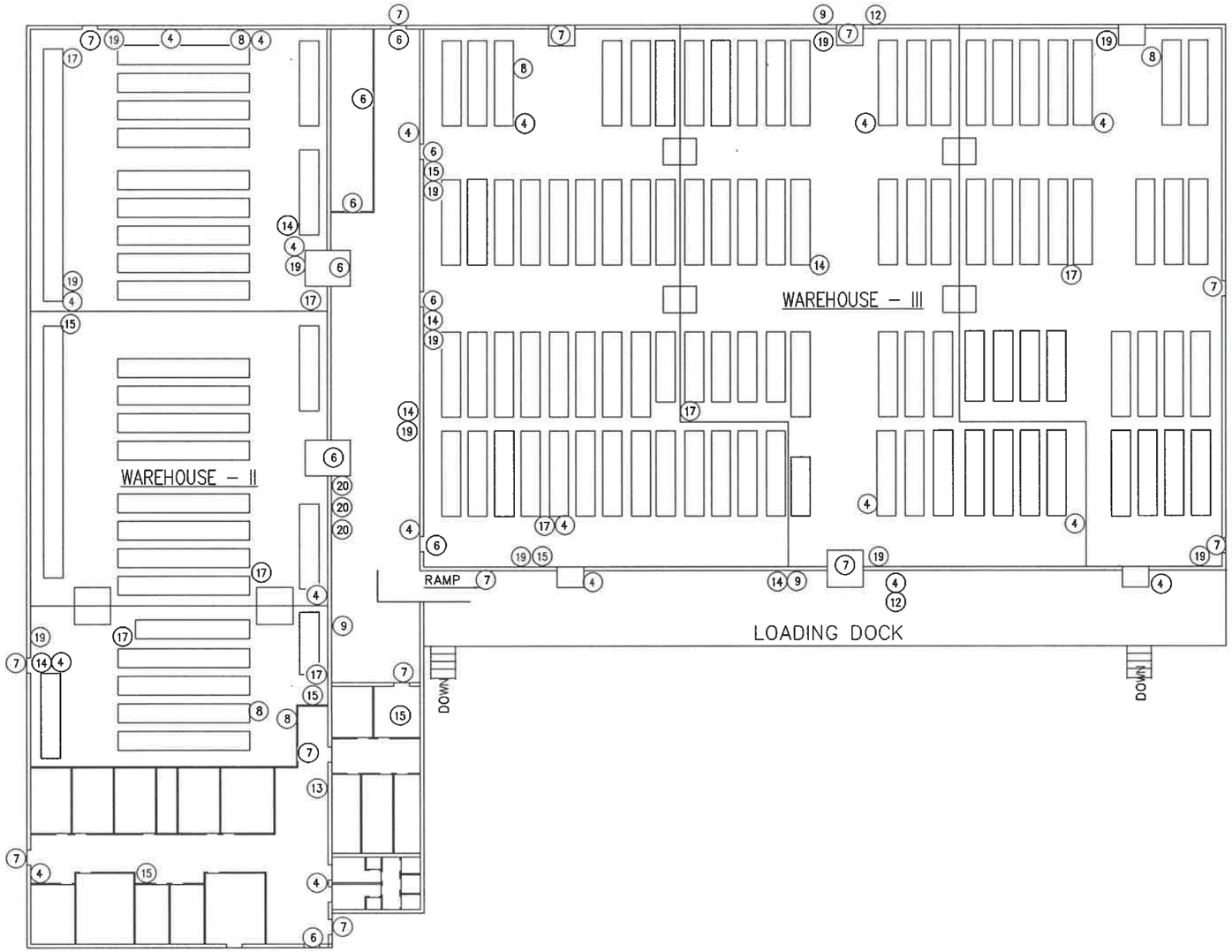
TITLE:
EMERGENCY EQUIPMENT PLAN AND EXIT PLAN ADMIN. & WAREHOUSE I

FILE: 30702203

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'-0"	307-02-203	8

N



ER/MAINT. SHED

REFERENCE DRAWINGS	
TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT EVACUATION PLAN: WARE HOUSE – I FIRE ALARM & MONITIORING SYSTEM	307-01-101 307-01-203 307-03-303

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
6	PERMIT RENEWAL 2020	KMC				DAD 4/2/20	
5	CLASS II MODIFICATION	KMC				B.R. 2/15/13	
4	REVISED ADDRESS & DESCRIPTION TABLE	KMC				MAR 7/30/09	
3	GENERAL REVISION	WDS				9/27/04	
2	GENERAL REVISION	WDS				2/4/04	
1	ADDED CYLINDER TREATMENT ROOM	WDS				10/14/03	
0	FINAL ISSUE	D.R.				R.H. 05/29/98	

STATE OF TEXAS
J. W. CALDWELL
94038
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PROFESSIONAL ENGINEER
05/13/20

LEGEND:

	DESIGNATION
4	FIRE EXTINGUISHER (SMALL)
6	EXIT
7	EMERGENCY EXIT
8	EYE WASH STATION
9	EMERGENCY SHOWER / EYE WASH STATION
11	RESPIRATOR
12	SUPPLIED AIR TANK & MASK
13	FIRST AID KIT
14	EMERGENCY HORNS (HAND HELD)
15	PHONE FOR SPEAKER SYSTEM
16	CONTAINER REPAIR KIT
17	SPILL CONTAINMENT EQUIPMENT
18	ELECTRICAL EQUIPMENT ROOM
19	PERSONAL EYE & SKIN IRRIGATION STATION
20	SATELLITE ACCUMULATION AREAS
21	FIRE BLANKET

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TITLE:
EMERGENCY EQUIPMENT PLAN AND EXIT PLAN WAREHOUSE II & III

FILE: 30702202

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'-0"	307-02-202	6

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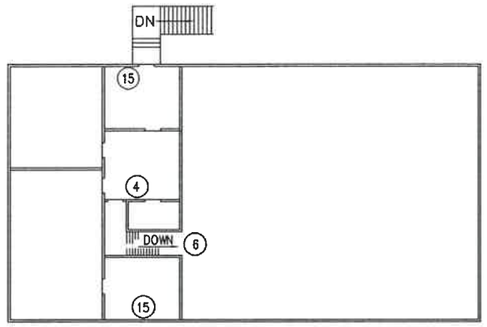
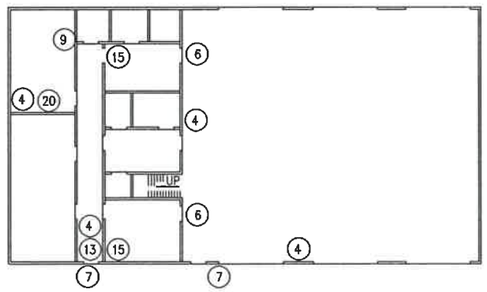
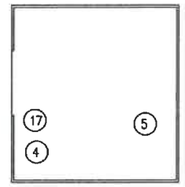


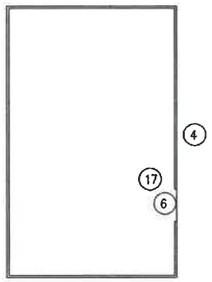
TECHNICAL BUILDING
2ND. FLOOR PLAN



TECHNICAL BUILDING
1ST. FLOOR PLAN



FIRE PUMP HOUSE



FOAM HOUSE

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

LEGEND:

DESIGNATION	
4	FIRE EXTINGUISHER (SMALL)
5	AUTOMATIC FIRE PUMP ROOM
6	EXIT
7	EMERGENCY EXIT
9	EMERGENCY SHOWER / EYE WASH STATION
13	FIRST AID KIT
15	PHONE FOR SPEAKER SYSTEM
17	SPILL CONTAINMENT EQUIPMENT
20	SATELLITE ACCUMULATION AREAS

REFERENCE DRAWINGS

TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT	307-01-101
EVACUATION PLAN: WARE HOUSE - I	307-01-203
FIRE ALARM & MONITIORING SYSTEM	307-03-303

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
4	PERMIT RENEWAL 2020	KMC			DAD	4/3/20	
3	REVISED ADDRESS, MOVED EQUIPMENT & ADDED STAIRS	KMC			MAR	7/30/09	
2	GENERAL REVISION	WDS				2/4/04	
1	ADDED BRANCH TRAILERS	WDS				10/14/03	
0	FINAL ISSUE	D.R.			R.H.	05/29/98	

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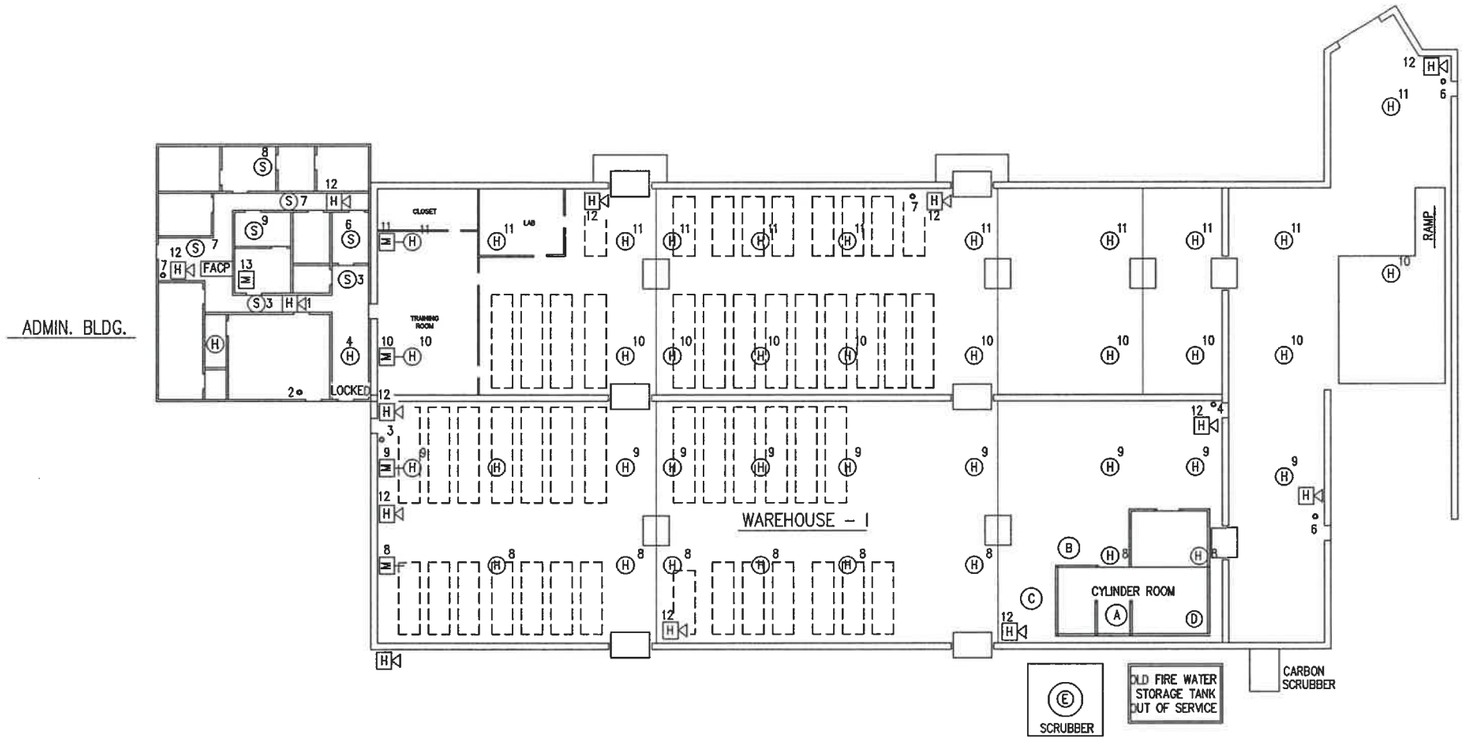
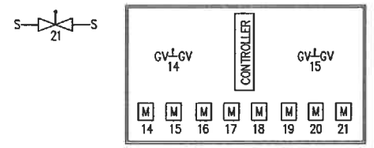
TITLE:
EMERGENCY EQUIPMENT LOCATION TECHNICAL BUILDING AND BRANCH

FILE: 30702203

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'-0"	307-02-204	4





FIRE PUMP ROOM

STATE OF TEXAS
J. W. CALDWELL
94038
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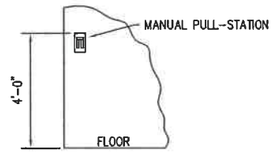
05/13/20

- (A) PROCESS TANK
- (B) CYLINDER RELEASE UNIT
- (C) PROCESS TANK SCRUBBER
- (D) PROCESS TANK
- (E) PROCESS ROOM SCRUBBER



PULL-BOX ELEVATION

LEGEND:

		MFG. & PART NO.
M	MONITORING MODULE	MODEL NO.
○	MANUAL PULL-STATION	MODEL NO.
H	HORN / STROBE SOUNDER	MODEL NO.
S	STROBE SOUNDER	MODEL NO.
(H)	HEAT DETECTOR	MODEL NO.
(S)	SMOKE DETECTOR	MODEL NO.
◇	WATERFLOW DETECTOR	MODEL NO.
GV	GATE VAVLE DETECTOR	MODEL NO.
FACP	FIRE ALARM CONTROL PANEL	MODEL NO. – NAPCO-6000
	INDICATING	2 #18AWG. (WIRE)
	INITIATING	2 #22AWG. (WIRE)

NOTES:

1. DUAL LINE DIGITAL COMMUNICATOR.
2. FIRE ALARM CONTROL PANEL IS ON A DEDICATED CIRCUIT (110 VOLTS).
3. FIRE ALARM CONTROL PANEL HAS 24 HOUR BATTERY BACK-UP.
4. UPON ACTVATION OF THE SPRINKLER SYSTEM, A ALARM SIGNAL SHALL BE SENT TO ADT CENTRAL STATION.
5. UPON ACTIVATION OF A GATE VALVE, A TROUBLE SIGNAL SHALL BE SENT TO ADT CENTRAL STATION.
6. UPON ACTIVATION OF A MANUAL PULL-STATION:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT
7. UPON ACTIVATION OF A HEAT DETECTOR:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT
8. UPON ACTIVATION OF A SMOKE DETECTOR:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT

REFERENCE DRAWINGS

TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT	307-01-101
EVACUATION PLAN: WAREHOUSE - I	307-01-203
EMERGENCY EQUIPMENT LOCATION PLAN	307-02-203

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. HR.
7	PERMIT RENEWAL 2020	KMC			DAD	3/31/20	
6	CLASS II MODIFICATION	KMC			B.R.	2/15/13	
5	REVISED ADDRESS & ADDED HORN	KMC			MAR	7/30/09	
4	GENERAL REVISION	WDS				2/25/08	
3	GENERAL REVISION	WDS				4/28/05	
2	GENERAL REVISION	WDS				4/4/05	
1	ADDED CYLINDER ROOM	WDS				10/28/03	

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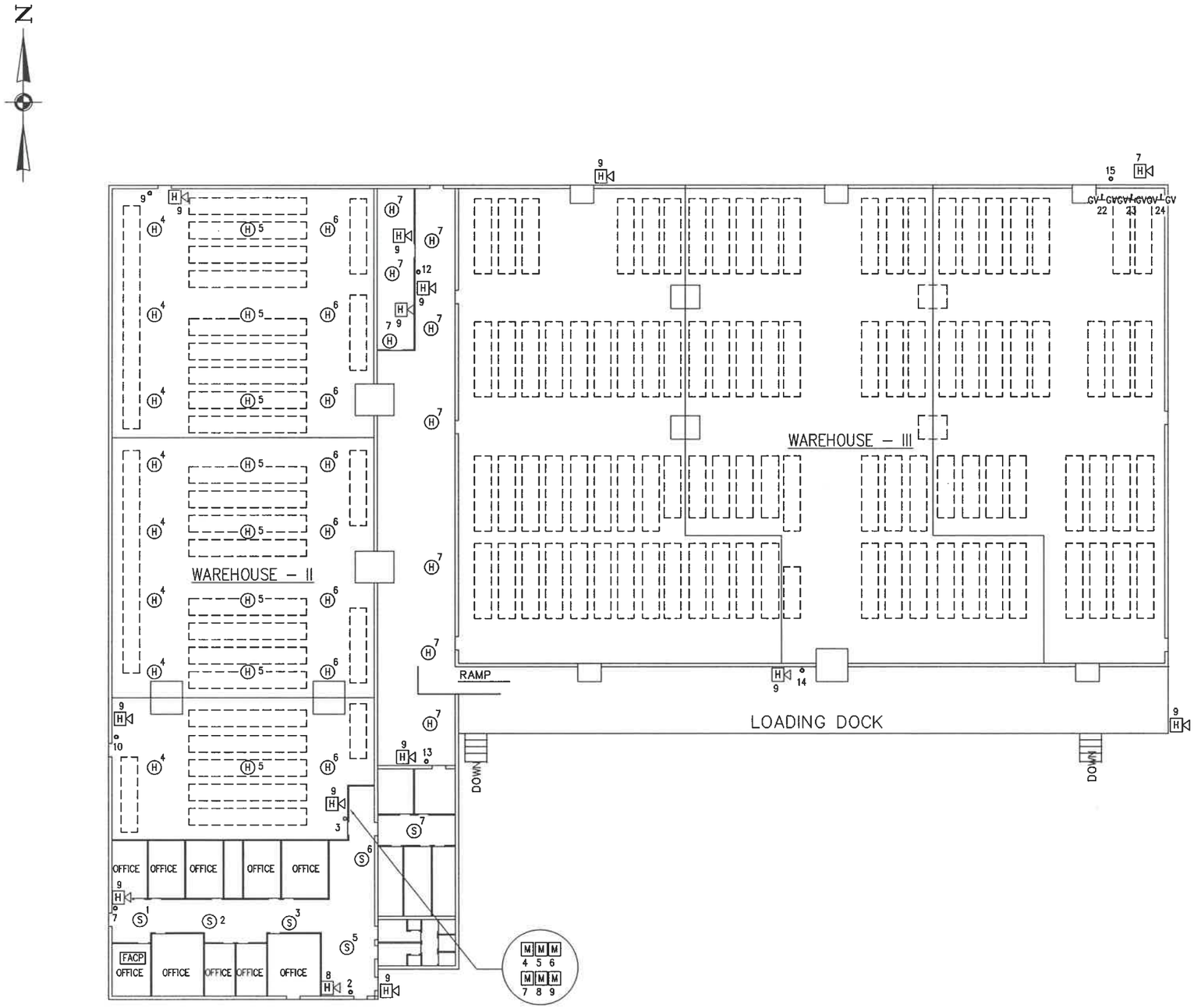
TITLE:
FIRE ALARM & MONITORING SYSTEM ADMIN. & WAREHOUSE I

FILE: 30703303

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'-0"	307-03-303	7



STATE OF TEXAS
J. W. CALDWELL
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05/13/20

LEGEND:

		MFG. & PART NO.
M	MONITORING MODULE	MODEL NO.
▫	MAMUAL PULL-STATION	MODEL NO.
H	HORN / STROBE SOUNDER	MODEL NO.
S	STROBE SOUNDER	MODEL NO.
H	HEAT DETECTOR	MODEL NO.
S	SMOKE DETECTOR	MODEL NO.
	WATERFLOW DETECTOR	MODEL NO.
GV–GV	GATE VAVLE DETECTOR	MODEL NO.
FACP	FIRE ALARM CONTROL PANEL	MODEL NO. – NAPCO–6000
	INDICATING	2 #18AWG. (WIRE)
	INITIATING	2 #22AWG. (WIRE)

NOTES:

1. DUAL LINE DIGITAL COMMUNICATOR.
2. FIRE ALARM CONTROL PANEL IS ON A DEDICATED CIRCUIT (110 VOLTS).
3. FIRE ALARM CONTROL PANEL HAS 24 HOUR BATTERY BACK–UP.
4. UPON ACTVATION OF THE SPRINKLER SYSTEM, A ALARM SIGNAL SHALL BE SENT TO ADT CENTRAL STATION.
5. UPON ACTIVATION OF A GATE VALVE, A TROUBLE SIGNAL SHALL BE SENT TO ADT CENTRAL STATION.
6. UPON ACTIVATION OF A MANUAL PULL–STATION:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT
7. UPON ACTIVATION OF A HEAT DETECTOR:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT
8. UPON ACTIVATION OF A SMOKE DETECTOR:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT

REFERENCE DRAWINGS

TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT	307–01–101
EVACUATION PLAN: WAREHOUSE – I	307–01–203
EMERGENCY EQUIPMENT LOCATION PLAN	307–02–203

REV.	DESCRIPTION OF ISSUE	BY/M.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
4	PERMIT RENEWAL 2020	KMC			DAD	3/31/20	
3	REVISED ADDRESS & ADDED HORNS	KMC			MAR	7/30/09	
2	GENERAL REVISION	WDS				1/4/04	
1	ADDED CYLINDER ROOM	WDS				10/28/03	
0	FINAL ISSUE	D.R.			R.H.	02/01/96	

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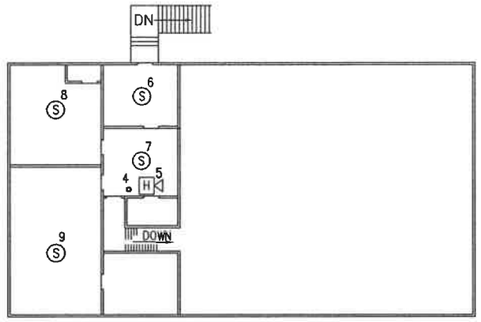
Phone: (281) 727–7600

TITLE:

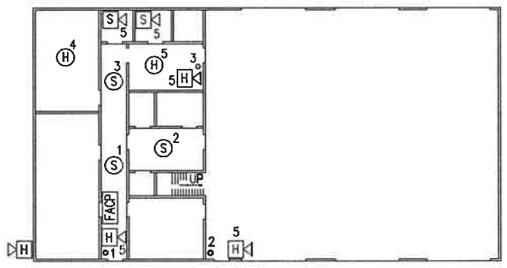
FIRE ALARM & MONITORING SYSTEM WAREHOUSE II & III

FILE: 30703302

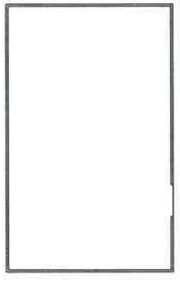
APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'–0"	307–03–302	4



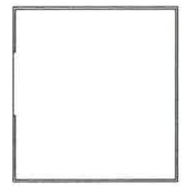
TECHNICAL BUILDING
2ND. FLOOR PLAN



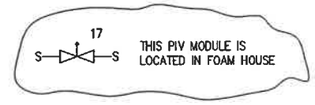
TECHNICAL BUILDING
1ST. FLOOR PLAN

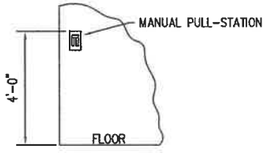


FOAM HOUSE



FIRE PUMP HOUSE





PULL-BOX ELEVATION

05/13/20

LEGEND:

		MFG. & PART NO.
M	MONITORING MODULE	MODEL NO.
o	MAMUAL PULL-STATION	MODEL NO.
H	HORN / STROBE SOUNDER	MODEL NO.
S	STROBE SOUNDER	MODEL NO.
H	HEAT DETECTOR	MODEL NO.
S	SMOKE DETECTOR	MODEL NO.
	WATERFLOW DETECTOR	MODEL NO.
GV-GV	GATE VAVLE DETECTOR	MODEL NO.
FACP	FIRE ALARM CONTROL PANEL	MODEL NO. – NAPCO-6000
	INDICATING	2 #18AWG. (WIRE)
	INITIATING	2 #22AWG. (WIRE)

NOTES:

1. DUAL LINE DIGITAL COMMUNICATOR.
2. FIRE ALARM CONTROL PANEL IS ON A DEDICATED CIRCUIT (110 VOLTS).
3. FIRE ALARM CONTROL PANEL HAS 24 HOUR BATTERY BACK-UP.
4. UPON ACTVATION OF THE SPRINKLER SYSTEM, A ALARM SIGNAL SHALL BE SENT TO ADT CENTRAL STATION.
5. UPON ACTIVATION OF A GATE VALVE, A TROUBLE SIGNAL SHALL BE SENT TO ADT CENTRAL STATION.
6. UPON ACTIVATION OF A MANUAL PULL-STATION:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT
7. UPON ACTIVATION OF A HEAT DETECTOR:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT
8. UPON ACTIVATION OF A SMOKE DETECTOR:
   A. HORN / STROBE WILL ACTIVATE
   B. ALARM SIGNAL SHALL BE SENT TO ADT

REFERENCE DRAWINGS

TITLE	DRAWING NO.
EVACUATION PLAN: GENERAL PLANT	307-01-101
EVACUATION PLAN: WARE HOUSE - 1	307-01-203
FIRE ALARM & MONITIORING SYSTEM	307-03-303

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
4	PERMIT RENEWAL 2020	KMC			DAD	4/3/20	
3	REVISED ADDRESS, ADDED HORN & STAIRS	KMC			MAR	7/30/09	
2	GENERAL REVISION	WDS				2/4/04	
1	ADDED BRANCH TRAILERS	WDS				10/14/03	
0	FINAL ISSUE	D.R.			R.H.	05/29/96	

CleanHarbors
LAPORTE
500 Independence Parkway South
LaPorte, Texas 77571
Phone: (281) 727-7600

TITLE:
FIRE ALARM & MONITORING SYSTEM TECHNICAL BUILDING AND BRANCH

FILE: 30702203

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1/16"=1'-0"	307-03-304	4

Exhibit #2

500 Independence Parkway South
LaPorte, TX 77571

Columbia Bayshore Medical Center
4000 Spencer Highway
Pasadena, Texas 77504

To Whom it May Concern:

Attached is a copy of the Emergency Response/Contingency Plan for the existing hazardous waste transfer and storage facility operated in La Porte, Texas by Clean Harbors La Porte, LP. Clean Harbors La Porte, LP is a waste treatment and storage facility offering waste treatment services such cylinder gas neutralization and compressed gas waste management.

This plan is designed to minimize hazards to human health and the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water. We are submitting it to you to familiarize you with our facility.

Title 40 of the Code of Federal regulations, Part 264.37, requires us to obtain an agreement with your agency regarding the implementation of our contingency plan and your ability to assist us within your capabilities in the event of an emergency, please sign the attached letter of confirmation.

Please feel free to contact me if you have any questions or if you would like me to arrange a plant tour to familiarize you with our facility at 281-884-5507.

Sincerely,

Steve Venti
Facility General Manager

PLEASE RETURN THIS FORM.

Date:

Clean Harbors LaPorte LLC
500 Independence Parkway South
LaPorte, TX 77571

Dear Sir or Madam:

This is to confirm that we have received a copy of the Clean Harbors LaPorte LLC, Emergency Response/Contingency Plan. Our agency will assist your facility within our capabilities in the event of an emergency.

We can offer the following services:

_____ Fire Response _____ Spill Response

_____ Medical _____ Traffic Control

_____ Other (specify):_____

Sincerely,

_____ _____
Print Name Signature

Title: _____

Columbia Bayshore Medical Center
4000 Spencer Highway
Pasadena, Texas 77504

500 Independence Parkway South
LaPorte, TX 77571

City of La Porte Fire Department
124 South 2nd Street
La Porte, TX 77571

To Whom it May Concern:

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Sincerely,

Steve Venti
Facility General Manager

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LaPorte, TX 77571

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_____ Fire Response _____ Spill Response

_____ Medical _____ Traffic Control

_____ Other (specify):_____

Sincerely,

_____ _____
Print Name Signature

Title: _____

City of La Porte Fire Department
124 South 2nd Street
La Porte, Texas 77571

500 Independence Parkway South
LaPorte, TX 77571

City of La Porte Emergency Medical Services
10428 Spencer Highway
La Porte, Texas 77571

To Whom it May Concern:

Attached is a copy of the Emergency Response/Contingency Plan for the existing hazardous waste transfer and storage facility operated in La Porte, Texas by Clean Harbors La Porte, LP. Clean Harbors La Porte, LP is a waste treatment and storage facility offering waste treatment services such cylinder gas neutralization and compressed gas waste management.

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Sincerely,

Steve Venti
Facility General Manager

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Date:

Clean Harbors LaPorte LLC
500 Independence Parkway South
LaPorte, TX 77571

Dear Sir or Madam:

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We can offer the following services:

_____ Fire Response _____ Spill Response

_____ Medical _____ Traffic Control

_____ Other (specify):_____

Sincerely,

_____ _____
Print Name Signature

Title: _____

City of La Porte Emergency Medical Services
10428 Spencer Highway
La Porte, Texas 77571

500 Independence Parkway South
LaPorte, TX 77571

Harris County Sheriff Department
1301 Franklin Street
Houston, Texas 77002

To Whom it May Concern:

Attached is a copy of the Emergency Response/Contingency Plan for the existing hazardous waste transfer and storage facility operated in La Porte, Texas by Clean Harbors La Porte, LP. Clean Harbors La Porte, LP is a waste treatment and storage facility offering waste treatment services such cylinder gas neutralization and compressed gas waste management.

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Steve Venti
Facility General Manager

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Clean Harbors LaPorte LLC
500 Independence Parkway South
LaPorte, TX 77571

Dear Sir or Madam:

This is to confirm that we have received a copy of the Clean Harbors LaPorte LLC, Emergency Response/Contingency Plan. Our agency will assist your facility within our capabilities in the event of an emergency.

We can offer the following services:

_____ Fire Response _____ Spill Response

_____ Medical _____ Traffic Control

_____ Other (specify):_____

Sincerely,

_____ _____
Print Name Signature

Title: _____

Harris County Sheriff Department
1301 Franklin Street
Houston, Texas 77002

Table III.E.1- Arrangements with Local Authorities

Police

Address	1301 Franklin Street Houston, Texas 77002
Person Contacted	Harris County Sheriff Department
Phone Number	(713) 221-6000
Agreed Arrangements	The Harris County Sheriff Department may provide for security and traffic control for emergencies occurring at the site.

Fire

Address	124 South 2nd Street La Porte, Texas 77571
Person Contacted	City of La Porte Fire Department
Phone Number	(281) 471-2211
Agreed Arrangements	The La Porte Fire Department may provide the primary fire response capabilities for the site. The nearest station is approximately 8 minutes away and is located at 1505 Lomax School Road in La Porte, TX. In the event of a very large fire, the La Porte Fire Department may coordinate its efforts with the Deer Park Fire Department and with Channel Industries Mutual Aid (CIMA), a collection of emergency response teams provided by the chemical industries located in the area.

Hospital

Address	10428 Spencer Highway La Porte, Texas 77571
Person Contacted	City of La Porte Medical Services
Phone Number	(281) 471-2211
Agreed Arrangements	The La Porte Emergency Medical Services may provide emergency first aid for the site and transportation of injured personnel off-site. Its capabilities are described in Section 6.0 of the Contingency Plan.

Other

Address	4000 Spencer Highway Pasadena, Texas 77504
Person Contacted	Columbia Bayshore Medical Center

Phone Number	(713) 944-6666
Agreed Arrangements	Columbia Bayshore Medical Center may provide triage and emergency medical treatment for personnel removed from the site. The hospital is located approximately 20 minutes from the site.

Table III.E.2 - Emergency Coordinators

Name	Home Address	Office Phone(s) and/or Pager	Home Phone(s)
Primary	Stephen Venti 7018 Jordan Road Manvel, TX 77587	(281) 884-5519	(713) 594-9038
Primary			

Name	Home Address	Office Phone(s) and/or Pager	Home Phone(s)
Alternate	Angel Cano 3614 Tanglebriar Pasadena, TX 77503	(281) 884-5536	(832) 347-6808
Alternate	Ed Isom 920 Azalea Pointe League City, TX 77573	(281) 884-5518	(832) 256-0921
Alternate	John Walker (also alternate Facility Security Officer) 906 E. Hampton Pearland, TX 77584	(281) 884-5500	(281) 542-1646

Table III.E.3- Emergency Equipment

Equipment	Location	Physical Description	Capability
Analog Heat Detectors (30)	Offices, Warehouse I and Warehouse II	Analog rate of rise heat detectors	Monitor for hear
Analog Addressable Photo-Electric Smoke Detectors (20)	Office Buildings	Analog photoelectric smoke detectors	Monitor for smoke
10# ABC Dry Chemical Fire Extinguishers	Container storage warehouses, loading areas and offices	10# hand held portable extinguishers	For use in general fire fighting purposes
2.5# ABC Dry Chemical Fire Extinguishers	Container storage warehouses, loading areas and offices	2.5# hand held portable extinguishers	For use in general fire fighting purposes
5-minute Air Packs (7 units)	Container Storage Warehouses	Escape Packs	5-minute self contained air supply
Slave Network Controllers (3 units)	Office Buildings	Digital controller monitors electronic alarm system	Monitor alarm system in each building
30# Met-L-X Fire Extinguishers (1 unit)	Container storage warehouses and loading areas	30 hand held portable extinguishers	For use in ignitable metals fires
305 HP Diesel Fire Pump Station	Northeast corner of property	305 HP diesel engine powers a 1,500 GPM ITT centrifugal pump	Provide pressure for main fire water supply
280,000-gallon Fire Water Tank	Northeast corner of property	Carbon steel above ground storage tank	Provide main water supply for fighting fires
Fire Hydrants	Along facility perimeter	Fire Hydrants	For remote access to main fire water supply
1,500-gallon Tank of Aqueous Film Forming Foam	Northeast of Warehouse III	Polyethylene above ground storage tank	For use in automated sprinkler system
25 HP Electric Foam Pump Station	Northeast of Warehouse III	25 HP electric motor powers a 90 GPM centrifugal pump	To deliver foam to automated sprinkler system
Automated Sprinkler System	Warehouse III and loading areas	Sprinkler heads mounted below roof-line in ceiling	For control of fires in ignitable storage areas
Alarm System Network Controller (4 units)	Guard station and office buildings	Digital controller monitors electronic alarm system	Supervises automated alarm system

Table III.E.3- Emergency Equipment

Equipment	Location	Physical Description	Capability
Manual Pull Stations (22)	Offices, container storage warehouses and loading areas	Manually operated pull-station with switch to activate alarms	Provides manual access to alarms
Horns with Strobe (24)	Offices, container storage warehouses and loading areas	Electronic horn with strobe light	Provides audible and visual alarm signals
Safety Horns (12 units)	Container storage warehouses	Hand held compressed air horns	Provides amplified warning signal
Telephones with Intercom Access (19)	Offices, container storage warehouses and loading areas	Conventional push-button telephones	Provides access to facility intercom system
Amplified Intercom Loud-Speakers	Offices, container storage warehouses and loading areas	Electric one-way amplified speakers	Provides amplified voice signals
Intercom Amplifier (1 unit)	Administration office	Solid State audio amplifier	Provides amplified electrical signal to intercom speakers
Gloves	Emergency Response Shed	Chemical Resistant Gloves	Provides chemical and mechanical protection for hands
Boots	Emergency Response Shed	Chemical Protective Boots	Protects feet from contact with chemicals
Organic Vapor/Acid Gas HEPA Respirator Cartridges	Emergency Response Shed	Chemical cartridges for air purifying respirators	Respiratory protection from organic vapors, acid gases, and dusts, fumes, and mists
Pesticide/Organic Vapor Respirators	Emergency Response Shed	Chemical cartridges for air purifying respirators	Respiratory protection from pesticides and organic vapors
Ammonia/Methylamine Respirator Cartridges	Emergency Response Shed	Chemical cartridges for air purifying respirators	Respiratory protection from ammonia and amine vapors
Formaldehyde Respirator Cartridges	Emergency Response Shed	Chemical cartridges for air purifying respirators	Respiratory protection from formaldehyde, organic vapors, and acid gases
Mercury Vapor/Chlorine Respirator Cartridges	Emergency Response Shed	Chemical cartridges for air purifying respirators	Respiratory protection from mercury and chlorine vapors
30-minute Positive Pressure SCBA's (9)	Warehouse I loading area and Warehouse III loading area	Emergency Response SCBA's	30-minute self contained air supply

Table III.E.3- Emergency Equipment

Equipment	Location	Physical Description	Capability
Protective Suits	Emergency Response Shed	Chemical protective clothing for spill clean-up	Protection against chemical splashes/ contact, particulates, and other materials
Zee Medical Iso-Tone Eye and Skin Emergency Stations (or equivalent) (19 units)	Container storage warehouses and loading areas	Station contains 54 ounces or more of eye and skin solution in bottles	Provides for localized water rinse in immediate work areas
Emergency Safety Showers/ Eyewash Stations (7 units)	Container storage warehouses and loading areas	Combination eye wash/safety showers hard piped to water supply	Provides generalized washing of chemicals or other materials
First Aid Kits (5 units)	Office areas	First Aid Kits	Provides first aid capabilities in immediate work areas
Brass Shovels or Polyethylene Shovels	Container storage areas and loading areas	Spark-proof equipment	Provides spark free hand removal of spilled solids and soil
Sorb-All Ground Clay Absorbent	Container storage areas and loading areas	Ground clay in 50-pound bags	Absorbent for spilled liquids
Strong-Lite Vermiculite	Container storage areas and loading areas	Course vermiculite in 30-pound bags	Absorbent for spilled liquids
4mm Polyethylene Sheeting	Container storage areas and loading areas	Rolls	Provide impermeable ground covering to prevent migration of liquids
Hazorb Pillows, Pads and Booms	Storage areas and loading areas	Rolls, Boxes, Bulk	Provide absorbent and diking for spilled liquids
Various Equipment (including, but not limited to): Squeegees, Pumps, Brooms, Shovels, and DOT-approved Containers	Container storage areas and loading areas	Spark-proof equipment & appropriate containers	For containment and remediation of spilled materials
Self-Contained Emergency Eye Wash Stations (9 units)	Container storage warehouses and loading areas	Units contain 15 gallons to 20 gallons of water, gravity fed	Provides 15-minute water rinse for chemical splashes to eyes or face
General 150# Wheeled Fire Extinguishers (4 units)	Container storage warehouses and loading areas	150# Wheeled portable dry chemical extinguishers	For use in general fire fighting purposes
20# ABC Dry Chemical Fire Extinguishers (24 units)	Container storage warehouses, loading areas and offices	20# hand held portable extinguishers	For use in general fire fighting purposes

Appendix III.F

RESERVED

Table IV.A Waste Management Information

This section is not applicable because this application is not for a new hazardous waste management facility and is not for a hazardous waste management facility capacity expansion that requires permitting as required by 30 TAC 305.50(a)(9).

Table IV.B. - Wastes Managed In Permitted Units

No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
101	Inorganic Liquid	All appropriate permitted EPA Waste codes (1)	All Form codes indicated by waste type classified as hazardous or class 1
102	Organic Liquid	All appropriate permitted EPA Waste codes (1)	All Form codes indicated by waste type classified as hazardous or class 1
103	Lab Packs	All appropriate permitted EPA Waste codes (1)	All Form codes indicated by waste type classified as hazardous or class 1
104	Inorganic Sludge	All appropriate permitted EPA Waste codes (1)	All Form codes indicated by waste type classified as hazardous or class 1
105	Organic Sludge	All appropriate permitted EPA Waste codes (1)	All Form codes indicated by waste type classified as hazardous or class 1
106	Inorganic Solid	All appropriate permitted EPA Waste codes (1)	All Form codes indicated by waste type classified as hazardous or class 1
107	Organic Solid	All appropriate permitted EPA Waste codes (1)	All Form codes indicated by waste type classified as hazardous or class 1
108	Containerized Gas	All appropriate permitted EPA Waste codes (1)	All Form codes indicated by waste type classified as hazardous or class 1
101	Inorganic Liquid	See codes below (2)	All Form codes indicated by waste type classified as hazardous or class 1
102	Organic Liquid	See codes below (2)	All Form codes indicated by waste type classified as hazardous or class 1
108	Containerized Gas	See codes below (2)	All Form codes indicated by waste type classified as hazardous or class 1

No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
101	Inorganic Liquid	See codes below (3)	All Form codes indicated by waste type classified as hazardous or class 1
102	Organic Liquid	See codes below (3)	All Form codes indicated by waste type classified as hazardous or class 1
108	Containerized gas	See codes below (3)	All Form codes indicated by waste type classified as hazardous or class 1
108	Containerized Gas	See codes below (4)	All Form codes indicated by waste type classified as hazardous or class 1
108	Containerized Gas	See codes below (5)	All Form codes indicated by waste type classified as hazardous or class 1

(1)Any of the following EPA waste numbers may apply based on the waste generated and compatibility with other commingled wastes for Permitted Storage Unit #’s 001, 002, 003, and 033.

D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, D012, D013, D014, D015, D016, D017, D018, D019, D020, D021, D022, D023, D024, D025, D026, D027, D028, D029, D030, D031, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, D042, D043,

F001, F002, F003, F004, F005, F006, F007, F008, F009, F010, F011, F012, F019, F020, F021, F022, F023, F024, F025, F026, F027, F028, F032, F034, F035, F037, F038, F039,

K001, K002, K003, K004, K005, K006, K007, K008, K009, K010, K011, K013, K014, K015, K016, K017, K018, K019, K020, K021, K022, K023, K024, K025, K026, K027, K028, K029, K030, K031, K032, K033, K034, K035, K036, K037, K038, K039, K040, K041, K042, K043, K044, K045, K046, K047, K048, K049, K050, K051, K052, K060, K061, K062, K069, K071, K073, K083, K084, K085, K086, K087, K088, K093, K094, K095, K096, K097, K098, K099, K100, K101, K102, K103, K104, K105, K106, K107, K108, K109, K110, K111, K112, K113, K114, K115, K116, K117, K118, K123, K124, K125, K126, K131, K132, K136, K141, K142, K143, K144, K145, K147, K148, K149, K150, K151, K156, K157, K158, K159, K161, K169, K170, K171, K172, K174, K175, K176, K177, K178, K181,

P001, P002, P003, P004, P005, P006, P007, P008, P009, P010, P011, P012, P013, P014, P015, P016, P017, P018, P020, P021, P022, P023, P024, P026, P027, P028, P029, P030, P031, P033, P034, P036, P037, P038, P039, P040, P041, P042, P043, P044, P045, P046, P047, P048, P049, P050, P051, P054, P056, P057, P058, P059, P060, P062, P063, P064, P065, P066, P067, P068, P069, P070, P071, P072, P073, P074, P075, P076, P077, P078, P081, P082, P084, P085, P087, P088, P089, P092, P093, P094, P095, P096, P097, P098, P099, P101, P102, P103, P104, P105, P106, P108, P109, P110, P111, P112, P113, P114, P115, P116, P118, P119, P120, P121, P122, P123, P127, P128, P185, P188, P189, P190, P191, P192, P194, P196, P197, P198, P199, P201, P202, P203, P204, P205,

U001, U002, U003, U004, U005, U006, U007, U008, U009, U010, U011, U012, U014, U015, U016, U017, U018, U019, U020, U021, U022, U023, U024, U025, U026, U027, U028, U029, U030, U031, U032, U033, U034, U035, U036, U037, U038, U039, U041, U042, U043, U044, U045, U046, U047, U048, U049, U050, U051, U052, U053, U055, U056, U057, U058, U059, U060, U061, U062, U063, U064, U066, U067, U068, U069, U070, U071, U072, U073, U074, U075, U076, U077, U078, U079, U080, U081, U082, U083, U084, U085, U086, U087, U088, U089, U090, U091, U092, U093, U094, U095, U096, U097, U098, U099, U101, U102, U103, U105, U106, U107, U108, U109, U110, U111, U112, U113, U114, U115, U116, U117, U118, U119, U120, U121, U122, U123, U124, U125, U126, U127, U128, U129, U130, U131, U132, U133, U134, U135, U136, U137, U138, U140, U141, U142, U143, U144, U145, U146, U147, U148, U149, U150, U151, U152, U153, U154, U155, U156, U157, U158, U159, U160, U161, U162, U163, U164, U165, U166, U167, U168, U169, U170, U171, U172, U173, U174, U176, U177, U178, U179, U180, U181, U182, U183, U184, U185, U186, U187, U188, U189, U190, U191, U192, U193, U194, U196, U197, U200, U201, U202, U203, U204, U205, U206, U207, U208, U209, U210, U211, U213, U214, U215, U216, U217, U218, U219, U220, U221, U222, U223, U225, U226, U227, U228, U234, U235, U236, U237, U238, U239, U240, U243, U244, U246, U247, U248, U249, U271, U278, U279, U280, U328, U353, U359, U364, U367, U372, U373, U387, U389, U394, U395, U404, U409, U410, U411

(2)Any of the following EPA waste numbers may apply based on the waste generated and compatibility with other commingled wastes for Permitted Unit #’s 024 and 025.

D001, D002, D003, D004, D010,
P031, P033, P056, P063, P076, P078, P095, P096,
U006, U029, U033, U092, U098, U099, U115, U133, U134, U135, U138

(3)Any of the following EPA waste numbers may apply based on the waste generated and compatibility with other commingled wastes for Proposed Unit # 027.

D001, D002, D003, U092

(4)Any of the following EPA waste numbers may apply based on the waste generated and compatibility with other commingled wastes for Permitted Unit # 026.

D001, D043, U043, U154, U220

(5)Any of the following EPA waste numbers may apply based on the waste generated and compatibility with other commingled wastes for Proposed Unit # 027.
D001, D002, D003, U092

Table IV.C. - Sampling and Analytical Methods

Waste No.[1]	Sampling Location	Sampling Method[2]	Frequency	Parameter	Test Method[2]	Desired Accuracy Level[3]
101 102	Generator's site or container storage area 001, 002, or 003. 2 These are the primary sampling locations only.	COLIWASA or sampling valve (for tank samples). See WAP for additional methods. Certain test methods have been modified as indicated in the WAP.	One per shipment or blend/batch unless exempted by WAP	Fingerprint Analysis: Physical description pH/ water reactivity Ignitability screen Supplemental analysis: Specific gravity Bulk density Halogens Acid scrub Reactive cyanides/ sulfides Not all parameters apply to each sample. See WAP for more details.	Visual observation SW 846, 9045C SW 846 1020 Mod. ASTM D1298 ASTM D5057 ASTM D2361 mod. EPA 305.2 SW-846 9010/ 9030	Duplicates must match ± 1.0 S.U. duplicates must match ± 0.1 ± 20% ± 10% ± 10% ± 15%
104 105	Generator's site or container storage area 001, 002, or 003. 2 These are the primary sampling locations only.	COLIWASA or tubing. See WAP for additional methods. Certain test methods have been modified as indicated in the WAP.	One per shipment or blend/batch unless exempted by WAP	See Waste No. 101 above. Not all parameters apply to each sample. See WAP for more details.	See Waste No. 101 above	See Waste No. 101 above

106 107	Generator's site or container storage areas 001, 002 or 003. 2 These are the primary sampling locations only.	Tubing, trier, auger, scoop, or shovel. See WAP for additional methods. Certain test methods have been modified as indicated in the WAP.	One per shipment or blend/batch unless exempted by WAP	See Waste No. 101 above Supplemental Analysis: Free liquid test Not all parameters apply to each sample. See WAP for more details	See Waste No. 101 above SW-846 9095	See Waste No. 101 above duplicates must match
103 108	Not sampled. Cylinders and Lab Packs are exempt from sampling, as noted in the WAP, but may be sampled at the Facility Manager's discretion.	Not sampled. Cylinders and Lab Packs are exempt from sampling, as noted in the WAP, but may be sampled at the Facility Manager's discretion.	N/A	N/A or if sampled, vapor pressure. Not all parameters apply to each sample. See WAP for more details.	N/A	N/A

[1] from Table IV.B, first column

[2] Sampling and Test/Analysis methods should be specified in enough detail to allow determination of whether they are suitable and correct for the purpose indicated while allowing flexibility in selection and future updates to the specified method. Standard methods, such as those from SW-846, will generally require no further submittal. Non-standard and proprietary methods may require additional information to determine suitability. ASTM methods may require submittal of a copy of the specified method.

3 Desired Accuracy Level should provide a specified numeric minimum performance level (maximum acceptable reporting limit) for method detection and quantitation limits that will be accepted from the laboratory performing the analysis and must ensure that reported data will allow determinations of compliance with regulatory limits for the parameter tested.

Waste Type and Number Form Code Legend

No. Listed in Column 1 of Table IV.B	Actual Form Codes Describing Waste
101	**Inorganic Liquids** -Waste that is primarily inorganic and highly fluid(e.g., aqueous), with low suspended inorganic solids and low organic content. 101 - Aqueous waste with low solvents 102 - Aqueous waste with low other toxic organics 103 - Spent acid with metals 104 - Spent acid without metals 105 - Acidic aqueous waste 106 - Caustic solution with metals but no cyanides 107 - Caustic solution with metals and cyanides 108 - Caustic solution with cyanides but no metals 109 - Spent caustic 110 - Caustic aqueous waste 111 - Aqueous waste with reactive sulfides 112 - Aqueous waste with other reactives (e.g., explosives) 113 - Other aqueous waste with high dissolved solids 114 - Other aqueous waste with low dissolved solids 115 - Scrubber water 116 - Leachate 117 - Waste liquid mercury 119 - Other inorganic liquids 198 - Nonhazardous photographic chemical wastes (inorganic) 199 - Brine solution that could also bear the form code 113
102	**Organic Liquids** - Waste that is primarily organic and is highly fluid, with low inorganic solids content and low-to-moderate water content. 201 - Concentrated solvent-water solution 202 - Halogenated (e.g., chlorinated) solvent 203 - Non-halogenated solvent 204 - Halogenated/non-halogenated solvent mixture 205 - Oil-water emulsion or mixture 206 - Waste oil 207 - Concentrated aqueous solution of other organics 208 - Concentrated phenolics 209 - Organic paint, ink, lacquer, or varnish 210 - Adhesives or epoxies 211 - Paint thinner or petroleum distillates 212 - Reactive or polymerizeable organic liquids 219 - Other organic liquids 296 - Ethylene glycol based antifreeze 297 - Nonhazardous liquids with >= 50 ppm and < 500 ppm PCBs 298 - Honhazardous liquids with >= 500 ppm PCBs 299 - Nonhazardous photographic chemical waste (organic)
103	**Lab Packs** - Lab packs of mixed wastes, chemicals, lab waste. 001 - Lab packs of old chemicals only 002 - Lab packs of debris only 003 - Mixed lab packs 004 - Lab packs containing acute hazardous wastes 009 - Other lab packs
104	**Inorganic Sludges** - Waste that is primarily inorganic with moderate-to-high water content and low organic content; mostly pumpable

	501 - Lime sludge without metals 502 - Lime sludge with metals/metal hydroxide sludge 503 - Wastewater treatment sludge with toxic organics 504 - Other wastewater treatment sludge 505 - Untreated plating sludge without cyanides 506 - Untreated plating sludge with cyanides 507 - Other sludge with cyanides 508 - Sludge with reactive sulfides 509 - Sludge with other reactives 510 - Degreasing sludge with metal scale or filings 511 - Air pollution control device sludge (e.g., fly ash, wet scrubber sludge) 512 - Sediment or lagoon dragout contaminated with organics 514 - Drilling mud 515 - Asbestos slurry or sludge 516 - Chloride or other brine sludge 519 - Other inorganic sludges 597 - Catalyst waste 598 - Nonhazardous sludges containing >= 50 ppm and < 500 ppm PCBs 599 - Nonhazardous sludge containing >= 500 ppm PCBs
105	**Organic Sludges** - Waste that is primarily organic with low-to-moderate inorganic solids content and water content; pumpable content. 601 - Still bottoms of halogenated (e.g., chlorinated) solvents or other organics 602 - Still bottoms of non-halogenated solvents or other organic liquids 603 - Oily sludge 604 - Organic paint or ink sludge 605 - Reactive or polymerizable organics 606 - Resins, tars or tarry sludge 607 - Biological treatment sludge 608 - Sewage or other untreated biological sludge 609 - Other organic sludges 695 - Petroleum contaminated sludges other than still bottoms and oily sludge 696 - Grease 697 - Catalyst waste 698 - Nonhazardous sludges containing >= 50 ppm and < 500 ppm PCBs 699 - Nonhazardous sludges containing >= 500 ppm PCBs
106	**Inorganic Solids** - Waste that is primarily inorganic and solid, with low organic content and low-to-moderate water content; not pumpable 301 - Soil contaminated with organics 302 - Soil contaminated with inorganics only 303 - Ash, slag or other residue from incineration of waste 304 - Other "dry" ash, slag or thermal residue 305 - "Dry" lime or metal hydroxide solids chemically "fixed" 306 - "Dry" lime or metal hydroxide solids not "fixed" 307 - Metal scale, filings or scrap 308 - Empty or crushed metal drums or conainers 309 - Batteries or battery parts, casings, cores 310 - Spent solid filters or adsorbents 311 - Asbestos solids and debris 312 - Metal-cyanide salts/chemicals 313 - Reactive cyanide salts/chemicals 314 - Reactive sulfide salts/chemicals 315 - Other reactive salts/chemicals 316 - Other metal salts/chemicals 319 - Other waste inorganic solids 388 - Empty or crushed glass containers 389 - Nonhazardous sandblasting waste 390 - Nonhazardous concrete/cement/construction debris 391 - Nonhazardous dewatered wastewater treatment sludge 392 - Nonhazardous dewatered air pollution control device sludge 393 - Catalyst waste

	394 - Nonhazardous solids with >= 50 ppm and < 500 ppm PCBs 395 - Nonhazardous solids with >= 500 ppm PCBs 396 - Nonhazardous electrical equipment/devices with >= 50 ppm and < 500 ppm 397 - Nonhazardous electrical equipment/devices with >= 500 ppm PCBs 398 - Nonhazardous soils with >= 50 ppm and < 500 ppm PCBs 399 - Nonhazardous soils with >= 500 ppm PCBs
107	**Organic Solids** - Waste that is primarily organic and solid, with low-to-moderate inorganic content and water content; not pumpable. 401 - Halogenated pesticide solid 402 - Non-halogenated pesticide solid 403 - Solids resins or polymerized organics 404 - Spent carbon 405 - Reactive organic solid 406 - Empty fiber or plastic containers 407 - Other halogenated organic solids 409 - Other non-halogenated organic solids 488 - Wood debris 489 - Petroleum contaminated solids 490 - Sand blasting waste 491 - Dewatered biological treatment sludge 492 - Dewatered sewage or other untreated biological sludge 493 - Catalyst waste 494 - Solids containing >= 50 ppm and < 500 ppm PCBs 495 - Solids containing >= 500 ppm PCBs 496 - Electrical equipment/devices with >= 50 ppm and < 500 ppm PCBs 497 - Electrical equipment/devices with >= 500 ppm PCBs 498 - Soils containing >= 50 ppm and < 500 ppm PCBs 499 - Soils containing >= 500 ppm PCBs
108	**Inorganic Gases** - Waste that is primarily inorganic with low organic content and is a gas at atmospheric pressure 701 - Inorganic gases **Organic Gases** - Waste that is primarily organic with low-to-moderate organic content and is a gas at atmospheric pressure 801 - Organic gases

Section IV. – Appendix IV.D. (Waste Analysis Plan)

Clean Harbors La Porte, LLC

Appendix IV.D
Waste Analysis Plan

INDEX

Table of Exhibits

I. INTRODUCTION

According to the United States Environmental Protection Agency (EPA) regulations found in 40 CFR 264.13, a hazardous waste facility must follow a written waste analysis plan. Elements of this plan include:

(A)

(1) Before an owner or operator treats, stores or disposes of any hazardous wastes, or non-hazardous wastes if applicable under §264.113(d), he must obtain a detailed chemical and physical analysis of a representative sample of the wastes. At a minimum, the analysis must contain all the information which must be known to treat, store, or dispose of the waste in accordance with this Part and Part 268 of this chapter.

(2) The analysis may include data developed under Part 261 of this chapter, and existing published or documented data on the hazardous waste or on hazardous waste generated from similar processes.

(3) The analysis must be repeated as necessary to ensure that it is accurate and up to date. At a minimum, the analysis must be repeated:

(i) When the owner or operator is notified, or has reason to believe, the process or operation generating the hazardous wastes, or non-hazardous wastes if applicable under § 264.113(d), has changed; and

(ii) For off-site facilities, when the results of the inspection required in paragraph (a)(4) of this section indicate that the hazardous waste received at the facility does not match the waste designated on the accompanying manifest or shipping paper.

(4) The owner or operator of an off-site facility must inspect and, if necessary, analyze each hazardous waste movement received at the facility to determine whether it matches the identity of the waste specified on the accompanying manifest or shipping paper.

(B) The owner or operator must develop and follow a written waste analysis plan describing the procedures he will carry out to comply with paragraph (a) of this section. He must keep this plan at the facility. At a minimum, the plan must specify:

(1) The parameters for which each hazardous waste or non-hazardous waste if applicable under §264.113(d), will be analyzed and the rationale for the selection of these parameters (i.e., how analysis for these parameters will provide sufficient information on the waste's properties to comply with paragraph (a) of this section);

(2) The test methods which will be used to test for these parameters;

(3) The sampling method(s) used to obtain a representative sample of the waste to be analyzed. A representative sample may be obtained using either;

(a) One of the sampling methods described in Appendix 1 of Part 261 of this chapter and
(b) An equivalent sampling method;

(4) The frequency with which the initial analysis of the waste will be reviewed or repeated to ensure that the analysis is accurate and up to date;

(5) For off-site facilities, the waste analysis waste generators have agreed to supply;

(6) Where applicable, the methods that will be used to meet the additional waste analysis requirements for specific waste management methods as specified in §§264.17, 264.314, 264.341, 264.1034(d), 264.1063(d) and 268.7 of this chapter.

(C) TCEQ in its permit application form lists these required items:

(1) Completed form for each waste to be managed at the facility.

(2) Proper addressing of Land Disposal Restrictions for wastes.

(3) A listing of specific procedures used to inspect and analyze each movement of hazardous waste received at the facility to ensure it matches the identity of the waste designated on the accompanying shipping ticket.

(4) The plan must describe methods used to determine the identity of each movement of waste managed by the Facility and sampling method used if the identification method includes sampling.

II. WASTE ANALYSIS PLAN ACTIVITIES

The waste follows the flowchart given in **Exhibit #1**. The Facility handles various wastes including material accepted from off-site generators and waste derived from Facility operations.

III. WASTE ACCEPTANCE PROCEDURES

(A) PRE-ACCEPTANCE PROCEDURE

(1) The waste generator (or his agent) and a Company representative make initial contact.

(2) If necessary, a representative waste sample may be sent by the generator to the Clean Harbors LaPorte facility. This step may be circumvented if, based on generator knowledge of the waste, all information on the profile can be completed otherwise.

(3) If a sample is necessary, it will be forwarded for necessary analysis to an independent laboratory if the on-site laboratory cannot determine the required analytical information for approval.

(4) The information supplied by the completed laboratory analysis will then be forwarded to the waste generator for the completion of a profile form, or similar document.

(5) The exact format of the profile form can vary, but all information on the sample form will be conveyed to the facility. Typical example of this form is provided in **Exhibit #2**. The profile documents the generator's waste analysis as well as regulatory requirements.

(6) Upon receipt of the completed profile, a Company Chemist will review the document for completeness, accuracy, and permit compliance.

(7) If it is determined that the waste is acceptable, the generator will be notified of the approval. Shipment of the waste can then be scheduled.

(8) Medical waste is exempt from the preacceptance approval process. Medical waste that is also RCRA regulated is required to follow the preacceptance process.

(B) ACCEPTANCE PROCEDURE

(1) **Schedule:** The generator (or his agent) schedules the shipment of the waste to the Clean Harbors LaPorte facility.

(2) **Acceptance Slots**: The operations department will designate a delivery time for the shipment.

(3) **Unloading:** The waste will be unloaded to one of the sample staging areas (containers).

(4) **Initial Paperwork Review:** The waste's accompanying paperwork will be reviewed and verified. This paperwork will typically consist of, at a minimum, a Uniform Hazardous Waste Manifest or Bill of Lading, and a Land Disposal Restriction and Certification Form, if required. Upon verification of the information listed on the manifest, the manifest will be signed and the driver allowed to leave.

(5) **Sampling Methods** The following methods will be used to sample wastes;

Waste Type	**Sampling Method**	**Sampling Equipment**
Homogeneous liquid	SW-846 Chapter 9 & Chapter 10 sample rod.	Grab sample COLIWASA or polypropylene
Multi-layered liquid	SW-846 Chapter 9 & Chapter 10 sample rod.	Grab sample COLIWASA or polypropylene
Dry solid	SW-846 Chapter 9 & Chapter 10 or D-1452-8 or D 140-93	Grab sample - scoop auger
Waste Type	**Sampling Method**	**Sampling Equipment**
Solid liquid mixtures	SW-846 Chapter 9 & Chapter 10	Grab sample COLOWASA or polypropylene sampling rod or composite of grabs from top, middle, and bottom.*
Large solids such as debris contaminated personal equipment, tubing etc..	No sampling methods	Waste will be inspected with a polypropylene sampling rod to ensure no liquids are present and that the contents are 100% solid. An aliquot of the drum will be obtained using cutting shears or a knife, then scooped off the top. Due to ID matrix, a composite sample of grabs from the middle and the bottom is almost impossible to obtain without emptying the entire contents of the drum.

**Exact device or devices depend on density and consistency of waste.*

See **Exhibit #4** for an example container sampling procedure.

(6) **Sampling Frequency:**

(a) **Bulk Containers** Each receipt, with the exception of those to be transshipped through the Facility for off-site management, is sampled by methods listed above. Transshipments will remain in their original containers and will not be accepted for bulking.

Since the transshipped loads are subject to the off-site destination facility's waste analysis and acceptance requirements, they are excepted from the Facility's waste acceptance procedures. Transshipments will be subject to pre-acceptance requirements (Section III.A) and will be visually inspected prior to acceptance by the Facility.

(b) **Non-bulk Containers** For each waste stream, with the exception of those that are to be transshipped for off-site management (i.e., storage only – containers not opened/sampled), ten (10) percent of all containers will be randomly selected for sampling.

In order to assure that at least one (1) container of each stream is sampled, the ten (10) percent will be rounded up to the next whole number. Sampling will be undertaken using only methods listed in this plan.

(c) **Lab Packs** Lab packs prepared by facility personnel have already undergone one hundred percent (100%) quality control testing in the field. Therefore, the on-site sampling of these units would be redundant. Ten percent (10%) of all lab packs not packaged by Facility will be inspected via verification of the packing slips.

(d) Medical Waste is exempt from acceptance sampling.

(7) Sample Exceptions: Due to the nature of the Facility's permit, many wastes accepted present a very significant hazard to the health and safety of the surrounding area, as well as to the facility itself, should they be opened and sampled. Some wastes have no permitted disposal currently available; other materials are particularly difficult to sample due to the nature of the waste or container. For these reasons, the following wastes will only be sampled with the permission of the Facility Manager:

- Reactive wastes (air, water, otherwise).
- Dioxin-related wastes.
- Fuming wastes (including hydrofluoric acid).
- Polychlorinated Biphenyls (PCB's), see Exhibit #6 for PCB management SOP.
- Gas cylinders.
- Elemental mercury, mercury salts, high mercury wastes (due to toxicity)
- Other difficult to sample media such as oil filters, crushed cans, large pieces of metal or rocks, batteries, ballasts/capacitors (non-PCB), polymerized/monolithic solids, or other items which exceed normal sample size.

Additionally, containers of hazardous or solid waste containing compounds with concentrations greater than the values listed below shall not be opened at any time, except with permission from the Facility Manager:

Compound	**Maximum Weight Fraction %**
Bis(chloromethyl)ether	15.0
Bromine	3.0
tert-Butyl mercaptan*	5.0
Chloromethyl methyl ether	35.0
Ethyl mercaptan*	5.0
Methyl mercaptan*	5.0
nickel carbonyl	0.1
Nitrosamines	5.0
Osmium tetroxide	0.2
Pentaborane	5.0
Phosphine	0.6
Trimethyl phosphite	2.5

*Highly odoriferous material

(8) Confirmation Fingerprint Analysis - The samples are forwarded to the on-site laboratory for confirmatory fingerprint analysis against the generator's specific profile. The analysis completed at this point will be determined by the planned on-site disposition of the waste.

Parameter	Method
Physical State	Visual observation
Color	Visual observation
Layers	Visual observation
General Appearance	Visual observation

pH	VSW-846 Method 9040 (pH paper method) or SW-846 Method 9040A (pH electrometric measurement method) or SW-846 Method 9045A (soil and waste pH)
Flash Point	Ignitability Screening test or ASTM D-3828-78
Specific Gravity/Density	Weighing of a specified volume
Compatibility	See **Exhibit #3**

Method 9040 from SW-846 uses the electrometric method and is only applicable to aqueous liquids and those multiphasic wastes where the aqueous phase comprises at least 20% of the total volume of the waste. Other materials, such as solids, semi-solids, liquids with suspended solids, organic liquids, or oily layers cannot be accurately tested by this method and can severely damage the electrode. Therefore, pH will generally be tested using colorimetric methods. In practice it is generally sufficient to determine pH to the nearest whole pH unit or tenth of a unit.

(9) Applicability of Compatibility Test The compatibility test referenced above will be conducted prior to bulking.

(10) Off-Specification Samples Should the sample of a waste prove to be off-specification, 100% of the containers in the waste stream receipt will be sampled and fingerprinted.

(11) Final Check After analysis all information gathered from the analysis will be compared with that of the manifest, LDR form and the waste stream's profile. Any discrepancies will be resolved at this point via communication with the client. Should profile, manifest, or LDR changes be necessary they will be approved by the customer, changed on the proper form, and documented.

(12) Flow Chart This procedure is tracked in Exhibit # 1.

(C) FOLLOW-UP PROCEDURE

(1) All documents referenced in this plan will be kept on file at the Clean Harbors LaPorte facility. This file will be useful to track a waste stream or generator history.

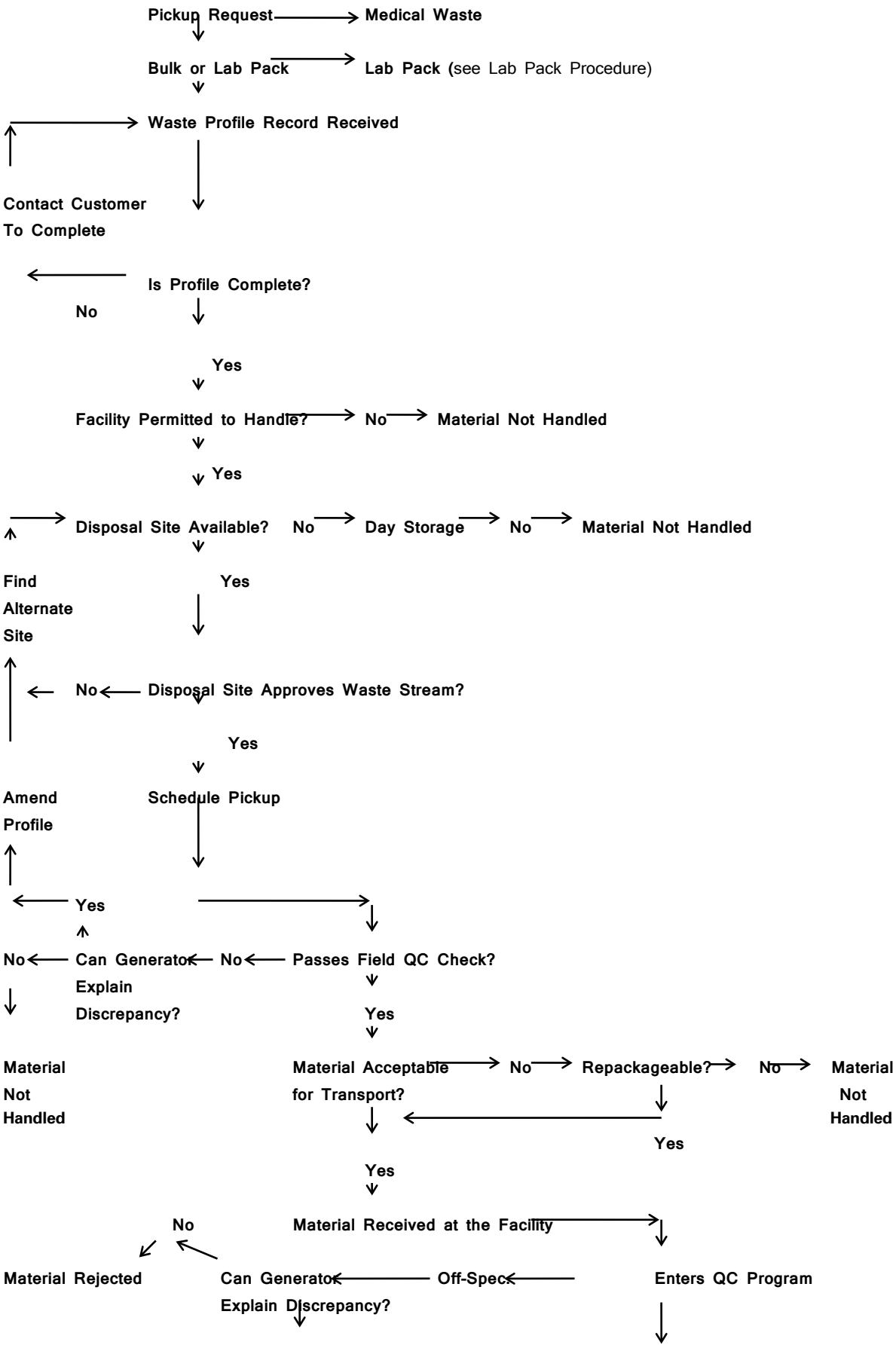
(2) Generators will be asked to resubmit their waste stream profiles on a regular basis to confirm consistency in generating processes of the waste stream. This resubmittal will typically be accomplished via letter form the generator.

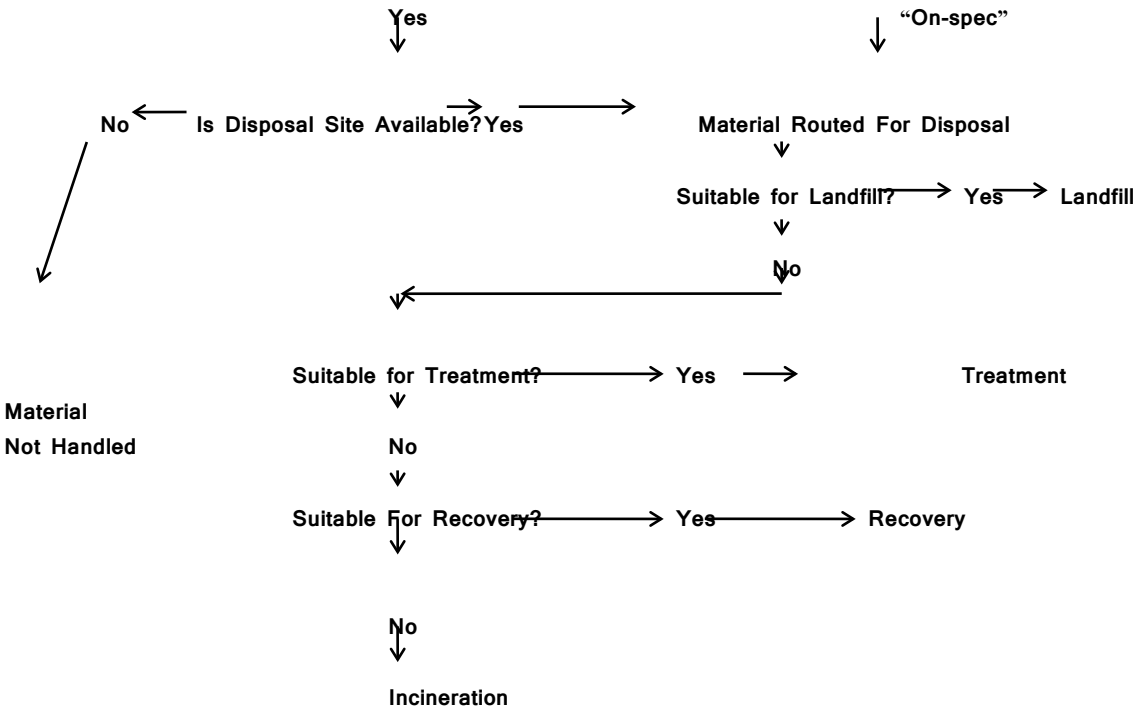
(3) Should the facility have reason to believe that a waste stream's generating process has changed in such a way to change the approved waste stream, the generator will be asked to resubmit his WPR for recertification or send a signed amendment to serve as an attachment to the original profile.

(4) Changes will not be made to the generators signed profile by Company personnel without authorization from the generator or his agent. This authorization will be permanently attached to the profile.

EXHIBIT #1

WASTE ACCEPTANCE FLOW CHART


Pickup Request
Medical Waste
Bulk or Lab Pack
Lab Pack (see Lab Pack Procedure)
Waste Profile Record Received
Contact Customer To Complete
Is Profile Complete?
No
Yes
Facility Permitted to Handle?
No
Material Not Handled
Yes
Disposal Site Available?
No
Day Storage
No
Material Not Handled
Find Alternate Site
Yes
No
Disposal Site Approves Waste Stream?
Yes
Amend Profile
Schedule Pickup
Yes
No
Can Generator Explain Discrepancy?
No
Passes Field QC Check?
Yes
Material Not Handled
Material Acceptable for Transport?
No
Repackageable?
No
Material Not Handled
Yes
Yes
No
Material Received at the Facility
Material Rejected
Can Generator Explain Discrepancy?
Off-Spec
Enters QC Program


Yes
"On-spec"
No
Is Disposal Site Available?
Yes
Material Routed For Disposal
Suitable for Landfill?
Yes
Landfill
No
Suitable for Treatment?
Yes
Treatment
Material
Not Handled
No
Suitable For Recovery?
Yes
Recovery
No
Incineration

LAB PACK PROCEDURE

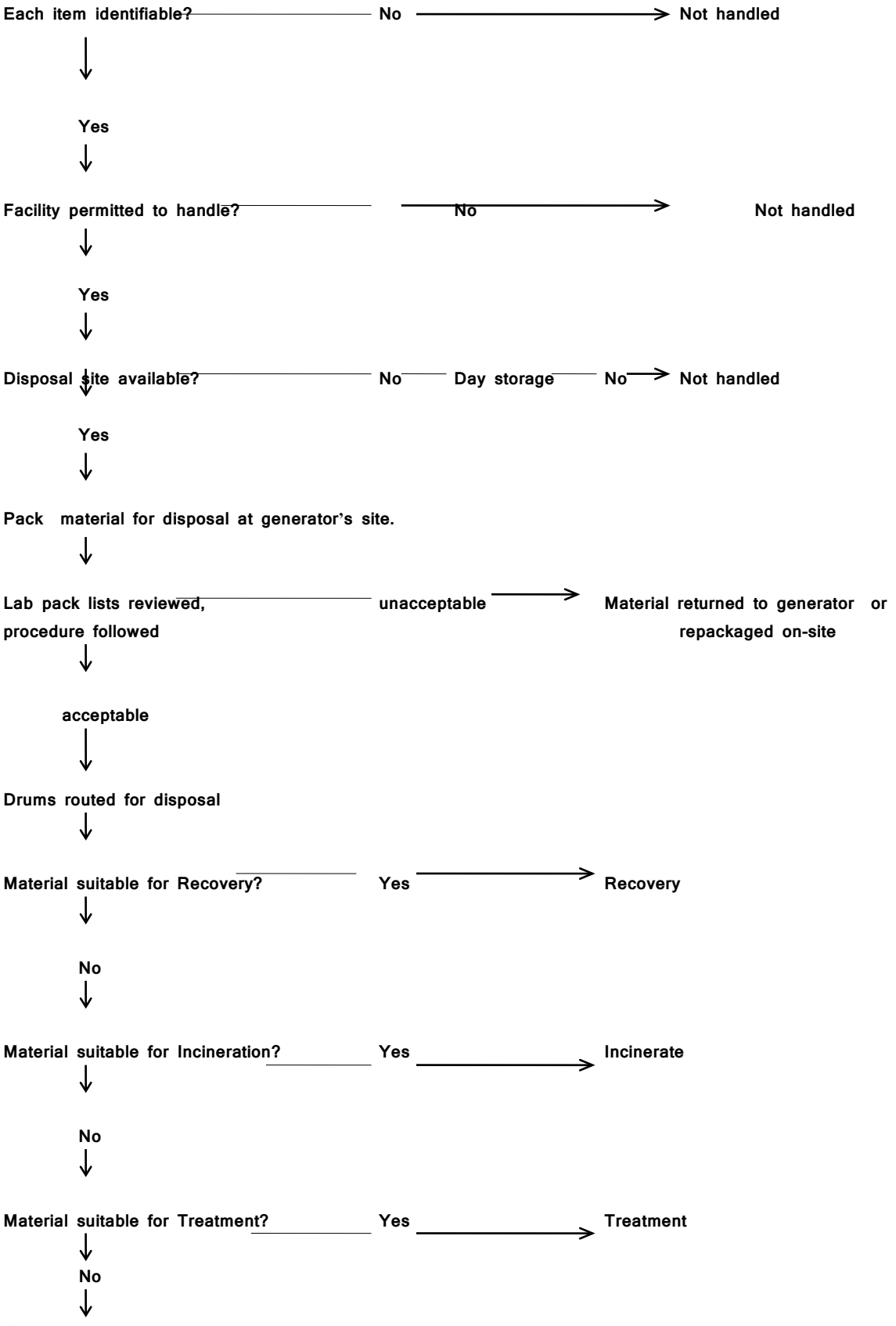


EXHIBIT #2

SAMPLE WASTE PROFILE RECORD

CleanHarbors® ENVIRONMENTAL SERVICES, INC.

WASTE MATERIAL PROFILE SHEET

Clean Harbors Profile No.

A. GENERAL INFORMATION

GENERATOR EPA-ID: GENERATOR PROFILE No.

GENERATOR CODE (Assigned by Clean Harbors) GENERATOR NAME:

ADDRESS CITY STATE ZIP/POSTAL CODE PHONE:

CUSTOMER CODE (Assigned by Clean Harbors) CUSTOMER NAME:

ADDRESS CITY STATE/PROVINCE ZIP/POSTAL CODE

B. WASTE DESCRIPTION

WASTE DESCRIPTION:

PROCESS GENERATING WASTE (Please provide detailed description of process generating waste):

C. PHYSICAL PROPERTIES (at 25C or 77F)

PHYSICAL STATE
- SOLID WITHOUT FREE LIQUID
- POWDER
- MONOLITHIC SOLID
- LIQUID WITH NO SOLIDS
- LIQUID/SOLID MIXTURE
  - % FREE LIQUID
  - % SETTLED SOLID
  - % TOTAL SUSPENDED SOLID
- SLUDGE
- GAS/AEROSOL

NUMBER OF PHASES/LAYERS

1 2 3

% BY VOLUME (Approx.)

TOP
MIDDLE
BOTTOM

VISCOSITY (If liquid present)
- 1 - 100 (e.g. WATER)
- 101 - 500 (e.g. MOTOR OIL)
- 501 - 10,000 (e.g. MOLASSES)
- > 10,000

COLOR

ODOR
- NONE
- MILD
- STRONG

Describe:

BOILING POINT °F (°C)
- <= 95 (<=35)
- 95 - 100 (35-38)
- 101 - 129 (38-54)
- >= 130 (>54)

MELTING POINT °F (°C)
- < 140 (<60)
- 140-200 (60-93)
- > 200 (>93)

TOTAL ORGANIC CARBON
- <= 1%
- 1-9%
- >= 10%

FLASH POINT °F (°C)
- < 73 (<23)
- 73 - 100 (23-38)
- 101 -140 (38-60)
- 141 -200 (60-93)
- > 200 (>93)

Actual:

pH
- <= 2
- 2.1 - 6.9
- 7 (Neutral)
- 7.1 - 12.4
- >= 12.5

Actual:

SPECIFIC GRAVITY
- < 0.8 (e.g. Gasoline)
- 0.8-1.0 (e.g. Ethanol)
- 1.0 (e.g. Water)
- 1.0-1.2 (e.g. Antifreeze)
- > 1.2 (e.g. Methylene Chloride)

ASH
- < 0.1
- 0.1 - 1.0
- 1.1 - 5.0
- 5.1 - 20.0
- > 20
- Unknown

Actual:

BTU/LB (MJ/kg)
- < 2,000 (<4.6)
- 2,000-5,000 (4.6-11.6)
- 5,000-10,000 (11.6-23.2)
- > 10,000 (>23.2)

Actual:

VAPOR PRESSURE (for liquids only) mm Hg

D. COMPOSITION (List the complete composition of the waste, include any inert components and /or debris. Ranges for individual components are acceptable. If a trade name is used, please supply an MSDS. Please do not use abbreviations.)

CHEMICAL	MIN – MAX	UOM	CHEMICAL	MIN – MAX	UOM

ANY METAL OBJECTs PRESENT? YES NO

If yes include dimension:

Page 1 of 3

CleanHarbors ENVIRONMENTAL SERVICES, INC.

Clean Harbors Profile No.

E. CONSTITUENTS -- Are these values based on testing or knowledge? ☐ Knowledge ☐ Testing

If constituent concentrations are base on analytical testing, analysis must be provided. If based on knowledge, basis of knowledge must be provided below.

RCRA	REGULATED METALS	REGULATORY LEVEL (mg/l)	TCLP mg/l	TOTAL ppm
D004	ARSENIC	5.0		
D005	BARIUM	100.0		
D006	CADMIUM	1.0		
D007	CHROMIUM	5.0		
D008	LEAD	5.0		
D009	MERCURY	0.2		
D010	SELENIUM	1.0		
D011	SILVER	5.0		

RCRA	VOLATILE COMPOUNDS	REGULATORY LEVEL (mg/l)	TCLP mg/l	TOTAL ppm
D018	BENZENE	0.5		
D019	CARBON TETRACHLORIDE	0.5		
D021	CHLOROBENZENE	100.0		
D022	CHLOROFORM	6.0		
D028	1,2-DICHLOROETHANE	0.5		
D029	1,1-DICHLOROETHYLENE	0.7		
D035	METHYL ETHYL KETONE	200.0		
D039	TETRACHLOROETHYLENE	0.7		
D040	TRICHLOROETHYLENE	0.5		
D043	VINYL CHLORIDE	0.2		

RCRA	SEMI-VOLATILE COMPOUND	REGULATORY LEVEL (mg/l)	TCLP mg/l	TOTAL ppm
D023	o-CRESOL	200.0		
D024	m-CRESOL	200.0		
D025	p-CRESOL	200.0		
D026	CRESOL (TOTAL)	200.0		
D027	1,4-DICHLOROBENZENE	7.5		
D030	2,4-DINITROTOLUENE	0.13		
D032	HEXACHLOROBENZENE	0.13		
D033	HEXACHLOROBUTADIENE	0.5		
D034	HEXACHLOROETHANE	3.0		
D036	NITROBENZENE	2.0		
D037	PENTACHLOROPHENOL	100.0		
D038	PYRIDINE	5.0		
D041	2,4,5-TRICHLOROPHENOL	400.0		
D042	2,4,6-TRICHLOROPHENOL	2.0		

RCRA	PESTICIDES AND HERBICIDES	REGULATORY LEVEL (mg/l)	TCLP mg/l	TOTAL ppm
D012	ENDRIN	0.02		
D013	LINDANE	0.4		
D014	METHOXYCHLOR	10.0		
D015	TOXAPHENE	0.5		
D016	2,4-D	10.0		
D017	2,4,5-TP (SILVEX)	1.0		
D020	CHLORDANE	0.03		
D031	HEPTACHLOR (AND ITS EPOXIDE)	0.008		

OTHER METALS	MIN	MAX	UOM
ALUMINUM			
ANTIMONY			
BERYLLIUM			
CALCIUM			
COPPER			
MAGNESIUM			
MOLYBDENUM			
NICKEL			
POTASSIUM			
SILICON			
SODIUM			
THALLIUM			
TIN			
VANADIUM			
ZINC			

NON-METALS	MIN	MAX	UOM
BROMINE			
CHLORINE			
FLUORINE			
IODINE			
SULFUR			

OTHER NON-METALS	MIN	MAX	UOM
AMMONIA			
REACTIVE SULFIDE			
CYANIDE-TOTAL			
CYANIDE AMENABLE			
CYANIDE REACTIVE			

OTHER CHEMICALS	MIN	MAX	UOM
PHENOL			
Total Petroleum Hydrocarbons			

OTHER

HOCs

NONE
< 1000 PPM
>= 1000 PPM

PCBs

NONE
<50 PPM
>= 50 PPM

IF PCBS ARE PRESENT, IS THE WASTE REGULATED BY TSCA 40 CFR 761?

YES NO

ADDITIONAL HAZARD

DOES THIS WASTE HAVE ANY UNDISCLOSED HAZARDS OR PRIOR INCIDENTS ASSOCIATED WITH IT, WHICH COULD AFFECT THE WAY IT SHOULD BE HANDLED?

YES NO (If yes, explain)

ASBESTOS
DEA REGULATED SUBSTANCES
DIOXIN
EXPLOSIVE
HERBICIDE
FUMING / SMOKING WASTE
INFECTIOUS, PATHOGENIC, OR ETIOLOGICAL AGENT
OXIDIZER
OSHA REGULATED CARCINOGENS
PESTICIDE
POLYMERIZABLE
RADIOACTIVE
REDUCING AGENT
SHOCK SENSITIVE
SPONTANEOUSLY IGNITES WITH AIR
THERMALLY SENSITIVE
WATER REACTIVE

NONE OF THE ABOVE

CleanHarbors
ENVIRONMENTAL SERVICES, INC.

Clean Harbors Profile No.

F. REGULATORY STATUS

YES	NO	USEPA HAZARDOUS WASTE?
YES	NO	DO ANY STATE WASTE CODES APPLY?
YES	NO	IS THIS WASTE PROHIBITED FROM LAND DISPOSAL WITHOUT FURTHER TREATMENT PER 40 CFR PART 268? LDR CATEGORY: VARIANCE INFO:
YES	NO	IS THIS A UNIVERSAL WASTE?
YES	NO	IS THIS A WASTEWATER PER 40 CFR PART 268.2?
YES	NO	IF ANY WASTE CODES D001, D002, D003 (OTHER THAN REACTIVE CYANIDE OR REACTIVE SULFIDE), D004-D0011, D012-DO17 NON-WASTEWATERS, OR D018- D043 APPLY, ARE ANY UNDERLYING HAZARDOUS (UHCs) PRESENT ABOVE UNIVERSAL TREATMENT STANDARDS (UTS)?
YES	NO	DOES TREATMENT OF THIS WASTE GENERATE A F006 OR F019 SLUDGE?
YES	NO	IS THIS WASTE SUBJECT TO CATEGORICAL PRETREATMENT DISCHARGE STANDARDS? IF YES, SPECIFY POINT SOURCE CATEGORY LISTED IN 40 CFR PART 401.
YES	NO	IS THIS WASTE REGULATED UNDER THE BENZENE NESHAP RULES? IF YES, IS THE GENERATOR'S TOTAL ANNUAL BENZENE >= 10 Megagrams? YES NO
YES	NO	DOES THIS WASTE CONTAIN VOC'S IN CONCENTRATIONS >=500 PPM?
YES	NO	DOES THE WASTE CONTAIN GREATER THAN 20% OF ORGANIC CONSTITUENTS WITH A VAPOR PRESSURE >= .3KPA (.044 PSIA)?
YES	NO	DOES THIS WASTE CONTAIN AN ORGANIC CONSTITUENT WHICH IN ITS PURE FORM HAS A VAPOR PRESSURE GREATER THAN 77 KPa (11.2PSIA)?
YES	NO	IS THIS CERCLA REGULATED (SUPERFUND) WASTE ?
YES	NO	IS THIS WASTE REGULATED UNDER THE OZONE DEPLETING SUBSTANCE ACT FOR ONTARIO?

G. D.O.T INFORMATION: (Include proper shipping name, hazard class and ID number).
US D.O.T. DESCRIPTION:

H. TRANSPORTATION REQUIREMENTS
ESTIMATED SHIPMENT FREQUENCY: ONE TIME WEEKLY MONTHLY QUARTERLY YEARLY OTHER

IF BULK LIQUID OR BULK SOLID PLEASE INDICATE THE EXPECTED NUMBER OF LOADS PER SHIPPING FREQUENCY:

CONTAINERIZED
CONTAINERS/SHIPMENT
STORAGE CAPACITY:
CONTAINER TYPE:
- CUBIC YARD BOX
- PALLET
- TOTE TANK
- OTHER:
- DRUM SIZE:

CONTAINER MATERIAL:
- STEEL
- FIBER
- PLASTIC
- OTHER

BULK LIQUID
GALLONS/SHIPMENT: GAL.
- FROM TANKS: TANK SIZE GAL.
- FROM DRUMS

VEHICLE TYPE:
- VAC TRUCK
- TANK TRUCK
- RAILROAD TANK CAR

CHECK COMPATIBLE STORAGE MATERIALS.
- STEEL
- STAINLESS STEEL
- RUBBER LINED
- FIBERGLASS LINED
- DERAKANE
- OTHER

BULK SOLID
SHIPMENT UOM: TON YARD
PER SHIPMENT: MIN MAX
STORAGE CAPACITY TON/YD
VEHICLE TYPE:
- DUMP TRAILER
- ROLL OFF BOX
- INTERMODAL ROLLOFF BOX
- CUSCO/VACTOR
- OTHER

I. SPECIAL REQUEST
SPECIFIC DISPOSAL RESTRICTIONS OR REQUESTS:
SPECIAL WASTE HANDLING REQUIREMENTS:
OTHER COMMENTS OR REQUESTS:

J. BIENNIAL / ANNUAL REPORTING INFORMATION
SIC CODE SOURCE CODE FORM CODE

K. SAMPLE STATUS
REPRESENTATIVE SAMPLE HAS BEEN SUPPLIED. YES NO SAMPLED BY DATE SAMPLED WHERE SENT

GENERATORS CERTIFICATION

I hereby certify that all information submitted in this and attached documents is correct to the best of my knowledge. I also certify that any samples submitted are representative of the actual waste. If Clean Harbors discovers a discrepancy during the approval process, Generator grants Clean Harbors the authority to amend the profile, as Clean Harbors deems necessary, to reflect the discrepancy.

AUTHORIZED SIGNATURE NAME (PRINT) TITLE DATE

Page 3 of 3

EXHIBIT #3

COMPATIBILITY TESTING PROCEDURE

EXHIBIT #3

COMPATIBILITY TESTING PROCEDURE

1. A sample of the waste stored in each container will be collected prior to being consolidated. These samples will be retained in the laboratory. Note: Medical waste is exempt from this requirement.

2. The Operations Department will select a container for anticipated consolidation.

3. A sample of the waste in question, representative of the contents of the container and shall be at least 50 ml in volume, will be slowly mixed together with samples from other containers being considered for consolidation in the same group.

4. All mixing shall take place under the laboratory ventilation hood and monitored by a laboratory technician or chemist.

5. The monitoring shall last approximately thirty (30) minutes.

6. The mixtures shall be monitored for:

    a. Temperature change.
    b. Evolution of gas.
    c. Changes in viscosity.
    d. Odors and color changes.
    e. Coagulation or polymerization.

7. The transfer of the waste to the selected container shall not be approved if:

a. Temperature rise is greater than 3°C.

b. Cases evolve.

c. Solids form.

d. Obvious changes in viscosity (so as to impede pumping) are observed.

8. Should no conditions arise to impede the waste transfer, the laboratory will approve the waste movement.

9. Should conditions listed in #7 above be encountered, this process may be repeated with samples from containers until a suitable mixture is found.

10. Should no available waste commingling be found to pass this procedure, the waste will not be considered for bulking.

EXHIBIT #4

Container Sampling Standard Operating Procedure

Container Sampling Standard Operating Procedure

Clean Harbors La Porte

Table of Contents

1.0 Objective

This SOP is to provide the guidance and necessary steps to standardize the process and technique of collecting representative samples from drums or containers. The procedure applies to all personnel who obtain samples from drums or containers. The procedure below will provide the steps to meet this objective.

2.0 Site Specific Terms

Sample rod or drum thief – Static free polypropylene tube for liquid sample collection

Sample cup – Polypropylene 4 ounce container for samples

3.0 Responsibilities

General Manager

The General Manager will ensure that all employees are trained and knowledgeable regarding the proper operating procedures used during sampling.

Supervisors

The supervisor and/or lead foreman for this process is responsible for training, monitoring, and enforcing this procedure with the employees, and for ensuring all equipment and required PPE are available to the employees.

Employees

Employees are responsible for adhering to safe work practices and all provisions found in this procedure. Employees must inspect equipment and report any failures or deficiencies to the appropriate Supervisor.

4.0 Prerequisites

Health and Safety

- Any incidents, including near misses, are to be reported immediately to the supervisor.
- Review the Job Hazard Analysis (Appendix 1) to become familiar with the hazards associated with this process.
- Consult the PPE Hazard Assessments (Appendix 2) to be worn for this job task.
- The buddy system (e.g., visual, audio contact, etc.) must be maintained when this process is being conducted.

Environmental

- Ensure all applicable monitoring equipment is available.
- If an incident occurs, report it immediately to your supervisor.
- Incidental releases are to be cleaned up immediately in the process designated PPE.
- If the incident requires additional assistance or equipment, the Contingency Plan may need to be implemented.

Documented Training

- HazWoper training
- OSHA regulated substances, as required (e.g., benzene, methylene chloride, vinyl chloride, asbestos, arsenic, etc.)
- RCRA training
- DOT training
- SOP training
- Equipment training (e.g., forklift)

Operations

- Ensure that all preventative maintenance on equipment has been conducted.
- Ensure that all equipment is clean, ready for the next sampling, and operational.
- Ensure that all waste to be sampled has been pre-approved
- Required equipment:
  - Static-free Poly Sampling tube or Coliwasa for liquids
  - Disposable scoop for solids or sludges
  - Appropriate sampling container
  - Clean rags or paper towels

5.0 Procedure

Receiving

All waste entering the facility must be properly identified before any processing can begin. Personnel who will be sampling the inbound waste containers must ensure that all proper documentation arrives with the load or is otherwise readily available. This will include, at a minimum:

- Manifests (solid or liquid hazardous waste) or Bill of Lading for non-hazardous solid waste) **and**
- Waste Data Sheet or Waste Profile

The plant coordinator will prepare the manifests and waste receiving reports (or other applicable data) and forwarded to the Receiving Chemist the day the load is scheduled for delivery.

For WinWeb data entry, the load must be Plant Received before it can be sampled. Once it has been sampled and analyzed, the analytical data is entered with the load being Final Coded in the Lab Results screen.

Waste Tracking

Waste tracking for the waste to be sampled will be provided by the following documents:

- Hazardous Waste Manifest or Bill of Lading
- Waste Profile
- Off-load Order
- On-site tracking documents (e.g., Load Sheet, weight ticket, waste receiving report, etc.)

Procedure

1. The buddy system will be adopted when sampling and may be accomplished via radio contact, visual, etc.
2. Review all required paperwork. Ensure that it is complete and that all handling instructions are understood.
3. Inspect drums for any condition that may compromise its integrity, such as damaged seams, gaskets, bungs, and rings.
4. Determine the drums to be sampled.
5. Drums are to remain closed, except when being inspected or when adding to or removing waste. Only the drum being actively sampled is to be opened.
6. Ensure all sampling apparatus noted above is available.
7. Don appropriate PPE as required. Supplied air may be required in accordance with the CHES Waste Safety Data Sheet (e.g., hydrofluoric acid).
8. Open the drum using non-sparking tools. Open slowly to ensure there is no pressure build up.
9. For liquids or low viscosity sludge:
   a. Use a clean sampling tube
   b. Lower the tube slowly into the liquid; ensure that the top open end is not restricted
   c. Do not slide the tube in your hand while sampling; lower it hand over hand to minimize any charge build up.
   d. Lower the tube at a rate that allows the liquid levels inside and outside the tube to remain approximately the same. If the level in the sampling tube is much lower than that outside it, the sample will not be representative of the waste.
   e. When the tube hits the bottom of the drum, close the tube with your thumb
   f. Slowly withdraw the sampling tube from the drum, wiping the tube with a disposable towel or rag
   g. Carefully discharge the sample into the appropriate sample container.

h. Close the sample jar lid tightly.
i. Replace and tighten the drum lid or bung.
j. Label the sample container, complete the appropriate paperwork and submit the sample to the laboratory.

10. Solids or high viscosity liquids:
    a. Open the drum using non-sparking tools
    b. Use a clean, disposable scoop to retrieve the sample
    c. Attempt to obtain a representative sample by digging through the material and choosing portions that best characterize the observed waste
    d. Fill the sample container and close the lid tightly
    e. Replace and tighten the drum lid or bung.
    f. Label the sample container, complete the appropriate paperwork and submit the sample to the laboratory.

Process Interruptions

If any process interruptions occur (e.g., exothermic reactions, fire, excessive odor or irritation, physical boiling, popping of material, fuming, off-gassing, spills, personnel contamination) make sure to:

1) Notify buddy and other coworkers
2) Close all open drums (if possible)
3) Keep all unnecessary people away and secure the area
4) Extinguish any fires
5) Contain any spills
6) Collect manifest, receiving report, drum profile, and call supervisor and Health and Safety.

Shut Down

1. Wipe any visible residue from the sampling device and store in its holder (container or bucket).
2. Waste contained in the storage bucket must be placed into an accumulation drum.
3. Properly dispose all rags and absorbent material into a PPE container.

6.0 Consequences of Deviations

In addition to the process interruptions which can occur, the following additional consequences of deviations could result:

- Injuries and/or fatalities
- Property damage
- Regulatory violations and/or fines
- Damaged public relations and/or customer relations
- Disciplinary actions up to and including termination

7.0 Appendices

- Site-specific Process Checklist
- Job Hazard Analysis
- PPE Hazard Assessment

Procedure Checklist

Name of Procedure: Receiving / Sampling **Page 1 of 1**

Location/Facility: LaPorte,TX

	Step #	*Procedure*	Recommended Action(s)
❑	1.	Review all require paperwork	Ensure that you have got receiving folders so that all handling instructions (profiles, chemical constituents) are understood.
❑	2.	Gather supplies	Ensure that you have got all supplies that you will need for the sampling job eg. Non-sparking tools, sample jars, thieves, etc.
❑	3.	Check area and inspect drums	Check area for location of spill kits, eyewash stations, fire pull station etc. Inspect drums for their integrity, check beads, seams, gaskets, bungs, and rings.
❑	4.	Determine drums to be sampled	Lay out sample jars and barcodes on top of drums.
❑	5.	Don PPE	Use the waste safety data sheets to determine the level and type of PPE to don on. (employee portal / tech manual)
❑	6.	Sample	Sample 100% but no more than 10 drums per composite. Close drums when finished and wipe excess waste from drum from sampling.
❑	7.	Doff PPE	Dispose of PPE, sample thieves, rags etc. properly.

❑	8.	Barcode drums	Bar code drums within the defined CH window. Mark process code on top and side of drums along with the barcode number.

CHESI JOB HAZARD ANALYSIS

Sequence of Job Steps	Potential Hazards	Recommended Procedures or Controls
1. Step 1 Operation Set-up Inspections	Slip, Trip & Fall Hazards, Pinch points	Ensure process area is neat and clean, tools and equipment should be properly stored.
2. Step 2 Place drums in staging area for sampling	Pinch point, drum rollover, moving equipment	Use proper forklift operating techniques, securely place drums on pallets, only move drums by hand as a final option, use forklift, or other drum movement equipment.
3. Step 3 Open containers	Pinch, Spark, Drum Rollover, Penetration, Exposure	Correct selection of PPE, Proper Drum Handling Techniques, Non-sparking tools and drum sample rod
4. Step 4 Sample containers	Static, Friction, Pinch, Exposure	Correct selection of PPE, Proper Drum Handling Techniques, Non-sparking tools and drum sample rod
5. Step 5 Close containers	Pinch, Spark, Penetration, Exposure	PPE, non-sparking tools
6. Step 6 Close & label sample jars	Exposure	PPE, minimize waste spillage
7. Step 7 Move containers to storage	Pinch, Penetration, Forklift operation hazards	PPE, Proper forklift & pedestrian traffic techniques
8. Step 8 Clean-up	Exposure, Slips, Trips & falls	PPE, store tools properly keep floor area free from clutter

PPE HAZARD ASSESSMENT

Mechanical/Physical Hazards	Chemical Hazards	Biological/Environmental Hazards	Minimum PPE Required
☐ Cutting ☐ Sawing ☐ Drilling ☐ Sanding ☐ Grinding ☐ Hammering ☐ Chopping ☐ Puncture ☐ Welding ☐ Flying particles ☐ Intense Rays ☐ Compressed Air	☒ Chemical Splash, contact ☒ Gas, vapors, & fumes ☐ Dust particles ☐ Objects under pressure ☐ Cryogenic Burn	☐ Blood ☐ Other Infectious Substance ☐ Harmful bacteria, virus	☐ Safety Glasses ☐ Safety Goggles ☐ Faceshield ☐ Welding Goggles ☐ Welding Helmet w/tinted lens ☒ Refer to Respirator PPE ☐ None

Mechanical/Physical Hazards	Chemical Hazards	Biological/Environmental Hazards	Minimum PPE Required
☐ Falling objects ☐ Electrical shock ☐ Impact	☐ Dust particles, debris	☒ Heat Stress ☐ Cold Stress	☒ Hard Hat ☐ Spray-head sock

Mechanical/Physical Hazards	Chemical Hazards	Biological/Environmental Hazards	Minimum PPE Required
☐ Impact / Falling objects ☐ Electrical ☐ Puncture ☐ Slippery/Wet surface ☐ Sharp objects ☐ Power tool(s) ☐ Crushing/Compression objects ☐ Welding/Sparks	☒ Chemical Splash, contact ☐ Objects under pressure ☐ Cryogenic Burn	☒ Heat Stress ☐ Cold Stress ☐ Dirt, Debris	☒ Steel-toe Safety Shoe ☐ Steel-shank Shoe ☐ PVC Overboot (Chicken boot) ☐ PVC Steel-toe Boot ☐ Boot/shoe Cover

Mechanical/Physical Hazards	Chemical Hazards	Biological/Environmental Hazards	Minimum PPE Required
☐ Cuts, abrasions ☐ Electrical shock ☐ Puncture ☐ Thermal burn ☐ Pinch/crush ☐ Impact/bruise ☐ Tools ☐ Welding/Sparks	☒ Chemical Splash, contact ☐ Cryogenic Burn ☐ Objects under pressure	☒ Heat Stress ☐ Cold Stress ☐ Dirt, Debris ☐ Blood ☐ Other Infectious Substance	☐ Cotton, inner ☐ Cotton, outer ☒ Nitrile, inner ☒ Nitrile, outer ☐ Canvas ☐ Leather ☐ Polar, insulated ☐ Kevlar ☐ Neoprene ☐ NitroSafe ☐ Rubber ☐ Latex ☐ SilverShields ☐ Other _____

	Mechanical/Physical Hazards	Chemical Hazards	Biological/Environmental Hazards	Minimum PPE Required
	☐ Cuts, abrasions ☐ Electrical shock ☐ Puncture ☐ Thermal burn ☐ Impact/bruise ☐ Tools	☒ Chemical Splash, contact ☐ Cryogenic Burn ☐ Objects under pressure	☒ Heat Stress ☐ Cold Stress ☐ Dirt, Debris ☐ Blood ☐ Other Infectious Substance	☐ Work Uniform ☐ Tyvek, suit ☐ Tyvek, apron ☐ Tyvek QC, suit ☐ Tyvek QC, apron ☐ Saranex, suit ☐ Saranex, apron ☐ CPF I, suit ☒ CPF I, apron ☐ Other: _____
	**Mechanical/Physical Hazards**	**Chemical Hazards**	**Biological/Environmental Hazards**	**Minimum PPE Required**
	☐ Noise			☐ Ear plugs ☐ Ear muffs
	**Mechanical/Physical Hazards**	**Chemical Hazards**	**Biological/Environmental Hazards**	**Minimum PPE Required**
	☐ Welding	☒ Chemical Splash, contact ☒ Gas, vapors, & fumes ☐ Dust particles	☐ Blood ☐ Other Infectious Substance ☐ Harmful bacteria, virus	☐ Half-face respirator ☒ Full-face respirator ☐ SCBA ☐ Supplied Airline Respirator ☒ OV/AG P100 Cartridge ☐ Amonia/Amine P100 Cartridge ☐ Particulate mask
	**Mechanical/Physical Hazards**	**Chemical Hazards**	**Biological/Environmental Hazards**	**Minimum PPE Required**
	☐ Fall Hazard			☐ Full-body Harness with Lanyard

Comments:

Professional Engineer Certification

The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date 05/20/20

J. W. Caldwell
Texas PE # 94038

GENERAL ENGINEERING REPORT

GENERAL INFORMATION

The maps and drawings listed below are included with this General Engineering Report for Clean Harbors LaPorte, LLC. These maps are included to provide the information required by 40 CFR 270.14.b.19.i through xii.

Overall Facility Plan
Plot Plan
Topographic Site Map
Facility Traffic Patterns
Wind Rose
Overall Facility Plan +1000 Feet
Regional Facility Map

General engineering drawings that are applicable to the facility as a whole include those listed below which are attached to this Engineering Report.

Overall Facility Plan
Current Facility Evacuation Plan (See Section III.E)
Current Emergency Equipment (See Section III.E)

The Proposed Site Plan shows the location of the existing tanks and associated containments, container storage areas, truck stations, and proposed units.

Stand-alone detailed engineering reports are provided for each container storage area, tank system and associated secondary containment, and miscellaneous units and associated secondary containment (Appendices V.B.i through V.B.iv for container storage areas, Appendices V.C.i through V.C.iii for tank systems, and V.K.i and V.K.ii for miscellaneous equipment). All of the hazardous waste management units at the facility meet the design and operation requirements set out in 40 CFR 264, and other applicable requirements. For specific details within these areas, refer to the applicable Engineering Reports for each waste management unit, which will include the specific drawings for that area.

The Clean Harbors LaPorte, LLC facility is located on three tracts of property which total 15 acres to be permitted. The facility is located in an area that is within an exclusively heavy industrial/manufacturing corridor north of State Highway 225 (see the Regional Map for additional details on adjacent zoning and land use).

The traffic pattern is illustrated on the attached Facility Traffic Patterns figure. All trucks carrying wastes are required to stay on a hard-surfaced (concrete or gravel) area. The estimated load-bearing capacity of the internal roads is 18,000 lbs/axle. This capacity is adequate to allow any traffic which can legally travel on Texas highways to enter the

facility. Access to the facility is provided by Independence Parkway South (State Highway 134). Independence Parkway South is used by industries located to the north of the Facility and current traffic includes numerous large tractor-trailer trucks. It is estimated that the Facility can service 8 or more trucks over a 12-hour period or at least one truck every hour. This frequency of traffic related to the facility will have an insignificant impact on the existing traffic on Independence Parkway South. Generally, trucks entering the Facility will be headed north on Independence Parkway South (the ferry at the Houston Ship Channel is not rated for medium to large trucks) and will enter by taking a right into the Facility without having to cross on-coming traffic. Trucks leaving the facility will turn either left or right onto Independence Parkway South. Parking space within the facility is adequate to allow staging of any trucks waiting to be loaded or unloaded.

The National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA) was contacted to provide a wind rose from the monitored weather station nearest the vicinity of the facility. A composite wind rose incorporating wind direction and speed measurements was provided by NCDC and is attached below. This wind rose represents statistical prevailing wind speed and direction using data collected from William P. Hobby Airport in Houston, Texas, located approximately 11.5 miles west-southwest of the facility. The prevailing wind is from the south-southeast (SSE) with predominant wind speeds between 4 and 12 miles per hour. From the wind rose, the SSE direction represents about 13.5 percent of all observed wind directions, while the predominant quadrant (South to ESE) represents about 42 percent of all observed wind directions.

The facility topographic map requirements are met with multiple drawings. This drawing package combines to meet the specifications in 40 CFR 270.14(b)(19) and are attached to this General Engineering Report. Several drawings that depict an overall plan view of the facility identifying all waste management units is included with the drawings at the end of this report.

WASTE RECEIVING, ACCEPTANCE AND STORAGE

All permitted units, except for the newly proposed outdoor storage area, are enclosed in commercial-grade metal buildings and include proper secondary containment, safety equipment and other design features discussed in detail in Appendices V.B (container storage areas), V.C. (tanks), and V.K (miscellaneous units). The entire facility also has the following adaptations specifically for the management of hazardous waste:

- Cyclone fencing with three (3)-strand barbed wire surrounding the facility with warning signs at appropriate spacing along the fence;
- Safety and communication equipment (fixed and portable) to provide on-site emergency notification and response; and

- Sealed concrete flooring, curbing and berms constructed to provide secondary containment in the event of a spill or leak from containers or tanks and for waste segregation.

In developing the process designs, special attention was given to:

- Overall facility layout to ensure optimum safety and handling efficiencies,
- Material handling safety,
- Employee exposure to VOC emissions during handling and processing operations,
- Specific processing technologies being used for processing activities,
- Emission control technology to ensure that appropriate technologies are being used for emissions being treated.

Traffic patterns have been planned to account for limitations in access to the facility from Independence Parkway South. The facility layout includes an employee change house and shower room within the facility confines along with the necessary sanitary facility upgrades.

Appropriate measures have been implemented according to NFPA 30 code related to fire safety and control of flammable materials. The design takes into consideration the fire protection system, including the location of a fire water storage tank, fire pump house and foam suppression utility building, as well as a firewater collection basin for capturing spent firewater and residues. The design allocates adequate resources and appropriate site arrangements for utility requirements of the facility regarding process air, process water, potable water, nitrogen, and supplied breathing air.

Furthermore, the layout of the container storage areas provide a minimum 50-foot buffer between stored containers and tanks and the property line in accordance with 40 CFR 264.176 and NFPA requirements. Further described in Sections V.B and V.C are measures for segregation of incompatible, ignitable or reactive wastes.

All site storage areas are inspected for evidence of spills, containers in poor condition, or other unsafe situations on a daily basis. If such a situation is discovered, immediate action is taken appropriate with the material and associated hazard. The LaPorte Facility has the necessary technical expertise available for evaluation and resolution of such situation, if required. Further details of site emergency procedures are provided in the Contingency Plan, Section III.E and Appendix III.E of the Part B application.

WASTE PREPARATION

The hazardous waste management units are shown on figures attached below. For purposes of identifying Hazardous Waste Management Units (HWMUs), the three container storage areas are permitted and are designated by their respective warehouse

names - Warehouse I, Warehouse II, and Warehouse III. The proposed outdoor storage area will be identified as Outdoor 033.

The two currently permitted Chemical Reactor tanks are located within Container Storage Area 1 (Warehouse I) and are shown on the Overall Facility Plan. The Cylinder Release Unit is also located within Container Storage Area 1 (Warehouse I) adjacent to the Chemical Reactor Tank area.

Waste management activities onsite consist of storage, processing, and disposal operations. Final disposal of waste materials at this site includes wastes processed in the Chemical Treatment Reactor Tanks and waste gases managed in the Cylinder Release Unit. Effluent from the Chemical Treatment Reactor Tanks is shipped off-site for further treatment. Waste materials generated on site are shipped off site for final disposal. Materials can be received in tank trucks, rail cars, roll-offs containers ("roll-offs"), drums, and smaller containers. Wastes may be shipped off site in rail cars, tank trucks, roll-offs and drums. All received materials are evaluated in accordance with the facility's Waste Analysis Plan before final acceptance.

WASTEWATER AND STORMWATER MANAGEMENT

The topographic map for the facility shows the general topography for the facility. The natural topography varies 3 to 5 feet per mile as determined by the USGS 7.5-minute quadrangle map (Figure IX-1). Therefore, within 1000 feet of the facility, natural grade elevations vary less than two (2) feet except for specific drainage channels associated with the off-site roads. The natural ground surface of the facility varies in elevation from about Elevation 28 to 29 feet MSL and the ground surface is undulating. The natural grade elevations vary less than two (2) feet across the facility, so contours are not provided.

A topographic survey map of the facility is provided (D-size sheet at 1"=50' scale), showing ground and pavement surface elevations. The improved areas of the facility have been built up on fill material, raising the ground surface for buildings and pavements to effectively promote drainage away from the waste management units. The developed portion of the facility is on fill material and is approximately between elevations 29 and 32 MSL. Finished floor elevations of the warehouse buildings are indicated on the Topographic Site Map. The bar ditch along Independence Parkway South is approximately one (1) foot below the corresponding elevation along the fence line. Independence Parkway South is approximately two (2) feet higher than the corresponding bar ditch elevation.

Pronounced drainage paths are indicated on this topographic map and on the Overall Facility Plan. Drainage from the facility varies, depending on location. Generally, the western half of the site drains toward the west side of the facility and flows into the ditch alongside Independence Parkway South, where it then flows under the road and drains westward toward Patrick Bayou. Drainage from the eastern half of the site drains eastward off the site and flows to a small canal which flows to the Upper San Jacinto Bay

(upper Galveston Bay). Surface waters from the facility would drain northward or eastward and would not drain toward any of the land areas south of State Highway 225.

Private property within 1000 feet of the facility boundary is either commercial or industrial and is mostly north of Texas State Highway 225. Property south of S.H. 225 and within a one-mile radius of the facility boundary includes some residential areas within the City of Deer Park and City of La Porte corporate limits, along with additional commercial and light industrial properties in both cities. None of the facility's drainage would impact residential areas south of S.H. 225.

Section II.F. of this application contains a portion of the Federal Emergency Management Agency's Flood Insurance Rate Map (FIRM) for the City of La Porte, Texas. As shown, the Facility and adjacent properties are outside the 100-year and 500-year flood plain. Consequently, the flood plain is not indicated on the topographic map. Consequently, no special flood control or drainage barriers are required.

The hazardous waste management units and ancillary facilities that are permitted are contained within totally enclosed buildings which precludes collection of precipitation and prevent run-on into the containment area as required by 40 CFR 264.175(b)(4). They also have secondary containment in accordance with the other provisions of 40 CFR 264.175 to ensure that surface waters are protected from the possibility of waste contamination. Since runoff will not have come in contact with wastes, it will be directed to the storm water drains, culverts and channels for eventual off-site discharge without collection, treatment, or monitoring. Drainage features will be inspected to verify that their capacity is not inhibited by sediment or debris buildup.

To eliminate the spread of contaminants on site, all spills are promptly and completely cleaned up. The spilled material and any absorbent used are placed into appropriate containers for disposal. Areas of higher risk for spills such as waste processing or storage areas are concreted and curbed. The spill response procedures are provided in the Contingency Plan (Appendix III.E of Part B application).

The facility is designed such that if equipment fails the effects are mitigated. For example, if a tank failed the liquid would be captured in secondary containment.

FEATURES TO MITIGATE UNSUITABLE SITE CHARACTERISTICS

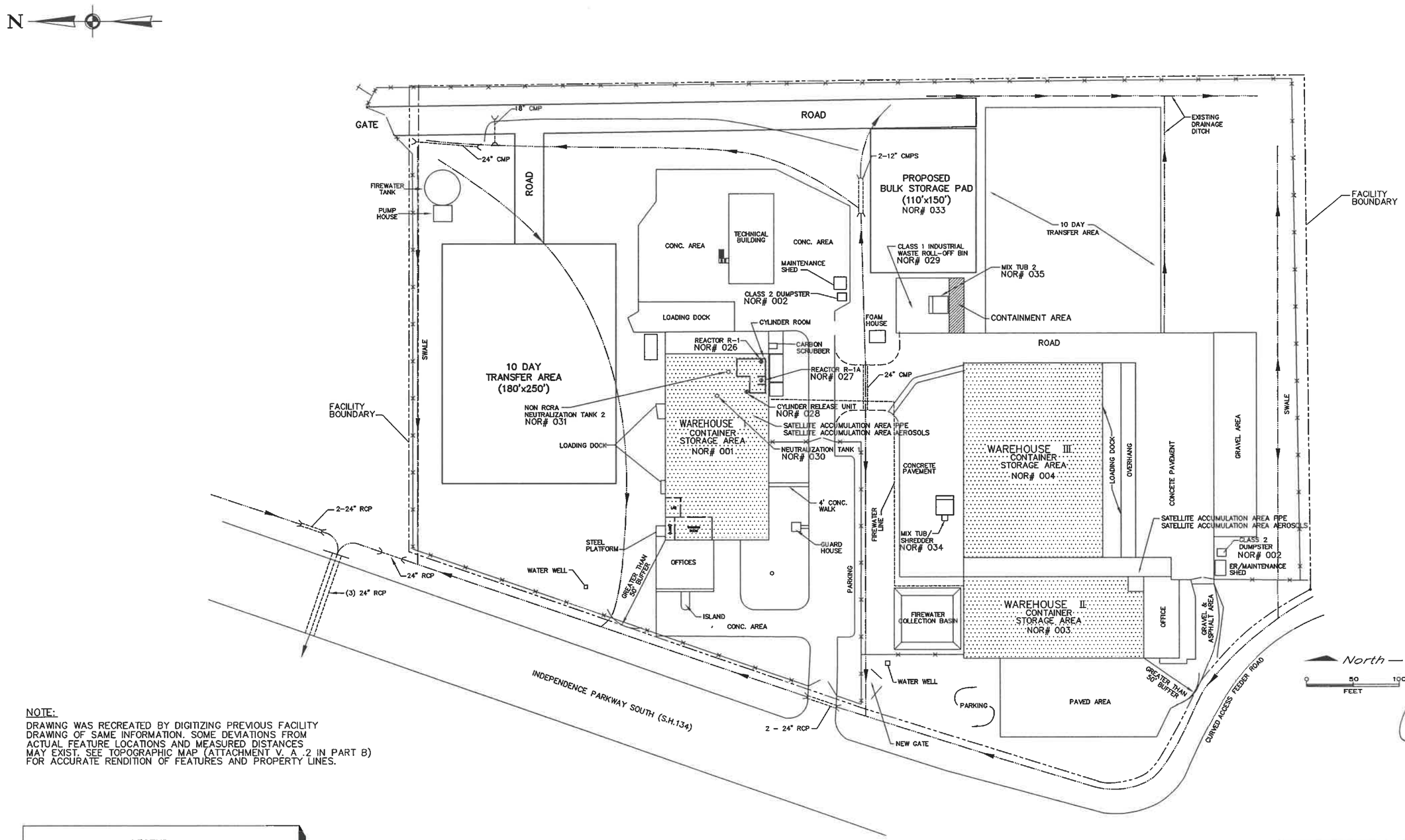
This facility does not lie within the 100-year flood plain. This facility is not known to overlie a regional aquifer or to be situated within a recharge zone of an aquifer. Furthermore, no portion of the facility lies within 50 feet of a known fault. Measures are in place to provide secondary containment for all storage and processing areas, where and if needed, according to 30 TAC 335.204(a) to protect surface and ground waters against releases due to operations at the facility.

CONSTRUCTION SCHEDULE

Construction Schedule for Addition of Outdoor storage area Outdoor 033

Submit specifications for unit – Approval plus 0 month
Choose contractor – Approval plus 0 months
Installation – Approval plus 2 months
Completion – Approval plus 2 months

MAPS AND DRAWINGS



NOTE:

DRAWING WAS RECREATED BY DIGITIZING PREVIOUS FACILITY DRAWING OF SAME INFORMATION. SOME DEVIATIONS FROM ACTUAL FEATURE LOCATIONS AND MEASURED DISTANCES MAY EXIST. SEE TOPOGRAPHIC MAP (ATTACHMENT V. A .2 IN PART B) FOR ACCURATE RENDITION OF FEATURES AND PROPERTY LINES.

LEGEND

- FACILITY PROPERTY BOUNDARY
- CHAIN LINK FENCE
- BOUNDARY OF EXISTING CONTAINER STORAGE AREAS
- DRAINAGE CHANNEL FLOWLINE AND FLOW DIRECTION

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

REFERENCE DRAWINGS

TITLE	DRAWING NO.

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
12	PERMIT RENEWAL 2020	KMC			D.A.D.	5/7/20	
11	ADDED NOR#34 & NOR#35	KMC	S.J.V.		D.A.D.	2/20/17	
10	CLASS I MODIFICATION	KMC			BR	3/21/14	
9	FENCE LINE MODIFICATION	KMC			BR	10/8/13	
8	CLASS II MODIFICATION	KMC			B.R.	2/15/13	
7	REMOVED "PROPOSED NOR# 032"	KMC			BR	8/10/12	
6	REMOVED "PROPOSED" FROM NOR# 030, ADDED NOR# 029 & NOR# 031	KMC			MC	12/29/09	

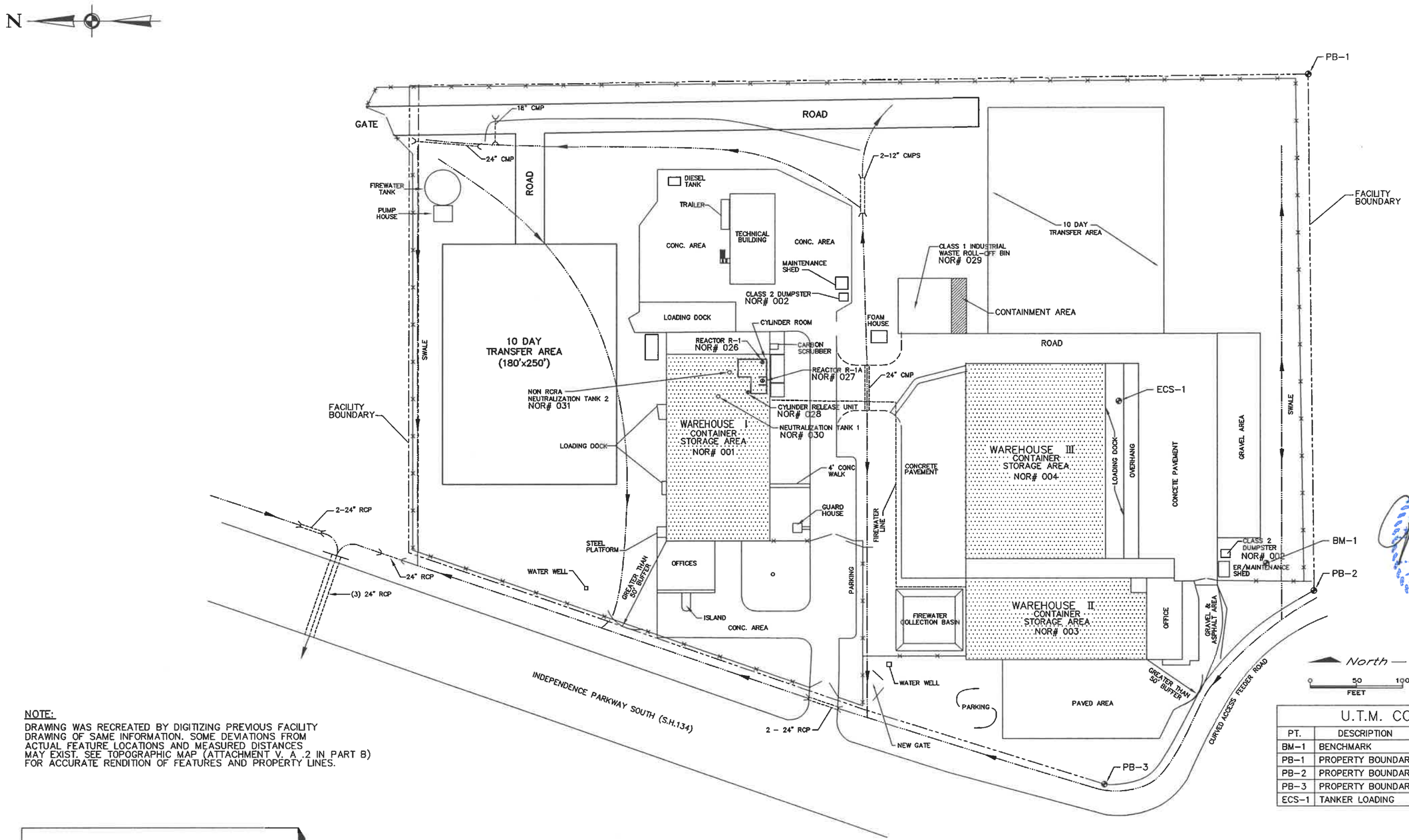
CleanHarbors
LAPORTE
500 Independence Parkway South
LaPorte, Texas 77571
Phone: (281) 727-7600

TITLE:

OVERALL FACILITY PLAN

FILE: 30701101

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1 = 50	403-01A	12



NOTE:
DRAWING WAS RECREATED BY DIGITIZING PREVIOUS FACILITY DRAWING OF SAME INFORMATION. SOME DEVIATIONS FROM ACTUAL FEATURE LOCATIONS AND MEASURED DISTANCES MAY EXIST. SEE TOPOGRAPHIC MAP (ATTACHMENT V, A .2 IN PART B) FOR ACCURATE RENDITION OF FEATURES AND PROPERTY LINES.

U.T.M. COORDINATES

PT.	DESCRIPTION	NORTHING	EASTING
BM-1	BENCHMARK	3287746.2963	297667.5858
PB-1	PROPERTY BOUNDARY	3287729.7414	297826.2394
PB-2	PROPERTY BOUNDARY	3287731.5809	297658.5455
PB-3	PROPERTY BOUNDARY	3287803.3003	297596.3458
ECS-1	TANKER LOADING	3288099.79	297751.54

LEGEND
- FACILITY PROPERTY BOUNDARY
- CHAIN LINK FENCE
- BOUNDARY OF EXISTING CONTAINER STORAGE AREAS
- DRAINAGE CHANNEL FLOWLINE AND FLOW DIRECTION

REFERENCE DRAWINGS

TITLE	DRAWING NO.

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
D	PERMIT RENEWAL 2020	KMC			DAD	5/7/20	
C	REMOVED "PROPOSED NOR# 032"	KMC			BR	8/10/12	
B	REMOVED "PROPOSED" FROM NOR# 030, ADDED NOR# 029 & NOR# 031	KMC			MC	12/29/09	
A	FOR PERMIT RENEWAL	KMC			MAR	7/30/09	

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LICENSED
PROFESSIONAL ENGINEER
05/6/20

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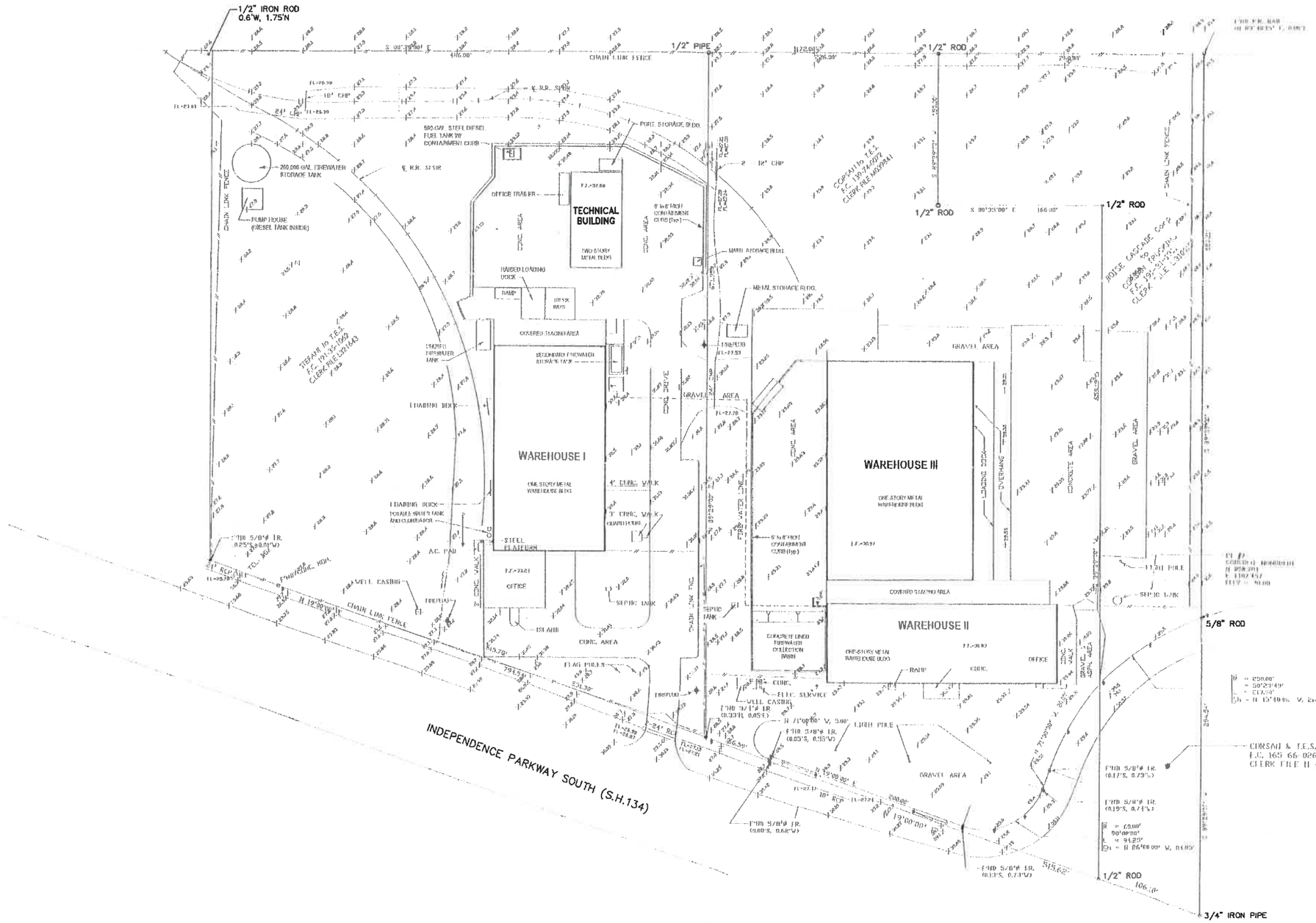
LAPORTE
500 Independence Parkway South
LaPorte, Texas 77571
Phone: (281) 727-7600

TITLE: PLOT PLAN

FILE: 67LT-1000-001

APPROVED:	SCALE:	DWG. NO.:	REV.
	1 = 50	67LT-1000-001	D



NOTE

TOPOGRAPHIC MAP ORIGINALLY PREPARED BY THE WINDROSE SURVEY COMPANY OF HOUSTON, TEXAS, DATED 5/29/92, BASED ON TOPOGRAPHIC AND BOUNDARY INFORMATION FROM WALSH ENGINEERING, INC. (PEARLAND, TEXAS), DATED 5/91.

NORTH

0 50 100
(FEET)

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/26/20

FIGURE V.A.2

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
A	FOR PERMIT RENEWAL	KMC	7/30/09	MAR

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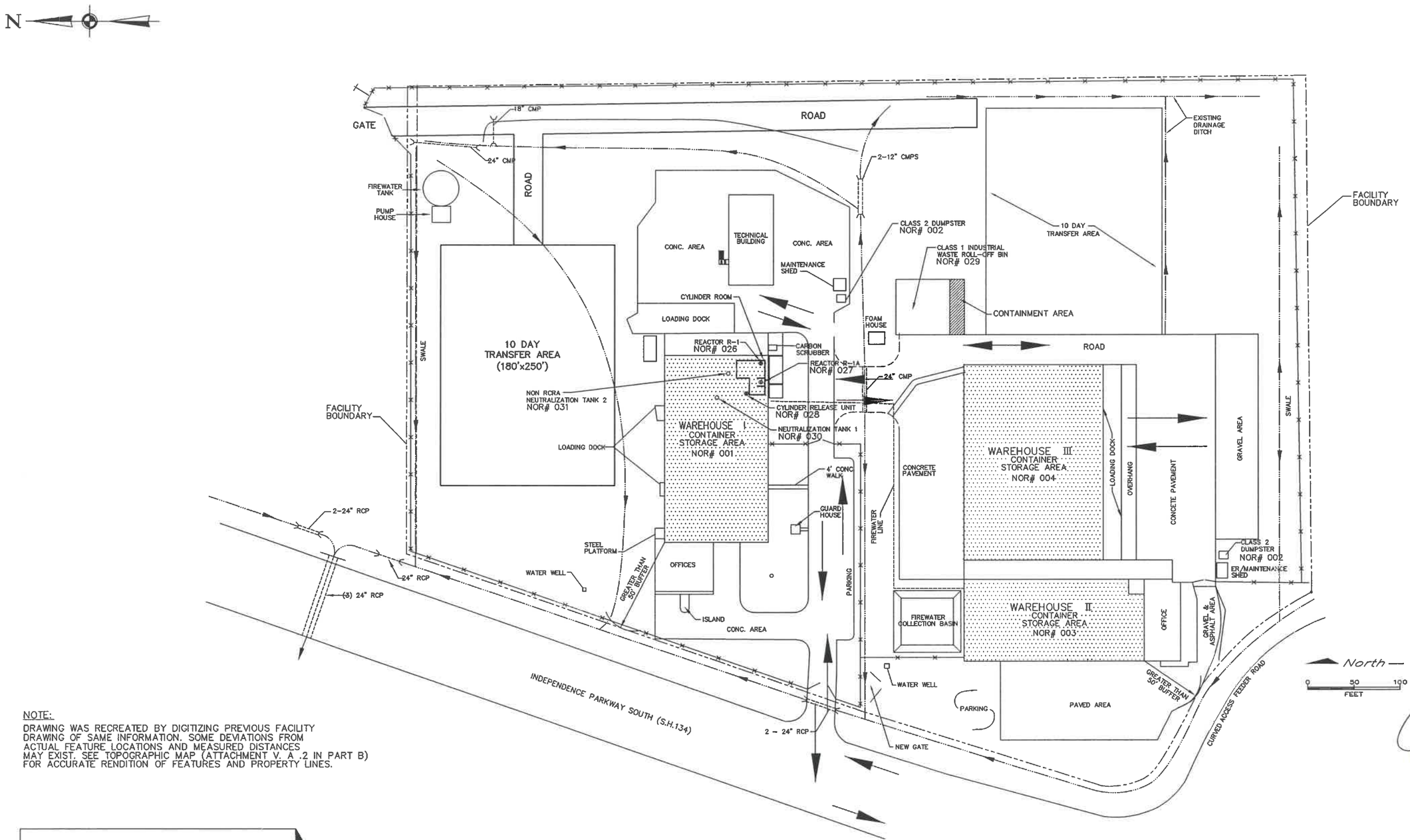
500 Independence Parkway South
LaPorte, Texas 77571
Phone: (281) 727-7800

THE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CLEAN HARBORS LAPORTE, LLC. ANY REPRODUCTION, CONSTRUCTION, OR DISTRIBUTION BY ANY PERSON OR ENTITY OTHER THAN CLEAN HARBORS LAPORTE, LLC, OR ITS AUTHORIZED AGENTS, IS STRICTLY PROHIBITED, EXCEPT WITH THE WRITTEN PERMISSION OF CLEAN HARBORS LAPORTE, LLC.

TITLE: CLEAN HARBORS LAPORTE TOPOGRAPHIC SITE MAP

DRAWN	CHECKED	SCALE	DATE	DRAWING NO.	REV.
KMC	JWC	AS NOTED	07/20/09	67LT-1000-002	A



NOTE:

DRAWING WAS RECREATED BY DIGITIZING PREVIOUS FACILITY DRAWING OF SAME INFORMATION. SOME DEVIATIONS FROM ACTUAL FEATURE LOCATIONS AND MEASURED DISTANCES MAY EXIST. SEE TOPOGRAPHIC MAP (ATTACHMENT V. A .2 IN PART B) FOR ACCURATE RENDITION OF FEATURES AND PROPERTY LINES.

LEGEND

- FACILITY PROPERTY BOUNDARY
- CHAIN LINK FENCE
- BOUNDARY OF EXISTING CONTAINER STORAGE AREAS
- DRAINAGE CHANNEL FLOWLINE AND FLOW DIRECTION

STATE OF TEXAS
J. W. CALDWELL
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PROFESSIONAL ENGINEER
05/13/20

CleanHarbors
LAPORTE
500 Independence Parkway South
LaPorte, Texas 77571
Phone: (281) 727-7600

REFERENCE DRAWINGS

TITLE	DRAWING NO.

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
10	PERMIT RENEWAL 2020	KMC			DAD	5/7/20	
9	CLASS I MODIFICATION	KMC			BR	3/21/14	
8	FENCE LINE MODIFICATION	KMC			BR	10/8/13	
7	REMOVED "PROPOSED NOR# 032"	KMC			BR	8/10/12	
6	REMOVED "PROPOSED" FROM NOR# 030, ADDED NOR# 029 & NOR# 031	KMC			MC	12/29/09	
5	REVISED ADDRESS, REMOVED ADJACENT PROPERTY INFORMATION & ADDED NOR #'S	KMC			MAR	7/30/09	
4	GENERAL REVISION	WDS				4/25/05	

TITLE:
SITE PLAN
FACILITY TRAFFIC PATTERNS

FILE: 403-01E

APPROVED:	SCALE:	DWG. NO.:	REV.
R.A.H.	1 = 50	403-01E	10

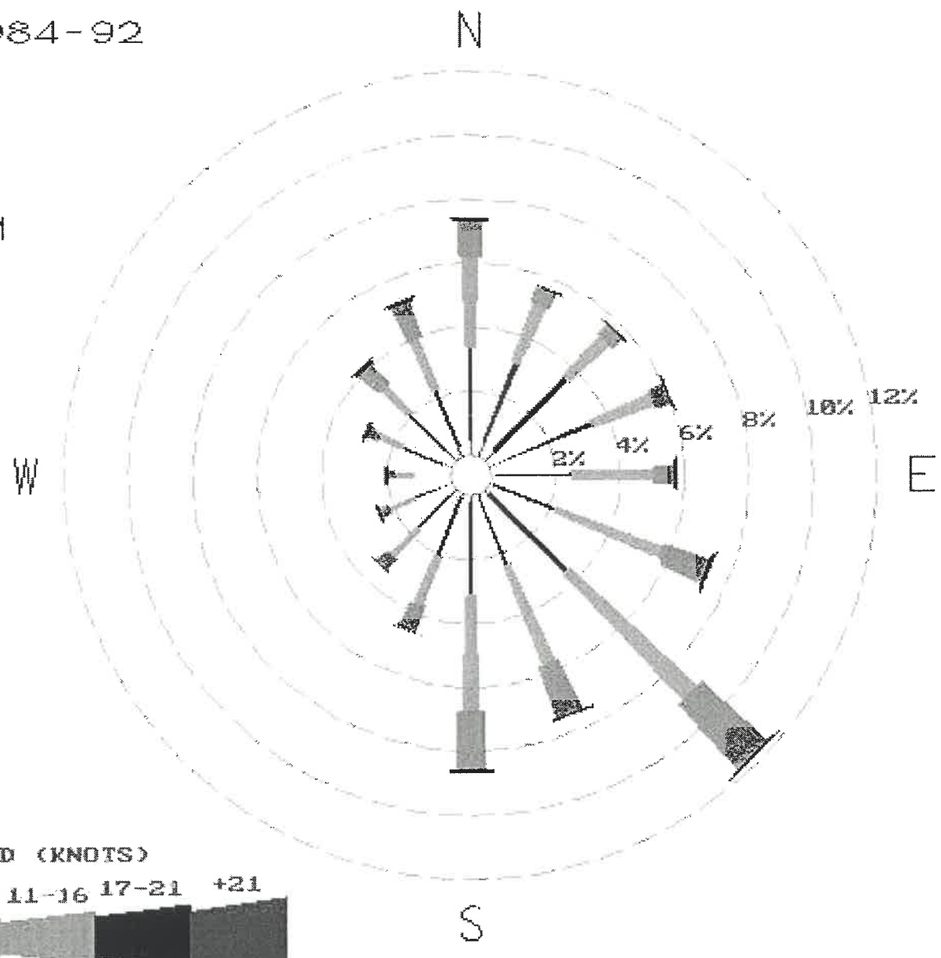
HOU Jan-Dec 1984-92

January 1

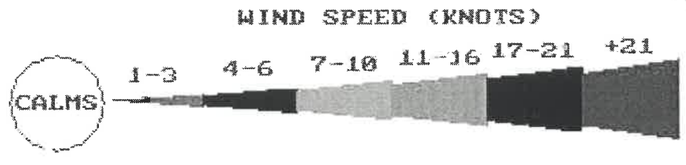
December 31

Midnight-11 PM

NOTE: Frequencies indicate direction from which the wind is blowing.



CALM WINDS 9.18%



Prevailing Wind Direction – Wind Rose

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J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/26/20

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
A	MSW TYPE V REGISTRATION	KMC	6/1/10	S.B.

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DRAWN	CHECKED	SCALE	DATE
K.M.C.	S.B.	AS NOTED	05/18/10

TITLE
CLEAN HARBORS LAPORTE FACILITY
WIND ROSE

DRAWING NO.
FIGURE II – C1

REV.
A

SITE LEGAL DESCRIPTION Tract 1:

A tract of land containing 6.533+5 acres out of the George Ross Survey, Abstract No. 646 in Harris County, Texas, being out of that fifty acre tract conveyed to T. & N.C.R.R. by deed recorded in Volume 3020, Page 611, Deed Records, which 50-acre tract was out of that. 79.747 acre tract, being Tract No. 1 in deed to Carl C. Pabick, Trustee recorded in Volume 2793, Page 851, Deed Records, of Harris County, Texas, subject tract being more particularly described by metes and bounds, as follows:

BEGINNING at a 5/8 inch iron pipe located South 00 degrees, 35 minutes, 00 seconds, East, a distance of 200.00 feet from the northeast corner of said 50-acre tract, on the east line of said Ross Survey, for the Northeast corner of this tract;

THENCE, continuing South 00 degrees, 35 minutes, 00 seconds, East, along the east survey line, a distance of 486.00 feet to a 1/2 inch iron pipe at the northeast corner of that 8.461-acre tract conveyed to Stahlman Lumber Co., by deed recorded in Volume 6027, Page 416, Deed Records, for the Southeast corner of, this tract;

THENCE, South 89 degrees, 29 minutes, 00 seconds, West, along a barbed wire fence on Stahlman's north line, a distance of 571.93 feet to a 1/2 inch iron rod on the southeasterly right-of-way line of Highway No. 134 (based on 120 feet width), for the Southwest corner of this tract;

THENCE, North 19 degrees, 00 minutes, 00 seconds, East, along the said southeasterly right-of-way line, a distance of 515.78 feet to a 5/8 inch iron rod for the Northwest corner of this tract;

THENCE, North 89 degrees, 30 minutes, 00 seconds, East, a distance of 499.35 feet to the PLACE OF BEGINNING.

SITE LEGAL DESCRIPTION Tract 2:

A 6.0113 acre tract out of a 8.4607 acre tract out of the George Ross Survey, Abstract 646, Harris County, Texas, (8.4607 acre tract described in instrument recorded under Film Code 191-31-1314, of the Harris. County Clerk's records);

COMMENCING at a 3/4" iron pipe located in the easterly right-of-way line of Battleground Road (State Highway No. 134) (120 feet wide), said iron pipe marking the Southwest corner of said 8.460-7 acre tract;

THENCE North 19 degrees 00, minutes; 00 seconds, East, 106.10 feet along the easterly right-of-way line of Battleground Road to a 1/2" iron rod set at the POINT OF BEGINNING of this tract;

THENCE continuing North 19 degrees, 00 minutes, 00 seconds,- East, 409.52 feet along the easterly right-of-way line of Battleground Road to a iron pipe at the Northwest corner of said 8.4607 acre tract;

THENCE North 89 degrees, 29 minutes ,00 seconds, East, 571.93 feet to a found wood corner post at the Northeast corner of said 8.4607 acre tract;

THENCE South 00 degrees, 35 minutes, 00 seconds, East, 226.00 feet along the east line of said 8.4607 acre tract to a 1/2" iron rod set for corner;

THENCE South 89 degrees, 29 minutes, 00 seconds, West, 150.00 feet to a 1/2" iron rod set for corner;

THENCE South 00 degrees, 35 minutes, 00 seconds, East 150.00 feet to a 1/2" iron rod set for corner;

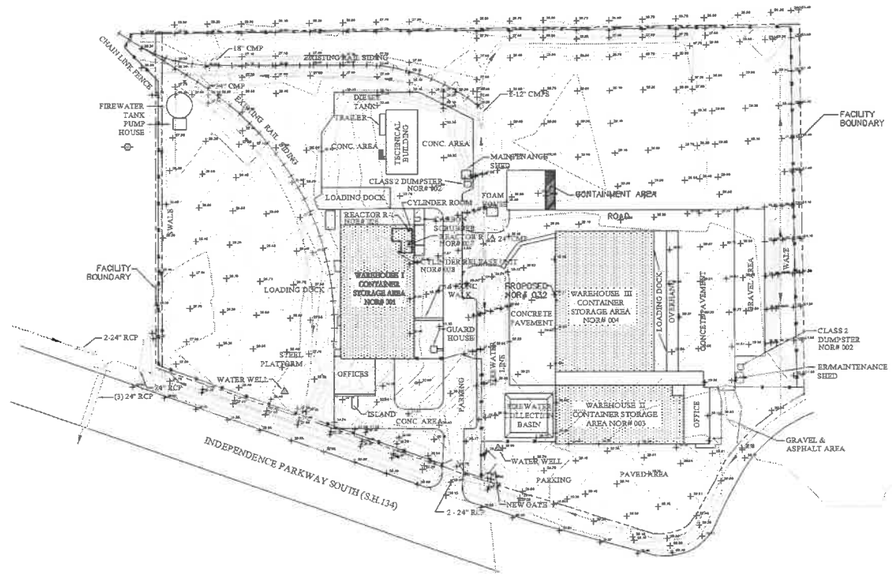
THENCE South 89 degrees, 29 minutes, OO seconds, West, 659.19 feet to the POINT OF BEGINNING and containing 261,854 square feet or 6.0113, acres of land.

SAVE AND EXCEPT from the above-described property a11 of that portion of said property which lies within the 0.8154 acre tract described in deed from Corsan Trucking Company, Inc. and Technical Environmental Systems, Inc. to the State of Texas, dated May 1, 1989 and recorded under Clerk's File No. M-451973 of the Real Property Records of Harris County, Texas, reference to which is hereby made for all purposes.

SITE LEGAL DESCRIPTION Tract 3:

All of that certain 2.449+ acre tract, more or less, out of the GEORGE ROSS SURVEY, ABSTRACT 646, Harris County, Texas, and being that portion of the 8.4607 acre tract described indeed to Corsan Trucking Company, Inc. recorded under Clerk's File No. L310019 of the Real Property Records of Harris County, Texas (Film Code No. 191-21-1311) which was, retained by Corsan Trucking, Inc. at the time it conveyed a 6.0113 acre tract, more or less, to Technical Environmental Systems, Inc. by deed under Clerk's File No. M-039841 of the Real Property Records of Harris County, Texas (Film Code No. 139-74=0072).

SAVE AND EXCEPT from the above-described property all of that , portion. of said propertywhich lies within the, 0.8154 acre tract described in deed from Corsan Trucking Company, Inc. and Technical Environmental Systems, Inc. to the State of Texas, dated May 1, , 1989, and recorded under Clerk's File No. M-451973 of the Real Property Records of Harris County, Texas, reference to which is hereby made for all purposes.



LEGEND

- FACILITY PROPERTY BOUNDARY
- CHAIN LINK FENCE
- BOUNDARY OF EXISTING CONTAINER STORAGE AREAS
- DRAINAGE CHANNEL FLOWLINE AND FLOW DIRECTION
- SPOT ELEVATION
- ONSITE WATER WELL
- OFFSITE WATER WELL

NOTES: SURROUNDING LAND USE IS INDUSTRIAL TO 2000 FEET
NEAREST 100 YEAR FLOOD PLAIN IS APPROXIMATELY 1 MILE FROM SITE

0 50 100
FEET

	BY	DATE
DRAWN	JGM	12/28/09
CHECKED		
REVISED		
APPROVED		
APPROVED		
APPROVED		

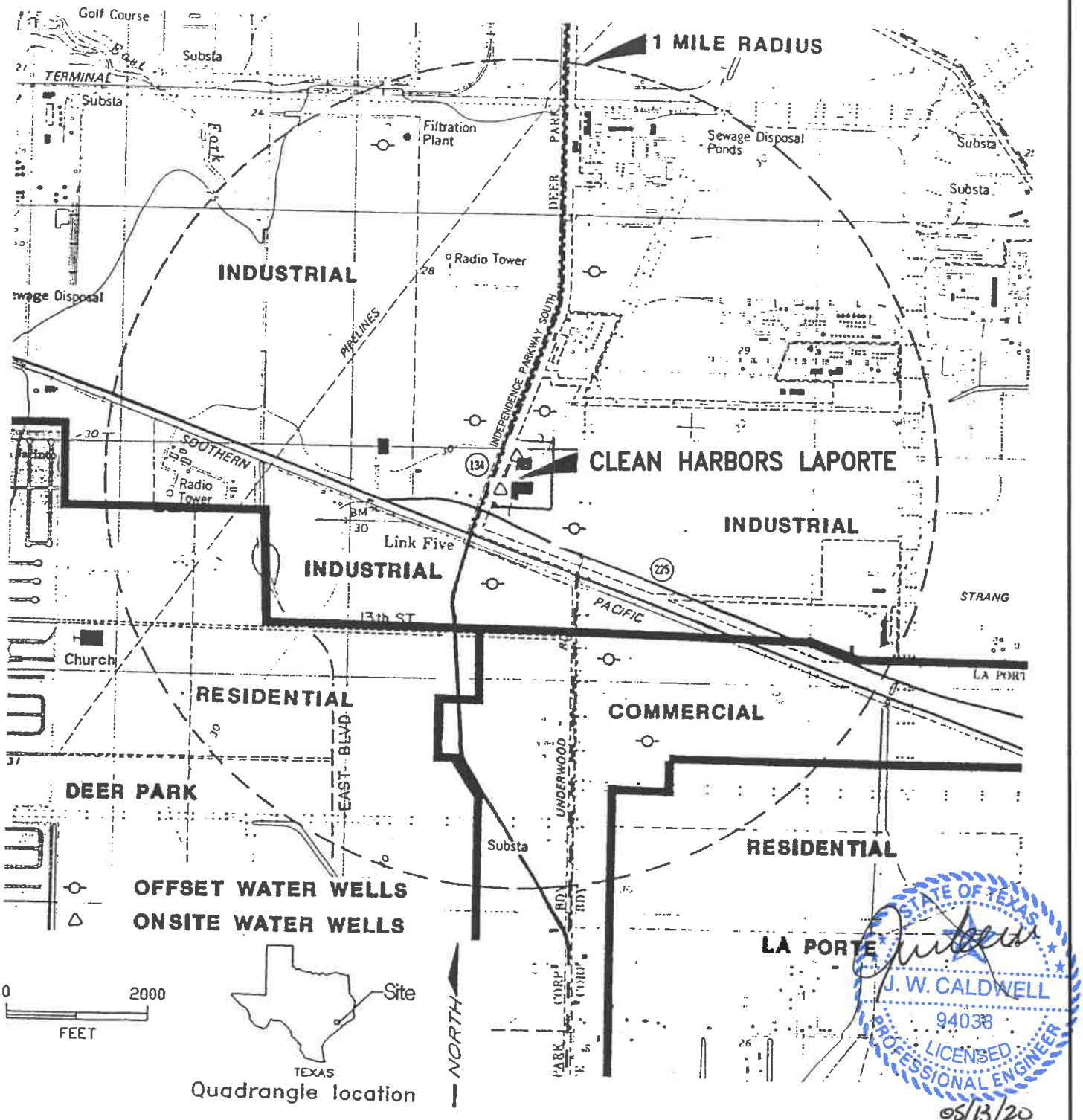
CleanHarbors

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/26/20

FIGURE V.A.5
OVERALL FACILITY PLAN + 1000 FEET
CLEAN HARBORS
LA PORTE, TEXAS

SCALE: AS SHOWN
PROJECT NO.: 1871

M:\Client\Cameron-Cox\1871-Laporte\1871-Facility-Plan_Water-Wells LAYOUT: 1 3/16/2010 3:15 PM



STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED PROFESSIONAL ENGINEER
05/13/20

Modified from USGS La Porte, Texas 7.5 Min.Quadrangle

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
B	PERMIT RENEWAL 2020	KMC	5/7/20	DAD

CleanHarbors®

TITLE

CLEAN HARBORS LAPORTE REGIONAL FACILITY MAP

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.A.R.	AS NOTED	07/30/09

DRAWING NO. 67LT-1000-003

REV. B

Table V.A. - Facility Waste Management Handling Units

TCEQ Permit Unit No. [1]	Unit Name	NOR No.[1]	Unit Description[3]	Capacity	Unit Status[2]
1	Container Storage Area I (Warehouse I)	001	202' x 109' covered storage area	403,960	Active
2	Container Storage Area II (Warehouse II)	003	188' x 76' covered storage area	264,970	Active
3	Container Storage Area III (Warehouse III)	004	209' x 142' covered storage area	395, 340	Active
4	Tank VS-593-1001	005	Storage Tank	22,500	Never Built and No Longer Permitted
5	Tank VS-593-1002	006	Storage Tank	22,500	Never Built and No Longer Permitted
6	Tank VS-593-2001	007	Storage Tank	22,500	Never Built and No Longer Permitted
7	Tank VS-593-2002	008	Storage Tank	22,500	Never Built and No Longer Permitted
8	Tank VS-593-2003	009	Storage Tank	22,500	Never Built and No Longer Permitted
9	Tank VS-593-2004	010	Storage Tank	22,500	Never Built and No Longer Permitted

TCEQ Permit Unit No. [1]	Unit Name	NOR No.[1]	Unit Description[3]	Capacity	Unit Status[2]
10	Tank VS-593-2005	011	Storage Tank	22,500	Never Built and No Longer Permitted
11	Tank VS-593-3001	012	Storage Tank	22,500	Never Built and No Longer Permitted
12	Tank VS-593-3002	013	Storage Tank	22,500	Never Built and No Longer Permitted
13	Tank VS-593-3003	014	Storage Tank	22,500	Never Built and No Longer Permitted
14	Tank VS-593-2101	015	Storage Tank	1,300	Never Built and No Longer Permitted
15	Tank VS-593-3101	016	Processing Tank	1,300	Never Built and No Longer Permitted
16	Tank VS-593-2006	017	Storage Tank	8,500	Never Built and No Longer Permitted
17	Tank VS-593-2007	018	Storage Tank	8,500	Never Built and No Longer Permitted
18	Tank VS-593-3004	019	Storage Tank	8,500	Never Built and No Longer Permitted
19	Tank VS-593-3005	020	Storage Tank	8,500	Never Built and No Longer Permitted
20	Tank VS-593-6101	021	Processing Tank	100	Never Built and No Longer Permitted

TCEQ Permit Unit No. [1]	Unit Name	NOR No.[1]	Unit Description[3]	Capacity	Unit Status[2]
21	Tank VS-593-4001	022	Storage Tank	5,100	Never Built and No Longer Permitted
22	Solids Shredder & Compactor	023	Miscellaneous Unit	To Be Determined	Never Built and No Longer Permitted
23	Drum Washer	024	Miscellaneous Unit	To Be Determined	Never Built and No Longer Permitted
24	Chemical Reactor Tank R-1	026	Processing Tank located inside Warehouse I	500	Active
25	Chemical Reactor Tank R-1A	027	Processing Tank located inside Warehouse I (Replacement Processing Tank to be located inside Warehouse I)	500 (Proposed 1,500)	Active (Proposed)
26	Cylinder Release Unit 1	028	Miscellaneous Unit, located inside Warehouse I	N.A.	Active
28	Cylinder Release Unit 2	032	Miscellaneous Unit, located inside Warehouse III	N.A.	Proposed
033	Bulk Container Storage Area	033	Bulk Outdoor Container Storage Area	181,777 (28 roll-off boxes)	Proposed
027	Chemical Reactor Tank R-2	030	Processing Tank located inside Warehouse I	500	Proposed

1. Permitted Unit No. and NOR No. cannot be reassigned to new units or used more than once and all units that were in the Attachment D of a previously issued permit must be listed.

2. Unit Status options: Active, Closed, Inactive (built but not managing waste), Proposed (not yet built), Never Built, Transferred, Post-Closure.

3. If a unit has been transferred, the applicant should indicate which facility/permit it has been transferred to in the Unit Description column of Table V.A.

Professional Engineer Certification

Container Storage Area 1 (Warehouse I) is a 22,018 ft² concrete pad surrounded by metal framed buildings designed and managed to meet the requirements of 40 CFR Subpart I (264.170-264.178), and 270.15.

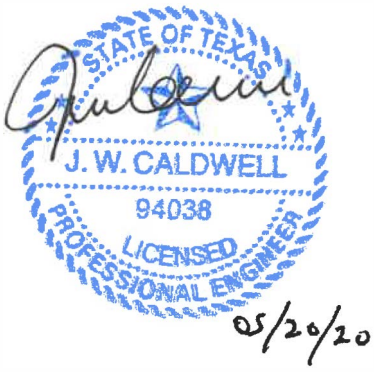
The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date 05/20/20

J. W. Caldwell
Texas PE # 94038



ENGINEERING REPORT - CONTAINER STORAGE AREA 1

GENERAL INFORMATION

This Engineering Report contains details specific to Container Storage Area 1 (TCEQ unit 1, NOR 001) of the Clean Harbors LaPorte, LLC. For additional details on this unit see: Current Site Plan included in the General Engineering Report (Appendix V.A of the Part B application); Tables V.A and V.B of Part B application. Below is a list of drawings for Container Storage Area 1:

Drawing No. 67LT-7100-501

Container Storage Area 1 (Warehouse I) is located east of the offices. The container storage area is enclosed metal frame buildings protecting the container storage areas from precipitation and weather related concerns and has a reinforced concrete floor with perimeter curbs. Because the building is completely enclosed, no stormwater containment is required. The approximate dimensions of Warehouse I are 109 feet wide by 202 feet long. Storage and staging areas at each warehouse have concrete bases and are covered by the building enclosure. All floor drains have been plugged using concrete, and the floors have been sealed with an epoxy coating. Warehouse I is currently subdivided into seven areas in accordance with previous permitted configurations; although remaining a single HWMU. The perimeter curbs are a minimum of 6 inch high reinforced concrete with 1-inch deep keys and water stops to seal the curb/slab interface. Additional interior curbing separates the subdivided areas; however, these are for the operational convenience of the owner and may be altered as the owner deems fit. Either a gently sloped concrete berm or metal ramp is provided for safe movement of container handling equipment over the curbs between the subdivided areas within each container storage and staging areas. Drawing No. 67LT-7100-501 attached to this Engineering Report show construction details for Warehouse I (i.e., curbs, dimensions).

Warehouse I is located outside a 100 year flood plain (see FEMA Map attached to Section II.F) and is more than 15 meters (50 ft) from the property line as required by 40 CFR 264.176 (see the Overall Facility Plan attached to Appendix V.A). Design details can be found in the attached drawing and containment calculations.

As shown on Table V.B of the Part B application, Warehouse I is designed to store 403,960 gallons (7,342 55-gallon drum equivalents) in DOT containers that contain a wide variety of organic and inorganic wastes including wastes that maybe ignitable, reactive or incompatible. Specific waste numbers are found on Tables IV.B and V.B of the Part B application.

The remaining sections below are structured based on the requirements of 40 CFR 264.171-264.173 and 264.175-264.177. The information outlined in 40 CFR 270.15 is

described in these sections, particularly the Containment section and associated drawings and calculations.

§264.171 Condition of Containers

Containers are unloaded under the covered areas at the loading/unloading docks and will be staged in these areas. Containers received by truck are unloaded at the docks adjacent to Warehouse I. These docks are covered and have secondary containment in the event of a release. Containers received by rail are unloaded at the rail car unloading areas in Warehouse I. Rail shipments received at Warehouse I could contain liquids or solids and are received at the area provided with secondary containment. Containers unloaded in these areas will be staged in the immediate dock area for inspection, segregation, and repackaging (if necessary).

Prior to moving any container into a storage area, it will be inspected for leaks and the condition of the container. The Waste Profile Record and any sample analysis required under the facility WAP will be used to determine the appropriate area within the facility for storage.

The wastes received in these areas are stored in a compatible manner. That is, they will be compatible with the storage containers as well as the wastes that are stored in the same container storage area. Regulated containers received at the facility will meet U.S. Department of Transportation (DOT) requirements for the applicable means of transportation (road or railroad). Only containers in good condition, free of excessive rust or structural defects, will be used for storage. Wastes to be received by the facility will come to the facility packaged in various sizes of containers, including but not limited to 5 gallon to 55 gallon drums, supersacks, one yard boxes, and portable tanks. Additionally, over pack containers of various sizes will be utilized for release minimization purposes.

Containers holding hazardous waste will remain closed during storage and handling, except when it is necessary to sample, inspect, add, or remove waste. Containers of hazardous waste will be handled, stored and disposed of in a manner so as to minimize spillage or leakage of waste from the container. Drums will normally be sealed (bungs tight or tops fastened tight). Containers holding hazardous waste will not be opened, handled, or stored in a manner that may rupture it, cause it to leak, or otherwise jeopardize the integrity of the container.

Hazards in unloading will be minimized though the proper training of the facility staff as provided in the Personnel Training Plan described in Section III of this Part B application. Spill response is detailed in the Contingency/Emergency Response Plan in Section III.

Methods will be employed to minimize air emissions related to the management of containers at this facility in accordance with 40 CFR 270.27 and 40 CFR 264, Subpart CC. These requirements apply to all wastes which have an average Volatile Organic Compound (VOC) concentration of 500 parts per million by weight or greater. These requirements

apply at the point of waste origination, defined as the point where the facility accepts the waste(s). Procedures to ensure compliance with any applicable air emission requirements are presented in Section X of this Part B application.

§264.172 Compatibility of Waste with Containers

The container storage portions of Warehouse I is segregated into subdivided areas by concrete curbs and berms. Warehouse I is subdivided into seven sub areas. The owner plans to use these subdivided areas in the container storage areas for additional operational controls, allowing for flexibility in storage of waste types, including segregation of incompatible wastes. However, the owner reserves the right to alter the arrangement of these subdivided areas, either by removing or relocating the concrete curbs, as deemed appropriate. Each subdivided area is used only to store wastes which are compatible. Flammable liquids are restricted to storage in Warehouse III only. These practices comply with the requirements of 40 CFR 264.177(c). Flammable and incompatible waste types will be managed in accordance with the requirements of the operating permit.

Each drum to be stored will be evaluated using the supplied waste profile record (WPR). The wastes are typically segregated into hazard class compatibility groups as indicated in the following list:

HAZARD CLASS COMPATIBILITY GROUPS

Group	Group
Oxidizer	Combustible/Flammable
Organic Peroxide	Reactive
Polychlorinated Biphenyl	Lab Packs
Alkaline	Otherwise Regulated Material
Acid	Non Hazardous/ Non regulated

There may be coexisting compatibility groups in the same container storage area, or an individual storage area may be limited to one compatibility group only. Compatibility of the wastes will be confirmed using the Waste Profile Record, any WAP required sample analysis, and reference documents such as "A METHOD FOR DETERMINING THE COMPATIBILITY OF HAZARDOUS WASTES" (EPA Document EPA 600/2 80 076).

Activities to be conducted by the facility do not include blending or co mingling of potentially incompatible waste materials. In accordance with 40 CFR 264.177(a), incompatible wastes or wastes and materials will generally not be placed in the same container unless specific analysis, trial testing, or established reference literature supports that an adverse reaction, as listed in 40 CFR 264.17(b), will not occur. Furthermore, hazardous waste will not be placed into an unwashed container that previously held an incompatible waste or material as required by 40 CFR 264.177(b). Therefore, the compatibility concerns are limited to the possibility of leaks from containers within a storage area mixing with leaks from another

container during a spill or emergency. Compatibility concerns include the potential for fire, generation of toxic and flammable gases, explosion, and violent polymerization. Accordingly, wastes which have the potential to cause these types of reactions will not be stored within the same subdivided area.

If the generator does not provide sufficient information to determine that the waste is potentially incompatible with any of the wastes stored in a required container storage area, the waste will either be rejected or additional analysis will be conducted by a contract laboratory prior to storage.

The EPA sponsored compatibility method allows determinations by type of waste and Standard Industrial Classification code of the generator. The resulting compatibility determination is, by design, conservative and eliminates the need for waste analyses.

In terms of the storage requirements for aisle space and maximum pile size under the applicable NFPA 30, these "generally compatible" wastes will be treated the same as the major waste type with which they are stored until removed from the storage area. For example, if a pH neutral oil is stored in a Class II flammable waste storage area, the drums containing the pH neutral oil will be included in determining the allowable size of the container piles within that area.

§264.173 Management of Containers

Loading docks are raised to truck bed level to minimize the potential for loading related spills. The Warehouse I dock is equipped with secondary containment. Walls of the dock are curbed and the truck bay entrance has a berm to contain spills and prevent run on. Staging areas used for temporary holding, weighing, and etc., also have concrete curbs for secondary containment. Concrete berms or steel ramps are used to pass over the curbed containment between sub areas of the storage areas or to exterior locations outside the warehouses.

The attached table summarizes the contained surface areas, rated storage capacities, required secondary containment capacity (10 percent of storage capacity), and the available secondary containment capacity provided by the 6 inch high curbs. Footnotes to the table describe how the quantities were derived. Based on these quantities and available secondary containment volumes, Warehouse I has more than the secondary containment capacity required by 40 CFR 264.175(b)(3).

Staging areas located adjacent to Warehouse I is are used only for temporary container holding while loading, unloading, segregating, weighing, and repackaging containers. They are not, however, used for container storage. The maximum volume of wastes held in each of the four staging areas will not exceed 8,800 gallons (160 55-gallon drum equivalents). For purposes of secondary containment, 6 inch high concrete curbing also encloses the staging areas, providing well in excess of 10 percent of the temporarily held container volume. The

maximum total container storage capacity, for purposes of permit limitations and closure cost calculations, is 403,960 gallons, exclusive of allowable staging area volumes.

Generally, containers used for waste storage will be kept on pallets (typically 4 to 4.5 inches high) with the majority of them subsequently elevated further on the storage racks. If 10 percent of the containers, which may hold liquids, leak their entire contents, the maximum depth of accumulated liquid within any of the subdivided storage area will be less than 2.5 inches. Thus the pallets and rack storage will prevent the design spill from contacting the bottoms of the containers. This condition precludes the need to slope the floors in order to drain and remove spilled liquids in accordance with 40 CRF 264.175(b)(2).

Spills will normally be managed by the use of absorbents and will be removed in a timely manner. Should a large spill occur, other means (such as a vacuum truck or a temporary tank) may be used. Should a tank be used, proper notification will be provided to the TCEQ and the tank will be operated in accordance with 90 day storage requirements. Based on the computed volumes for secondary containment, the excess capacity will provide an ample factor of safety to prevent overflow of the systems used to collect the spill.

§264.175 Containment

Warehouse I is built to the following specifications in compliance with 40 CFR 261.175 (b)(1):

> Concrete base: 4" minimum thickness, 3,000 psi, with rebar reinforcing. Sub-base loading is minimum 1,500 psi.
>
> All container storage areas are curbed for containment and are monolithic in character. All bases are free of cracks and gaps, and where cracks have developed over time, a suitable filler and sealer has been used. The bases are smooth in appearance without spalling, flaking, or having signs of chemical attack. The areas have significant containment.
>
> The structural integrity of the bases is adequate for the purposes for which they were designed, that is, for chemical containment.
>
> Warehouse I is in an enclosed and covered area therefore rainfall infiltration is not an issue relative to adequate secondary containment capacity.

Containment calculations are attached that show that the containment structure has a volume greater than 10% of the total volume and larger than the largest container (1.1 cubic yard-box container or four 55-gallon drums).

§264.176 Special Requirements for Ignitable or Reactive Wastes

All storage areas are at least fifty (50) feet from the property lines, greater than the 50 feet required by 40 CFR 264.176 and applicable NFPA codes. Minimum buffer zone distances for the container storage areas are shown on figures attached to V.A and Drawing No. 67LT-7100-501.

§264.177 Special Requirements for Incompatible Wastes

As shown in Drawing No. 67LT-7100-501 the container storage portions of Warehouse I is segregated into subdivided into seven sub areas by concrete curbs and berms. The owner plans to use these subdivided areas in the container storage areas for additional operational controls, allowing for flexibility in storage of waste types, including segregation of incompatible wastes. However, the owner reserves the right to alter the arrangement of these subdivided areas, either by removing or relocating the concrete curbs, as deemed appropriate. Each subdivided area is used only to store wastes which are compatible. Flammable liquids are restricted to storage in Warehouse III only. These practices comply with the requirements of 40 CFR 264.177(c). Flammable and incompatible waste types will be managed in accordance with the requirements of the operating permit.

DRAWING AND CALCULATIONS

SECONDARY CONTAINMENT CALCULATIONS

Container Storage Area 1

Total building footprint: 202 ft x 109 ft = 22,018 s.f.

Area within building excluding internal partitions and ramps = 20,610 s.f. with 6" curb

Containment capacity = 20,610 s.f. x 0.5 ft x 0.9 usage factor x 7.48 gal./c.f. = 69,300 gallons

Storage capacity = 10x containment capacity = 693,000 gallons

Rated storage capacity = 403,960 gallons (approximately 7,345 55-gallon drum equivalents)

Supplemental calculations (attached) regarding change in capacity resulting from installation of training room and laboratory indicate that storage capacity remains sufficient.

Container Storage Area 1 is covered and surrounded by curb, so precipitation and run-on do not need to be included in storage capacity calculations.

This information is to demonstrate that construction of a training room and laboratory within the current containment system of warehouse I at Clean Harbors, La Porte LLC would not lower the available secondary containment below the required secondary containment for warehouse I. The Secondary containment of warehouse I is calculated by determining the surface area within 6 inch perimeter curb, multiplying this area by the six inch height of the curb to determine volume then converting this volume to gallons using 7.48 gallons/ cubic foot. This number was reduced by 10%. The resulting available secondary containment volume in gallons is 69,300 gallons. The required secondary containment needed for the rated storage capacity of warehouse I is 40,400 gallons. This information is part of the incorporated permit application found in V.B.1.4.

Building an interior wall will not change the available secondary containment since it is calculated based on the perimeter of the warehouse. Within the warehouse there are other berms and curbs which restrict liquid transfer between areas. The current permit application states these berms/curbs can be altered as needed to accommodate the stored waste within the warehouse to achieve separation and segregation.

The proposed area of the laboratory, training room and closet is calculated below.

24 ft x 45 ft = 1,080 ft^2 Training room and closet

20 ft x 16 ft = 320 ft^2 Laboratory

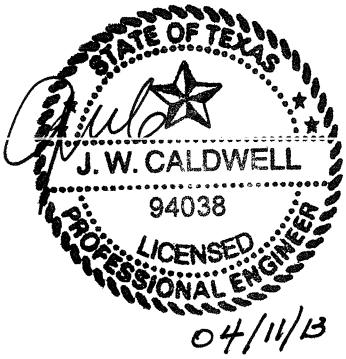
320 ft^2 + 1,080 ft^2 = 1,400 ft^2 total area

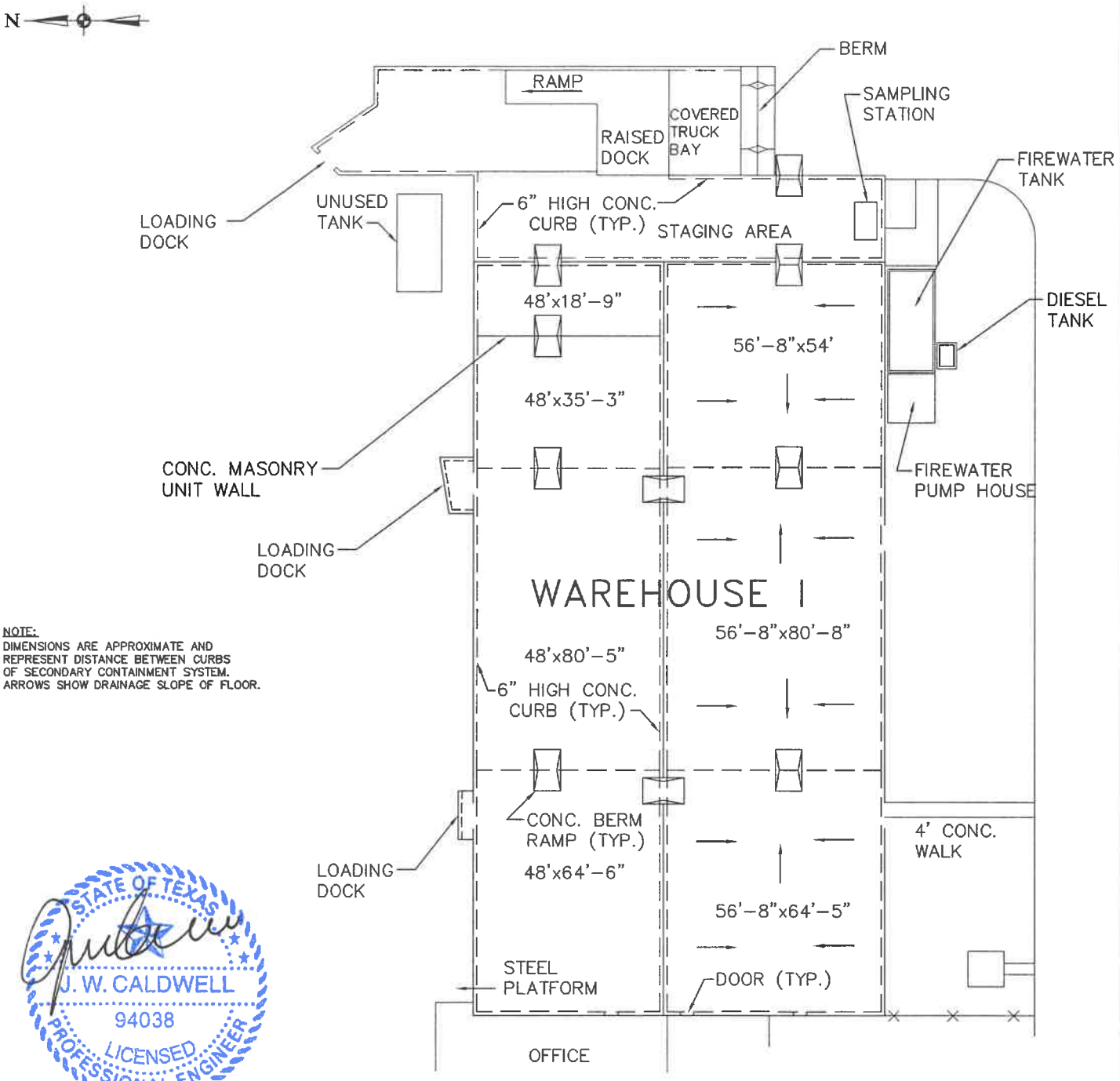
Calculated Volume 1,400 ft^2 x .5 ft (curb height) = 700 ft^3

Gallon conversion 700 ft x 7.48 gal/ft^3 = 5,236 round to 5,240 gallons

69,300 gallons – 5,240 gallons = 64,060 gallons

64,060 gallons is significantly greater than the required secondary containment of 40,400 gallons. This confirms if this area were to restrict the flow of liquid within the secondary containment of the warehouse there is still an excess of available secondary containment.





NOTE:
DIMENSIONS ARE APPROXIMATE AND REPRESENT DISTANCE BETWEEN CURBS OF SECONDARY CONTAINMENT SYSTEM. ARROWS SHOW DRAINAGE SLOPE OF FLOOR.

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED PROFESSIONAL ENGINEER
05/13/20

0 20 40 80
GRAPHIC SCALE

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	PERMIT RENEWAL 2020	KMC	5/7/20	DAD
B	FOR PERMIT RENEWAL UPDATE	KMC	3/30/10	S.B.
A	FOR PERMIT RENEWAL	KMC	7/30/09	MAR

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TITLE
CLEAN HARBORS LAPORTE WAREHOUSE I CONTAINER STORAGE AREA

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.A.R.	1" = 40'	07/14/09

DRAWING NO. 67LT-7100-501

REV. C

Professional Engineer Certification

Container Storage Area 2 (Warehouse II) is a 14,288 ft² concrete pad surrounded by metal framed building designed and managed to meet the requirements of 40 CFR Subpart I (264.170-264.178), and 270.15.

The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature  Date 05/20/20

J. W. Caldwell
Texas PE # 94038

ENGINEERING REPORT - CONTAINER STORAGE AREA 2

GENERAL INFORMATION

This Engineering Report contains details specific to Container Storage Area 2 (TCEQ unit 2, NOR 003) of the Clean Harbors LaPorte, LLC. For additional details on this unit see: Overall Facility Plan included in the General Engineering Report (Appendix V.A of the Part B application); Tables V.A and V.B of Part B application. Below is a list of drawings for Container Storage Area 2:

Drawing No. 67LT-7200-501
Drawing No. 67LT-7200-502

Container Storage Area 2 (Warehouse II) is located west of Warehouse III and south of the firewater collection basin. The container storage area is an enclosed metal frame building protecting the container storage area from precipitation and weather related concerns and has a reinforced concrete floor with perimeter curbs. Because the building is completely enclosed, no stormwater containment is required. The approximate dimensions of Warehouse II are 76 feet wide by 188 feet long. Storage and staging areas at each warehouse have concrete bases and are covered by the building enclosure. All floor drains have been plugged using concrete, and the floors have been sealed with an epoxy coating. Warehouse II is currently subdivided into three areas in accordance with previous permitted configurations; although remaining a single HWMU. The perimeter curbs are a minimum of 6 inch high reinforced concrete with 1-inch deep keys and water stops to seal the curb/slab interface. Additional interior curbing separates the subdivided areas; however, these are for the operational convenience of the owner and may be altered as the owner deems fit. Either a gently sloped concrete berm or metal ramp is provided for safe movement of container handling equipment over the curbs between the subdivided areas within each container storage and staging area. Drawing No. 67LT-7200-501 attached to this Engineering Report show construction details for Warehouse II (i.e., curbs, dimensions).

Warehouse II is located outside a 100 year flood plain (see FEMA Map attached to Section II.F) and is more than 15 meters (50 ft) from the property line as required by 40 CFR 264.176 (see the Overall Facility Plan drawing attached to Appendix V.A). Design details can be found in the attached drawings and containment calculations.

As shown on Table V.B of the Part B application, Warehouse II is designed to store 264,970 gallons (4,816 55-gallon drum equivalents) in DOT containers that contain a wide variety of organic and inorganic wastes including wastes that maybe ignitable, reactive or incompatible. Specific waste numbers are found on Table IV.B and Table V.B of the Part B application.

The remaining sections below are structured based on the requirements of 40 CFR 264.171-264.173 and 264.175-264.177. The information outlined in 40 CFR 270.15 is

described in these sections, particularly the Containment section and associated drawings and calculations.

§264.171 Condition of Containers

Containers are unloaded under the covered areas at the loading/unloading docks and will be staged in these areas. Containers received by truck are unloaded at the docks adjacent to Warehouse II. These docks are covered and have secondary containment in the event of a release. Containers unloaded in these areas will be staged in the immediate dock area for inspection, segregation, and repackaging (if necessary).

Prior to moving any container into a storage area, it will be inspected for leaks and the condition of the container. The Waste Profile Record and any sample analysis required under the facility WAP will be used to determine the appropriate area within the facility for storage.

The wastes received in these areas are stored in a compatible manner. That is, they will be compatible with the storage containers as well as the wastes that are stored in the same container storage area. Regulated containers received at the facility will meet U.S. Department of Transportation (DOT) requirements for the applicable means of transportation (road or railroad). Only containers in good condition, free of excessive rust or structural defects, will be used for storage. Wastes to be received by the facility will come to the facility packaged in various sizes of containers, including but not limited to 5 gallon to 55 gallon drums, supersacks, one yard boxes, and portable tanks. Additionally, over pack containers of various sizes will be utilized for release minimization purposes.

Containers holding hazardous waste will remain closed during storage and handling, except when it is necessary to sample, inspect, add, or remove waste. Containers of hazardous waste will be handled, stored and disposed of in a manner so as to minimize spillage or leakage of waste from the container. Drums will normally be sealed (bungs tight or tops fastened tight). Containers holding hazardous waste will not be opened, handled, or stored in a manner that may rupture it, cause it to leak, or otherwise jeopardize the integrity of the container.

Clean Harbors La Porte will receive medical waste on site for repackaging, consolidation and subsequent off site transportation for off site disposal. See Attachment V.B.ii.1.

Hazards in unloading will be minimized though the proper training of the facility staff as provided in the Personnel Training Plan described in Section III of this Part B application. Spill response is detailed in the Contingency/Emergency Response Plan in Section III.

Methods will be employed to minimize air emissions related to the management of containers at this facility in accordance with 40 CFR 270.27 and 40 CFR 264, Subpart CC. These requirements apply to all wastes which have an average Volatile Organic Compound (VOC) concentration of 500 parts per million by weight or greater. These requirements

apply at the point of waste origination, defined as the point where the facility accepts the waste(s). Procedures to ensure compliance with any applicable air emission requirements are presented in Section X of this Part B application.

§264.172 Compatibility of Waste with Containers

The container storage portions of the warehouse is segregated into three subdivided areas by concrete curbs and berms. The owner plans to use these subdivided areas in the container storage area for additional operational controls, allowing for flexibility in storage of waste types, including segregation of incompatible wastes. However, the owner reserves the right to alter the arrangement of these subdivided areas, either by removing or relocating the concrete curbs, as deemed appropriate. Each subdivided area is used only to store wastes which are compatible. Flammable liquids are restricted to storage in Warehouse III only. These practices comply with the requirements of 40 CFR 264.177(c). Flammable and incompatible waste types will be managed in accordance with the requirements of the operating permit.

Each drum to be stored will be evaluated using the supplied waste profile record (WPR). The wastes are typically segregated into hazard class compatibility groups as indicated in the following list:

HAZARD CLASS COMPATIBILITY GROUPS

Group	Group
Oxidizer	Combustible/Flammable
Organic Peroxide	Reactive
Polychlorinated Biphenyl	Lab Packs
Alkaline	Otherwise Regulated Material
Acid	Non Hazardous/ Non regulated

There may be coexisting compatibility groups in the same container storage area, or an individual storage area may be limited to one compatibility group only. Compatibility of the wastes will be confirmed using the Waste Profile Record, any WAP required sample analysis, and reference documents such as "A METHOD FOR DETERMINING THE COMPATIBILITY OF HAZARDOUS WASTES" (EPA Document EPA 600/2 80 076).

Activities to be conducted by the facility do not include blending or comingling of potentially incompatible waste materials. In accordance with 40 CFR 264.177(a), incompatible wastes or wastes and materials will generally not be placed in the same container unless specific analysis, trial testing, or established reference literature supports that an adverse reaction, as listed in 40 CFR 264.17(b), will not occur. Furthermore, hazardous waste will not be placed into an unwashed container that previously held an incompatible waste or material as required by 40 CFR 264.177(b). Therefore, the compatibility concerns are limited to the possibility of leaks from containers within a storage area mixing with leaks from another

container during a spill or emergency. Compatibility concerns include the potential for fire, generation of toxic and flammable gases, explosion, and violent polymerization. Accordingly, wastes which have the potential to cause these types of reactions will not be stored within the same subdivided area.

If the generator does not provide sufficient information to determine that the waste is potentially incompatible with any of the wastes stored in a required container storage area, the waste will either be rejected or additional analysis will be conducted by a contract laboratory prior to storage.

The EPA sponsored compatibility method allows determinations by type of waste and Standard Industrial Classification code of the generator. The resulting compatibility determination is, by design, conservative and eliminates the need for waste analyses.

In terms of the storage requirements for aisle space and maximum pile size under the applicable NFPA 30, these "generally compatible" wastes will be treated the same as the major waste type with which they are stored until removed from the storage area. For example, if a pH neutral oil is stored in a Class II flammable waste storage area, the drums containing the pH neutral oil will be included in determining the allowable size of the container piles within that area.

§264.173 Management of Containers

Staging areas used for temporary holding, weighing, and etc., also have concrete curbs for secondary containment. Concrete berms or steel ramps are used to pass over the curbed containment between sub areas of the storage areas or to exterior locations outside the warehouses.

The following table summarizes the contained surface areas, rated storage capacities, required secondary containment capacity (10 percent of storage capacity), and the available secondary containment capacity provided by the 6 inch high curbs. Footnotes to the table describe how the quantities were derived. Based on these quantities and available secondary containment volumes, each container storage area has more than the secondary containment capacity required by 40 CFR 264.175(b)(3).

Staging areas located adjacent to the Warehouse II container storage area are used only for temporary container holding while loading, unloading, segregating, weighing, and repackaging containers. They are not, however, used for container storage. The maximum volume of wastes held in each of the four staging areas will not exceed 8,800 gallons (160 55-gallon drum equivalents). For purposes of secondary containment, six inch high concrete curbing also encloses the staging areas, providing well in excess of 10 percent of the temporarily held container volume. The maximum total container storage capacity, for purposes of permit limitations and closure cost calculations, is 264,970 gallons, exclusive of allowable staging area volumes.

Generally, containers used for waste storage will be kept on pallets (typically 4 to 4.5 inches high) with the majority of them subsequently elevated further on the storage racks. If 10 percent of the containers, which may hold liquids, leak their entire contents, the maximum depth of accumulated liquid within any of the subdivided storage area will be less than 2.5 inches. Thus the pallets and rack storage will prevent the design spill from contacting the bottoms of the containers. This condition precludes the need to slope the floors in order to drain and remove spilled liquids in accordance with 40 CRF 264.175(b)(2).

Spills will normally be managed by the use of absorbents and will be removed in a timely manner. Should a large spill occur, other means (such as a vacuum truck or a temporary tank) may be used. Should a tank be used, proper notification will be provided to the TCEQ and the tank will be operated in accordance with 90 day storage requirements. Based on the computed volumes for secondary containment, the excess capacity will provide an ample factor of safety to prevent overflow of the systems used to collect the spill.

§264.175 Containment

Warehouse II is built to the following specifications in compliance with 40 CFR 261.175 (b)(1):

Concrete base: 4” minimum thickness, 3,000 psi, with rebar reinforcing. Sub-base loading is minimum 1,500 psi.

All container storage areas are curbed for containment, and are monolithic in character. Where a joint exists, a chemical resistant backer rod is embedded in the joint, below the slab surface. Curb heights vary depending upon the amount of containment required.

All bases are free of cracks and gaps, and where cracks have developed over time, a suitable filler and sealer has been used. The bases are smooth in appearance without spalling, flaking, or having signs of chemical attack. The areas have significant containment.

The structural integrity of the bases is adequate for the purposes for which they were designed, that is, for chemical containment.

Warehouse II is in an enclosed and covered area therefore rainfall infiltration is not an issue relative to adequate secondary containment capacity.

Containment calculations are attached that show that the containment structure has a volume greater than 10% of the total volume and larger than the largest container (1.1 cubic yard-box container or four 55-gallon drums).

§264.176 Special Requirements for Ignitable or Reactive Wastes

All storage areas are at least fifty (50) feet from the property lines as required by 40 CFR 264.176 and applicable NFPA codes. Minimum buffer zone distances for the container storage areas are shown on figures attached to V.A and V.B.ii.

§264.177 Special Requirements for Incompatible Wastes

As shown in the attached drawings the container storage portions of Warehouse II are segregated into subdivided into three sub-areas by concrete curbs and berms. The owner plans to use these subdivided areas in the container storage area for additional operational controls, allowing for flexibility in storage of waste types, including segregation of incompatible wastes. However, the owner reserves the right to alter the arrangement of these subdivided areas, either by removing or relocating the concrete curbs, as deemed appropriate. Each subdivided area is used only to store wastes which are compatible. Flammable liquids are restricted to storage in Warehouse III only. These practices comply with the requirements of 40 CFR 264.177(c). Flammable and incompatible waste types will be managed in accordance with the requirements of the operating permit.

DRAWINGS, CALCULATIONS

AND ATTACHMENT V.B.A

SECONDARY CONTAINMENT CALCULATIONS

Container Storage Area 2

Dimensions = 188’ long x 76’ wide, 6” curb

Containment capacity = 188’ x 76’ x 0.5’ x 0.9 usage factor x 7.48 gal./c.f. = 48,093 rounded down to 48,000 gallons

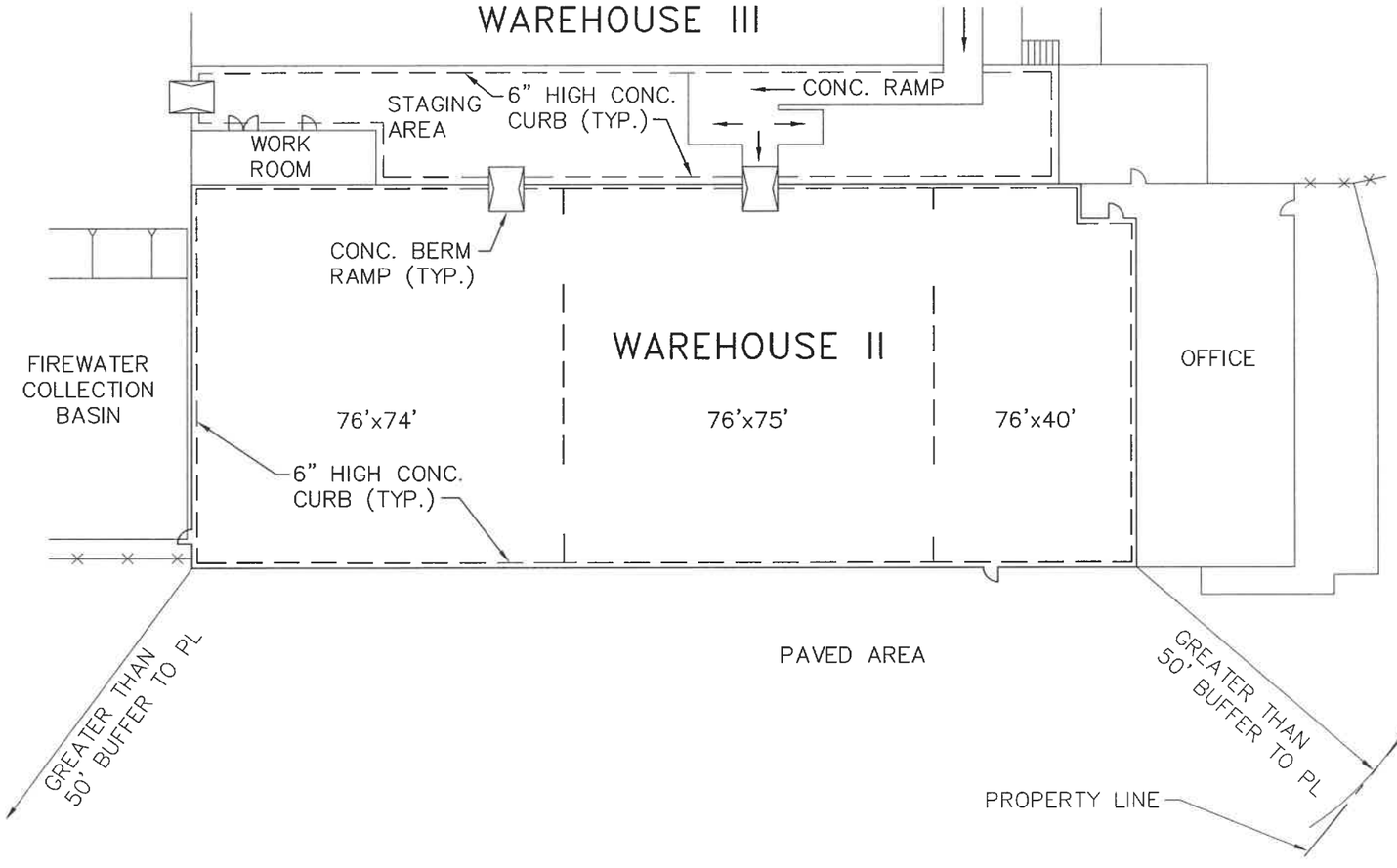
Storage capacity = 10x containment capacity = 480,000 gallons

Maximum to be stored = 264,970 gallons

Maximum to be stored is less than storage capacity.

Container Storage Area 2 is covered and surrounded by curb, so precipitation and run on do not need to be included in storage capacity calculations.

N



NOTE:

DIMENSIONS ARE APPROXIMATE AND REPRESENT DISTANCE BETWEEN CURBS OF SECONDARY CONTAINMENT SYSTEM. ALL AREAS ESSENTIALLY FLAT.

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

0 15 30 60

GRAPHIC SCALE

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	PERMIT RENEWAL 2020	KMC	5/7/20	DAD
B	FOR PERMIT RENEWAL UPDATE	KMC	3/30/10	S.B.
A	FOR PERMIT RENEWAL	KMC	7/30/09	MAR

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DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.A.R.	1" = 30'	07/15/09

TITLE

CLEAN HARBORS LAPORTE WAREHOUSE II CONTAINER STORAGE AREA

DRAWING NO. 67LT-7200-501

REV. C

N

WAREHOUSE III

EXIT

LOADING DOCK

REFRIGERATED TRAILER STORAGE

(MOVEMENT TO WAREHOUSE II AND BACK TO TRAILERS FROM WAREHOUSE II)

EXIT

EXIT

EXIT

RAMP

DOWN

STAGING AREA

6" HIGH CONC. CURB (TYP.)

CONC. RAMP

WORK ROOM

CONC. BERM RAMP (TYP.)

WAREHOUSE II

HAZARDOUS & MEDICAL WASTE STORAGE; MEDICAL WASTE REPACKAGING/CONTAINER WASHING/TREATMENT

OFFICE

76'

6" HIGH CONC. CURB (TYP.)

189'

PAVED AREA

0 15 30 60

GRAPHIC SCALE

NOTE:

DIMENSIONS ARE APPROXIMATE AND REPRESENT DISTANCE BETWEEN CURBS OF SECONDARY CONTAINMENT SYSTEM. ALL AREAS ESSENTIALLY FLAT.

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
C	PERMIT RENEWAL 2020	KMC	5/7/20	DAD
B	APRIL 2012	KMC	4/18/12	MC
A	FOR REGISTRATION	KMC	7/30/09	MAR

CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.		1" = 30'	04/21/10

TITLE

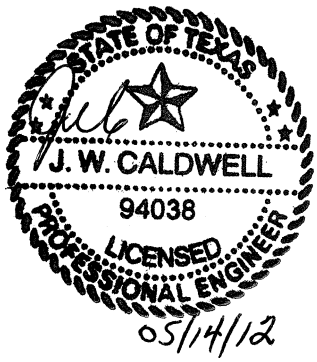
CLEAN HARBORS LAPORTE WAREHOUSE II TRANSFER AREA

DRAWING NO. 67LT-7200-502

REV. C

TYPE V MEDICAL WASTE PROCESSING AND TRANSFER FACILITY OPERATIONS PLAN
30 TAC 330.65

May 2012



SUPPLEMENTAL TECHNICAL REPORT - SUMMARY

1.0 INTRODUCTION

In accordance with 30 TAC 305.45, a supplementary technical report must be submitted in connection with a registration application. The report shall be prepared either by a Texas licensed professional engineer, a licensed professional geoscientist, or by a qualified person who is competent and experienced in the field to which the application relates and who is thoroughly familiar with the operation or project for which the application is made. This registration is being accomplished by incorporation into this existing permit as a Class 3 Modification.

This report is prepared by Mr. William Caldwell, licensed Texas Professional Engineer.

This Type V Medical Waste Processing Facility is to be located in the existing facility at 500 Independence Parkway South, La Porte, Harris County, Texas. The building proposed (Warehouse II) for medical waste repackaging is 75' x 190' (14,250 square feet). No changes to the building will be required. The building is enclosed with sealed concrete floors. There are no floor drains. See V.B.1 for additional details of the permitted storage warehouse.

Clean Harbors La Porte will conduct repackaging operations of Medical Waste. There will be no treatment nor disposal conducted on site. Medical waste will be received by the facility in recyclable/reusable plastic containers DOT approved for medical waste. These containers will in turn be repackaged / consolidated into authorized / approved DOT containers for subsequent transportation off-site for final destruction. The empty containers will be washed and returned to the customer for reuse.

2.0 WASTE MATERIAL HANDLING

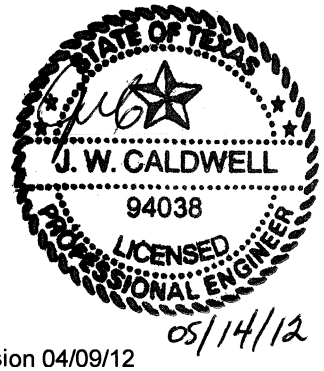
Waste disposal will not take place at this facility. The facility will be used for the receipt, repackaging, consolidation and temporary storage of medical waste. Medical waste is defined by §330.03(85) as:

Medical waste--Treated and untreated special waste from health care-related facilities that is comprised of animal waste, bulk blood, bulk human blood, bulk human body fluids, microbiological waste, pathological waste, and sharps as those terms are defined in 25 TAC §1.132 (relating to Definitions) from the sources specified in 25 TAC §1.134 (relating to Application), as well as regulated medical waste as defined in 49 Code of Federal Regulations §173.134(a)(5), except that the term does not include medical waste produced on a farm or ranch as defined in 34 TAC §3.296(f) (relating to Agriculture, Animal Life, Feed, Seed, Plants, and Fertilizer), nor does the term include artificial, nonhuman materials removed from a patient and requested by the patient, including, but not limited to, orthopedic devices and breast implants. Health care-related facilities do not include:

***(85)**(A) single or multi-family dwellings; and*

***(85)**(B) hotels, motels, or other establishments that provide lodging and related services for the public.*

Clean Harbors La Porte will accept medical waste primarily from health care institutions, hospitals, physicians' offices, clinics, labs and veterinary facilities. If RCRA hazardous waste is mixed with medical waste, it can be accepted by the facility under the existing RCRA permit and managed as RCRA regulated. No radioactive



waste will be accepted at the facility.

Waste inspection and verification activities are identified in the Waste Analysis Plan (WAP) portion of this permit in Section IV. All transfer, storage, and repackaging activities will occur in Warehouse II and refrigerated storage on trailers in the Warehouse III truck dock. Please refer to drawing 67LT-7200-502 (end of this Appendix) for the location of the repacking area in Warehouse II and the refrigerated trailer parking in the Warehouse III truck dock. Medical wastes held in storage for >72 hours will be refrigerated. Refrigerated storage will be conducted using refrigerated trailers parked in the truck dock.

Refrigerated trailers are identical to the typical van trailers used to deliver RCRA regulated waste to the facility, but have integrated refrigeration units to keep the trailer contents cooled. Trailers will be kept in one of the Warehouse III truck bays. Containers will be moved to Warehouse II via forklift. Medical waste that has been repackaged in Warehouse II may be stored in that unit for <72 hours. Repackaged waste will be moved to a trailer for storage or shipment off-site via forklifts.

The throughput of the plant is estimated to be 25 to 40 tons/ day. Medical waste will be accepted in plastic re-useable containers (or other DOT approved containers). These containers vary in size but are typically five (5) to thirty (30) gallons. All medical waste containers will be stored only in Warehouse II or in trailers kept in the Warehouse III truck dock.

Medical Waste will be accepted in plastic reusable DOT containers (or other DOT approved containers). These containers vary in size but will typically be 5 to 30 gallons. Containers in storage for > 72 hours will be stored on refrigerated trailers in the truck dock adjacent to Warehouse III.

Warehouse II is designed with 48,000 gallons of containment capacity. Medical waste is not considered a liquid, so capacity is limited by the warehouse area (14,280 ft²) and capacity for trailers in the truck bay. The maximum amount of medical waste on-site at any time will be 200 tons. (approximately 5,000 containers at 80# per container) The average amount will be 1000-2000 containers at any one time.

3.0 Compliance with 30 TAC 330.63(b)(2)

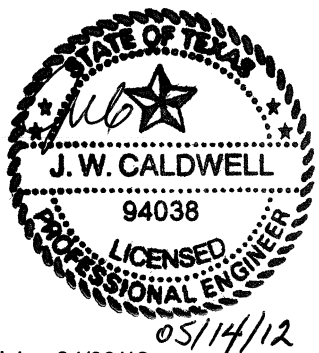
This section addresses compliance with 30 TAC 330.63(b)(2).

(b) General facility design.

***(b)**(1) Facility access. The owner or operator shall describe how access will be controlled for the facility such as the type and location of fences or other suitable means of access control to prevent the entry of livestock, to protect the public from exposure to potential health and safety hazards, and to discourage unauthorized entry or uncontrolled disposal of solid waste or hazardous materials.*

The RCRA permitted facility is secured with a fence surrounding the property, topped with barb wire. Access is controlled by gates kept closed. Access is permitted only by stopping at the administrative building and presently a valid picture identification.

***(b)**(2) Waste movement. The owner or operator shall submit a generalized process design and working plan of the overall facility that includes, at a minimum:*



(b)(2)*(A) flow diagrams indicating the storage, processing, and disposal sequences for the various types of wastes and feedstocks received;*

A process block flow diagram is included in the Waste Analysis Plan.

(b)(2)*(B) schematic view drawings showing the various phases of collection, separation, processing, and disposal as applicable for the types of wastes and feedstocks received at the facility;*

Drawing 67LT-7200-502 has been updated to include this information and can be found at the end of this Appendix. This drawing is a schematic view of the storage and processing areas.

(b)(2)*(C) proposed ventilation and odor control measures for each storage, separation, processing, and disposal unit;*

Warehouse II is equipped with a wall fan to provide ventilation as needed. Because the containers will be accepted and kept closed, odor is not expected to be an issue. When the waste is repackaged, it will be transferred promptly to another container, minimizing odor potential. The waste will be refrigerated if held for > 72 hours, further reducing the potential for odor.

(b)(2)*(D) generalized construction details of all storage and processing units and ancillary equipment (i.e., tanks, foundations, sumps, etc.) with regard to approximate dimensions and capacities, construction materials, vents, covers, enclosures, protective coatings of surfaces, etc. Performance data on all units shall be provided;*

Waste will be repackaged and stored for < 72 hours in existing Warehouse II. This is a RCRA permitted unit constructed of reinforced concrete with no floor drains and concrete berms to provide containment. Specifications can be found in Section V of the RCRA permit. Refrigerated trailers will be kept in the truck dock adjacent to Warehouse III and is constructed of concrete.

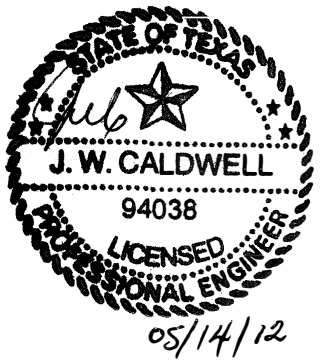
(b)(2)*(E) generalized construction details of slab and subsurface supports of all storage and processing components;*

Warehouse II is constructed of reinforced concrete with no floor drains and 6" high concrete berms that completely surround the perimeter to provide containment. Details can be found in Section V.B.1.4 and Figure V.B.4.

(b)(2)*(F) locations and engineering design details of all containment dikes or walls (with indicated freeboard) proposed to enclose all storage and processing components and all loading and unloading areas;*

All design details for Warehouse II and the truck dock adjacent to Warehouse III can be found in Section V. This includes containment berms and available containment.

(b)(2)*(G) plans for the storage of grease, oil, and sludge on site including determinations of maximum periods of time all separated materials will remain on site and the ultimate disposition of such materials off site;*



Not applicable. There will not be any storage of grease, oil or sludge identified in this regulation.

(b)(2)*(H) proposed disposition of effluent resulting from all processing operations; and*

The only liquid generated is from the container washing system. The spent bleach solution will be containerized and shipped off-site for disposal.

(b)(2)(I) for transfer stations, provide designs for noise pollution control.

Not applicable. This facility is not a solid waste transfer station.

4.0 WASTE REPACKAGING PROCEDURES

Medical waste is repackaged into DOT approved containers. The process will involve removing medical waste from reusable plastic containers and immediately repackage into a fiber container (or similar) for off-site disposal. This is performed inside a building (Warehouse II) on a sealed concrete floor with no floor drains. The empty recyclable containers will be washed and returned to generators for reuse. Containers will be washed in Warehouse II using a Bruel brand type T-S-D6-1X4200 or similar unit. Refer to the end of this Appendix for a schematic. The washing machine is designed to clean reusable containers using a bleach solution followed by air drying. The cleaning solution is reused until spent and then sent off-site for disposal.

See Section IV of permit WAP for a process flow diagram of the overall process.

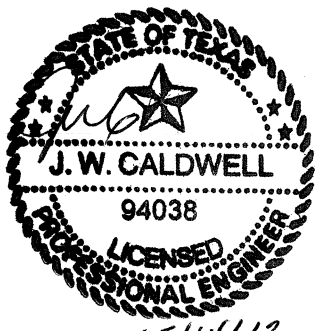
All repackaged medical waste will be packaged and labeled in compliance with 30 TAC 330.1207. Upon receipt, every container is tracked with a unique ID number in our electronic system. This unique number is used to track all activity, including repackaging and shipment off-site to the final destruction facility. Clean Harbors La Porte is able to track each container from the generator to the destruction facility and issue a certificate of destruction once the waste is treated or destroyed. All transportation will occur in properly registered vehicles and in compliance with 30 TAC 330.1211.

Facility Operations - 30 TAC 330.65

This section addresses information required by 30 TAC 330.65 (a,b,c, and d).

(a) The Site Operating Plan has been prepared by Clean Harbors and presents general operating procedures for the management and daily operations of the facility and addresses the requirements of TAC 330 Subchapter E (330.201- 249): Operational Standards for Municipal Solid Waste Storage and Processing Facilities. The requirements of TAC 330 Subchapter D (Operational Standards for Municipal Solid Waste Landfill Facilities) are not applicable to this Type V Medical Waste Processing and Transfer Facility Modification.

(b) This facility does not have an Environmental Management System (Chapter 90,90.32). This requirement is



not applicable to this Type V Medical Waste Processing and Transfer Facility Modification.

(c) This requirement related to the production of leachate or gas applies to landfills and is not applicable to this Type V Medical Waste Processing and Transfer Facility Modification.

(d) This facility will not have a grease trap, grit trap waste, or septage processing facility. This requirement is not applicable to this Type V Medical Waste Processing and Transfer Facility Modification.

Introduction

This Site Operating Plan provides general operating procedures for the daily management of the Type V Medical Waste Processing and Transfer Facility located at 500 Independence Parkway South, LaPorte, Texas. This Site Operating Plan is organized according to the requirements of TAC Chapter 330, Subchapter E: Operational Standards for Municipal Solid Waste Storage and Processing Units. For sections that are not applicable to this operation, a "not applicable" statement has been provided.

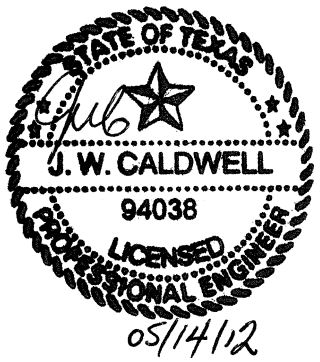
330.203 Waste Acceptance and Analysis

(a) This Type V Medical Waste Processing Facility is to be located in the existing facility at 500 Independence Parkway South, La Porte, Harris County, Texas. The building proposed (Warehouse II) for medical waste repackaging is 75' x 190' (14,250 square feet). The building is enclosed with sealed concrete floors. There are no floor drains. See V.B.1 for additional details of permitted storage warehouse.

Clean Harbors La Porte will conduct repackaging operations of Medical Waste. There will be no treatment nor disposal conducted on site. Medical waste will be received by the facility in recyclable/reusable plastic containers designed / approved for medical waste. These containers will in turn be repackaged / consolidated into authorized / approved DOT containers for subsequent transportation off-site for final destruction. The empty containers will be washed and returned to the customer for reuse.

Waste disposal will not take place at this facility. The facility will be used for the receipt, repackaging, consolidation and temporary storage of medical waste. Medical waste is defined by §330.03(85) as:

Medical waste--Treated and untreated special waste from health care-related facilities that is comprised of animal waste, bulk blood, bulk human blood, bulk human body fluids, microbiological waste, pathological waste, and sharps as those terms are defined in 25 TAC §1.132 (relating to Definitions) from the sources specified in 25 TAC §1.134 (relating to Application), as well as regulated medical waste as defined in 49 Code of Federal Regulations §173.134(a)(5), except that the term does not include medical waste produced on a farm or ranch as defined in 34 TAC §3.296(f) (relating to Agriculture, Animal Life, Feed, Seed, Plants, and Fertilizer), nor does the term include artificial, nonhuman materials removed from a patient and requested by the patient, including, but not limited to, orthopedic devices and breast implants. Health care-related facilities do not include:



(A) single or multi-family dwellings; and

(B) hotels, motels, or other establishments that provide lodging and related services for the public.

Clean Harbors La Porte will accept medical waste primarily from health care institutions, hospitals, physicians' offices, clinics, labs and veterinary facilities. If RCRA hazardous waste is mixed with medical waste, it can be accepted by the facility under the existing RCRA permit and managed as RCRA regulated. No radioactive waste will be accepted at the facility.

(b) The waste receipts, storage and processing time estimates are provided in the following table:

Waste Amounts/ Time	Units
Maximum Waste Received	50 Tons per day
Maximum Storage Amount	200 Tons[1]
Maximum Storage Time (non refrigerated)	≤72 hours
Maximum Storage Time (refrigerated)	30 days
Average Storage Time (non refrigerated)	36 hours
Average Storage Time (refrigerated)	7 days

Untreated waste stored for longer than 72 hours will be refrigerated.

(c) This Type V MSW Medical Waste Repackaging Facility will not discharge any effluent.

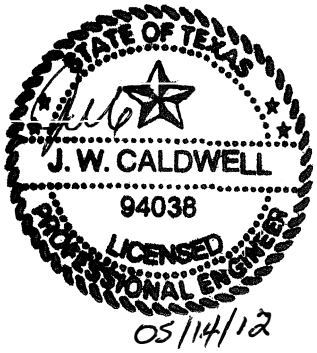
330.205 Facility Generated Waste

(a) This Type V MSW Medical Waste Repackaging Facility will generate waste in the form of repackaged waste originally received and generated off site and any spent solution from cleaning the reusable containers. The repackaged medical waste will be sent off-site for destruction at a licensed facility. The spent solution from container washing and general area cleaning will be containerized and shipped off-site for disposal.

(b) Wastes generated by the facility will be shipped off-site and disposed at a permitted solid waste management facility.

(c) The wastewaters generated will be shipped off-site for disposal at a permitted solid waste management facility.

[1] Amount based on average weight of 80 lbs per container.



(d) This medical waste facility will not accept or generate sludge. This section is not applicable to this Type V MSW Medical Waste Repackaging Facility Application.

330.207 Contaminated Water Management

(a) All liquids resulting from the operation of this facility will be shipped off-site for disposal at a permitted solid waste management facility.

(b) Contaminated water is containerized in the container washing unit. It will be collected and shipped off-site for disposal. There will not be any leachate generated.

(c) This MSW application does not entail any mining process, so this section is not applicable to this Type V MSW Medical Waste Repackaging Facility Registration Application.

(d) No contaminated water will be discharged to a septic system.

(e) No contaminated water will be discharged off-site via drainage ditches to waters of the state.

(f) No wastewaters will be discharged to the City of La Porte's POTW.

(g) Because no wastewaters will be discharged to the City of La Porte's POTW and as such there will not be any discharge of oil and grease leaving the facility and entering the public sewer system.

(h) This facility is not a liquid transfer facility. This section is not applicable to this Type V MSW Medical Waste Repackaging Facility Registration Application.

330.209 Storage Requirements

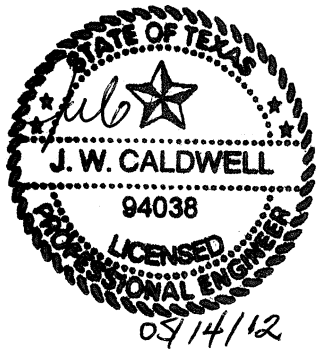
(a) All materials will be stored in a manner that does not constitute fire, safety, or health hazard or provide food or harborage for animals and vectors, and shall be contained in such a way as not to result in litter. Untreated medical waste may need to be stored on site. Any untreated medical waste requiring storage for a period longer than 72 hours will be refrigerated at temperatures of 45 degrees Fahrenheit or less which may be accomplished by use of refrigerated trailers.

(b) This section is not applicable because there is no source separation or recyclable material processing performed.

(c) This section is not applicable to this Type V MSW Medical Waste Repacking Facility.

330.211 Approved Containers

Solid waste containing food will not be accepted at this Type V MSW Medical Waste Repacking Facility. This



section is not applicable.

330.213 Citizens Collection Stations

Citizen's collection stations will not be provided at this facility. This section is not applicable.

330.215 Requirements for Stationary Compactors

Stationary Compactors will not be used at this facility; therefore this section is not applicable.

330.217 Pre-Operation Notice

This Type V MSW Medical Waste Repacking Facility will not employ a mobile liquid waste processing unit. This section is not applicable.

330.219 Recordkeeping and Reporting Requirements

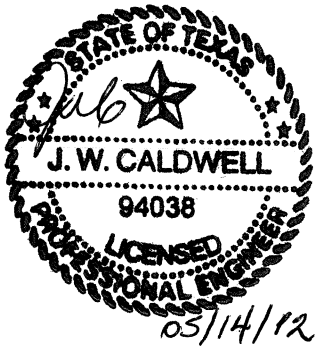
(a) A copy of the registration, the approved registration application, and any other required plan or other related document, including construction specifications and drawings, will be maintained at the Facility at all times as part of the Facility Operating Record. These documents will be available for inspection by agency representatives;

(b) The following information will be retained in the Facility Operating Record for the life of the facility as required by 30 TAC 330.219(f):

- Location- restriction demonstrations (if applicable);
- inspection records and training procedures;
- closure plans and any monitoring, testing, or analytical data relating to closure requirements;
- all cost estimates and financial assurance documentation relating to financial assurance for closure;
- copies of all correspondence and responses relating to the operation of the facility, modifications to the registration, approvals, and other matters pertaining to technical assistance;
- all documents, manifests, shipping documents, ship tickets, etc., involving special waste (medical waste, pharmaceuticals, etc);
- any document(s) as specified by the approved authorization or by the Executive Director; and
- record retention provisions for trip tickets as required by 312.145 (relating to Transporters-Record Keeping) does not apply to this Type V MSW Medical Waste Repackaging Facility.

b(a) – is not applicable – The facility will not accept any medical waste to recycle. All medical waste is shipped off-site for disposal.

(c) For signatories to reports, the following conditions apply.
(1) The owner/operator or duly authorized representative shall sign all reports and other information requested



by the executive director as described in 305.44(a)
(2) If authorization under this section is no longer accurate because of a change in individuals or position, a new authorization satisfying the requirements of this section will be submitted to the executive director prior to, or together with, any reports, information, or applications to be signed by an authorized representative.
(3) Authorized signatories will make the certification specified in 305.44(b).

(d) This section, relating to solid waste composting and landfill mining, is not applicable to this Type V MSW Medical Waste Repacking Facility.

(e) All information contained in the operating record will be furnished upon request to the Executive Director and shall be made available at all reasonable times for inspection by the Executive Director.

(f) The owner or operator will retain all information contained within the operating record and the various plans required for the facility for the life of the operation.

(g) An alternative schedule for record keeping and notification requirements may be set by the Executive Director as specified in subsections (a)-(e) of this section.

(h) As owner operator of a Type V repackaging facility accepting delivery of untreated medical waste for which a shipping document is required under 330.1211 (relating to Transporters of Untreated Medical Waste) for processing, Clean Harbors shall ensure each of the following requirements are met:

- a shipping document accompanies the shipment which designates the type V facility to receive waste;
- the owner or operator signs the shipping document and immediately gives at least one copy of the signed shipping document to the transporter;
- the owner or operator retains at least one copy of the shipping Document; and
- within 45 days after final disposal, the owner or operator sends a written or electronic copy of the shipping document to the generator that includes a statement that the medical waste was treated in accordance with 25 TAC 1.136 (relating to Approved methods of Treatment and Disposition).

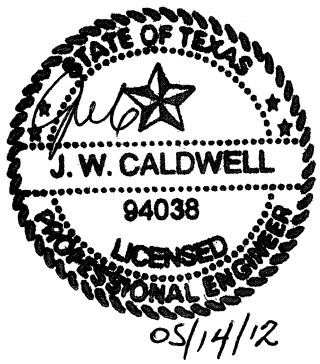
330.1219(b) The facility will not treat or dispose of medical waste onsite. This section is not applicable.

330.221 Fire Protection

(a) An adequate supply of water under pressure is provided by the facilities fire suppression system. Potable water is pumped from an on-site well and used to fill a water supply tank.

(b) Firefighting equipment is readily available and accessible. Fire extinguishers are located at each exit door in the Facility building, File extinguishers are typically 20-lb ABC type.

(c) A Fire Protection Plan is included in the Contingency Plan as Attachment IV-B. Employees will be trained in



its contents and use. The Fire Protection Plan includes measures for fire protection, procedures for using fire protection measures, employee training and safety procedures, notification protocol, etc. The Fire Protection Plan is in compliance with local file codes.

330.223 Access Control

(a) Public access control is maintained through several means. During operational hours, access is controlled to the facility building which houses the repackaging area. No repackaging occurs outside of the facility building. Traffic is controlled by vehicle signage and access roads. The facility is locked and secured during non-operational hours. The facility is equipped with an alarm system monitored offsite.

(b) The access roads to the facility are all paved roadways. Entrance is off Independence Parkway South.

(c) The operating area is housed in the enclosed Warehouse II. Access to the facility is controlled via a fence that surrounds the perimeter, locking doors and gates and an alarm system.

330.225 Unloading of Waste

(a) The unloading of solid waste shall occur inside the facility in a dock area with an impervious floor. An attendant will monitor all incoming loads of waste. Pavement will be used in conjunction with signage to direct vehicles to the appropriate unloading areas. If unacceptable wastes are identified (such as hazardous) they may be accepted under the RCRA permit or refused and returned to their point of origin for proper handling. Medical waste in storage for >72 hours will be refrigerated.

(b) The unloading of waste in unauthorized areas is prohibited. Any waste deposited in an unauthorized area will immediately be removed to an authorized area. All waste will be shipped off-site for disposal.

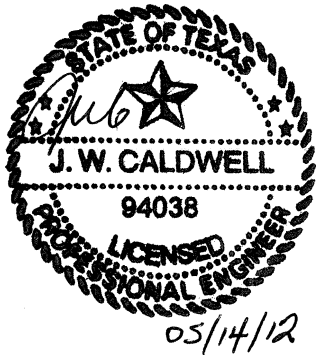
(c) The unloading of prohibited waste at the facility will not be allowed. Prohibited waste will be returned immediately to the transporter or generator of the waste, or transported to an appropriately permitted facility described in 330.225(a).

330.227 Spill Prevention and Control

Storage and repackaging areas are designed to control and contain spills to prevent contaminated water from leaving the facility. The areas are located indoors in an enclosed heavy metal frame building (Warehouse II) which was designed and constructed to contain hazardous waste spills and protect the areas from precipitation and weather concerns. The interior floors are all solid concrete with the entire warehouse being contained with a 6 inch high berm.

330.229 Operating Hours

(a) The facility typically operates one shift per day but may be operated on a continuous basis (24 hours a day 7-



days a week) as needed. Waste acceptance hours are typically 7:00 a.m. to 7:00 pm, Monday through Friday.

(b) Special operating hours are not anticipated at this facility.

(c) Clean Harbors may seek approval from TCEQ for operating hours outside those specified in this application in order to accommodate emergency situations or unforeseen circumstances that may disrupt waste management services in the area.

(d) Approved alternative operating hours will be recorded in the Facility Operating Record, including dates, times, and duration.

330.231 Facility Sign

Once registered, Clean Harbors will display a sign at the entrance of the facility which measures at least four feet by four feet with letters at least 3 inches in height stating the following:

- Facility Name
- Type of Facility
- Hours and Days of Operation
- Registration Number or Facility Number
- Facility Rules

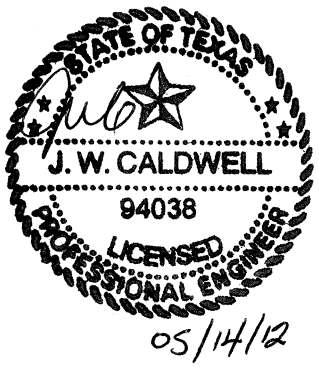
330.233 Control of Windblown Material and Litter

(a) Windblown litter is not anticipated at this facility. Repackaging and storage areas of the facility are completely enclosed indoors. The facility does not accept solid wastes typically associated with windblown material.
(1) A litter fence is not necessary for this facility.
(2) Any litter identified on facility property or identified in the vicinity as originating from the facility will be properly cleaned up and disposed.
(3) The operations area of the facility is completely enclosed and additional fencing or screening is not necessary.

330.235 Material along the Route to the Facility

Should Clean Harbors be informed or discover an off-site spill of medical waste materials by a delivery truck, along or within the right-of-way of public access roads serving the facility for a distance of two miles in either direction from the entrance, Clean Harbors will coordinate with the hauler to initiate clean-up activities. This operation will receive waste already containerized and delivered in closed box vans or van trailers. Containers are kept closed at all times unless opened for repackaging. This regulation is written to address compactor trucks of trash and is geared primarily to a solid waste management facility.

330.237 Facility Access Roads



(a) Access and on-site roads are paved, all weather roads. Mud is not an issue from vehicles entering or leaving the facility as there are no unpaved roadways used to access the site and on-site roads/parking are paved.
(b) Dust is not an issue for vehicles entering or leaving the facility as there are no unpaved roads used to access the site and on-site roads/parking lots are paved.
(c) On-site roads/parking areas are maintained by Clean Harbors. Access roads are paved and maintained by the proper authority (municipal or state entity).

330.239 Noise Pollution and Visual Screening

Facility operations and repackaging are conducted inside an enclosed building in an industrial business area, preventing potential noise and visual impacts.

330.241 Overloading and Breakdown

(a) The design capacity of the repackaging facility unit is 50 tons per day of medical waste and this rate will not be exceeded. The facility will not accumulate solid waste in quantities that cannot be processed within such time that would allow for the creation of odors, insect breeding, or harborage of other vectors. There will be several measures employed by Clean Harbors to ensure waste is stored properly and repackaged in a timely manner:

Clean Harbors has sufficient storage capacity for incoming waste for at least two days of projected receipts. Incoming wastes stored >72 hours are refrigerated. Incoming waste shipments can be delayed, or sent to an alternative permitted treatment facility if necessary.

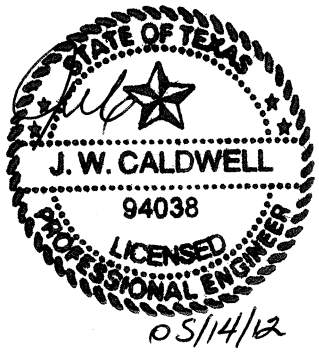
This facility does not process grease trap waste, grit trap waste, or septage. This facility is not a mobile liquid waste processing facility.

(b) If significant work stoppage should occur due to unexpected circumstances, the facility will restrict the receipt of waste accordingly. Under such circumstances, incoming deliveries will be delayed or diverted to an approved backup facility. If the stoppage lasts long enough to create a nuisance, odor or vectors, waste will be transferred off-site to an alternate approved facility.

(c) In such an event that the facility becomes inoperable for periods longer than 24 hours, waste will be transported via approved transportation vehicles to an alternative processing facility approved by the TCEQ.

330.243 Sanitation

(a) All working surfaces that come into contact with wastes are washed down regularly at the completion of repackaging. Washing and cleaning activities are conducted as needed in processing areas, at least twice weekly. Processing facilities that operate continuously must be swept daily. All working areas will be swept daily



when in use as needed.

(b) Wash waters are not allowed to accumulate on site in order to prevent the creation of odors or attraction of vectors.

(c) Mopping is conducted for floor cleaning. Spills are cleaned with a 10% sodium hypochlorite solution or similar disinfection material. Spilled material is disinfected, containerized and shipped off-site for disposal.

330.245 Ventilation and Air Pollution

(a) Air emissions from this facility will not cause or contribute to air pollution as defined in the Texas Clean Air Act.

(b) This Facility will comply with all applicable regulations regarding air emissions and will obtain any required authorizations from the TCEQ Air Permits Division.

(c) All liquid waste and solid waste shall be stored in odor-retaining containers and vessels.

(d) No odors are expected to occur in the facility since the medical waste is kept in sealed containers unless being repackaged. The facility is designed to provide adequate ventilation for odor control and employee safety. In the event of odors passing the facility boundary, actions will be taken to prevent nuisance odors from leaving the facility.

(f) Control of potential odors is accomplished through a number of measures including use of the routine cleanup, sealed containerized and refrigerated storage, and conducting operations within the enclosed indoor structure.

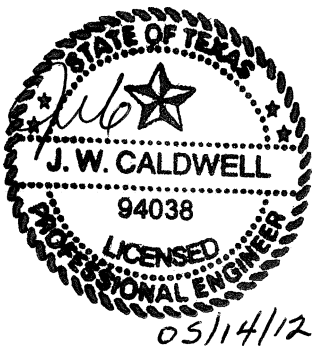
(g) Repackaging and storage is conducted within the facility structure.

(h) Medical waste exposure to the air is limited and minimal. Waste is received and stored in enclosed containers. When ready for repackaging, containers are opened and promptly placed into other acceptable medical waste containers which are subsequently sealed.

(i) This facility is not a mobile waste processing unit.

(j) If applicable, reporting of emissions events will be made in accordance with 101.201 (relating to Emissions Event Reporting and Recordkeeping Requirements) and reporting of scheduled maintenance will be made in accordance with 101.211 of this title (relating to Scheduled Maintenance, Startup, and Shutdown Reporting and Record Keeping Requirements).

(k) The paved surfaces of the facility, positive drainage and storm sewer system minimize the potential for ponding of stormwater which could result in objectionable odors.



330.247 Health and Safety

A Health and Safety Plan is included in Attachment IV-C. Facility personnel will be trained appropriately regarding health and safety at the facility.

330.249 Employee Sanitation Facilities

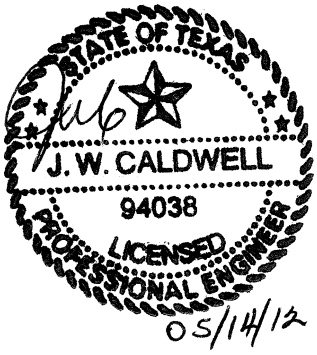
Potable water and sanitary facilities are provided for all employees and visitors.

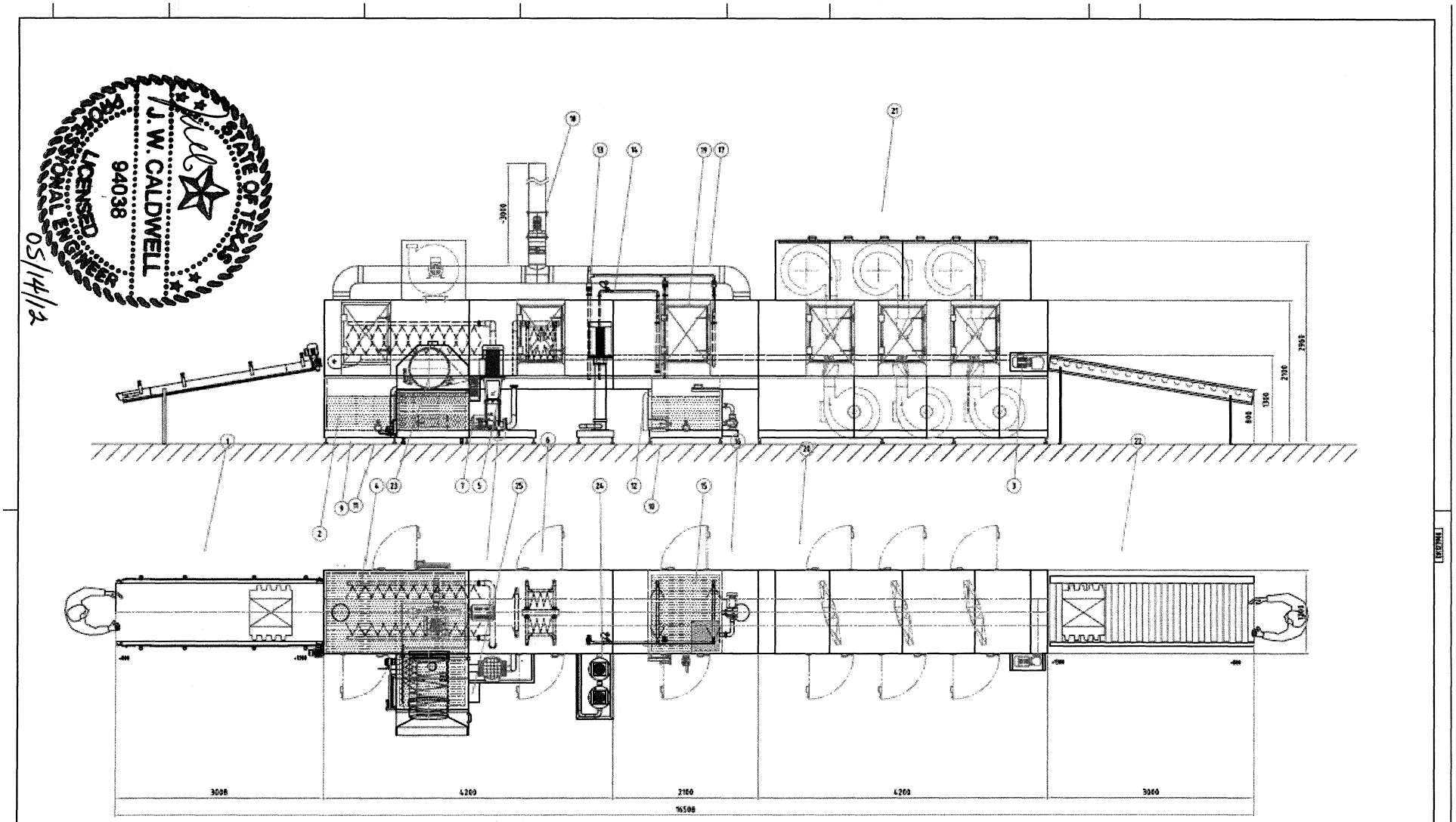
Contingency Plan: See Section III.E of this Part B IHW Permit

Health & Safety Plan: See Section III.B – Appendix A of this Part B IHW Permit

Required Submission Of Letters Requesting Review: Attached

- Texas State Historical Commission
- Harris Co. Galveston Area Council





25	Filter gear	1	0,18 kW	16	Extraction fan	1	825mm - 0,37 kW, 1200m³/h	9	Sludge door	2	400x200mm
24	High pressure pumps	1	2x15 kW, 15m³/h, 50 Bar	17	Extraction	1		8	Static filter	1	
23	Rotary filter with filterscrew	1		14	After-rinse pump	1	1,5 kW 15m³/h 2,8bar	7	Heating system	1	Gas - Lanemark
22	Outfeed conveyor	1	Roller conveyor - gravity	13	After-rinse system	1	0,45 m³	6	Wash system	1	
21	Blower	4	5,5 kW-4,5m VS-2200m³/h	12	Overflow	2	ø63,5mm	5	Dewaxing and wash pump	1	5,5kW 50m³/h 4,5Bar - 15m³/h 2,8bar
20	Drying system	1		11	Drain	2	2 1/2"	4	Dissolving system	1	1,35 m³
19	Inspection door	12	900x900mm	10	Water inlet	1	1 1/4"	3	Conveyor gear	3	0,55 kW
Pos.	Description	Qty.	Dimension	9	Sludge door	1	200x200mm	2	Conveyor	2	
				Pos.	Description	Pos.	Dimension	1	Infeed conveyor	1	Rubberbelt
								Pos.	Description	Pos.	Dimension

brüel

brüel international ab
W. Brüelsvej 11
DK-8600 Silkeborg
Tlf. +45 86 82 00 11
Fax. +45 86 82 03 05

brüel washing machine
Cap.: 600 Boxes/h
Type: T-S-DS-1x4200

This drawing must not without our permission be copied or shown to anybody not concerned.

A1	Dwg.	36805	M
1:25	Rev.	36962	P
	Prelimary		

Drawing: DK123900 Rev. A

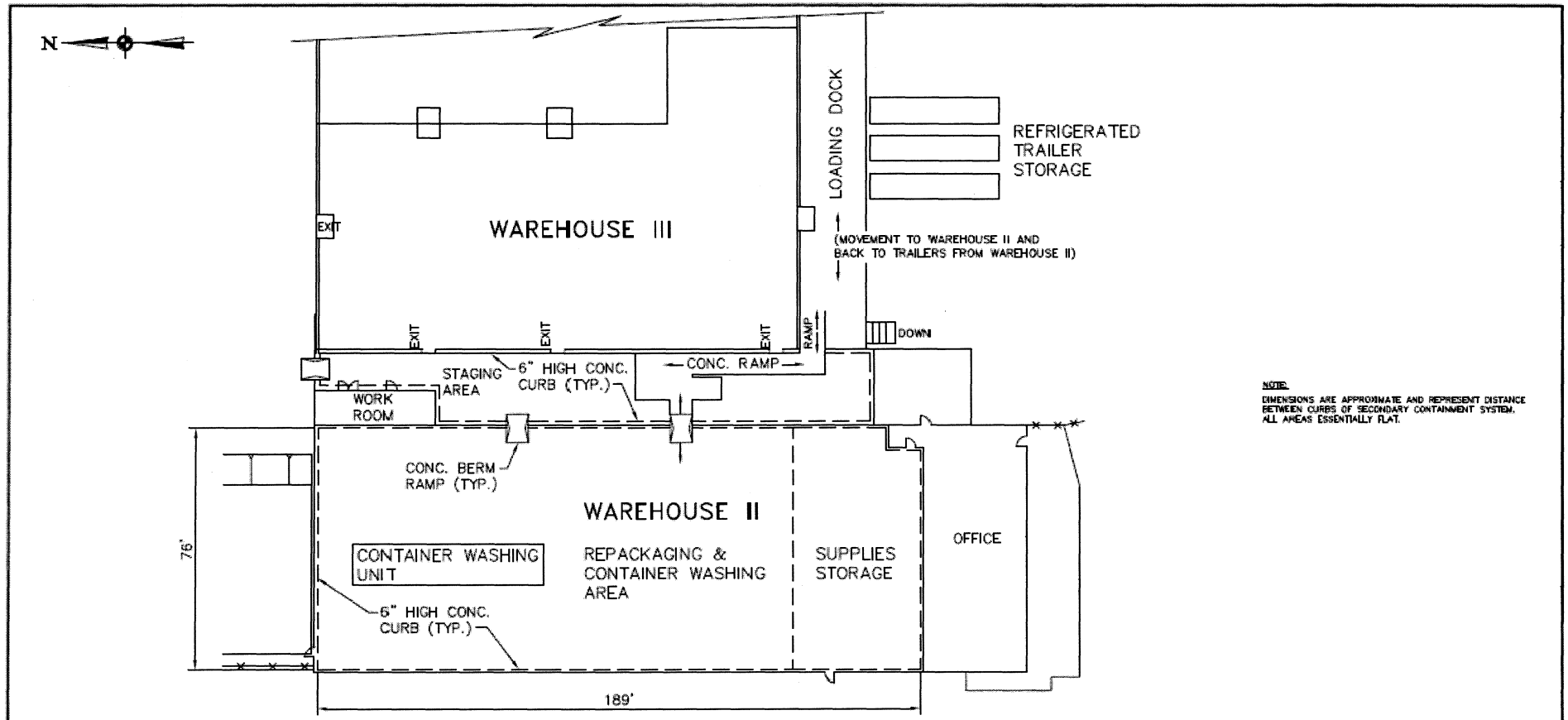


FIGURE III–A.2

For most recent sealed version please see Section V.B.ii.

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
B	APRIL 2012	KMC	4/18/12	MC
A	FOR REGISTRATION	KMC	7/30/09	MAR

CleanHarbors

TITLE
CLEAN HARBORS LAPORTE
WAREHOUSE II
TRANSFER AREA

DRAWN	CHECKED	SCALE	DATE	DRAWING NO.	REV.
K.M.C.		1" = 30'	04/21/10	67LT–7200–502	B

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED PROFESSIONAL ENGINEER
05/14/12

Professional Engineer Certification

Container Storage Area 3 (Warehouse III) is a 29,678 ft² concrete pad surrounded by metal framed buildings designed and managed to meet the requirements of 40 CFR Subpart I (264.170-264.178), and 270.15.

The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date 05/20/20

J. W. Caldwell
Texas PE # 94038

ENGINEERING REPORT - CONTAINER STORAGE AREA 3

GENERAL INFORMATION

This Engineering Report contains details specific to Container Storage Area 3 (TCEQ unit 003, NOR 004) of the Clean Harbors LaPorte, LLC facility. For additional details on this unit see: Overall Facility Plan included in the General Engineering Report (Appendix V.A of the Part B application); Tables V.A and V.B of Part B application. Below is a list of drawings for Container Storage Area 3:

Drawing No. 67LT-7300-501
Drawing No. 67LT-7300-502
Drawing No. 67LT-7100-502

Container Storage Area 3 (Warehouse III) is located east of Warehouse II. The container storage area is enclosed metal frame buildings protecting the container storage areas from precipitation and weather related concerns and has a reinforced concrete floor with perimeter curbs. Because the building is completely enclosed, no stormwater containment is required. The approximate dimensions of Warehouse III are 142 feet wide by 209 feet long. Storage and staging areas at each warehouse have concrete bases and are covered by the building enclosure. All floor drains have been plugged using concrete, and the floors have been sealed with an epoxy coating. Each warehouse is currently subdivided in accordance with previous permitted configurations; although remaining a single HWMU. The perimeter curbs are a minimum of 6 inch high reinforced concrete. The curbs for Warehouse III were constructed monolithically with the floor slab at the time of construction and actually form the base of the wall. Details of the floor curbs are illustrated on Drawing 67LT-7300-502. Additional interior curbing separates the subdivided areas; however, these are for the operational convenience of the owner and may be altered as the owner deems fit. Either a gently sloped concrete berm or metal ramp is provided for safe movement of container handling equipment over the curbs between the subdivided areas within each container storage and staging areas. Drawing 67LT-7300-501 attached to this Engineering Report show construction details for Warehouse III (i.e., curbs, dimensions).

Warehouse III is located outside a 100 year flood plain (see FEMA Map attached to Section II.F) and is more than 15 meters (50 ft) from the property line as required by 40 CFR 264.176 (see the Overall Facility Plan attached to Appendix V.A). Design details can be found in the attached drawings and containment calculations.

As shown on Table V.B of the Part B application, Warehouse III is designed to store 395,340 gallons (7,188 55-gallon drum equivalents) in DOT containers that contain a wide variety of organic and inorganic wastes including wastes that maybe ignitable, reactive or incompatible. Specific waste numbers are found on Table IV.B and Table V.B of the Part B application.

High hazard wastes such as gases classified under DOT as Inhalation Hazard / Toxic / Poison Zone A Gases will be stored in the high hazard storage vault located within Warehouse III. This storage vault has its own ventilation for the sole purpose of providing additional protection of employees in the event of a leak or release. The high hazard storage vault is completely enclosed with four walls (one of which has access doors) and a ceiling. See drawings 67LT-7300-502 and 67LT-7100-502.

The remaining sections below are structured based on the requirements of 40 CFR 264.171-264.173 and 264.175-264.177. The information outlined in 40 CFR 270.15 is described in these sections, particularly the Containment section and associated drawings and calculations.

§264.171 Condition of Containers

Containers are unloaded under the covered areas at the loading/unloading docks and will be staged in these areas. Containers received by truck are unloaded at the docks adjacent to Warehouse III. These docks are covered and have secondary containment in the event of a release. Containers unloaded in these areas will be staged in the immediate dock area for inspection, segregation, and repackaging (if necessary).

Prior to moving any container into a storage area, it will be inspected for leaks and the condition of the container. The Waste Profile Record and any sample analysis required under the facility WAP will be used to determine the appropriate area within the facility for storage.

The wastes received in these areas are stored in a compatible manner. That is, they will be compatible with the storage containers as well as the wastes that are stored in the same container storage area. Regulated containers received at the facility will meet U.S. Department of Transportation (DOT) requirements for the applicable means of transportation (road or railroad). Only containers in good condition, free of excessive rust or structural defects, will be used for storage. Wastes to be received by the facility will come to the facility packaged in various sizes of containers, including but not limited to 5 gallon to 55 gallon drums, supersacks, one yard boxes, and portable tanks. Additionally, over pack containers of various sizes will be utilized for release minimization purposes.

Containers holding hazardous waste will remain closed during storage and handling, except when it is necessary to sample, inspect, add, or remove waste. Containers of hazardous waste will be handled, stored and disposed of in a manner so as to minimize spillage or leakage of waste from the container. Drums will normally be sealed (bungs tight or tops fastened tight). Containers holding hazardous waste will not be opened, handled, or stored in a manner that may rupture it, cause it to leak, or otherwise jeopardize the integrity of the container.

Hazards in unloading will be minimized though the proper training of the facility staff as provided in the Personnel Training Plan described in Section III of this Part B application. Spill response is detailed in the Contingency/Emergency Response Plan in Section III.

Methods will be employed to minimize air emissions related to the management of containers at this facility in accordance with 40 CFR 270.27 and 40 CFR 264, Subpart CC. These requirements apply to all wastes which have an average Volatile Organic Compound (VOC) concentration of 500 parts per million by weight or greater. These requirements apply at the point of waste origination, defined as the point where the facility accepts the waste(s). Procedures to ensure compliance with any applicable air emission requirements are presented in Section X of this Part B application.

§264.172 Compatibility of Waste with Containers

The container storage portions of warehouse III are segregated into three subdivided areas by concrete curbs and berms. The owner plans to use these subdivided areas in the container storage areas for additional operational controls, allowing for flexibility in storage of waste types, including segregation of incompatible wastes. However, the owner reserves the right to alter the arrangement of these subdivided areas, either by removing or relocating the concrete curbs, as deemed appropriate. Each subdivided area is used only to store wastes which are compatible. Flammable liquids are restricted to storage in Warehouse III only. These practices comply with the requirements of 40 CFR 264.177(c). Flammable and incompatible waste types will be managed in accordance with the requirements of the operating permit.

Each drum to be stored will be evaluated using the supplied waste profile record (WPR). The wastes are typically segregated into hazard class compatibility groups as indicated in the following list:

HAZARD CLASS COMPATIBILITY GROUPS

Group	Group
Oxidizer	Combustible/Flammable
Organic Peroxide	Reactive
Polychlorinated Biphenyl	Lab Packs
Alkaline	Otherwise Regulated Material
Acid	Non Hazardous/ Non regulated

There may be coexisting compatibility groups in the same container storage area, or an individual storage area may be limited to one compatibility group only. Compatibility of the wastes will be confirmed using the Waste Profile Record, any WAP required sample analysis, and reference documents such as "A METHOD FOR DETERMINING THE COMPATIBILITY OF HAZARDOUS WASTES" (EPA Document EPA 600/2 80 076).

Activities to be conducted by the facility do not include blending or comingling of potentially incompatible waste materials. In accordance with 40 CFR 264.177(a), incompatible wastes or wastes and materials will generally not be placed in the same container unless specific analysis, trial testing, or established reference literature supports that an adverse reaction, as listed in 40 CFR 264.17(b), will not occur. Furthermore, hazardous waste will not be placed into an unwashed container that previously held an incompatible waste or material as required by 40 CFR 264.177(b). Therefore, the compatibility concerns are limited to the possibility of leaks from containers within a storage area mixing with leaks from another container during a spill or emergency. Compatibility concerns include the potential for fire, generation of toxic and flammable gases, explosion, and violent polymerization. Accordingly, wastes which have the potential to cause these types of reactions will not be stored within the same subdivided area.

If the generator does not provide sufficient information to determine that the waste is potentially incompatible with any of the wastes stored in a required container storage area, the waste will either be rejected or additional analysis will be conducted by a contract laboratory prior to storage.

The EPA sponsored compatibility method allows determinations by type of waste and Standard Industrial Classification code of the generator. The resulting compatibility determination is, by design, conservative and eliminates the need for waste analyses.

In terms of the storage requirements for aisle space and maximum pile size under the applicable NFPA 30, these "generally compatible" wastes will be treated the same as the major waste type with which they are stored until removed from the storage area. For example, if a pH neutral oil is stored in a Class II flammable waste storage area, the drums containing the pH neutral oil will be included in determining the allowable size of the container piles within that area.

§264.173 Management of Containers

Loading docks are raised to truck bed level to minimize the potential for loading related spills. The loading dock at Warehouses III has a secondary containment curb along its outer perimeter to catch potential spillage from the dock as well as out of the back of the trucks. The dock at Warehouse III has a secondary containment curb at the base of the dock at ground level which serves to contain both spillage from the dock as well as spillage out the back of trucks backed up to the dock. Staging areas used for temporary holding, weighing, and etc., also have concrete curbs for secondary containment. Concrete berms or steel ramps are used to pass over the curbed containment between sub areas of the storage areas or to exterior locations outside the warehouses.

The following table summarizes the contained surface areas, rated storage capacities, required secondary containment capacity (10 percent of storage capacity), and the available secondary containment capacity provided by the 6 inch high curbs. Footnotes to the table

describe how the quantities were derived. Based on these quantities and available secondary containment volumes, each container storage area has more than the secondary containment capacity required by 40 CFR 264.175(b)(3).

Staging areas located adjacent to each warehouse container storage area are used only for temporary container holding while loading, unloading, segregating, weighing, and repackaging containers. They are not, however, used for container storage. The maximum volume of wastes held in each of the four staging areas will not exceed 8,800 gallons (160 55-gallon drum equivalents). For purposes of secondary containment, six inch high concrete curbing also encloses the staging areas, providing well in excess of 10 percent of the temporarily held container volume. The maximum total container storage capacity, for purposes of permit limitations and closure cost calculations, is 395,340 gallons, exclusive of allowable staging area volumes.

Generally, containers used for waste storage will be kept on pallets (typically 4 to 4.5 inches high) with the majority of them subsequently elevated further on the storage racks. If 10 percent of the containers, which may hold liquids, leak their entire contents, the maximum depth of accumulated liquid within any of the subdivided storage area will be less than 2.5 inches. Thus the pallets and rack storage will prevent the design spill from contacting the bottoms of the containers. This condition precludes the need to slope the floors in order to drain and remove spilled liquids in accordance with 40 CRF 264.175(b)(2).

Spills will normally be managed by the use of absorbents and will be removed in a timely manner. Should a large spill occur, other means (such as a vacuum truck or a temporary tank) may be used. Should a tank be used, proper notification will be provided to the TCEQ and the tank will be operated in accordance with 90 day storage requirements. Based on the computed volumes for secondary containment, the excess capacity will provide an ample factor of safety to prevent overflow of the systems used to collect the spill.

§264.175 Containment

Warehouse III is built to the following specifications in compliance with 40 CFR 261.175 (b)(1):

> Concrete base: 4” minimum thickness, 3,000 psi, with rebar reinforcing. Sub-base loading is minimum 1,500 psi.
>
> All container storage areas are curbed for containment, and are monolithic in character. Where a joint exists, a chemical resistant backer rod is embedded in the joint, below the slab surface. Curb heights vary depending upon the amount of containment required.
>
> All bases are free of cracks and gaps, and where cracks have developed over time, a suitable filler and sealer has been used. The bases are smooth in appearance without

spalling, flaking, or having signs of chemical attack. The areas have significant containment.

The structural integrity of the bases is adequate for the purposes for which they were designed, that is, for chemical containment.

Warehouse III is in an enclosed and covered area therefore rainfall infiltration is not an issue relative to adequate secondary containment capacity.

Containment calculations are attached that show that the containment structure has a volume greater than 10% of the total volume and larger than the largest container (1.1 cubic yard-box container or four 55-gallon drums).

§264.176 Special Requirements for Ignitable or Reactive Wastes

All storage areas are at least fifty (50) feet from the property lines, greater than the 50 feet required by 40 CFR 264.176 and applicable NFPA codes. Minimum buffer zone distances for the container storage areas are shown on figures attached to V.A and V.B.3.

§264.177 Special Requirements for Incompatible Wastes

As shown in Drawing No. 67LT-7300-501 the container storage portions of Warehouse III is segregated into subdivided into three sub areas by concrete curbs and berms. The owner plans to use these subdivided areas in the container storage areas for additional operational controls, allowing for flexibility in storage of waste types, including segregation of incompatible wastes. However, the owner reserves the right to alter the arrangement of these subdivided areas, either by removing or relocating the concrete curbs, as deemed appropriate. Each subdivided area is used only to store wastes which are compatible. Flammable liquids are restricted to storage in Warehouse III only. These practices comply with the requirements of 40 CFR 264.177(c). Flammable and incompatible waste types will be managed in accordance with the requirements of the operating permit.

DRAWINGS AND CALCULATIONS

SECONDARY CONTAINMENT CALCULATIONS

Container Storage Area 3

Dimensions = 209’ long x 142’ wide, 6” curb

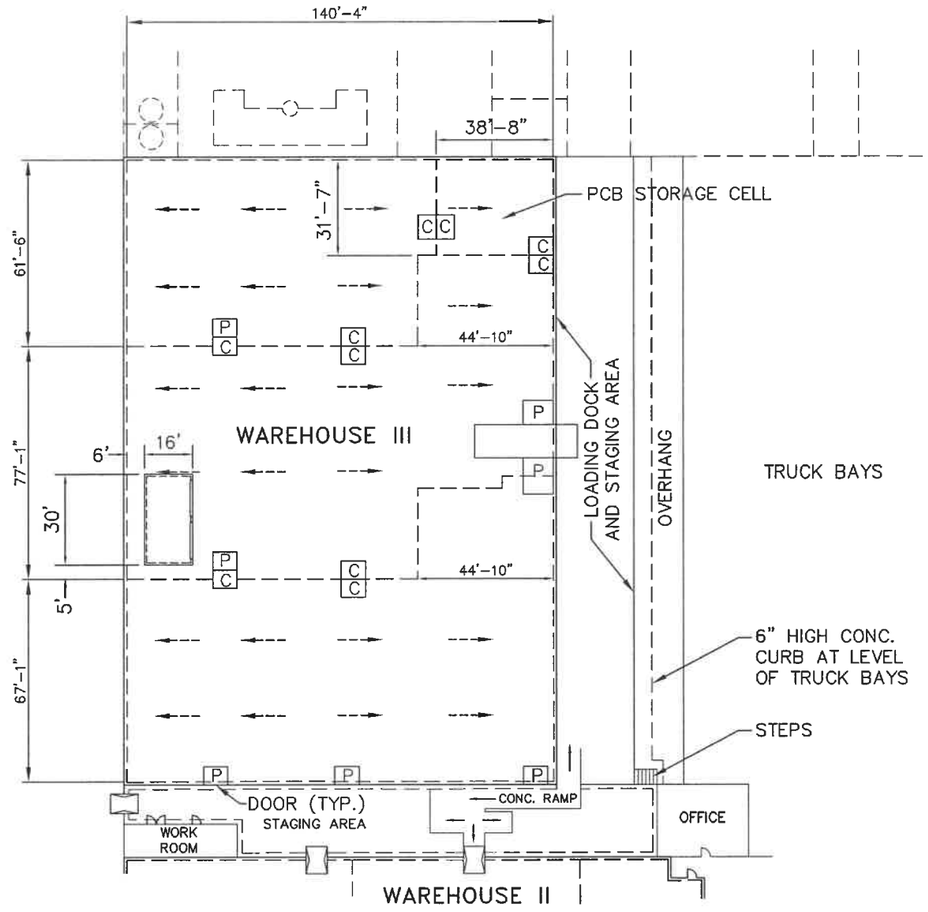
Containment capacity = 209’ x 142’ x 0.5’ x 0.9 usage factor x 7.48 gal./c.f. = 99,896 gallons rounded down to 99,800 gallons

Storage capacity = 10x containment capacity = 998,000 gallons

Maximum to be stored = 395,340 gallons

Container Storage Area 3 is covered and surrounded by curb, so precipitation and run-on do not need to be included in storage capacity calculations.

N



LEGEND

- SLOPE IN FLOOR
- P/C — RAMP OR BERM
- C — CONCRETE RAMP
- P — PORTABLE STEEL RAMP
- 6" HIGH CONC. CURB

NOTE:

DIMENSIONS ARE APPROXIMATE AND REPRESENT DISTANCE BETWEEN CURBS OF SECONDARY CONTAINMENT SYSTEM. ARROWS SHOW DRAINAGE SLOPE OF FLOOR.

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

0 25 50 100
GRAPHIC SCALE

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
E	PERMIT RENEWAL 2020	KMC	5/7/20	D.A.D.
D	RCRA PERMIT RENEWAL UPDATE	KMC	1/26/12	S.B.
C	ADDED HIGH HAZ STORAGE VAULT	KMC	1/10/11	P.T.W.
B	FOR PERMIT RENEWAL UPDATE	KMC	3/30/10	S.B.
A	FOR PERMIT RENEWAL	KMC	7/30/09	MAR

CleanHarbors®

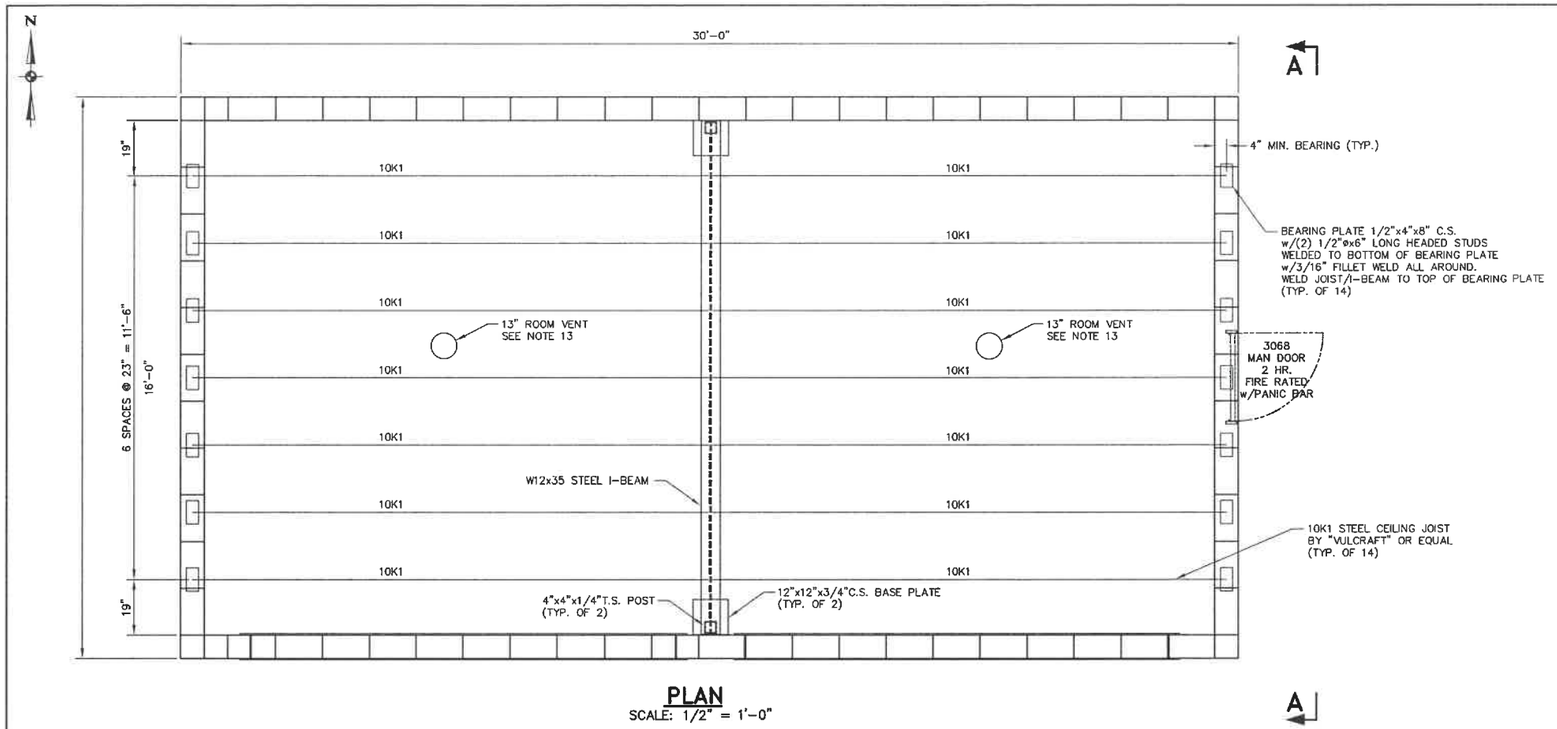
DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.A.R.	1" = 50'	07/15/09

TITLE

CLEAN HARBORS LAPORTE WAREHOUSE III

DRAWING NO. 67LT-7300-501

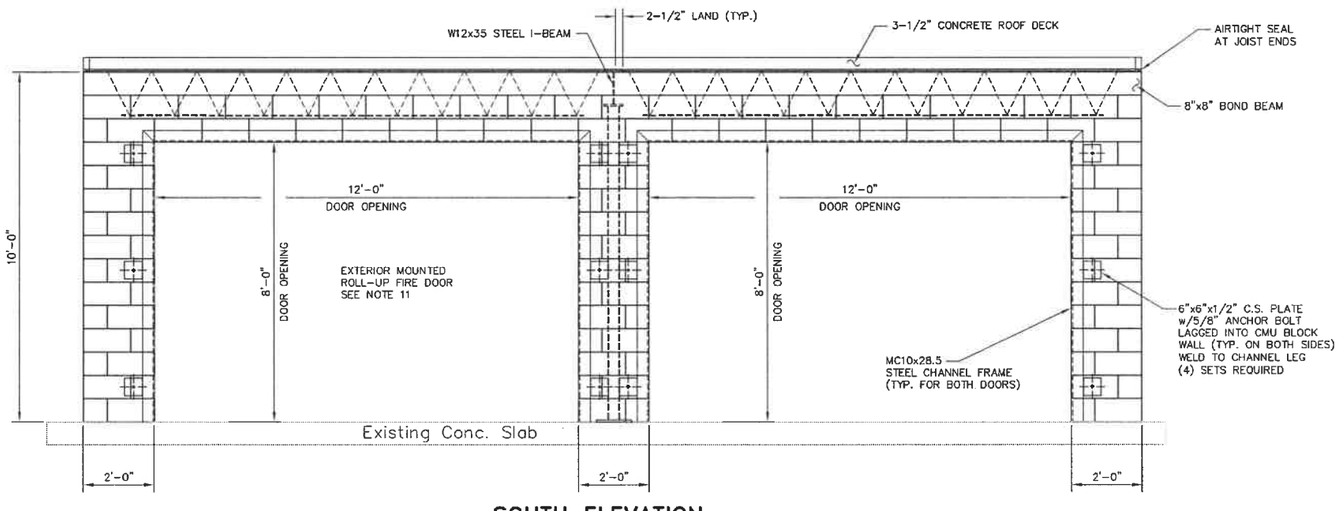
REV. E



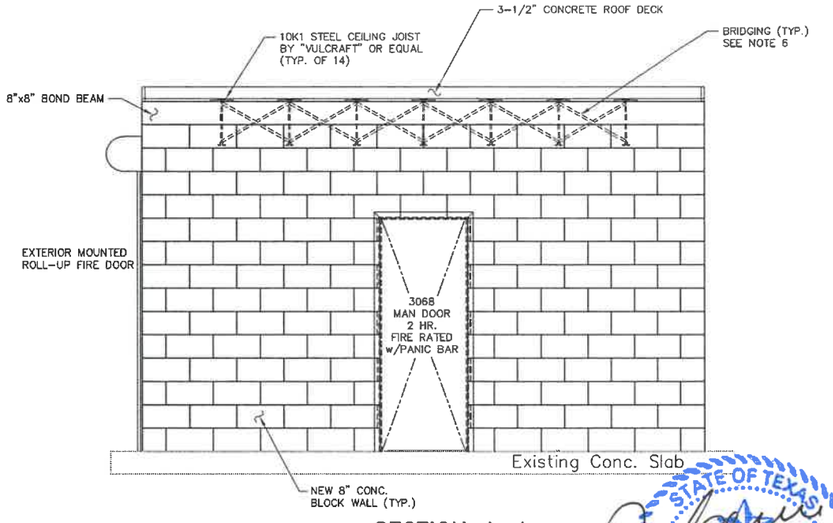
PLAN
SCALE: 1/2" = 1'-0"

STRUCTURAL NOTES:

1. 8" NORMAL WEIGHT CMU W/fm=2000 psi LAID IN RUNNING BOND WITH FACE SHELL BEDDING WITH 1-#5 BAR @ 24"O.C. AND AT EACH END WALL RUN IN CORES GROUTED WITH NORMAL WEIGHT CONCRETE WITH fc=3000 psi. DOWEL VERTICAL BARS MIN. 6" INTO EXISTING SLAB THROUGH EXISTING CONCRETE CURB. GROUT BOTTOM COURSE OF CMU SOLID FULL HT. PROVIDE TRUSS TYPE HORIZONTAL JOINT REINFORCING WITH 3/16" DIA. SIDE RODS AT 16"O.C. VERT. PROVIDE 8"x8" BOND BEAM AT TOP WALL WITH 2-#5 BARS CONT. PROVIDE #5 BAR DOWELS 12/12 @ 24"O.C. INTO CONCRETE CAP SLAB.
2. BEARING PLATE 1/2"x4"x8" w/2-1/2" DIA. 6" LONG HEADED STUDS WELDED TO BOTTOM OF BEARING PLATE WITH 3/16" FILLET WELD ALL AROUND. WELD JOISTS OR BEAM TO TOP OF BEARING PLATE USING 2-4" LINES OF 3/16" FILLET WELD AT EACH END OF EACH JOIST OR BEAM WITH WELD PARALLEL TO MEMBER SPAN.
3. TOP OF CMU WALL AND TOP OF JOIST BEARING PLATE AT 10'-0" ABOVE FINISH FLOOR.
4. 10K1 FLOOR JOIST AT 24"O.C.
5. 9/16" 28 GA. GALV. STEEL DECK WITH 3-1/2" TOTAL DEPTH OF NORMAL WEIGHT CONCRETE SLAB WITH 6x6-W2.1x2.1 WWF. CONNECT DECK TO SUPPORTING ROOF FRAMING MEMBERS USING EITHER 5/8" DIA. PUDDLE WELDS WITH WELDING WASHERS OR #12 TEK SCREWS IN A 30/4 PATTERN. NO_____?
6. BRIDGING 1-1/4" BY 1-1/4" BY 3/16" ANGLES WELDED TO TOP AND BOTTOM CHORDS OF EACH JOIST.
7. CONCRETE BLOCKS – VARIOUS DESIGNS, CLASSIFICATION O-2 (2 HR.).
8. MORTAR – BLOCKS LAID IN FULL BED OF MORTAR, NOM. 3/8" THICK, OF NOT LESS THAN 2-1/4" AND NOT MORE THAN 3-1/2 PARTS OF CLEAN SHARP SAND AND 1 PART PORTLAND CEMENT (PROPORTIONAL BY VOLUME) AND NOT MORE THAN 50% HYDRATED LIME (BY CEMENT VOLUME)-VERTICAL JOINTS STAGGERED.
9. SPRINKLER DESIGN DOUSITY 0.30 gpm/ft. sq..
10. ROOM SHALL BE EXHAUSTED AT A RATE OF 9600 cfm.
11. EXTERIOR MOUNTED ROLL-UP FIRE DOOR w/2 HR. MINIMUM FIRE RATING, "FIRE KING" 631 SERIES, AS MANUFACTURED BY OVERHEAD DOOR CO., LEWISVILLE, TX. ONLY ONE DOOR SHALL BE OPEN AT A TIME.
12. ALL CEILING LIGHTING AND SWITCHING SHALL BE CLASS 1 DIV. 2.
13. EXHAUST FAN FOR 13" ROOM VENT SHALL RUN CONTINUOUSLY WHILE CYLINDERS ARE STORED INSIDE.



SOUTH ELEVATION
SCALE: 1/2" = 1'-0"



SECTION A-A
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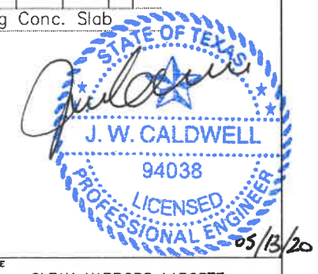


REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
D	PERMIT RENEWAL 2020	KMC	5-7-20	DAD
C	ISSUED FOR BIDS	KMC	6-10-11	PTW
B	ADDED VENT AND ROLL-UP DOOR TEXT	KMC	1-10-11	MC
A	PRELIMINARY	KMC	12-2-10	PTW

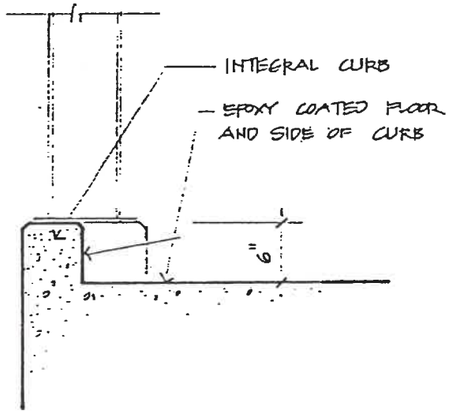
REFERENCE DRAWINGS

CleanHarbors

DRAWN	CHECKED	SCALE	DATE
K.M.C.	P.T.W.	AS NOTED	11/02/10

TITLE
CLEAN HARBORS LAPORTE
WAREHOUSE III
HAZARDOUS GAS CYLINDER STORAGE ROOM

DRAWING NO. 67LT-7300-502 REV. D



1 SECTION @ DOCK
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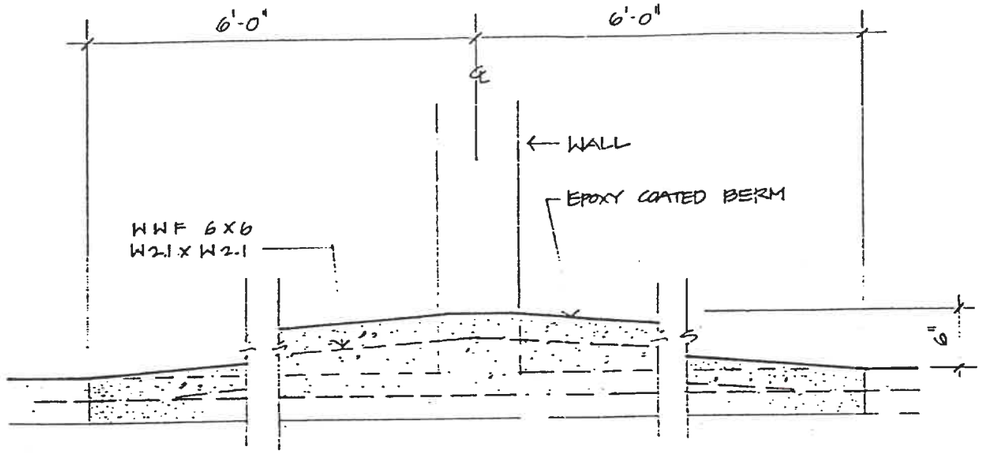
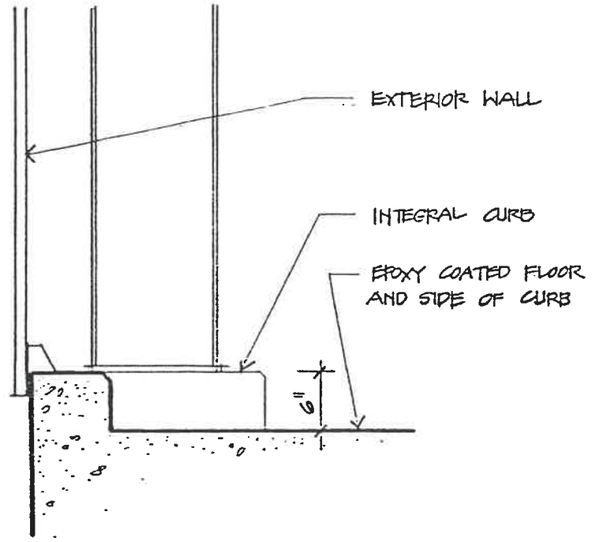


2 SECTION THRU BERM
3/4" = 1'-0"



3 SECTION @ EXTERIOR WALL
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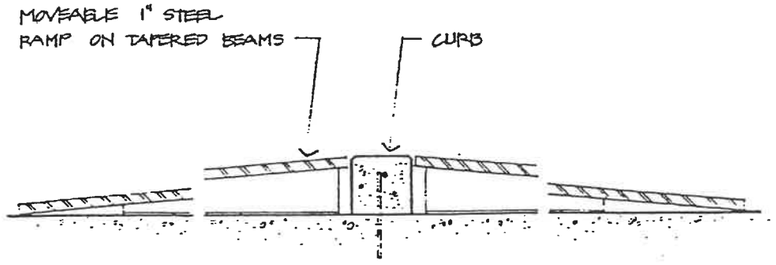


4 SECTION @ MOVEABLE RAMP
3/4" = 1'-0"

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED PROFESSIONAL ENGINEER
05/13/20

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
B	PERMIT RENEWAL 2020	KMC	5/7/20	DAD
A	FOR PERMIT RENEWAL	KMC	7/30/09	MAR

CleanHarbors®

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.A.R.	AS NOTED	07/21/09

TITLE
CLEAN HARBORS LAPORTE WAREHOUSE CONTAINER STORAGE AREAS SECONDARY CONTAINMENT SYSTEM DETAILS

DRAWING NO. 67LT-7100-502

REV. B

Professional Engineer Certification

Container Storage Area 4 (Bulk Container Storage Area) is a proposed 16,500 ft^2 concrete pad designed and managed to meet the requirements of 40 CFR Subpart I (264.170-264.178), and 270.15.

The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date 05/20/20

J. W. Caldwell
Texas PE # 94038

ENGINEERING REPORT - CONTAINER STORAGE AREA 4

GENERAL INFORMATION

This Engineering Report contains details specific to Container Storage Area 4 (TCEQ unit 033, NOR 033) of the Clean Harbors LaPorte, LLC facility. For additional details on this unit see: Current Site Plan included in the General Engineering Report (Appendix V.A of the Part B application); Tables V.A and V.B of Part B application.

Container Storage Area 4 (Outdoor Storage 033) is proposed to be constructed east of Container Storage Area 3. This unit was permitted on January 7, 2016 as a Class 2 Permit Modification based on an initial submittal in June 2015 and revisions through December 2015. The container storage area is a proposed outdoor container storage pad used to store bulk storage container bins that will be constructed with containment to accommodate thirty cubic yard units. The proposed unit is permitted to store waste with no free liquids. The area will mirror all storage conditions and requirements of the previously permitted storage areas but will not have a roof. The approximate dimensions of Outdoor Storage 033 are 110 feet wide by 150 feet long. The storage and staging area will have concrete bases with floors that have been sealed with an epoxy coating. The proposed perimeter curbs are a minimum of 6 inch high reinforced concrete. Either a gently sloped concrete berm or metal ramp is provided for safe movement of container handling equipment over the curbs. between the subdivided areas within each container storage and staging areas. The Overall Facility Plan attached to the General Engineering Report (Appendix V.A) shows proposed construction details for Outdoor Storage 033 (i.e., curbs, dimensions).

Outdoor Storage 033 is located outside a 100 year flood plain (see FEMA Map attached to Section II.F) and is more than 15 meters (50 ft) from the property line as required by 40 CFR 264.176 (see the Overall Facility Plan attached to Appendix V.A). Final design details are pending construction. .

As shown on Table V.B of the Part B application, Outdoor Storage 033 is designed to store 181,775 gallons (3,305 55-gallon drum equivalents) in DOT containers that contain a wide variety of organic and inorganic wastes including wastes that maybe ignitable, reactive or incompatible. No free liquids are to be stored in Outdoor Storage 033. Specific waste numbers are found on Table IV.B and Table V.B of the Part B application.

The remaining sections below are structured based on the requirements of 40 CFR 264.171-264.173 and 264.175-264.177. The information outlined in 40 CFR 270.15 is

described in these sections, particularly the Containment section and associated drawings and calculations.

§264.171 Condition of Containers

Prior to moving any container into the storage area, it will be inspected for leaks and the condition of the container. The Waste Profile Record and any sample analysis required under the facility WAP will be used to determine the appropriate area within the facility for storage.

The wastes received in this area are stored in a compatible manner. That is, they will be compatible with the storage containers as well as the wastes that are stored in the same container storage area. Regulated containers received at the facility will meet U.S. Department of Transportation (DOT) requirements for the applicable means of transportation. Only containers in good condition, free of excessive rust or structural defects, will be used for storage. Wastes to be received by the facility will come to the facility packaged in various sizes of containers, including but not limited to 5 gallon to 55 gallon drums, supersacks, one yard boxes, and portable tanks. Additionally, over pack containers of various sizes will be utilized for release minimization purposes.

Containers holding hazardous waste will remain closed during storage and handling, except when it is necessary to sample, inspect, add, or remove waste. Containers of hazardous waste will be handled, stored and disposed of in a manner so as to minimize spillage or leakage of waste from the container. Drums will normally be sealed (bungs tight or tops fastened tight). Containers holding hazardous waste will not be opened, handled, or stored in a manner that may rupture it, cause it to leak, or otherwise jeopardize the integrity of the container.

Hazards in unloading will be minimized though the proper training of the facility staff as provided in the Personnel Training Plan described in Section III of this Part B application. Spill response is detailed in the Contingency/Emergency Response Plan in Section III.

Methods will be employed to minimize air emissions related to the management of containers at this facility in accordance with 40 CFR 270.27 and 40 CFR 264, Subpart CC. These requirements apply to all wastes which have an average Volatile Organic Compound (VOC) concentration of 500 parts per million by weight or greater. These requirements apply at the point of waste origination, defined as the point where the facility accepts the waste(s). Procedures to ensure compliance with any applicable air emission requirements are presented in Section X of this Part B application.

§264.172 Compatibility of Waste with Containers

The container storage portions of the proposed bulk outdoor storage area are not subdivided as the Warehouses are. The area is used only to store wastes which are compatible. Flammable liquids are restricted to storage in Warehouse III only. These practices comply with the requirements of 40 CFR 264.177(c). Flammable and incompatible waste types will be managed in accordance with the requirements of the operating permit.

Each drum to be stored will be evaluated using the supplied waste profile record (WPR). The wastes are typically segregated into hazard class compatibility groups as indicated in the following list:

HAZARD CLASS COMPATIBILITY GROUPS

Group	Group
Oxidizer	Combustible/Flammable
Organic Peroxide	Reactive
Polychlorinated Biphenyl	Lab Packs
Alkaline	Otherwise Regulated Material
Acid	Non Hazardous/ Non regulated

There may be coexisting compatibility groups in the same container storage area, or an individual storage area may be limited to one compatibility group only. Compatibility of the wastes will be confirmed using the Waste Profile Record, any WAP required sample analysis, and reference documents such as "A METHOD FOR DETERMINING THE COMPATIBILITY OF HAZARDOUS WASTES" (EPA Document EPA 600/2 80 076).

Activities to be conducted by the facility do not include blending or comingling of potentially incompatible waste materials. In accordance with 40 CFR 264.177(a), incompatible wastes or wastes and materials will generally not be placed in the same container unless specific analysis, trial testing, or established reference literature supports that an adverse reaction, as listed in 40 CFR 264.17(b), will not occur. Furthermore, hazardous waste will not be placed into an unwashed container that previously held an incompatible waste or material as required by 40 CFR 264.177(b). Therefore, the compatibility concerns are limited to the possibility of leaks from containers within a storage area mixing with leaks from another container during a spill or emergency. Compatibility concerns include the potential for fire, generation of toxic and flammable gases, explosion, and violent polymerization. Accordingly, wastes which have the potential to cause these types of reactions will not be stored within the same area.

If the generator does not provide sufficient information to determine that the waste is potentially incompatible with any of the wastes stored in a required container storage area, the waste will either be rejected or additional analysis will be conducted by a contract laboratory prior to storage.

The EPA sponsored compatibility method allows determinations by type of waste and Standard Industrial Classification code of the generator. The resulting compatibility determination is, by design, conservative and eliminates the need for waste analyses.

In terms of the storage requirements for aisle space and maximum pile size under the applicable NFPA 30, these "generally compatible" wastes will be treated the same as the major waste type with which they are stored until removed from the storage area. For example, if a pH neutral oil is stored in a Class II flammable waste storage area, the drums containing the pH neutral oil will be included in determining the allowable size of the container piles within that area.

§264.173 Management of Containers

The roll-off containers proposed to be stored in this area will be unloaded directly on to the concrete pad for storage within secondary containment. A secondary containment curb at the base of the area at ground level will be constructed which serves to contain both spillage from the roll-off containers as well as spillage out the back of trucks backed up to the dock. Staging areas used for temporary holding, weighing, and etc., also have concrete curbs for secondary containment. Concrete berms or steel ramps are used to pass over the curbed containment between sub areas of the storage areas or to exterior locations outside the warehouses.

The attached table summarizes the contained surface areas, rated storage capacities, required secondary containment capacity (10 percent of storage capacity), and the available secondary containment capacity provided by the 6 inch high curbs. Footnotes to the table describe how the quantities were derived. Based on these quantities and available secondary containment volumes, each container storage area has more than the secondary containment capacity required by 40 CFR 264.175(b)(3).

For purposes of secondary containment, six inch high concrete curbing also encloses the staging areas, providing well in excess of 10 percent of the temporarily held container volume. The maximum total container storage capacity, for purposes of permit limitations and closure cost calculations, is 181,777 gallons, exclusive of allowable staging area volumes.

Containers used for waste storage will not contain liquids. This condition precludes the need to slope the floors in order to drain and remove spilled liquids in accordance with 40 CRF 264.175(b)(2). Spills will be removed in a timely manner.

§264.175 Containment

Outdoor Storage 033 has not been built but is planned to be constructed to the following specifications in compliance with 40 CFR 261.175 (b) (1):

> Concrete base: 4" minimum thickness, 3,000 psi, with rebar reinforcing. Sub-base loading is minimum 1,500 psi.
>
> All container storage areas are curbed for containment, and are monolithic in character. Where a joint exists, a chemical resistant backer rod is embedded in the joint, below the slab surface. Curb heights vary depending upon the amount of containment required.
>
> All bases will be free of cracks and gaps, and where cracks have developed over time, a suitable filler and sealer has been used. The bases will be smooth in appearance without spalling, flaking, or having signs of chemical attack. The areas have significant containment.
>
> The structural integrity of the bases will be adequate for the purposes for which they were designed, that is, for chemical containment.
>
> Outdoor Storage 033 is not in a covered area but the proposed construction does not pose an issue relative to adequate secondary containment capacity.

Containment calculations that show that the containment structure has a volume greater than 10% of the total volume and larger than the largest container are not necessary since this container storage area will not hold hazardous wastes with free liquids.

§264.176 Special Requirements for Ignitable or Reactive Wastes

All storage areas are at least fifty (50) feet from the property lines, greater than the 50 feet required by 40 CFR 264.176 and applicable NFPA codes. Minimum buffer zone distances for the container storage areas are shown on figures attached to V.A and V.B.iii.

§264.177 Special Requirements for Incompatible Wastes

As shown in 67LT-7100-502 the container storage portions of is not segregated into subdivided areas. The owner reserves the right to alter the arrangement of these areas as deemed appropriate. This area is used only to store wastes which are compatible. Flammable liquids are restricted to storage in Warehouse III only. These practices

comply with the requirements of 40 CFR 264.177(c). Flammable and incompatible waste types will be managed in accordance with the requirements of the operating permit.

CALCULATIONS

SECONDARY CONTAINMENT CALCULATIONS

Container Storage Area 4

Container Storage Area 4 is a proposed unit. This unit is currently permitted to store waste with no free liquids. Therefore secondary containment is not required.

Table V.B. - Container Storage Area

Permit Unit No.	Container Storage Area	N.O.R. No.	Waste Nos.[4]	Rated Capacity[3]	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable[1], Reactive[1], or Incompatible[2] waste (state all that apply)
001	Warehouse I	001	See Table IV.B	403,960 gallons	202' x 109'	69,300 gallons	Reactive and Incompatible
002	Warehouse II	003	See Table IV.B	264,970 gallons	188' x 76'	48,000 gallons	Reactive and Incompatible
003	Warehouse III	004	See Table IV.B	395,340 gallons	209' x 142'	99,800 gallons	Ignitable, Reactive, and Incompatible
033	Outdoor Storage 033	033	See Table IV.B	181,775 gallons	110' x 150'	NA (no free liquids)	Ignitable, Reactive, and Incompatible

Professional Engineer Certification

Tank system R-1 is a permitted chemical treatment reactor tank. This tank is a steel vertical above ground tank located in Warehouse I and is designed and managed to meet the requirements of 40 CFR 264.190 through 264.199.

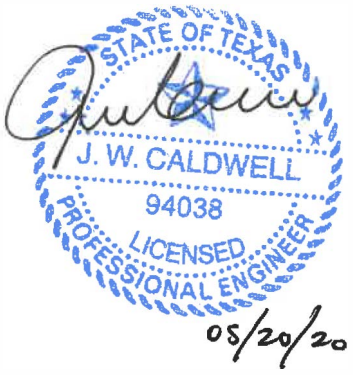
The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date 05/20/20

J. W. Caldwell
Texas PE # 94038



ENGINEERING REPORT – R-1

GENERAL INFORMATION

The drawings listed below are included with this Engineering Report (R-1) for Clean Harbors LaPorte, LLC.

Drawing No. 270361-1
Drawing No. L-201-PF-001-D
Drawing No. L-201-PI-001-D

This section provides basic descriptions and specifications for the current permitted tank system (Permitted unit # 024). Chemical Treatment Reactor Tank R-1 described herein is utilized to treat certain wastes received at the facility. The tank is operated independently and in batch-mode and is designed to operate with zero emissions. The tank utilizes a two-stage wet scrubber for potential upset emission control. They contain solutions designed to react with the various wastes and convert them to less toxic byproducts. The solutions contained within the tanks may be acidic, alkaline, oxidizing or reducing depending on the nature of the waste being treated. Once a batch is complete the contents of the tank are drained and placed into containers. The containers are stored in a Container Storage Area until being shipped off-site for disposal

The Table V.C. and the table below list the tank currently permitted and in operation, the current permit unit number and rated capacity and process description. A General description follows.

Reaction Tanks			
Permit Unit No.	**Tank Designation No.**	**Rated Capacity (gallons)**	**Tank Process Description**
024	R-1	200	Chemical Treatment Reactor Tank

The permitted tank was constructed in accordance with the design requirements of 40 CFR Part 264, Subpart J and has a concrete secondary containment system with a chemical resistant coating. The chemical treatment tank is located in Warehouse I to eliminate the effects of contact with rainfall. Warehouse I secondary containment volume is sufficient to meet the requirements of the unit.

Containers of waste, destined to be processed in this unit, will be staged in Warehouse I for processing. Chemical Treatment Reactor R-1, located in Warehouse I, will be charged with the appropriate quantity of chemical reagent specific to the chemical to be treated. The amount of chemical reagent transferred into the reactor determines the type and amount of waste chemical that can be treated per batch. The reactor volume limits the batch treatment volume as well as the amount of heat generated during the reaction. Before processing, each waste treatment batch is reviewed by an operator to determine specifically what waste streams and quantities of wastes will be treated.

The Chemical Treatment Reactor tank system is used to treat certain compatible waste groups as described in the process description of each tank unit. Wastes managed in these units include all hazardous wastes listed in Table IV.B.2. Waste types include hazardous and non-hazardous liquids, and compressed gases. Prohibited wastes are not introduced into the Chemical Treatment Reactor tank system – prohibited waste includes those that contain PCBs regulated under 40 CFR Part 761, dioxin-containing wastes, explosives as defined by DOT under 49 CFR Part 173, infectious materials, putrescible wastes, or other waste which cannot be safely managed within the process unit.

Only compatible wastes are processed in the treatment tanks. Wastes included in batches to be treated in the units described in this section will be identified according to the relevant criteria as listed in the Facility's Waste Analysis Plan.

Treatment solution will be transferred into the reactor using a pump. Waste will be introduced into the reactor using the internal pressure of the container in which the waste is stored. If there is insufficient pressure within the container, an inert gas will be used to pressurize the container and provide a motive force allowing transfer of the waste into the unit. The reaction rate will be limited by three variables; the inlet line size (1/8" inner diameter), the inlet line pressure, and the flow rate as determined by the position of a manual valve controlled by an operator. An operator will manually control the rate of the reaction by adjusting the pressure in the line and/or adjusting the position of the manual flow control valve. Lines from the waste container, inert gas container and reactor are connected via a manifold, valves in this manifold are used to isolate each of these lines so they can be pressurized and leak tested, so the waste container can be pressurized, and so the reactor tank can be pressurized and leak tested.

The waste line will be attached to the waste container using an appropriate fitting and will have a regulator (where necessary) and control valve. There will be an isolation valve and regulator between the manifold and inert gas container. There will be an isolation valve between the reactor tank and the manifold as well. Once the waste container is attached (container valve remaining closed), the line will be pressure checked by opening the inert gas valve and waste control valve. Leak test solution (e.g. soapy water) will be applied to the fittings to determine if any leaks are present. Any leaks found will be eliminated before processing commences. At this point, inert gas may be introduced into the waste container, as needed, to provide motive force to transfer the waste to the reactor tank.

Once the line is determined to be leak-free, the inert gas isolation valve will be closed and the waste container valve opened. The isolation valve to the reactor tank will be opened and treatment will begin. Pressure, temperature and pH will be monitored and controlled to ensure the complete reaction of the waste in the unit.

The waste chemical reactant will flow into the reaction tank through a dip tube or line mounted outside the tank and into the reagent solution. Gas or liquid being processed may be neutralized, hydrolyzed, oxidized or reduced depending on the reaction chemistry for the compound (a list of example chemical equations are included in Exhibit V.C-2 this list is not all inclusive but is incorporated to reflect the chemistry involved in the reactor treatment of typical waste streams). The reactor tank is designed, through reaction chemistry and parameter monitoring, to ensure that the waste introduced into the reactor tank is be completely reacted. Normal vent gas will contain only displaced air from the transfer of material into the reactor. This vent gas will freely vent out of the reactor and will be captured in a vapor collection line. The vapor collection line will be under a vacuum of two (2) inches of water column. The vapors will be pulled from the hood through a two-stage wet scrubber, identified X-4. The first stage of the scrubber is a venture-eductor. The second stage is a packed bed scrubber that will contain a solution equivalent to the solution used in the reactor tank. The venture-eductor will also provide the motive force for moving the air through the vent line. Acid gas removal efficiency is expected to be greater than 99%.

Once the batch is complete, the unit will be flushed with inert gas to purge the system and the spent solution in the tank and any solids that have been created will be transferred to containers. The tank will be thoroughly flushed between batches of incompatible wastes or incompatible treatment solutions. Scrubber water will be transferred to containers as well, as necessary, to maintain its viability and/or to avoid incompatibility with wastes being processed. The containers will be properly labeled, and removed to a storage area where the waste will be stored until off-site disposal is arranged. Records of waste processed, operating parameter monitoring, inspections of the unit and amounts of waste generated from this process will be kept in the Facility's Operating Record.

Empty waste containers are generated from the operations discussed above. These empty containers, as defined in 40 CFR 261.7, will be flushed with an inert gas, have their valves removed and sent to an off-site recycling facility or disposal facility. Empty container flushing also serves to flush the tank unit piping. If appropriate, empty containers are reused onsite or sent back to the generator for reuse. Containers from the treatment process that last contained P-listed wastes are thoroughly flushed with inert gas or an appropriate solvent to meet the definition of 40 CFR 261.7, then sent off-site to a disposal, recycling or reclamation facilities.

The Process flow diagram is attached as Drawing No. L-201-PF-001-D. A Piping and Instrumentation Diagram is attached as Drawing No. L-201-PI-001-D and original R-1 tank unit drawing attached as Drawing No. 270361-1.

The following sections show that the assessment followed and addressed the regulatory requirements. All reviews and assessments used the documents and drawings listed above. These references are not stated at every location in which they were used to avoid redundancy and repetitive entries.

§264.191 Assessment of Existing Tank's Integrity

The treatment tank has been designed and constructed in accordance with the design standards of the American Society of Mechanical Engineers (ASME), American National Standards Institute (ANSI), and the National Fire Prevention Association (NFPA) as follows.

Standards Organization	**Section**	**Application**
ASME	Sec. VIII, Div. 1	Tank design
ASME	Sec. VIII, Div. 1	Tank support design Appendix H
ANSI	B31.3	Piping system design
NFPA	Part 30	Tank location, spacing, emergency relief venting and support protection

Design, construction, and installation according to referenced industry standards combined with regular inspections, including annual thickness determinations, ensure that tank systems will not collapse, rupture, or fail.

§264.192 Design and installation of new tank systems or components

Chemical Reactor Tank R-1 wall thickness is designed based on a maximum pressure of 100 psig. This is greater than the combined hydrostatic pressure under full conditions plus maximum allowable vapor pressures. The tank is constructed of 316 stainless steel. The reactor tank system is to be operated at Standard Temperatures and Pressures.

The tank is designed to provide sufficient structural integrity for containment and operating pressures, structural support, and material compatibility to prevent collapse, rupture, or other failure of the tanks as required by 40 CFR 264.192(a). All currently permitted tank designs are based on standards established in the "1995 ASME Boiler and Pressure Vessel Code, Section VIII, Division 1,". Design information and specifications for Tank R-1 can be found in historical information previously submitted and attached as exhibit V.C.1.

The table below presents the permitted tank R-1 along with the approximate dimensions, capacity, and minimum design shell thickness. The thickness values are based on nominal strength properties for 316 stainless steel at an operating temperature of less than 200 F.

Tank Shell Thickness Summary				
			Minimum Shell Thickness (inches)	
Tank Designation	**Dimensions Dia. by Ht. (inches)**	**Rated Capacity (Gallons)**	**Circumferential Direction**	**Longitudinal Direction**
R-1	26.0 by 54.0	200	0.25	0.25

Tank supports have been designed in accordance with ASME Section VIII, Division 1 standards regarding structural capabilities, and NFPA standards regarding fire protection from failure. Tank R-1 is supported on four steel legs, mounted on base plates. The foundation design for Warehouse I is sufficient to support tank R-1. See attached certifications previously submitted and approved (Exhibit V.C-1).

The design, fabrication, assembly, testing and inspection of the piping systems was performed as appropriate for the wastes contained and rated for the expected working pressures, structural stresses and compatibility issues. Design and installation of piping conforms with American National Standards Institute (ANSI) B31.3, "Petroleum Refinery Piping." Piping (mainly hoses) is constructed of rubber reinforced with stainless steel and/or stainless steel tubing. Also, synthetic materials (such as high-density polyethylene or fiberglass reinforced plastic, provided these are compatible with the liquid wastes to be handled) of such size and wall thickness schedule is used for the maximum pressures to be experienced and corrosion allowance. Piping will be supported by appropriate cradles, hangers or brackets at appropriate spacing to prevent physical damage and excessive stress due to suspension stresses, settlement, vibration, expansion, or contraction.

Valves, Instruments and controls consist of temperature, pressure and pH sensors utilized to verify that reactions occurring in the tanks are within operating parameters and that there is sufficient reaction time to fully react all the waste being treated. The system is designed to be operated at atmospheric pressure with the only emissions being the displacement of headspace from the tank. Operating temperature is designed to be within 100 ° Fahrenheit of ambient. Valves, regulators, and monitoring instruments used to control/monitor flow into the vessels are constructed of materials compatible with the wastes introduced and the reagent chemicals used. The Piping and Instrumentation Diagram for Tank R-1 is attached as Drawing No. L-201-PI-001-D.

Tank R-1 is a closed-top tank equipped with vent lines that are connected to vent gas scrubbing systems. The system is designed to be a zero emission process, the media in the gas scrubbing systems are designed to adsorb or neutralize the gas that may inadvertently be generated from the process. Reaction temperatures and pressures (rate of reaction and heats of reaction) within the treatment vessels are controlled by the size and flow control valves. Each tank will be filled at essentially atmospheric pressure. During which time, it is vented to the gas scrubbing system to control emissions. Pressure relief valves with rupture disks having 10 psi rupture pressures are installed on R-1.

All tanks are connected to a vent system to minimize release of any potential acid, alkaline, or waste gases to the atmosphere. Vented gases are routed to a wet scrubber designed to manage any uncontrolled off-gas from the process. Amounts of vented gases are limited by the rate of reaction in the vessel and the size of the vent hose (or pipe) and are anticipated to be equal to the headspace in the treatment tank.

Ancillary components include equipment used to facilitate operation of the processes in the Chemical Treatment Tank System, along with equipment associated with emissions control and disposition of residuals from the process. A list of this equipment is presented below. Because the tanks, piping, and all ancillary components are installed above-ground and not supported on the soil, corrosion protection such as cathodic protection or use of special corrosion-resistant materials will not be necessary. Therefore, no part of 40 CFR 264.192(a)(3) is addressed in this application. The tank areas will not be subject to vehicular traffic or loading. Based on their isolated arrangement, the tanks do not require additional protective measures to prevent their potential damage.

Ancillary Equipment List	
Equipment Designation	**Equipment Description**
P-2	Product/Waste Solution Pump
X-4	2-Stage Wet Scrubber

Every reasonable effort will be taken to prevent damage to any portion of the storage and process system and secondary containment systems during installation of the system. Prior to placing any of the proposed units into hazardous waste service:

- An independent, qualified registered professional engineer will inspect the system for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction/installation;
- The tank system will be tested for tightness;

- All discrepancies noted in the inspection, and leaks detected by the tightness test will be repaired and remedied; and
- Leak detection and secondary containment will be in place.

§264.193 Containment and detection of releases

Current secondary containment for the tanks meet or exceed the standards found under 40 CFR 264.193(a)(1). The secondary containment system is integrally constructed with the foundation floor of the buildings used to enclose the tank systems. Each secondary containment system consists of above-ground reinforced concrete curbs and floor and an epoxy coating (or equivalent) over the entire containment area. Secondary containment is part of container storage buildings which have been originally permitted at this facility and all such information and certifications were previously submitted, reviewed and approved by TCEQ.

See Table V.C. for details pertaining to secondary containment capacity. Total capacity of secondary containment areas show excess capacity available well over current required capacity for existing units including all proposed units. See section V.B.1 for details pertaining to secondary containment for Warehouse I and the Facility Inspection Plan in Section III for details regarding the inspection of the tanks and container storage areas for tank and containment area integrity. See the Facility Contingency/ER Plan in Section III for spill response and removal procedures.

§264.194 General operating requirements

(a) Hazardous wastes or treatment reagents must not be placed in a tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail.

In accordance with 40 CFR 264.194(a), hazardous wastes will not be placed into the tank system if they will cause the tanks, piping, ancillary equipment, or secondary containment system to rupture, leak, corrode or otherwise fail. Waste acceptance criteria and quality control precludes knowingly processing wastes not approved for these units. Appropriate controls and practices are used to prevent spills and overflows from the tank and the secondary containment per 40 CFR 264.194(b) as discussed below.

The storage and processing tanks utilize manual controls to prevent them from being overfilled. Operators will determine and track the amount of reagent and wastes added to each tank and to the wet scrubber.

The R-1 Chemical Treatment Reactor system is enclosed by a commercial-grade building and will not be subject to rainfall or wind action that could cause over-topping. Consequently, no freeboard level is needed.

The engineering assessment finds that the tank systems are properly designed for hazardous waste service as proposed and should be resistant to rupture leaks, corrosion or failure.

§264.195 Inspections

Clean Harbors LaPorte, LLC has standard operating procedures for tank inspections at the facility and other documents that indicate appropriate inspections and operational procedures are in place to ensure the tanks are maintained and any leaks are discovered and fixed. Clean Harbors LaPorte, LLC's inspection plan found in Section III confirms that these tanks will be inspected according to the schedule. An example of the inspection record to be used was reviewed as part of this assessment and found to cover the regulatory requirements of 264.195 and the conditions of the RCRA permit.

§264.196 Response to leaks or spills and disposition of leaking or unfit-for-use tank systems

Clean Harbors LaPorte, LLC provided a standard operating procedure that is used at the facility for inspection and response to any detected leaks or spills in the R-1 area and facility. See the Facility Contingency/ER Plan in Section III for spill response and removal procedures. See the Facility Inspection Plan in Section III for details regarding the inspection of the tank system for R-1 and containment area integrity.

Based on the documents provided and history of the tank system operation and procedures for the currently permitted tanks, this assessment finds that there are procedures in place to detect leaks and response to leaks and spills in accordance with the regulations and the facilities RCRA permit.

§264.197 Closure and Post-Closure Care

Information pertaining to closure and cost of closure was presented in Section VII of the Part B application. Table VII.A Unit closure shows the tanks and possible decontamination methods and disposal methods for the tanks. The tanks are included in Table VII.A that is used as part of the closure plan and documentation for the current RCRA permit. The detail cost of closure data for R-1 is presented in Table VII.B of the Part B application.

§264.198 Special requirements for ignitable or reactive wastes and §264.199 Special requirements for incompatible wastes

As treatment units, the reagent solution used in the Chemical Treatment Reactor Tank System is designed to be incompatible with the wastes introduced and, therefore, cause the waste to react and be transformed into other, less hazardous, compounds. The wastes will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan

and then will be treated accordingly, using the appropriate reagent. Flow control via line size, pressure regulation and valve position are used to control the rate of reaction.

The reactor tank meets the '50 feet from the property line' standard in the National Fire Protection Association's (NFPA) "Flammable and Combustible Liquids Code," (1981). Figure V.A-1 shows that the Facility's hazardous waste management units are located more than 50 feet from the facility property line or public right-of-way.

Incompatible wastes and waste which is incompatible with tank construction materials is not placed into a tank system. Wastes processed in the treatment tanks will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan.

As previously described, all tanks are constructed of 316 stainless steel with a corrosion allowance of at least 1/8 inch. The wastes and treatment chemicals to be managed in these tanks are compatible with 316 stainless steel. Based on industry experience, the corrosion rate for 316 stainless steel tanks storing these types of materials is expected to be less than 0.02 inches per year, providing at least 6 years of corrosion allowance, plus that given by the excess wall thickness required by the maximum design pressure.

To ensure that compatibility between waste and tank construction materials is maintained and that excessive corrosion is not occurring, the Facility conducts annual shell thickness determinations using non-destructive ultrasonic methods. Internal inspections are not necessary and will not be conducted to monitor tank integrity, because all tanks are constructed above-ground and supported on legs, thereby providing complete access to external ultrasonic testing. The minimum tank thickness values are designed to safely withstand the stresses from 100 psig of internal pressure for R-1. However, these tank is normally operated at ambient pressure. Therefore, even when the minimum shell thickness has been reached, the lower operating pressure provides an additional safety factor, and additional assurance that annual tank thickness determinations will identify any structural problems with a tank before the possibility of failure.

§264.198 Special requirements for ignitable or reactive wastes

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Figure V.A-1 shows that the Facility's hazardous waste management units are located more than 50 feet from the facility property line or public right-of-way.

§264.199 Special requirements for incompatible wastes

Incompatible wastes and waste which is incompatible with tank construction materials is not placed into a tank system. Wastes processed in the treatment tanks will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan.

As previously described, all tanks are constructed of 316 stainless steel with a corrosion allowance of at least 1/8 inch. The wastes and treatment chemicals to be managed in these tanks are compatible with 316 stainless steel. Based on industry experience, the corrosion rate for 316 stainless steel tanks storing these types of materials is expected to be less than 0.02 inches per year, providing at least 6 years of corrosion allowance, plus that given by the excess wall thickness required by the maximum design pressure.

To ensure that compatibility between waste and tank construction materials is maintained and that excessive corrosion is not occurring, the Facility conducts annual shell thickness determinations using non-destructive ultrasonic methods. Internal inspections are not necessary and will not be conducted to monitor tank integrity, because all tanks are constructed above-ground and supported on legs, thereby providing complete access to external ultrasonic testing. The minimum tank thickness values are designed to safely withstand the stresses from 100 psig of internal pressure for R-1. However, the tank is normally operated at ambient pressure. Therefore, even when the minimum shell thickness has been reached, the lower operating pressure provides an additional safety factor, and additional assurance that annual tank thickness determinations will identify any structural problems with the tank before the possibility of failure.

§264.17 as referenced in §264.198 and §264.198

Clean Harbors LaPorte meets the requirements of 264.17 for managing ignitable reactive and incompatible wastes by restricting the use of open flames, smoking, or cutting or welding anywhere that these types of special waste are stored, handled, or processed. Further, the wastes are separated from any heating producing sources, sparks, spontaneous ignition sources and radiant heat by the exclusion of these sources from the tank areas and other processing locations within the facility. Smoking is not allowed in the facility. All tank farm areas are clearly labelled with No Smoking Signs. Further, Clean Harbors LaPorte has an in-house permitting system that requires "hot work" permits be obtained anytime an open flame, welding, cutting, or other potential source of ignition is planned for use as part of equipment maintenance or installation. The permit system requires that the planned work be reviewed by appropriate facility management including the safety department staff, and that a signed permit be issued prior to the start of the work. Part of the permitting process includes a review for any special waste that may be

in the vicinity of the planned work. For work on tanks such as these storage tanks, the tank will be emptied before any work is started that involves a potential ignition source.

The SOPs for chemical reactor tank, loading and unloading along with waste characteristics determination and compatibility testing under the Waste Analysis Plan are all used to minimize the potential for reaction of wastes that might generate extreme heat or pressure, fire or explosions. Drawing No. L-201-PF-001-D shows the process flow for the tank.

Other applicable RCRA Regulations §270.11

The original permit application, renewals and revisions have been signed by an appropriate Clean Harbors LaPorte, LLC Responsible Official in accordance with §270.11 and as required by the TCEQ Part B Application. This permit has also been signed in accordance with §270.11. See the signature page.

§270.16 Specific part B information requirements for tank systems

This engineering report presents the information described in §270.16 for submittal of permit applications for tank systems.

§270.16(a) – A written assessment reviewed and certified by a Texas professional engineer is included in this permit application. This engineering report has been reviewed and certified in accordance with the regulations.

§270.16(b) – The dimensions and capacity of the tank (200 gallons) is shown on Table V.C of the Part B application. Engineering drawings for R1 are attached to this Engineering Report.

§270.16(c) – The tank will be attached to the existing permitted off-loading system and vapor control system; the storage and processing tanks utilize manual controls to prevent them from being overfilled; there are pressure measurements for the tanks; and the tanks are connected to the existing vent system. See previous discussion in the engineering report.

§270.16(d) – Diagram of piping, instrumentation, and process flow are shown in drawings attached below for R-1.

§270.16(e) – No external corrosion control is required as stated under §264.192 and in the engineering report, as the tanks are not in contact with underground metal structures and have concrete foundations.

§270.16(f) – This clause is not applicable because new tank systems associated with R-1 are not proposed. Any new components of the existing tank system will be installed in compliance with §264.192 as discussed above.

§270.16(g) Secondary containment calculations and a description of containment within the currently permitted containment R-1 is presented in Section §264.193 in this document and as shown on the attached calculations on Table V.C.

§270.16(h) – No variance is being requested or needed from the requirements of §264.193.

§270.16(i) – The spill and overflow protection procedures are part of the manual and are included in the Standard Operating Procedures for R-1. Section §264.194 in this document describes the spill and overflow protection approach.

§270.16(j) – Sections §264.198 and §264.199 in this document describes the procedures in place for handing ignitable, reactive, and incompatible wastes.

§270.16(k) – R-1 is a zero-emissions tank system as discussed above. The vent system process and instrumentation connecting it to the existing vent system are shown in drawings the attached drawings, which show the process flow for these tanks.

DRAWINGS AND CALCULATIONS

SECONDARY CONTAINMENT CALCULATIONS

Warehouse I / Container Storage Area 1 in which Tank System R-1 is Located

Calculations from Container Storage Area 1 in Appendix V.B.i

Containment capacity = 20,610 s.f. x 0.5 ft x 0.9 usage factor x 7.48 gal./c.f. = 69,300 gallons

Storage capacity = 10x containment capacity = 693,000 gallons

Rated storage capacity = 403,960 gallons (approximately 7,345 55-gallon drum equivalents) for waste handled in Container Storage Area 1

Tank System R-1

Tank Systems R-1, R-1A, and R-2 are located inside Warehouse I

Tank System R-1 rated capacity = 200 gallons

Tank System R-1A rated capacity = 1,500 gallons (proposed)

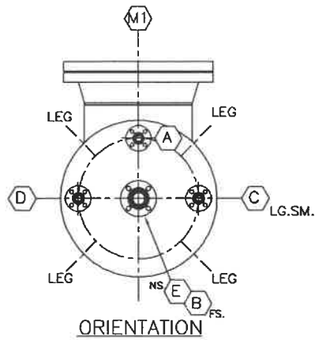
Tank System R2 rated capacity = 500 gallons

Combined rated capacity for Container Storage Area 1, Tank System R-1, Tank System R-1A, and Tank System R-2 is:

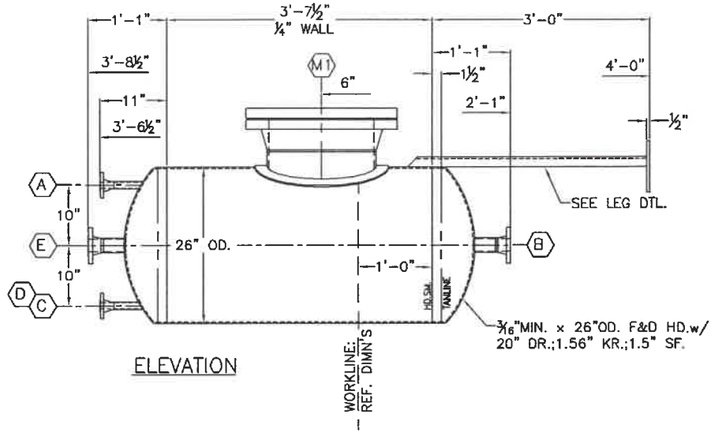
403,960 gallons + 200 gallons + 1,500 gallons + 500 gallons = 406,160 gallons

This combined amount is less than the calculated storage capacity for Warehouse I (693,000 gallons) in which these Units reside.

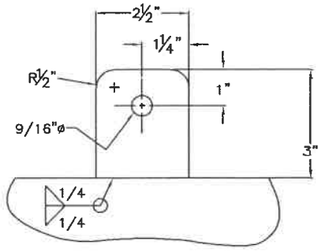
This area is covered with a perimeter berm, so rainfall and run-on do not need to be considered in containment calculations.



ORIENTATION



ELEVATION

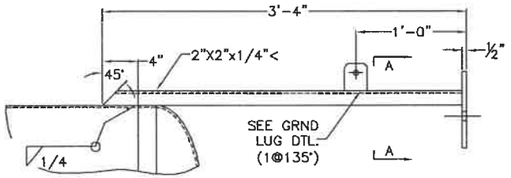


GRND LUG DTL.

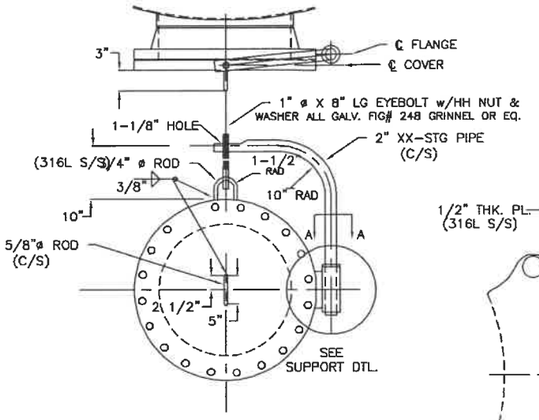
MK NO	QTY	DESCRIPTION	MATERIAL
1	2	3/16" MIN. x 26" OD. F&D 20"DR;1.56"KR;1.5"SF.	SA 240-316L
2	1	1/4" x 26" OD. x 3'-7 1/2" LG. CYL. "SHELL"	SA 240-316L
3	1	18"-150# RFWN (STD WT. BORE)	SA 182-F316L
4	1	18"-150# RF BLIND	SA 182-F316L
5	1	BOLTING FOR 20"-150#	SA 193-B7/2H
6	1	18"-150# S.W. GRAFOIL FILL'D	316L S/S
7	1	18" STD WT PIPE x 8" LG. "M1"	SA 312-TP316L
8	1	18" DAVIT ARM ASSMBLY	S/S-CS.(GALV)
9	1	5/8" x 3.5" ID. x 7.52" OD. "PAD @ M1"	SA 240-316L
10	2	2"-150# RFWN (STD BORE) "B,E"	SA 182-F316L
11	2	2" STD WT PIPE x 6" LG. "E,B"	SA 312-TP316L
12	3	1"-150# RFWN "A,C,D,"	SA 182-F316L
13	3	1" STD WT PIPE x 6" LG. "A,C,D"	SA 312-TP316L
14	1	1/4" x 2 1/2" x 3" LG. "GRND. LUG"	SA 240-316L
15	3	1/4" x 4" x 8" LG. "PAD @ LEG"	SA 240-316L
16	3	2"x2"x1/4" < ANGLE x 40" LG.	SA 240-304L
17	3	1/2" x 4"x 4" "BASE PL."	SA 240-304L
18	1	1/4" x 2 1/2" x 3" LG. "GRND. LUG"	SA 240-316L
19			
20			
21			
22			
23			
24			
25			
26			
27	1	ASME CODE NAME PL.	S/S
28	1	NAME PL. BRKT	S/S

BILL OF MATERIAL

CERTIFIED BY: JIMMY SIMMONS

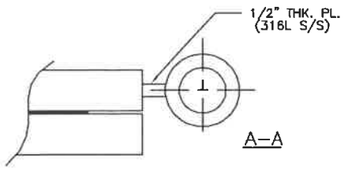


LEG DTL.
(4-REQ'D)

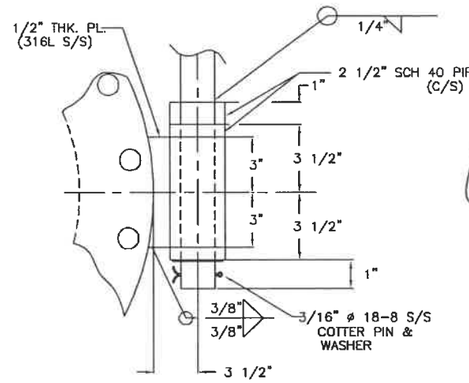


DAVIT DETAIL

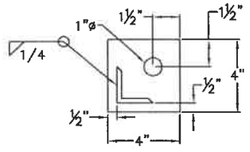
NOTE: DAVIT ARM TO BE HOT DIPPED GALVANIZED



A-A



SUPPORT DETAIL



A--A

SHOP NOTES

1. ALL BOLT HOLES STRADDLE NORMAL VESSEL CENTER LINES, EXCEPT WHERE NOTED.
2. INSIDE OF ALL VESSELS SHALL BE FREE OF ALL WELD SPLATTER, GRIT, SLAG, ETC. & COMPLETELY DRY BEFORE SHIPMENT.
3. ALL FLANGES TO BE ANSI B16.5 w/125-250 AARH GASKET FINISH UNLESS NOTED.
4. VESSEL IS FOR LETHAL SERVICE, ALL PIPE PRODUCTS TO BE SEAMLESS.
5. PT ALL FINISHED WELDS INSIDE & OUTSIDE.

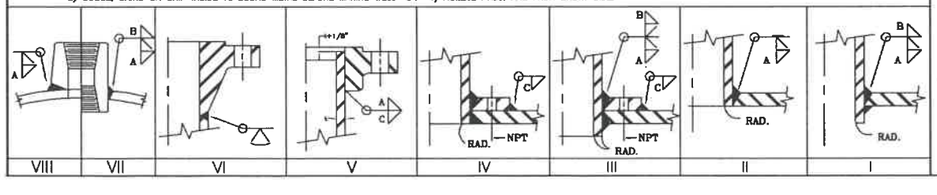
STATE OF TEXAS
J.W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/26/20

WORK LINE
ALL TAIL DIMS. ARE TO THIS LINE

MARK	REQ'D	SIZE	RATING & TYPE	SERVICE	NECK O.D.	NECK SCH.	O.S. PROJECTION	I.S. PROJECTION	REINF. PAD SIZE	WELDING DETAIL NO.	A WELD SIZE	B WELD SIZE	C WELD SIZE	BOM ITEM NO.'S
A	1	1"	150# RFWN	VAPOR OUTLET	1.32"	STD WT	ELEV	FLSH	----	VI,II	1/4	--	--	12,13
B	1	2"	150# RFWN	INLET/OUTLET	2.38"	STD WT	ELEV.	FLSH	----	VI,II	3/8	--	--	10,11
C	1	1"	150# RFWN	NITROGEN BL'NKT	1.32"	STD WT	ELEV	FLSH	----	VI,II	1/4	--	--	12,13
D	1	1"	150# RFWN	INLET/PRESS.	1.32"	STD WT	ELEV	FLSH	----	VI,II	1/4	--	--	12,13
E	1	2"	150# RFWN	VAPOR OUTLET	2.38"	STD WT	ELEV	FLSH	----	VI,II	3/8	--	--	10,11
M1	1	18"	150# RFWN	MANWAY w/BLD.	18"	STD. WT.	8"	1"	1/4" x 2" WD.	VI,III	1/4	1/4	1/4	3 THRU 9

NOZZLE SCHEDULE & WELDING DETAILS

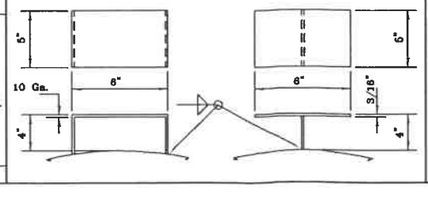
NOZZLE NOTES
1) DRILL AND TAP 1/4" N.P.T. HOLE IN REINFORCING PADS. 2) INSIDE EDGES OF NOZZLE NECKS SHALL BE ROUNDED TO 1/8" RAD. OR HALF THE WALL THICKNESS IF LESS THAN 1/4".
3) GOUGE, GRIND OR CHIP INSIDE TO SOUND METAL BEFORE MAKING WELD "b". 4) NOZZLE PROJ. ARE FROM SHORT SIDE.



U
W
RT-1
L

CERTIFIED BY
SIMMONS FABRICATORS LTD
PASADENA, TEXAS

M.A.W.P.	190	PSI @	200 °F
M.A.E.P.	15	PSI @	200 °F
MIN. DESIGN METAL TEMP.	-20	°F @	150 PSI
MFG S/N	270361	YR. BUILT	2007
X-1		WT. EMPTY	835



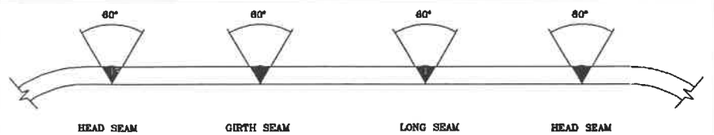
DESIGN DATA

CONSTRUCTION IN ACCORDANCE WITH THE 2005 EDITION OF ASME CODE SECTION VIII, DIV. 1

CODE STAMP YES REQ'D.
DESIGN PRESS. (INT) 50 P.S.I.G. TEMP. 200 °F
DESIGN PRESS. (EXT) 15 P.S.I.G. TEMP. 200 °F
M.A.W.P. 190 P.S.I.G. LIMITED BY HEAD
M.A.P. (N.&C.) 190 P.S.I.G. LIMITED BY HEAD
HYDROSTATIC TEST (N.&C.) 248 P.S.I.G.
CORROSION ALLOW. SHELL 0 HEAD 0 NOZZ. 0
P.W.H.T. (STRESS RELIEVE) N/A MINUTES N/A °F
RADIOGRAPH FULL JOINT EFF. 100 %
INSPECTION BY SENECA INSURANCE CO.
EST. WEIGHT EMPTY 835 LBS.
EST. WEIGHT FULL OF WATER 2250 LBS.

MATERIAL

SHELL SA 240-316L FLANGES SA 182-F316L
HEADS SA 240-316L SUPTS. SA 304
CPLG NONE INTERNALS N/A
STUDS SA 193-B7 REINF. PADS SA 240-316L
NUTS SA 194-2H NOZZ. NECKS SA 312-TP316L
GSKT'S SW GRAPHITE 316 FITTINGS NONE



WELD PROCEDURES:

NO	BY	REVISION	DATE
0	CA	FOR APPROVAL	4/1/07
1	CA	AS BUILT	7/1/07
2			
3			

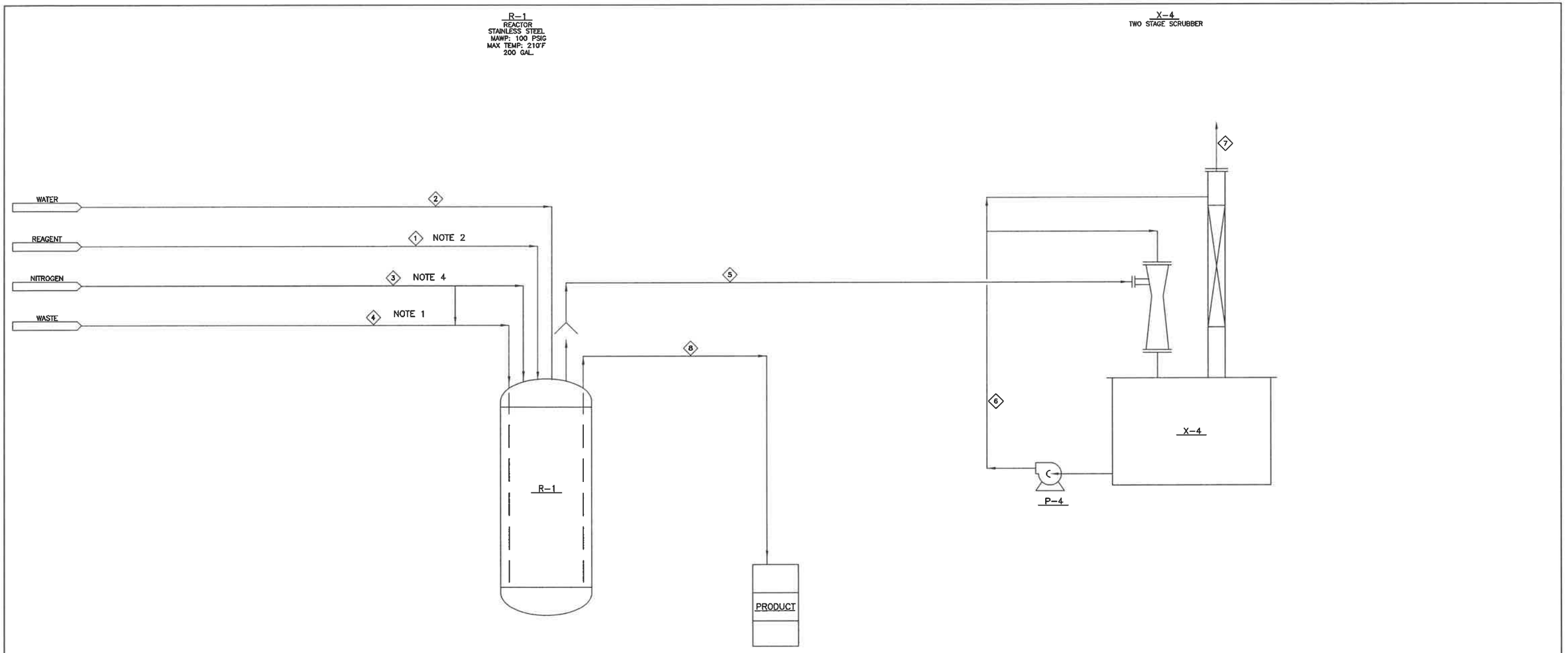
270361 | (1) REQ'D ITM# R-1

SIMMONS FABRICATORS, LTD.
2418 BEVERLY RD.
Pasadena, Texas 77508
Phone No. (281) 487-1396 Fax. No. (281) 487-8558

CUSTOMER: CLEAN-HARBORS
P.O. #: ----
LOCATION: LA PORTE, TEXAS
TITLE: 26" OD. x 3'-7 1/2" S/S VERTICAL OXIDIZER REACTOR R-1

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED	DATE	SCALE
MVA	4/07					NONE

DRAWING NO. 270361-1 SHEET NO. 1 OF 1 REVISION 1



STREAM NO.	1	2	3	4	5	6	7	8
STREAM NAME	REAGENT NaOH SOLUTION	WATER	NITROGEN	WASTE NITROSYL FLUORIDE	VENT GAS	SCRUBBER LIQUID	VENT GAS	PRODUCT
MOLECULAR WEIGHT	40	18	28	49	28	18	28	–
SPECIFIC GRAVITY	1.50	–	–	–	–	1.3	–	1.20
LIQUID (USGPM)	5.0	100	–	–	–	[50]	–	105
GAS/VAPOR (SCFM)	–	–	20	5.7	200	–	200	–
MASS FLOW (LBS/BATCH)	63	834	–	38	–	417	750	897
TEMPERATURE (°F)	68	60	60	–	140	70	80	120
PRESSURE (PSIA)	14.7	25.0	24.7	–	14.6	29.7	14.7	14.7
(IN.WC)	–	–	–	–	-2	–	2	–

NOTES:
1. INORGANIC GASES, LIQUIDS OR SOLIDS WILL BE PROCESSED IN R-1. EXAMPLES INCLUDE, HYDRIDE GASES, CYANIDE BEARING WASTE, CORROSIVE GASES AND LIQUIDS, CORROSIVE OXIDIZERS AND FLAMMABLE GASES.
2. TREATMENT REAGENT VARIES BASED ON MATERIAL BEING TREATED. PFD SHOWS TREATMENT FOR NITROSYL FLUORIDE AS AN EXAMPLE.
3. WASTE IS TREATED BATCHWISE.
4. NITROGEN IS USED FOR PURGING THE LINES AND VESSEL PRIOR TO AND AFTER PROCESSING.

REFERENCE DRAWINGS

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
E	PERMIT RENEWAL 2020	KMC	5/7/20	D.A.D.
D	REVISED TITLE BLOCK	KMC	7/30/09	MAR
C	FOR APPROVAL	WDS	9/25/03	

CleanHarbors® LAPORTE

DRAWN	CHECKED	SCALE	DATE
WDS		NTS	8/8/03

TITLE L201PF001

CLEAN HARBORS LAPORTE
PROCESS FLOW DIAGRAM
CHEMICAL TREATMENT

DRAWING NO. L-201-PF-001-D REV. E

STATE OF TEXAS
J.W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

R-1
REACTOR
200 GAL.

P-2
1/2" DIAPHRAGM PUMP

P-4
SCRUBBER PUMP

X-4
TWO STAGE SCRUBBER

1/4"

PCV

1/4" N.C.

1/8"

FG

1/4"

1/2"

PI

1/2" SS

WASTE

R-1

TI

1/4"

1/4"

PI

PCV

NITROGEN

1/4"

PI

1 1/2"

HS START STOP

M

P-4

PI AE

2"

X-4

LCV

FI

INSIDE OUTSIDE

PLANT AIR

PCV

PI

1/2"

REAGENT

P-2

PRODUCT

TO DISPOSAL OFFSITE

PLANT WATER

1 1/2"

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
E	PERMIT RENEWAL 2020	KMC	5/7/20	DAD
D	REVISED TITLE BLOCK	KMC	7/30/09	MAR
C	FOR APPROVAL	WDS	9/24/03	

REFERENCE DRAWINGS

CleanHarbors LAPORTE

DRAWN	CHECKED	SCALE	DATE
WDS		NTS	8/8/03

TITLE
CLEAN HARBORS LAPORTE
PIPING & INSTRUMENTATION DIAGRAM
CHEMICAL TREATMENT

L201PI001

DRAWING NO. L-201-PI-001-D

REV. E

Professional Engineer Certification

Tank system R-1A is a permitted chemical treatment reactor tank. This tank is a steel vertical above ground tank located in Warehouse I and is designed and managed to meet the requirements of 40 CFR 264.190 through 264.199.

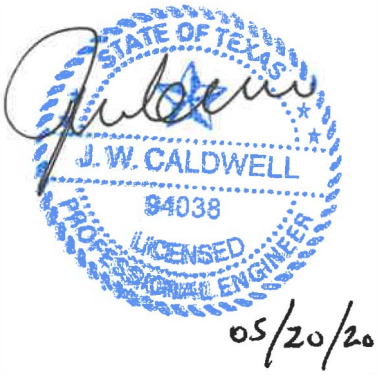
The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date 05/20/20

J. W. Caldwell
Texas PE # 94038



ENGINEERING REPORT – R-1A

GENERAL INFORMATION

The drawings listed below are included with this Engineering Report (R-1A) for Clean Harbors LaPorte, LLC.

Drawing No. 6726-M-01
Drawing No. L-201A-PF-001-D
Drawing No. L-201A-PI-001-D

This section provides basic descriptions and specifications for the current permitted tank system (Permitted unit # 025). Chemical Treatment Reactor Tank R-1A described herein is utilized to treat certain wastes received at the facility. The tank is operated independently and in batch-mode and is designed to operate with zero emissions. The tank utilizes a two-stage wet scrubber for potential upset emission control. They contain solutions designed to react with the various wastes and convert them to less toxic byproducts. The solutions contained within the tanks may be acidic, alkaline, oxidizing or reducing depending on the nature of the waste being treated. Once a batch is complete the contents of the tank are drained and placed into containers. The containers are stored in a Container Storage Area until being shipped off-site for disposal

The Table V.C. and the table below list the tank currently permitted and in operation, the current permit unit number and rated capacity and process description. A General description follows.

Reaction Tanks			
Permit Unit No.	**Tank Designation No.**	**Rated Capacity (gallons)**	**Tank Process Description**
025	R-1A	500 **(Proposed 1,500)**	Chemical Treatment Reactor Tank

The permitted tank was constructed in accordance with the design requirements of 40 CFR Part 264, Subpart J and has a concrete secondary containment system with a chemical resistant coating. The chemical treatment tank is located in Warehouse I to eliminate the effects of contact with rainfall. Warehouse I secondary containment volume is sufficient to meet the requirements of the unit.

Containers of waste, destined to be processed in this unit, will be staged in Warehouse I for processing. Chemical Treatment Reactor R-1A, located in Warehouse I, will be charged with the appropriate quantity of chemical reagent specific to the chemical to be treated. The amount of chemical reagent transferred into the reactor determines the type and amount of waste chemical that can be treated per batch. The reactor volume limits the batch treatment volume as well as the amount of heat generated during the reaction. R-1A will be operated in the same manner as R-1, but, due to its larger size, will allow larger batch quantities to be processed. Before processing, each waste treatment batch is reviewed by an operator to determine specifically what waste streams and quantities of wastes will be treated.

The Chemical Treatment Reactor tank system is used to treat certain compatible waste groups as described in the process description of each tank unit. Wastes managed in these units include all hazardous wastes listed in Table IV.B.2. Waste types include hazardous and non-hazardous liquids, and compressed gases. Prohibited wastes are not introduced into the Chemical Treatment Reactor tank system – prohibited waste includes those that contain PCBs regulated under 40 CFR Part 761, dioxin-containing wastes, explosives as defined by DOT under 49 CFR Part 173, infectious materials, putrescible wastes, or other waste which cannot be safely managed within the process unit.

Only compatible wastes are processed in the treatment tanks. Wastes included in batches to be treated in the units described in this section will be identified according to the relevant criteria as listed in the Facility's Waste Analysis Plan.

Treatment solution will be transferred into the reactor using a pump. Waste will be introduced into the reactor using the internal pressure of the container in which the waste is stored. If there is insufficient pressure within the container, an inert gas will be used to pressurize the container and provide a motive force allowing transfer of the waste into the unit. The reaction rate will be limited by three variables; the inlet line size (1/8" inner diameter), the inlet line pressure, and the flow rate as determined by the position of a manual valve controlled by an operator. An operator will manually control the rate of the reaction by adjusting the pressure in the line and/or adjusting the position of the manual flow control valve. Lines from the waste container, inert gas container and reactor are connected via a manifold. Valves in this manifold are used to isolate each of these lines so they can be pressurized and leak tested.

The waste line will be attached to the waste container using an appropriate fitting and will have a regulator (where necessary) and control valve. There will be an isolation valve and regulator between the manifold and inert gas container. There will be an isolation valve between the reactor tank and the manifold as well. Once the waste container is attached (container valve remaining closed), the line will be pressure checked by opening the inert gas valve and waste control valve. Leak test solution (e.g. soapy water) will be applied to the fittings to determine if any leaks are present. Any leaks found will be eliminated before processing commences. At this point, inert gas may be introduced into the waste

container, as needed, to provide motive force to transfer the waste to the reactor tank. Once the line is determined to be leak-free, the inert gas isolation valve will be closed and the waste container valve opened. The isolation valve to the reactor tank will be opened and treatment will begin. Pressure, temperature and pH will be monitored and controlled to ensure the complete reaction of the waste in the unit.

The waste chemical reactant will flow into the reaction tank through a dip tube and into the reagent solution. Gas or liquid being processed may be neutralized, hydrolyzed, oxidized or reduced depending on the reaction chemistry for the compound (a list of example chemical equations are attached as Exhibit V.C-2 to Appendix V.C.i this list is not all inclusive but is incorporated to reflect the chemistry involved in the reactor treatment of typical waste streams). Waste introduced into the reactor tank is designed, through reaction chemistry and parameter monitoring, to be completely reacted. Normal vent gas will contain only displaced air from the transfer of material into the reactor. This vent gas will freely vent out of the reactor and will be captured in a vapor collection line. The vapor collection line will be under a vacuum of two (2) inches of water column. The vapors will be pulled from the hood through a two-stage wet scrubber, identified as X-4. The first stage of the scrubber is a venture-eductor. The second stage is a packed bed scrubber that will contain a solution equivalent to the solution used in the reactor tank. The venture-eductor will also provide the motive force for moving the air through the vent line. Acid gas removal efficiency is expected to be greater than 99%.

Once the batch is complete, the unit will be flushed with inert gas to purge the system and the spent solution in the tank and any solids that have been created will be transferred to containers. The tank will be thoroughly flushed between batches of incompatible wastes or incompatible treatment solutions. Scrubber water will be transferred to containers as well, as necessary, to maintain its viability and/or to avoid incompatibility with wastes being processed. The containers will be properly labeled, and removed to a storage area where the waste will be stored until off-site disposal is arranged. Records of waste processed, operating parameter monitoring, inspections of the unit and amounts of waste generated from this process will be kept in the Facility's Operating Record.

The Process Flow Diagram for this tank is attached as Drawing No. L-201A-PF-001-D. A Piping and Instrumentation Diagram is attached as Drawing No. L-201A-PI-001-D and the original R-1A tank unit drawing is attached as Drawing No. 6726-M-01.

Empty waste containers will be managed in the same manner as those from R-1 (see Appendix V.C.i).

The following sections show that the assessment followed and addressed the regulatory requirements. All reviews and assessments used the documents and drawings listed above. These references are not stated at every location in which they were used to avoid redundancy and repetitive entries.

§264.191 Assessment of Existing Tank's Integrity

The treatment tank has been designed and constructed in accordance with the design standards of the American Society of Mechanical Engineers (ASME), American National Standards Institute (ANSI), and the National Fire Prevention Association (NFPA) as follows.

Standards Organization	**Section**	**Application**
ASME	Sec. VIII, Div. 1	Tank design
ASME	Sec. VIII, Div. 1	Tank support design Appendix H
ANSI	B31.3	Piping system design
NFPA	Part 30	Tank location, spacing, emergency relief venting and support protection

Design, construction, and installation according to referenced industry standards combined with regular inspections, including annual thickness determinations, ensure that tank systems will not collapse, rupture, or fail.

§264.192 Design and installation of new tank systems or components

Chemical Reactor Tank R-1A wall thickness is designed based on a maximum pressure of 100 psig. This is greater than the combined hydrostatic pressure under full conditions plus maximum allowable vapor pressures. The tank is constructed of 316 stainless steel. The reactor tank system is to be operated at Standard Temperatures and Pressures.

The tank is designed to provide sufficient structural integrity for containment and operating pressures, structural support, and material compatibility to prevent collapse, rupture, or other failure of the tanks as required by 40 CFR 264.192(a). All currently permitted tank designs are based on standards established in the "1995 ASME Boiler and Pressure Vessel Code, Section VIII, Division 1,". Design information and specifications for Tank R-1 can be found in historical information previously submitted and attached as exhibit V.C.1.

The table below presents the permitted tank R-1 along with the approximate dimensions, capacity, and minimum design shell thickness. The thickness values are based on nominal strength properties for 316 stainless steel at an operating temperature of less than 200 F.

Tank Shell Thickness Summary				
			Minimum Shell Thickness (inches)	
Tank Designation	Dimensions Dia. by Ht. (inches)	Rated Capacity (Gallons)	Circumferential Direction	Longitudinal Direction
R-1A	48.0 by 66.0 (Proposed 72.0 by 96.0)	500 (Proposed 1500)	0.25	0.25

Tank supports have been designed in accordance with ASME Section VIII, Division 1 standards regarding structural capabilities, and NFPA standards regarding fire protection from failure. Tank R-1A is supported on four steel legs, mounted on base plates. The foundation design for Warehouse I is sufficient to support tank R-1A. See attached certifications previously submitted and approved.

The design, fabrication, assembly, testing and inspection of the piping systems was performed as appropriate for the wastes contained and rated for the expected working pressures, structural stresses and compatibility issues. Design and installation of piping conforms with American National Standards Institute (ANSI) B31.3, "Petroleum Refinery Piping." Piping (mainly hoses) is constructed of rubber reinforced with stainless steel and/or stainless steel tubing. Also, synthetic materials (such as high-density polyethylene or fiberglass reinforced plastic, provided these are compatible with the liquid wastes to be handled) of such size and wall thickness schedule is used for the maximum pressures to be experienced and corrosion allowance. Piping will be supported by appropriate cradles, hangers or brackets at appropriate spacing to prevent physical damage and excessive stress due to suspension stresses, settlement, vibration, expansion, or contraction.

Valves, Instruments and controls consist of temperature, pressure and pH sensors utilized to verify that reactions occurring in the tanks are within operating parameters and that there is sufficient reaction time to fully react all the waste being treated. The system is designed to be operated at atmospheric pressure with the only emissions being the displacement of headspace from the tank. Operating temperature is designed to be within 100 ° Fahrenheit of ambient. Valves, regulators, and monitoring instruments used to control/monitor flow into the vessels are constructed of materials compatible with the wastes introduced and the reagent chemicals used. The Piping and Instrumentation Diagram for Tank R-1A is attached below.

Tank R-1A is a closed-top tank equipped with vent lines that are connected to vent gas scrubbing systems. The system is designed to be a zero emission process, the media in the gas scrubbing systems are designed to adsorb or neutralize the gas that may inadvertently be generated from the process. Reaction temperatures and pressures (rate of reaction and heats of reaction) within the treatment vessels are controlled by the size and flow control valves. Each tank will be filled at essentially atmospheric pressure. During which time, it is vented to the gas scrubbing system to control emissions. Pressure relief valves with rupture disks having 10 psi rupture pressures are installed on R-1A.

R-1A is connected to a vent system to minimize release of any potential acid, alkaline, or waste gases to the atmosphere. Vented gases are routed to a wet scrubber designed to manage any uncontrolled off-gas from the process. Amounts of vented gases are limited by the rate of reaction in the vessel and the size of the vent hose (or pipe) and are anticipated to be equal to the headspace in the treatment tank.

Ancillary components include equipment used to facilitate operation of the processes in the Chemical Treatment Tank System, along with equipment associated with emissions control and disposition of residuals from the process. A list of this equipment is presented below. Because the tanks, piping, and all ancillary components are installed above-ground and not supported on the soil, corrosion protection such as cathodic protection or use of special corrosion-resistant materials will not be necessary. Therefore, no part of 40 CFR 264.192(a)(3) is addressed in this application. The tank areas will not be subject to vehicular traffic or loading. Based on their isolated arrangement, the tanks do not require additional protective measures to prevent their potential damage.

Ancillary Equipment List	
Equipment Designation	**Equipment Description**
P-2	Product/Waste Solution Pump
X-4	2-Stage Wet Scrubber

Every reasonable effort will be taken to prevent damage to any portion of the storage and process system and secondary containment systems during installation of the system. Prior to placing any of the proposed units into hazardous waste service:

- An independent, qualified registered professional engineer will inspect the system for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction/installation;
- The tank system will be tested for tightness;

- All discrepancies noted in the inspection, and leaks detected by the tightness testwill be repaired and remedied; and
- Leak detection and secondary containment will be in place.

§264.193 Containment and detection of releases

Current secondary containment for the tanks meet or exceed the standards found under 40 CFR 264.193(a)(1). The secondary containment system is integrally constructed with the foundation floor of the buildings used to enclose the tank systems. Each secondary containment system consists of above-ground reinforced concrete curbs and floor and an epoxy coating (or equivalent) over the entire containment area. Secondary containment is part of container storage buildings which have been originally permitted at this facility and all such information and certifications were previously submitted, reviewed and approved by TCEQ.

See Table V.C. for details pertaining to secondary containment capacity. Total capacity of secondary containment areas show excess capacity available well over current required capacity for existing units including all proposed units. See section V.B.1 for details pertaining to secondary containment for Warehouse I and the Facility Inspection Plan in Section III for details regarding the inspection of the tanks and container storage areas for tank and containment area integrity. See the Facility Contingency/ER Plan in Section III for spill response and removal procedures.

§264.194 General operating requirements.

(a) Hazardous wastes or treatment reagents must not be placed in a tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail.

In accordance with 40 CFR 264.194(a), hazardous wastes will not be placed into the tank system if they will cause the tanks, piping, ancillary equipment, or secondary containment system to rupture, leak, corrode or otherwise fail. Waste acceptance criteria and quality control precludes knowingly processing wastes not approved for these units. Appropriate controls and practices are used to prevent spills and overflows from the tank and the secondary containment per 40 CFR 264.194(b) as discussed below.

The storage and processing tanks utilize manual controls to prevent them from being overfilled. Operators will determine and track the amount of reagent and wastes added to each tank and to the wet scrubber.

The R-1A Chemical Treatment Reactor system is enclosed by a commercial-grade building and will not be subject to rainfall or wind action that could cause over-topping. Consequently, no freeboard level is needed.

The engineering assessment finds that the tank systems are properly designed for hazardous waste service as proposed and should be resistant to rupture leaks, corrosion or failure.

§264.195 Inspections

Clean Harbors LaPorte, LLC has standard operating procedures for tank inspections at the facility and other documents that indicate appropriate inspections and operational procedures are in place to ensure the tanks are maintained and any leaks are discovered and fixed. Clean Harbors LaPorte, LLC's inspection plan found in Section III confirms that these tanks will be inspected according to the schedule. An example of the inspection record to be used was reviewed as part of this assessment and found to cover the regulatory requirements of 264.195 and the conditions of the RCRA permit.

§264.196 Response to leaks or spills and disposition of leaking or unfit-for-use tank systems

Clean Harbors LaPorte, LLC provided a standard operating procedure that is used at the facility for inspection and response to any detected leaks or spills in the R-1A area and facility. See the Facility Contingency/ER Plan in Section III for spill response and removal procedures. See the Facility Inspection Plan in Section III for details regarding the inspection of the tank system for R-1A and containment area integrity.

Based on the documents provided and history of the tank system operation and procedures for the currently permitted tanks, this assessment finds that there are procedures in place to detect leaks and response to leaks and spills in accordance with the regulations and the facilities RCRA permit.

§264.197 Closure and Post-Closure Care

Information pertaining to closure and cost of closure was presented in Section VII of the Part B application. Table VII.A Unit closure shows the tanks and possible decontamination methods and disposal methods for the tanks. The tanks are included in Table VII.A that is used as part of the closure plan and documentation for the current RCRA permit. The detail cost of closure data for R-1A is presented in Table VII.B of the Part B application.

§264.198 Special requirements for ignitable or reactive wastes and §264.199 Special requirements for incompatible wastes

As treatment units, the reagent solution used in the Chemical Treatment Reactor Tank System is designed to be incompatible with the wastes introduced and, therefore, cause the waste to react and be transformed into other, less hazardous, compounds. The wastes will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan

and then will be treated accordingly, using the appropriate reagent. Flow control via line size, pressure regulation and valve position are used to control the rate of reaction.

The reactor tank meets the 50 feet from the property line' standard in the National Fire Protection Association's (NFPA) "Flammable and Combustible Liquids Code," (1981). Figure V.A.1 shows that the Facility's hazardous waste management units are located more than 50 feet from the facility property line or public right-of-way.

Incompatible wastes and waste which is incompatible with tank construction materials is not placed into a tank system. Wastes processed in the treatment tanks will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan.

As previously described, all tanks are constructed of 316 stainless steel with a corrosion allowance of at least 1/8 inch. The wastes and treatment chemicals to be managed in these tanks are compatible with 316 stainless steel. Based on industry experience, the corrosion rate for 316 stainless steel tanks storing these types of materials is expected to be less than 0.02 inches per year, providing at least 6 years of corrosion allowance, plus that given by the excess wall thickness required by the maximum design pressure.

To ensure that compatibility between waste and tank construction materials is maintained and that excessive corrosion is not occurring, the Facility conducts annual shell thickness determinations using non-destructive ultrasonic methods. Internal inspections are not necessary and will not be conducted to monitor tank integrity, because all tanks are constructed above-ground and supported on legs, thereby providing complete access to external ultrasonic testing. The minimum tank thickness values are designed to safely withstand the stresses from 100 psig of internal pressure for R-1A. However, these tank is normally operated at ambient pressure. Therefore, even when the minimum shell thickness has been reached, the lower operating pressure provides an additional safety factor, and additional assurance that annual tank thickness determinations will identify any structural problems with a tank before the possibility of failure.

§264.198 Special requirements for ignitable or reactive wastes

As treatment units, the reagent solution used in the Chemical Treatment Reactor Tank System is designed to be incompatible with the wastes introduced and, therefore, cause the waste to react and be transformed into other, less hazardous, compounds. The wastes will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan and then will be treated accordingly, using the appropriate reagent. Flow control via line size, pressure regulation and valve position are used to control the rate of reaction.

The reactor tank meets the '50 feet from the property line' standard in the National Fire Protection Association's (NFPA) "Flammable and Combustible Liquids Code," (1981).

Figure V.A.1 shows that the Facility's hazardous waste management units are located more than 50 feet from the facility property line or public right-of-way.

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§264.17 as referenced in §264.198 and §264.198

Clean Harbors LaPorte meets the requirements of 264.17 for managing ignitable reactive and incompatible wastes by restricting the use of open flames, smoking, or cutting or welding anywhere that these types of special waste are stored, handled, or processed. Further, the wastes are separated from any heating producing sources, sparks, spontaneous ignition sources and radiant heat by the exclusion of these sources from the tank areas and other processing locations within the facility. Smoking is not allowed in the facility. All tank farm areas are clearly labelled with No Smoking Signs. Further, Clean Harbors LaPorte has an in-house permitting system that requires "hot work" permits be obtained anytime an open flame, welding, cutting, or other potential source of ignition is planned for use as part of equipment maintenance or installation. The permit system requires that the planned work be reviewed by appropriate facility management including the safety department staff, and that a signed permit be issued prior to the start of the work. Part of the permitting process includes a review for any special waste that may be

in the vicinity of the planned work. For work on tanks such as these storage tanks, the tank will be emptied before any work is started that involves a potential ignition source.

The SOPs for chemical reactor tank, loading and unloading along with waste characteristics determination and compatibility testing under the Waste Analysis Plan are all used to minimize the potential for reaction of wastes that might generate extreme heat or pressure, fire or explosions. Drawing No. L-201-PF-001-D shows the process flow for the tank.

Other applicable RCRA Regulations §270.11

The original permit application, renewals and revisions have been signed by an appropriate Clean Harbors LaPorte, LLC Responsible Official in accordance with §270.11 and as required by the TCEQ Part B Application. This permit has also been signed in accordance with §270.11. See the signature page.

§270.16 Specific part B information requirements for tank systems

This engineering report presents the information described in §270.16 for submittal of permit applications for tank systems.

§270.16(a) – A written assessment reviewed and certified by a Texas professional engineer is included in this permit application. This engineering report has been reviewed and certified in accordance with the regulations.

§270.16(b) – The dimensions and capacity of the tank (500 gallons) is shown on Table V.C of the Part B application. Engineering drawings for R-1A of the tank present is attached to this Engineering Report.

§270.16(c) – The tank will be attached to the existing permitted off-loading system and vapor control system; the storage and processing tanks utilize manual controls to prevent them from being overfilled; there are pressure measurements for the tanks; and the tanks are connected to the existing vent system.

§270.16(d) – Diagram of piping, instrumentation, and process flow are shown in drawings attached below, which show the process flow for R-1A.

§270.16(e) – No external corrosion control is required as stated under §264.192 and in the engineering report, as the tanks are not in contact with underground metal structures and have concrete foundations.

§270.16(f) –Any new components of the existing tank system will be installed in compliance with §264.192 as discussed above.

§270.16(g) Secondary containment calculations and a description of containment within the currently permitted containment R-1A is presented in Section §264.193 in this document and as shown on the attached calculations on Table V.C.

§270.16(h) – No variance is being requested or needed from the requirements of §264.193.

§270.16(i) – The spill and overflow protection procedures are part of the manual and are included in the Standard Operating Procedures for R-1A. Section §264.194 in this document describes the spill and overflow protection approach.

§270.16(j) – Sections §264.198 and §264.199 in this document describes the procedures in place for handing ignitable, reactive, and incompatible wastes.

§270.16(k) – R-1A is a zero-emissions tank system as discussed above. The vent system process and instrumentation connecting it to the existing vent system are shown in drawings the attached drawings, which show the process flow for these tanks.

DRAWINGS AND CALCULATIONS

SECONDARY CONTAINMENT CALCULATIONS

Warehouse I / Container Storage Area 1 in which Tank System R-1A is Located

Calculations from Container Storage Area 1 in Appendix V.B.i

Containment capacity = 20,610 s.f. x 0.5 ft x 0.9 usage factor x 7.48 gal./c.f. = 69,300 gallons

Storage capacity = 10x containment capacity = 693,000 gallons

Rated storage capacity = 403,960 gallons (approximately 7,345 55-gallon drum equivalents) for waste handled in Container Storage Area 1

Tank System R-1A

Tank Systems R-1, R-1A, and R-2 are located inside Warehouse I

Tank System R-1 rated capacity = 200 gallons

Tank System R-1A rated capacity = 1,500 gallons (proposed)

Tank System R2 rated capacity = 500 gallons

Combined rated capacity for Container Storage Area 1, Tank System R-1, Tank System R-1A, and Tank System R2 is:

403,960 gallons + 200 gallons + 1,500 gallons + 500 gallons = 406,160 gallons

This combined amount is less than the calculated storage capacity for Warehouse I (693,000 gallons) in which these Units reside.

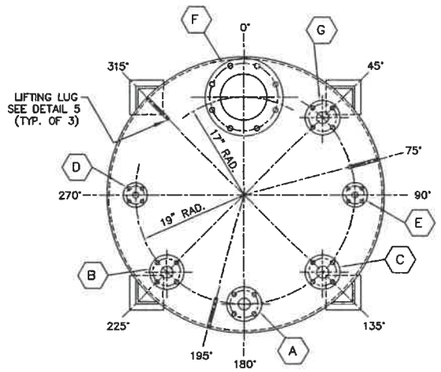
This area is covered with a perimeter berm, so rainfall and run-on do not need to be considered in containment calculations.

LIST OF MATERIAL

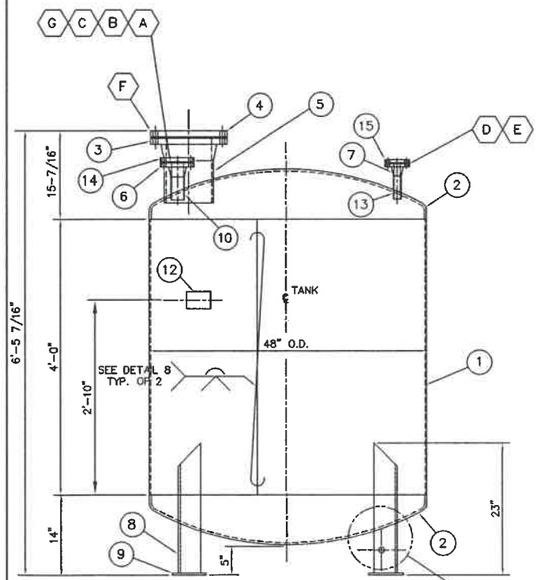
ITEM NO.	QTY. REQ'D	DESCRIPTION	MATERIAL SPEC.	MAT'L.	REMARKS	HEAT NO. OR SERIAL NO.
1	1	SHELL PLATE – 1/4" x 48" x 12'–6"	SA 240	316L S.S.	ROLL TO 48" O.D.	482498
2	2	48" O.D. x 3/8" THK. NOM. ASME F & D HEAD	SA 240	316L S.S.		6MP
3	1	8"–150# WELDING NECK FLANGE, R.F.	SA 182	F316L S.S.		H7474
4	1	8"–150# BLIND FLANGE, R.F.	SA 182	F316L S.S.		G3J2
5	1	8" SCH. 40 PIPE, SMLS x 7–3/8" LONG	SA 312	316L S.S.		2A523
6	4	2"–150# WELDING NECK FLANGE, R.F.	SA 182	F316L S.S.		E40891 & 61770
7	2	1"–150# WELDING NECK FLANGE, R.F.	SA 182	F316L S.S.		A67600
8	8 FT.	4" x 4" x 3/8" THICK ANGLE (CUT TO SUIT)	SA 479	316L S.S.		64108
9	4	6" x 6" x 3/8" THICK PLATE	SA 240	304L S.S.		209920
10	2 FT.	2" SCH. 40 PIPE, SMLS	SA 312	316L S.S.	CUT TO SUIT NOZZLE	430482
11	3	LIFTING LUGS 1/2" THICK PLATE	SA 240	316L S.S.		BJ20
12	1	11 GAUGE x 4" x 6" NAME PLATE BRACKET	SA 240	316L S.S.		811418
13	1 FT.	1" SCH. 40 PIPE, SMLS	SA 312	316L S.S.	CUT TO SUIT NOZZLE	330220
14	4	2"–150# BLIND FLANGE, R.F.	SA 182	F316L S.S.		HAJS
15	2	1"–150# BLIND FLANGE, R.F.	SA 182	F316L S.S.		1N8

NOZZLE SCHEDULE

MARK	SIZE	SERVICE	LOCATION
A	2"	VENT	TOP HEAD
B	2"	REAGENT	TOP HEAD
C	2"	PRODUCT	TOP HEAD
D	1"	WASTE IN	TOP HEAD
E	1"	NITROGEN PURGE	TOP HEAD
F	8"	SITE GLASS	TOP HEAD
G	2"	WET SCRUBBER	TOP HEAD

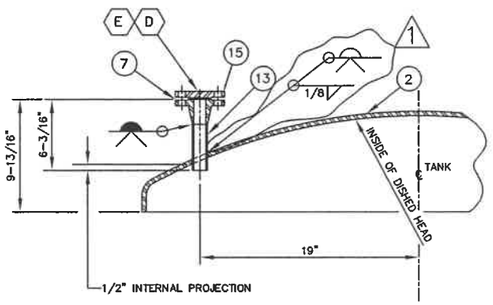


PLAN



ELEVATION

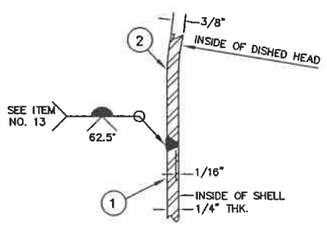
SEE PLAN FOR NOZZLE ORIENTATION



ELEVATION

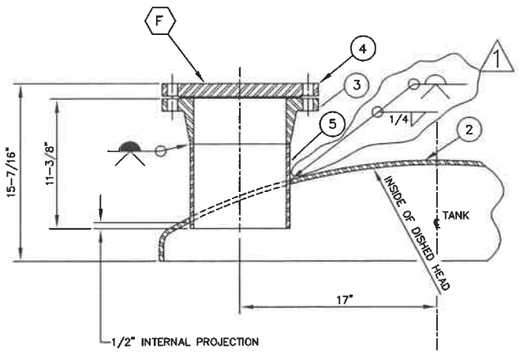
DETAIL 3

1" WASTE IN NOZZLE (D) TO TOP HEAD
1" NITROGEN PURGE NOZZLE (E) TO TOP HEAD
SCALE: 2"=1'–0"



DETAIL 7

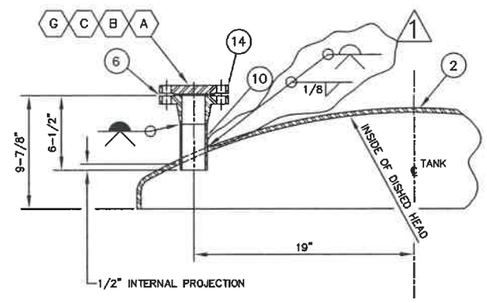
WELDING OF SHELL TO TOP & BOTTOM HEADS
SCALE: NONE



ELEVATION

DETAIL 1

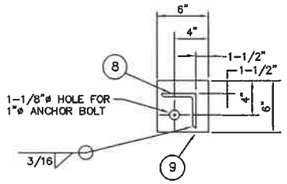
8" SITE GLASS NOZZLE (F) TO TOP HEAD
SCALE: 2"=1'–0"



ELEVATION

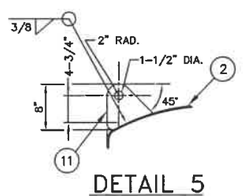
DETAIL 2

2" VENT NOZZLE (A) TO TOP HEAD
2" REAGENT NOZZLE (B) TO TOP HEAD
2" PRODUCT NOZZLE (C) TO TOP HEAD
2" WET SCRUBBER NOZZLE (G) TO TOP HEAD
SCALE: 2"=1'–0"



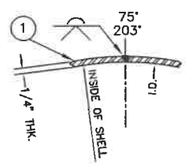
DETAIL 4

LEG & BASE PLAN DETAIL
(TYP. OF 4)
SCALE: 1–1/2"=1'–0"



DETAIL 5

LIFTING LUG (TYP. OF 3)
SCALE: 1" = 1'–0"



DETAIL 8

LONGITUDINAL SEAM ON SHELL
SCALE: NONE

GENERAL NOTES:

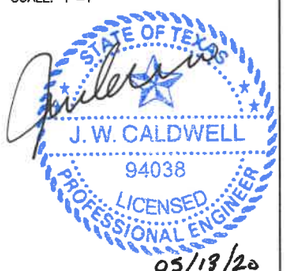
1. THIS DRAWING IS DEVELOPED FOR FABRICATION OF VESSEL SHOWN. BUILT IN ACCORDANCE WITH ASME SECTION VIII, 2001 EDITION WITH 2003 ADDENDUM.
2. COMPLETED VESSEL SHALL BE CLEANED OF ALL WELD SPLATTER, SLAG, SCRATCHES, GREASE, OIL AND DIRT. INSIDE NOZZLE EDGES TO BE CHAMFERED 1/16" MIN. OR ROUNDED 1/8" MIN. RADIUS AS REQUIRED. TOLERANCES TO BE 1/8".
3. ALL WELDING SHALL BE ACCOMPLISHED BY WELDERS CERTIFIED TO ASME PRESSURE VESSEL CODE, SECTION IX. THE ACTUAL WELDERS/ PROCEDURES USED SHALL BE IDENTIFIED ON THE SPECIAL WELDING SEQUENCE.
4. ALL NOZZLE FLANGES ARE TO BE INSTALLED WITH BOLT HOLES POSITIONED TO STRADDLE MAJOR CENTERLINES.
5. DIMENSIONAL LOCATIONS FOR ALL NOZZLES ARE TO CENTERLINE AND FACE OF FLANGES.
6. ALL GASKETS TO BE 1/8" THICK PTFE.
7. VESSEL DESIGNED FOR LETHAL SERVICE (UW–2).

DESIGN SPECIFICATIONS

DESIGN PRESSURE	100 psig @ –20°F TO 200°F
HYDRO TEST PRESSURE	130 psi
MINIMUM DESIGN METAL TEMPERATURE	–20°F
VESSEL SERIAL NO.	GW6726
NATIONAL BOARD NO.	11
YEAR BUILT	2005
NOMINAL CAPACITY	400 gal.
CORROSION ALLOWANCE	NONE
RADIOGRAPH	FULL

DETAIL 6

TANK NAME PLATE
SCALE: 1"=1"



ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
1	REVISED WELD SYMBOLS & REACTOR TAG	K.M.C.	A.F.M.	A.F.M.	4/8/05
0	ISSUED FOR CONSTRUCTION	K.M.C.	A.F.M.	A.F.M.	3/3/05

JOB NO. – GW–6726

APPROVED – QC MANAGER

ACCEPTED – AUTHORIZED INSPECTOR

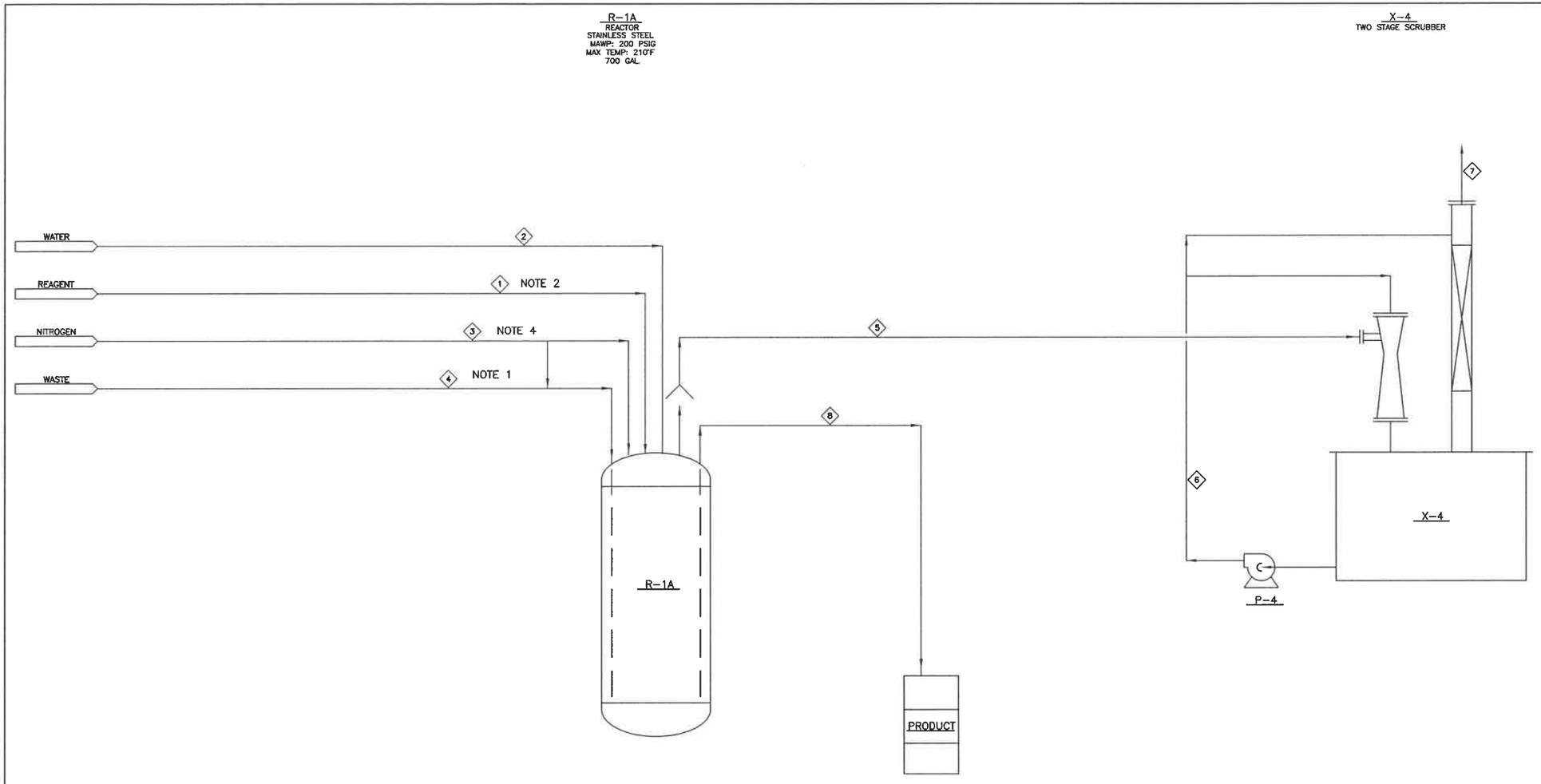
CleanHarbors
ENVIRONMENTAL SERVICES
REMEDIATION AND ENVIRONMENTAL CONSTRUCTION
1501 Washington Street
Braintree, Massachusetts 02185
Telephone (781) 849–1800

TITLE
CHES HIGH HAZ GROUP
LaPORTE, TEXAS

CHEMICAL TREATMENT REACTOR LAYOUT & DETAILS

1 R–1A

PROJECT NO.	DRAWING NO.
GW–6725	6726–M–01
SCALE 1" = 1'–0"	



STREAM NO.	①	②	③	④	⑤	⑥	⑦	⑧
STREAM NAME	REAGENT NaOH SOLUTION	WATER	NITROGEN	WASTE NITROSYL FLUORIDE	VENT GAS	SCRUBBER LIQUID	VENT GAS	PRODUCT
MOLECULAR WEIGHT	40	18	28	49	28	18	28	–
SPECIFIC GRAVITY	1.50	–	–	–	–	1.3	–	1.20
LIQUID (USGPM)	15.0	300	–	–	–	[50]	–	315
GAS/VAPOR (SCFM)	–	–	20	17.2	200	–	200	–
MASS FLOW (LBS/BATCH)	188	2502	14	115	–	417	750	2690
TEMPERATURE (°F)	68	60	60	–	140	70	80	120
PRESSURE (PSIA)	14.7	25.0	24.7	–	14.6	29.7	14.7	14.7
(IN.WC)	–	–	–	–	-2	–	2	–

NOTES:
1. INORGANIC GASES, LIQUIDS OR SOLIDS WILL BE PROCESSED IN R-1. EXAMPLES INCLUDE, HYDRIDE GASES, CYANIDE BEARING WASTE, CORROSIVE GASES AND LIQUIDS, CORROSIVE OXIDIZERS AND FLAMMABLE GASES.
2. TREATMENT REAGENT VARIES BASED ON MATERIAL BEING TREATED. PFD SHOWS TREATMENT FOR NITROSYL FLUORIDE AS AN EXAMPLE.
3. WASTE IS TREATED BATCHWISE.
4. NITROGEN IS USED FOR PURGING THE LINES AND VESSEL PRIOR TO AND AFTER PROCESSING.

REFERENCE DRAWINGS

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
E	PERMIT RENEWAL 2020	KMC	5/7/20	D.A.D.
D	REVISED TITLE BLOCK	KMC	7/30/09	MAR
C	FOR APPROVAL	WDS	9/25/03	

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

CleanHarbors
LAPORTE

DRAWN	CHECKED	SCALE	DATE
WDS		NTS	8/8/03

TITLE
CLEAN HARBORS LAPORTE
PROCESS FLOW DIAGRAM
CHEMICAL TREATMENT

L201APF001

DRAWING NO. L-201A-PF-001-D

REV. E

R-1A
REACTOR
700 GAL

P-2
1/2" DIAPHRAGM PUMP

P-4
SCRUBBER PUMP

X-4
TWO STAGE SCRUBBER

1/4"

PCV

1/4" N.C.

1/8"

1/4"

1/2"

FG

1/4"

1/2" SS

PI

WASTE

R-1A

TI

1/4"

1/4"

PI

PCV

NITROGEN

1/4"

INSIDE OUTSIDE

PI

1 1/2"

PI AE

START

HS

STOP

M

2"

P-4

X-4

LCV

FI

TO DISPOSAL

OFFSITE

PCV

PI

PLANT AIR

1/2"

REAGENT

P-2

PRODUCT

PLANT WATER

1 1/2"

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

REFERENCE DRAWINGS

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
E	PERMIT RENEWAL 2020	KMC	5/7/20	DAD
D	REVISED TITLE BLOCK	KMC	7/30/09	MAR
C	FOR APPROVAL	WDS	9/24/03	

CleanHarbors
LAPORTE

DRAWN	CHECKED	SCALE	DATE
WDS		NTS	8/8/03

TITLE
L201API001
CLEAN HARBORS LAPORTE
PIPING & INSTRUMENTATION DIAGRAM
CHEMICAL TREATMENT

DRAWING NO.
L-201A-PI-001-D

REV.
E

Professional Engineer Certification

Tank system R2 is a proposed permitted chemical treatment reactor tank. This tank is a steel vertical above ground tank proposed to be located in Warehouse I and is designed and managed to meet the requirements of 40 CFR 264.190 through 264.199.

The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date 05/20/20

J. W. Caldwell
Texas PE # 94038

ENGINEERING REPORT – R2

GENERAL INFORMATION

This section provides basic descriptions and specifications for the current permitted tank system (Permitted unit # 027). Chemical Treatment Reactor Tank R2 described herein is proposed to be utilized to treat certain wastes received at the facility. The proposed unit to be added will be similarly constructed and co-located in the same containment area as R-1 and R-1A and does not affect the required containment capacity. The tank is operated independently and in batch-mode and is designed to operate with zero emissions. The tank utilizes a two-stage wet scrubber for potential upset emission control. They contain solutions designed to react with the various wastes and convert them to less toxic byproducts. The solutions contained within the tanks may be acidic, alkaline, oxidizing or reducing depending on the nature of the waste being treated. Once a batch is complete the contents of the tank are drained and placed into containers. The containers are stored in a Container Storage Area until being shipped off-site for disposal

The Table V.C. and the table below list the tank currently permitted, the current permit unit number and rated capacity and process description. A General description follows.

Reaction Tanks			
Permit Unit No.	**Tank Designation No.**	**Rated Capacity (gallons)**	**Tank Process Description**
027	R2	Proposed, 500	Chemical Treatment Reactor Tank

The permitted tank is proposed to be constructed in accordance with the design requirements of 40 CFR Part 264, Subpart J and will have a concrete secondary containment system with a chemical resistant coating. The chemical treatment tank is proposed to be located in Warehouse I to eliminate the effects of contact with rainfall. Warehouse I secondary containment volume is sufficient to meet the requirements of the unit.

Containers of waste, destined to be processed in this unit, will be staged in Warehouse I for processing. Chemical Treatment Neutralization Tank R2, also located in Warehouse I, will be charged with the appropriate quantity of chemical reagent specific to the chemical to be treated. The amount of chemical reagent transferred into the reactor determines the type and amount of waste chemical that can be treated per batch. The reactor volume limits the batch treatment volume as well as the amount of heat generated during the

reaction. R2 will be operated in the same manner as R-1 and R-1A. Before processing, each waste treatment batch is reviewed by an operator to determine specifically what waste streams and quantities of wastes will be treated.

The Chemical Treatment Reactor tank system is used to treat certain compatible waste groups as described in the process description of each tank unit. Wastes managed in these units include all hazardous wastes listed in Table IV.B.2. Waste types include hazardous and non-hazardous liquids, and compressed gases. Prohibited wastes are not introduced into the Chemical Treatment Reactor tank system – prohibited waste includes those that contain PCBs regulated under 40 CFR Part 761, dioxin-containing wastes, explosives as defined by DOT under 49 CFR Part 173, infectious materials, putrescible wastes, or other waste which cannot be safely managed within the process unit.

Only compatible wastes are processed in the treatment tanks. Wastes included in batches to be treated in the units described in this section will be identified according to the relevant criteria as listed in the Facility's Waste Analysis Plan.

Treatment solution will be transferred into the reactor using a pump. Waste will be introduced into the reactor using the internal pressure of the container in which the waste is stored. If there is insufficient pressure within the container, an inert gas will be used to pressurize the container and provide a motive force allowing transfer of the waste into the unit. The reaction rate will be limited by three variables; the inlet line size (1/8" inner diameter), the inlet line pressure, and the flow rate as determined by the position of a manual valve controlled by an operator. An operator will manually control the rate of the reaction by adjusting the pressure in the line and/or adjusting the position of the manual flow control valve. Lines from the waste container, inert gas container and reactor are connected via a manifold. Valves in this manifold are used to isolate each of these lines so they can be pressurized and leak tested.

The waste line will be attached to the waste container using an appropriate fitting and will have a regulator (where necessary) and control valve. There will be an isolation valve and regulator between the manifold and inert gas container. There will be an isolation valve between the reactor tank and the manifold as well. Once the waste container is attached (container valve remaining closed), the line will be pressure checked by opening the inert gas valve and waste control valve. Leak test solution (e.g. soapy water) will be applied to the fittings to determine if any leaks are present. Any leaks found will be eliminated before processing commences. At this point, inert gas may be introduced into the waste container, as needed, to provide motive force to transfer the waste to the reactor tank. Once the line is determined to be leak-free, the inert gas isolation valve will be closed and the waste container valve opened. The isolation valve to the reactor tank will be opened and treatment will begin. Pressure, temperature and pH will be monitored and controlled to ensure the complete reaction of the waste in the unit.

The waste chemical reactant will flow into the reaction tank through a dip tube and into the reagent solution. Gas or liquid being processed may be neutralized, hydrolyzed, oxidized or reduced depending on the reaction chemistry for the compound (a list of example chemical equations are included in Exhibit V.C-2 of Appendix V.C.i this list is not all inclusive but is incorporated to reflect the chemistry involved in the reactor treatment of typical waste streams). Waste introduced into the reactor tank is designed, through reaction chemistry and parameter monitoring, to be completely reacted. Normal vent gas will contain only displaced air from the transfer of material into the reactor. This vent gas will freely vent out of the reactor and will be captured in a vapor collection line. The vapor collection line will be under a vacuum of two (2) inches of water column. The vapors will be pulled from the hood through a two-stage wet scrubber, identified as X-4. The first stage of the scrubber is a venture-eductor. The second stage is a packed bed scrubber that will contain a solution equivalent to the solution used in the reactor tank. The venture-eductor will also provide the motive force for moving the air through the vent line. Acid gas removal efficiency is expected to be greater than 99%.

Once the batch is complete, the unit will be flushed with inert gas to purge the system and the spent solution in the tank and any solids that have been created will be transferred to containers. The tank will be thoroughly flushed between batches of incompatible wastes or incompatible treatment solutions. Scrubber water will be transferred to containers as well, as necessary, to maintain its viability and/or to avoid incompatibility with wastes being processed. The containers will be properly labeled, and removed to a storage area where the waste will be stored until off-site disposal is arranged. Records of waste processed, operating parameter monitoring, inspections of the unit and amounts of waste generated from this process will be kept in the Facility's Operating Record.

Empty waste containers will be managed in the same manner as those from R-1.

The following sections show that the assessment followed and addressed the regulatory requirements. All reviews and assessments used the documents and drawings listed above. These references are not stated at every location in which they were used to avoid redundancy and repetitive entries.

§264.191 Assessment of Existing Tank's Integrity.

The treatment tank has been designed and is proposed to be constructed in accordance with the design standards of the American Society of Mechanical Engineers (ASME), American National Standards Institute (ANSI), and the National Fire Prevention Association (NFPA) as follows.

Standards Organization	Section	Application
ASME	Sec. VIII, Div. 1	Tank design
ASME	Sec. VIII, Div. 1	Tank support design Appendix H
ANSI	B31.3	Piping system design
NFPA	Part 30	Tank location, spacing, emergency relief venting and support protection

Design, construction, and installation according to referenced industry standards combined with regular inspections, including annual thickness determinations, ensure that proposed tank systems will not collapse, rupture, or fail.

§264.192 Design and installation of new tank systems or components

Chemical Reactor Tank R2 is currently proposed. Wall thickness will be designed and constructed similar to the of R-1 and R-1A. The reactor tank system is to be operated at Standard Temperatures and Pressures.

The tank is designed to provide sufficient structural integrity for containment and operating pressures, structural support, and material compatibility to prevent collapse, rupture, or other failure of the tanks as required by 40 CFR 264.192(a). All currently permitted tank designs are based on standards established in the "1995 ASME Boiler and Pressure Vessel Code, Section VIII, Division 1,". Design information and specifications for Tank R-1 can be found in historical information previously submitted and attached as exhibit V.C.1.

The table below presents the permitted tank R-1 along with the approximate dimensions, capacity, and minimum design shell thickness. The thickness values are based on nominal strength properties for 316 stainless steel at an operating temperature of less than 200 F.

Tank Shell Thickness Summary				
		Minimum Shell Thickness (inches)		
Tank Designation	Dimensions Dia. by Ht. (inches)	Rated Capacity (Gallons)	Circumferential Direction	Longitudinal Direction
R2	TBD	500	TBD	TBD

Tank supports have been designed in accordance with ASME Section VIII, Division 1 standards regarding structural capabilities, and NFPA standards regarding fire protection from failure. The foundation design for Warehouse I is sufficient to support tank R2.

The design, fabrication, assembly, testing and inspection of the piping systems was performed as appropriate for the wastes contained and rated for the expected working pressures, structural stresses and compatibility issues. Design and proposed installation of piping conforms with American National Standards Institute (ANSI) B31.3, "Petroleum Refinery Piping." Piping (mainly hoses) is constructed of rubber reinforced with stainless steel and/or stainless steel tubing. Also, synthetic materials (such as high-density polyethylene or fiberglass reinforced plastic, provided these are compatible with the liquid wastes to be handled) of such size and wall thickness schedule will be used for the maximum pressures to be experienced and corrosion allowance. Piping will be supported by appropriate cradles, hangers or brackets at appropriate spacing to prevent physical damage and excessive stress due to suspension stresses, settlement, vibration, expansion, or contraction.

Valves, Instruments and controls consist of temperature, pressure and pH sensors will be utilized to verify that reactions occurring in the tanks are within operating parameters and that there is sufficient reaction time to fully react all the waste being treated. The system is designed to be operated at atmospheric pressure with the only emissions being the displacement of headspace from the tank. Operating temperature is designed to be within 100 ° Fahrenheit of ambient. Valves, regulators, and monitoring instruments used to control/monitor flow into the vessels are constructed of materials compatible with the wastes introduced and the reagent chemicals used.

Proposed tank R2 is a closed-top tank equipped with vent lines that are connected to vent gas scrubbing systems. The system is designed to be a zero emission process, the media in the gas scrubbing systems are designed to adsorb or neutralize the gas that may inadvertently be generated from the process. Reaction temperatures and pressures (rate of reaction and heats of reaction) within the treatment vessels are controlled by the size and flow control valves. Proposed tank R2 will be filled at essentially atmospheric

pressure. During which time, it is vented to the gas scrubbing system to control emissions. Pressure relief valves with rupture disks having 10 psi rupture pressures will be installed on R2.

R2 will be connected to a vent system to minimize release of any potential acid, alkaline, or waste gases to the atmosphere. Vented gases are routed to a wet scrubber designed to manage any uncontrolled off-gas from the process. Amounts of vented gases are limited by the rate of reaction in the vessel and the size of the vent hose (or pipe) and are anticipated to be equal to the headspace in the treatment tank.

Ancillary components include equipment used to facilitate operation of the processes in the Chemical Treatment Tank System, along with equipment associated with emissions control and disposition of residuals from the process. A list of this equipment is presented below. Because the proposed tanks, piping, and all ancillary components will be installed above-ground and not supported on the soil, corrosion protection such as cathodic protection or use of special corrosion-resistant materials will not be necessary. Therefore, no part of 40 CFR 264.192(a)(3) is addressed in this application. The tank area will not be subject to vehicular traffic or loading. Based on their isolated arrangement, the tank does not require additional protective measures to prevent their potential damage.

Ancillary Equipment List	
Equipment Designation	**Equipment Description**
P-2	Product/Waste Solution Pump
X-4	2-Stage Wet Scrubber

Every reasonable effort will be taken to prevent damage to any portion of the storage and process system and secondary containment systems during installation of the system. Prior to placing any of the proposed units into hazardous waste service:

- An independent, qualified registered professional engineer will inspect the system for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction/installation;
- The tank system will be tested for tightness;
- All discrepancies noted in the inspection, and leaks detected by the tightness test will be repaired and remedied; and
- Leak detection and secondary containment will be in place.

§264.193 Containment and detection of releases

Current secondary containment for the tank meets or exceeds the standards found under 40 CFR 264.193(a)(1). The secondary containment system is integrally constructed with the foundation floor of the buildings used to enclose the tank systems. Each secondary containment system consists of above-ground reinforced concrete curbs and floor and an epoxy coating (or equivalent) over the entire containment area. Secondary containment is part of container storage buildings which have been originally permitted at this facility and all such information and certifications were previously submitted, reviewed and approved by TCEQ.

See Table V.C. for details pertaining to secondary containment capacity. Total capacity of secondary containment areas show excess capacity available well over current required capacity for existing units including all proposed units. See section V.B.1 for details pertaining to secondary containment for Warehouse I and the Facility Inspection Plan in Section III for details regarding the inspection of the tanks and container storage areas for tank and containment area integrity. See the Facility Contingency/ER Plan in Section III for spill response and removal procedures.

§264.194 General operating requirements.

(a) Hazardous wastes or treatment reagents must not be placed in a tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail.

In accordance with 40 CFR 264.194(a), hazardous wastes will not be placed into the tank system if they will cause the tanks, piping, ancillary equipment, or secondary containment system to rupture, leak, corrode or otherwise fail. Waste acceptance criteria and quality control precludes knowingly processing wastes not approved for these units. Appropriate controls and practices are used to prevent spills and overflows from the tank and the secondary containment per 40 CFR 264.194(b) as discussed below.

The storage and processing tanks utilize manual controls to prevent them from being overfilled. Operators will determine and track the amount of reagent and wastes added to each tank and to the wet scrubber.

The R2 Chemical Treatment Reactor system will be enclosed by a commercial-grade building and will not be subject to rainfall or wind action that could cause over-topping. Consequently, no freeboard level is needed.

The engineering assessment finds that the tank systems are properly designed for hazardous waste service as proposed and should be resistant to rupture leaks, corrosion or failure.

§264.195 Inspections

Clean Harbors Laporte, LLC has standard operating procedures for tank inspections at the facility and other documents that indicate appropriate inspections and operational procedures are in place to ensure the tanks are maintained and any leaks are discovered and fixed. Clean Harbors LaPorte, LLC's inspection plan found in Section III confirms that these tanks will be inspected according to the schedule. An example of the inspection record to be used was reviewed as part of this assessment and found to cover the regulatory requirements of 264.195 and the conditions of the RCRA permit.

§264.196 Response to leaks or spills and disposition of leaking or unfit-for-use tank systems

Clean Harbors LaPorte, LLC provided a standard operating procedure that is used at the facility for inspection and response to any detected leaks or spills in the R2 area and facility. See the Facility Contingency/ER Plan in Section III for spill response and removal procedures. See the Facility Inspection Plan in Section III for details regarding the inspection of the tank system for R2 and containment area integrity.

Based on the documents provided and history of the tank system operation and procedures for the currently permitted tanks, this assessment finds that there are procedures in place to detect leaks and response to leaks and spills in accordance with the regulations and the facilities RCRA permit.

§264.197 Closure and Post-Closure Care

Information pertaining to closure and cost of closure was presented in Section VII of the Part B application. Table VII.A Unit closure shows the tanks and possible decontamination methods and disposal methods for the tanks. The tanks are included in Table VII.A that is used as part of the closure plan and documentation for the current RCRA permit. The detail cost of closure data for proposed R2 is presented in Table VII.B of the Part B application.

§264.198 Special requirements for ignitable or reactive wastes and §264.199 Special requirements for incompatible wastes

As treatment units, the reagent solution used in the Chemical Treatment Reactor Tank System is designed to be incompatible with the wastes introduced and, therefore, cause the waste to react and be transformed into other, less hazardous, compounds. The wastes will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan and then will be treated accordingly, using the appropriate reagent. Flow control via line size, pressure regulation and valve position are used to control the rate of reaction.

The reactor tank meets the '50 feet from the property line' standard in the National Fire Protection Association's (NFPA) "Flammable and Combustible Liquids Code," (1981). Figure V.A.1 shows that the Facility's hazardous waste management units are located more than 50 feet from the facility property line or public right-of-way.

Incompatible wastes and waste which is incompatible with tank construction materials is not placed into a tank system. Wastes processed in the treatment tanks will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan.

To ensure that compatibility between waste and tank construction materials is maintained and that excessive corrosion is not occurring, the Facility conducts annual shell thickness determinations using non-destructive ultrasonic methods. Internal inspections are not necessary and will not be conducted to monitor tank integrity, because all tanks are constructed above-ground and supported on legs, thereby providing complete access to external ultrasonic testing. The proposed tank will be normally operated at ambient pressure. Therefore, even when the minimum shell thickness has been reached, the lower operating pressure provides an additional safety factor, and additional assurance that annual tank thickness determinations will identify any structural problems with a tank before the possibility of failure.

§264.198 Special requirements for ignitable or reactive wastes

As treatment units, the reagent solution used in the Chemical Treatment Reactor Tank System is designed to be incompatible with the wastes introduced and, therefore, cause the waste to react and be transformed into other, less hazardous, compounds. The wastes will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan and then will be treated accordingly, using the appropriate reagent. Flow control via line size, pressure regulation and valve position are used to control the rate of reaction.

The reactor tank meets the '50 feet from the property line' standard in the National Fire Protection Association's (NFPA) "Flammable and Combustible Liquids Code," (1981). Figure V.A.1 shows that the Facility's hazardous waste management units are located more than 50 feet from the facility property line or public right-of-way.

§264.199 Special requirements for incompatible wastes

Incompatible wastes and waste which is incompatible with tank construction materials is not placed into a tank system. Wastes processed in the treatment tanks will be identified via the pre-approval and acceptance criteria in the Waste Analysis Plan.

To ensure that compatibility between waste and tank construction materials is maintained and that excessive corrosion is not occurring, the Facility conducts annual shell thickness determinations using non-destructive ultrasonic methods. Internal inspections are not necessary and will not be conducted to monitor tank integrity, because

all tanks are constructed above-ground and supported on legs, thereby providing complete access to external ultrasonic testing. The proposed tank will be normally operated at ambient pressure. Therefore, even when the minimum shell thickness has been reached, the lower operating pressure provides an additional safety factor, and additional assurance that annual tank thickness determinations will identify any structural problems with the tank before the possibility of failure.

§264.17 as referenced in §264.198 and §264.198

Clean Harbors LaPorte meets the requirements of 264.17 for managing ignitable reactive and incompatible wastes by restricting the use of open flames, smoking, or cutting or welding anywhere that these types of special waste are stored, handled, or processed. Further, the wastes are separated from any heating producing sources, sparks, spontaneous ignition sources and radiant heat by the exclusion of these sources from the tank areas and other processing locations within the facility. Smoking is not allowed in the facility. All tank farm areas are clearly labelled with No Smoking Signs. Further, Clean Harbors LaPorte has an in-house permitting system that requires “hot work” permits be obtained anytime an open flame, welding, cutting, or other potential source of ignition is planned for use as part of equipment maintenance or installation. The permit system requires that the planned work be reviewed by appropriate facility management including the safety department staff, and that a signed permit be issued prior to the start of the work. Part of the permitting process includes a review for any special waste that may be in the vicinity of the planned work. For work on tanks such as these storage tanks, the tank will be emptied before any work is started that involves a potential ignition source.

The SOPs for chemical reactor tank, loading and unloading along with waste characteristics determination and compatibility testing under the Waste Analysis Plan are all used to minimize the potential for reaction of wastes that might generate extreme heat or pressure, fire or explosions.

Other applicable RCRA Regulations
§270.11

The original permit application, renewals and revisions have been signed by an appropriate Clean Harbors LaPorte, LLC Responsible Official in accordance with §270.11 and as required by the TCEQ Part B Application. This permit has also been signed in accordance with §270.11. See the signature page.

§270.16 Specific part B information requirements for tank systems

This engineering report presents the information described in §270.16 for submittal of permit applications for tank systems.

§270.16(a) – A written assessment reviewed and certified by a Texas professional engineer is included in this permit application. This engineering report has been reviewed and certified in accordance with the regulations.

§270.16(b) – The dimensions and capacity of the tank (500 gallons) is shown on Table V.C of the Part B application. Engineering drawings for R-1A of the tank present is attached to this Engineering Report.

§270.16(c) – The tank will be attached to the existing permitted off-loading system and vapor control system; the storage and processing tanks utilize manual controls to prevent them from being overfilled; there are pressure measurements for the tanks; and the tanks are connected to the existing vent system.

§270.16(d) – Diagram of piping, instrumentation, and process flow have not been drawn as the unit is proposed and not constructed.

§270.16(e) – No external corrosion control is required as stated under §264.192 and in the engineering report, as the tanks are not in contact with underground metal structures and have concrete foundations.

§270.16(f) –Any new components of the permitted tank system will be installed in compliance with §264.192 as discussed above.

§270.16(g) Secondary containment calculations and a description of containment within the currently permitted containment R2 is presented in Section §264.193 in this document and as shown on the attached calculations on Table V.C.

§270.16(h) – No variance is being requested or needed from the requirements of §264.193.

§270.16(i) – The spill and overflow protection procedures are part of the manual and are included in the Standard Operating Procedures for R2. Section §264.194 in this document describes the spill and overflow protection approach.

§270.16(j) – Sections §264.198 and §264.199 in this document describes the procedures in place for handing ignitable, reactive, and incompatible wastes.

§270.16(k) – R2 is a zero-emissions tank system as discussed above. The vent system process and instrumentation connecting it to the existing vent system are shown in drawings the attached drawings, which show the process flow for these tanks.

DRAWINGS AND CALCULATIONS

SECONDARY CONTAINMENT CALCULATIONS

Warehouse I / Container Storage Area 1 in which Tank System R2 is Located

Calculations from Container Storage Area 1 in Appendix V.B.i

Containment capacity = 20,610 s.f. x 0.5 ft x 0.9 usage factor x 7.48 gal./c.f. = 69,300 gallons

Storage capacity = 10x containment capacity = 693,000 gallons

Rated storage capacity = 403,960 gallons (approximately 7,345 55-gallon drum equivalents) for waste handled in Container Storage Area 1

Tank System R2

Tank Systems R-1, R-1A, and R-2 are located inside Warehouse I

Tank System R-1 rated capacity = 200 gallons

Tank System R-1A rated capacity = 1,500 gallons (proposed)

Tank System R2 rated capacity = 500 gallons

Combined rated capacity for Container Storage Area 1, Tank System R-1, Tank System R-1A, and Tank System R2 is:

403,960 gallons + 200 gallons + 1,500 gallons + 500 gallons = 406,160 gallons

This combined amount is less than the calculated storage capacity for Warehouse I (693,000 gallons) in which these Units reside.

This area is covered with a perimeter berm, so rainfall and run-on do not need to be considered in containment calculations.

EXHIBIT V.C.1

CleanHarbors®
ENVIRONMENTAL SERVICES, INC.
200 Arbor Lake Drive, 3rd Floor
Columbia, SC 29223

March 25, 2005

Clean Harbors La Porte, LP
500 Battleground Road
La Porte, TX 77571
Attn. David Taylor

Re: Certification of Miscellaneous Treatment Unit 028 Cylinder Release Unit

Dear Mr. Taylor:

This is to certify that the equipment and documentation developed by the Clean Harbors La Porte, LP (Facility) for the Cylinder Release Unit has been evaluated and determined to meet the requirements of the specifications submitted in the Class 3 Modification of Clean Harbors La Porte, LP's Industrial and Hazardous Waste Permit HW-50225-001. Further, the construction of said facility has been performed in accordance with and in compliance with good engineering practices.

As stated in the modification to the Engineering Plan:

V.K.3.1 Process Description

Containerized atmospheric gases are processed as described on the process flow diagram presented on Figure V.C-3 in Appendix V-H. Gases received in containers are stored in one of the container storage areas prior to processing for final disposal in the Cylinder Release Unit (Permit Miscellaneous Unit 3/Notice of Registration Unit 028). Containerized atmospheric gases will be secured within the Unit and connected to a 1/4 inch stainless steel braided hose which discharges to a 1/4 inch inner diameter tube (stack) that vents at an elevation of twenty feet above the ground. The gas will be released using the following criteria:

Maximum Line Pressure – 1800 pounds per square inch (psi)
Discharge Line – ¼" inner diameter or smaller, braided stainless steel
Vent Line – ½" inner diameter or smaller, copper or stainless steel
Maximum Flow Rate – 200 standard cubic feet per minute (scfm)

An operator will be present at all times during the releasing of the gas. If at any time the process is disrupted, the operator will close the valve on the release hose and the valve on the container.

Findings of Fact:

¼ inch braided stainless steel hose has been installed to connect the cylinder from which gases will be released;

¼ inch braided stainless steel hose has been installed to connect the cylinder from which purge gas will be obtained; and

1/2 inch stainless steel tubing has been installed and has release point at least 20' above current ground elevation.

Additionally, please note the attached leak test form, a revised technical drawing of the unit and pictures showing the unit as installed.

Thank you for your attention to this matter. Please contact me if you have any further questions.

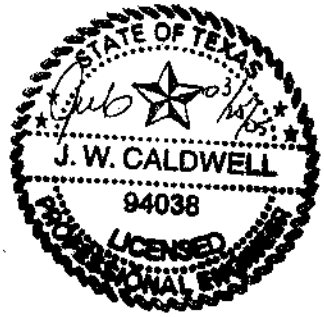
Sincerely,

J. William Caldwell, P.E.
Registered Texas Professional Engineer # 94038

Enclosure

Cc: Mr. J. Scott Kuhn

Stamp:



M.V. ATCHISON & ASSOC.
9894 Bissonnet Ste. 110
Houston, Texas 77036
(713) 541-9674 off.
(713) 541-3342 fax

6/[illegible]/2007

DOCUMENT CERTIFICATION STATEMENT
For
F-1 NEW PROCESS VESSEL
UNDER PERMIT No. HW-50225-001

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I certify that the vessel meets all applicable design requirements of 40 CFR 264.192 for Clean Harbors La Porte, LP located at 500 Battleground Rd. La Porte, TX.

Respectfully Submitted,

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.

STATE OF TEXAS
WILLIAM A. PHILLIPS
45557
REGISTERED PROFESSIONAL ENGINEER

June 4, 2007

W.A. Phillips, P.E.
Chief Engineer

M.V.ATCHISON & ASSOC.
9884 Bissonnet Ste. 119
Houston, Texas 77036
(713) 541-9674 off.
(713) 541-3342 fax

6/04/2007

INSPECTION CERTIFICATION
R-1 PROCESS VESSEL
UNDER PERMIT No. HW-50223-001

M.V. Atchison & Assoc. has performed an inspection and integrity assessment for Tank R-1 in the week of June 4th[th]. This tank is located at the Clean Harbors La Porte, LP facility located at 500 Battleground Rd. La Porte, TX.

Based upon the inspections performed on Tank R-1 it would appear to be (suitable) for continued service as a vessel to contain, process, and store liquids under the design pressure. There is no discernable deterioration of the vessel or any of it's components.

M.V. Atchison & Assoc. certifies that its services were performed, its findings obtained, and this report prepared in accordance with generally accepted principles and practices.

Respectfully Submitted,

Martin V. Atchison, Jr. BSME
MV Atchison & Assoc.

STATE OF TEXAS
WILLIAM A. PHILLIPS
15631
REGISTERED
PROFESSIONAL ENGINEER

June 9, 2007

W.A. Phillips, P.E.
Chief Engineer

CleanHarbors®
ENVIRONMENTAL SERVICES, INC.
200 Arbor Lake Drive, 3rd Floor
Columbia, SC 29223

March 25, 2005

Clean Harbors La Porte, LP
500 Battleground Road
La Porte, TX 77571
Attn. David Taylor

Re: Certification of Miscellaneous Treatment Unit 028 Cylinder Release Unit

Dear Mr. Taylor:

This is to certify that the equipment and documentation developed by the Clean Harbors La Porte, LP (Facility) for the Cylinder Release Unit has been evaluated and determined to meet the requirements of the specifications submitted in the Class 3 Modification of Clean Harbors La Porte, LP's Industrial and Hazardous Waste Permit HW-50225-001. Further, the construction of said facility has been performed in accordance with and in compliance with good engineering practices.

As stated in the modification to the Engineering Plan:

V.K.3.1 Process Description

Containerized atmospheric gases are processed as described on the process flow diagram presented on Figure V.C-3 in Appendix V-H. Gases received in containers are stored in one of the container storage areas prior to processing for final disposal in the Cylinder Release Unit (Permit Miscellaneous Unit 3/Notice of Registration Unit 028). Containerized atmospheric gases will be secured within the Unit and connected to a 1/4 inch stainless steel braided hose which discharges to a 1/4 inch inner diameter tube (stack) that vents at an elevation of twenty feet above the ground. The gas will be released using the following criteria:

Maximum Line Pressure – 1800 pounds per square inch (psi)
Discharge Line – ¼" inner diameter or smaller, braided stainless steel
Vent Line – ½" inner diameter or smaller, copper or stainless steel
Maximum Flow Rate – 200 standard cubic feet per minute (scfm)

An operator will be present at all times during the releasing of the gas. If at any time the process is disrupted, the operator will close the valve on the release hose and the valve on the container.

Findings of Fact:

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1/2 inch stainless steel tubing has been installed and has release point at least 20' above current ground elevation.

Additionally, please note the attached leak test form, a revised technical drawing of the unit and pictures showing the unit as installed.

Thank you for your attention to this matter. Please contact me if you have any further questions.

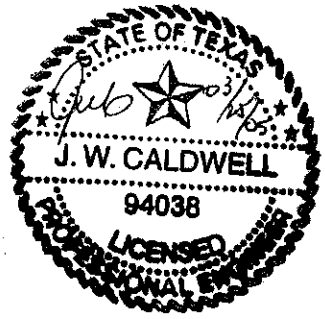
Sincerely,

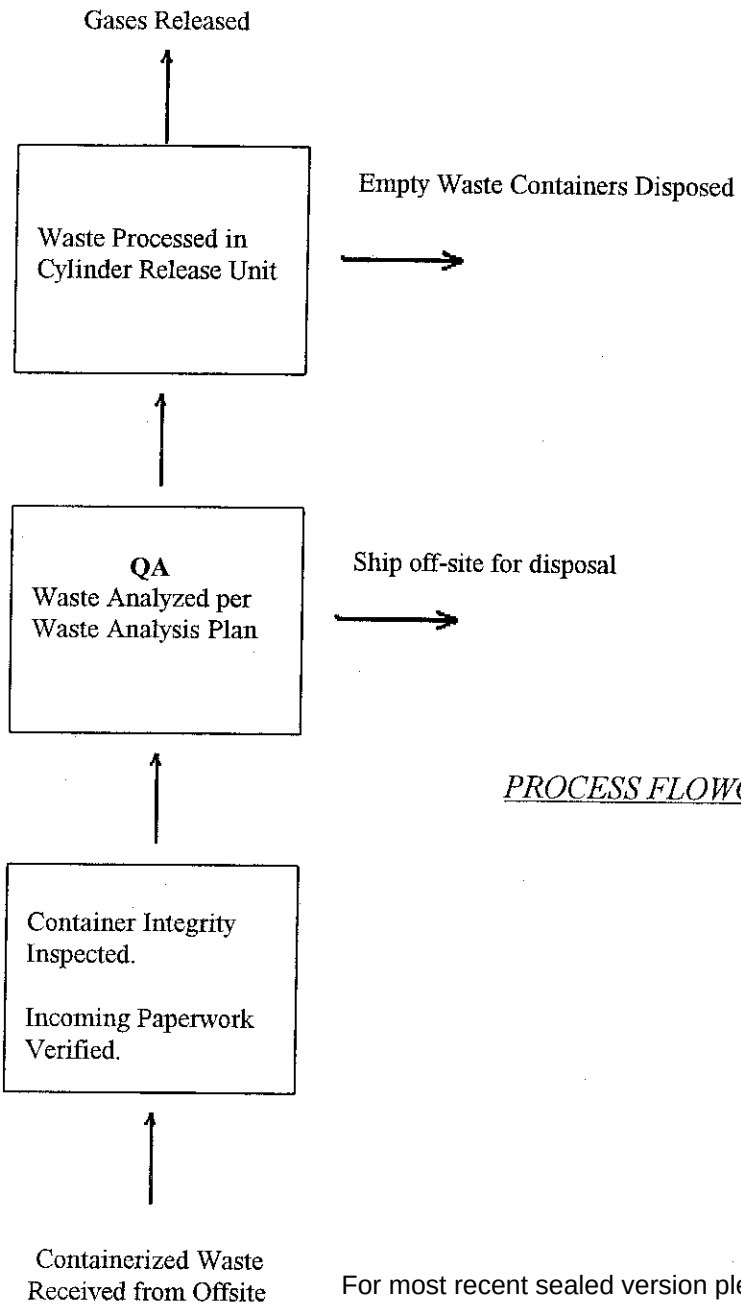
J. William Caldwell, P.E.
Registered Texas Professional Engineer # 94038

Enclosure

Cc: Mr. J. Scott Kuhn

Stamp:

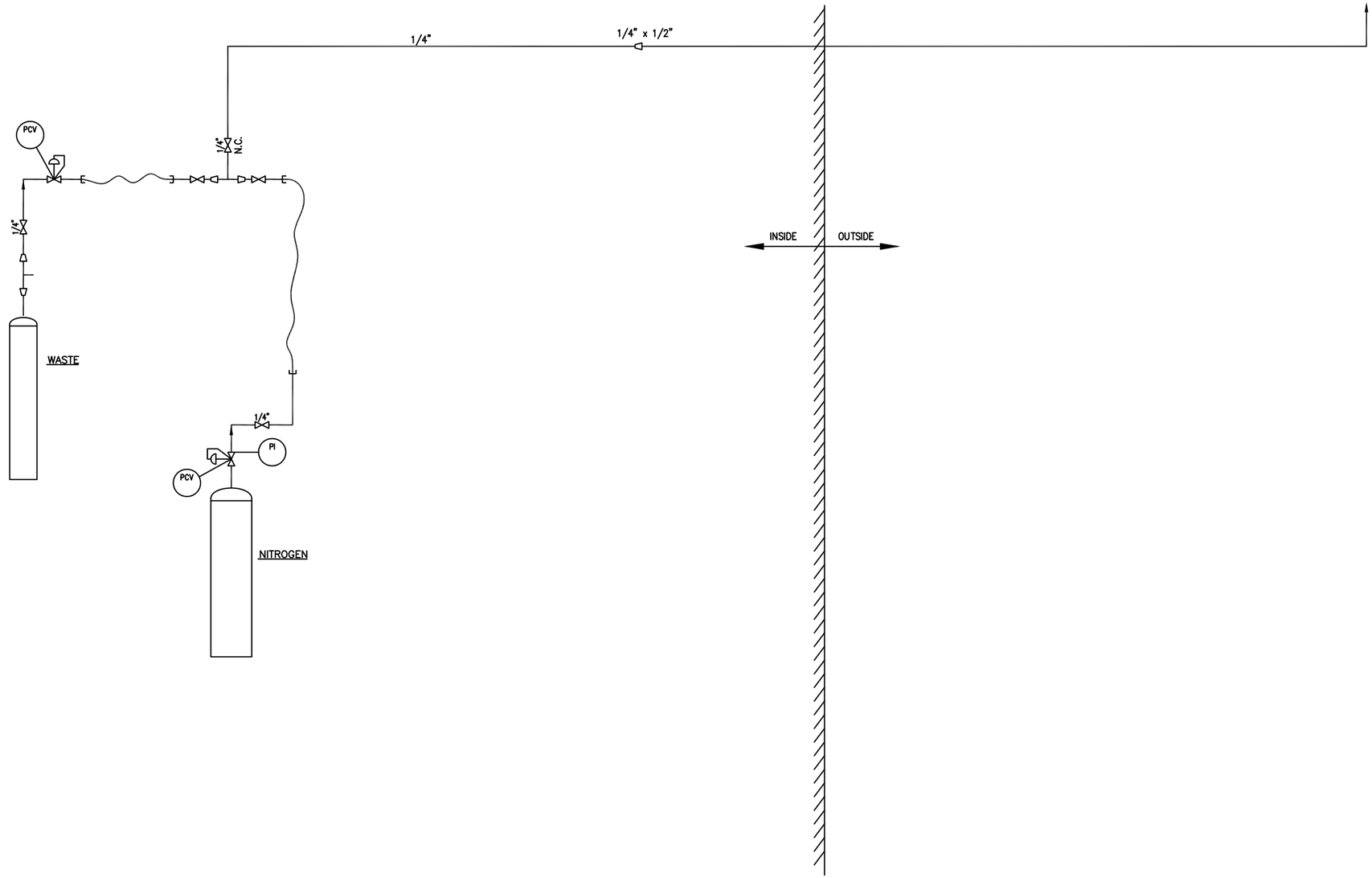




PROCESS FLOWCHART

For most recent sealed version please see Section V.K.i.

	Clean Harbors La Porte, LP		500 Battleground Road La Porte, TX 77571 Phone: (281) 476-0645	
	TITLE: PROCESS FLOWCHART FOR CONTAINERIZED WASTES RECEIVED FOR PROCESSING IN CYLINDER RELEASE UNIT			
	DWN: DT	SCALE: **AS SHOWN**	DWG No.: Figure V.K-3	REV 0.0
FILE: Section VK Figure VK-3.doc				



For most recent sealed version please see Section V.K.i.

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
E	REVISED TITLE BLOCK	KMC	7/15/09	
D	FOR PERMIT APPROVAL	JWC	4/25/05	

REFERENCE DRAWINGS

CleanHarbors LAPORTE

DRAWN	CHECKED	SCALE	DATE
WDS		NTS	8/8/03

TITLE

CLEAN HARBORS LAPORTE
PIPING & INSTRUMENT DIAGRAM
CYLINDER RELEASE

L201PI001

DRAWING NO. L-201-PI-002-D

REV. E

M.V.ATCHISON & ASSOC.
9894 Bissonnet Ste. 110
Houston, Texas 77036
(713) 541-9674 off.
(713) 541-3342 fax

6/04/2007

DOCUMENT CERTIFICATION STATEMENT
For
R-1 NEW PROCESS VESSEL
UNDER PERMIT No. HW-50225-001

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I certify that the vessel meets all applicable design requirements of 40 CFR 264.192 for Clean Harbors La Porte, LP located at 500 Battleground Rd. La Porte, TX.

Respectfully Submitted,

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.

STATE OF TEXAS
WILLIAM A. PHILLIPS
45651
REGISTERED
PROFESSIONAL ENGINEER

June 4, 2007

W.A. Phillips, P.E.
Chief Engineer

M.V.ATCHISON & ASSOC.
9894 Bissonnet Ste. 110
Houston, Texas 77036
(713) 541-9674 off.
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6/04/2007

INSPECTION CERTIFICATION
R-1 PROCESS VESSEL
UNDER PERMIT No. HW-50225-001

M.V. Atchison & Assoc. has performed an inspection and integrity assessment for Tank R-1 in the week of June 4th th. This tank is located at the Clean Harbors La Porte, LP facility located at 500 Battleground Rd. La Porte, TX.

Based upon the inspections performed on Tank R-1 it would appear to be (suitable) for continued service as a vessel to contain, process, and store liquids under the design pressure. There is no discernable deterioration of the vessel or any of it's components.

M.V. Atchison & Assoc. certifies that its services were performed, its findings obtained, and this report prepared in accordance with generally accepted principles and practices.

Respectfully Submitted,

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.

W.A. Phillips, P.E.
Chief Engineer

M.V.ATCHISON & ASSOC.
9894 Bissonnet Ste. 110
Houston, Texas 77036
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6/04/2007

REF: 40 CFR 264.192. Design and installation of new tank systems or components.

Comments & Review

> (a) Owners or operators of new tank systems or components must obtain and submit to the Regional Administrator, at time of submittal of part B information, a written assessment, reviewed and certified by an independent, qualified registered professional engineer, in accordance with Sec. 270.11(d), attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of hazardous waste. The assessment must show that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail. This assessment, which will be used by the Regional Administrator to review and approve or disapprove the acceptability of the tank system design, must include, at a minimum, the following information:
REPLY: *The tank design has been reviewed & found acceptable.*

(1) Design standard(s) according to which tank(s) and/or the ancillary equipment are constructed;
REPLY: *ASME Code Section VIII, Div. 1 was used and is applicable*

(2) Hazardous characteristics of the waste(s) to be handled;
REPLY: *Waste materials to be handled are those from other working tanks. Materials of construction are equal to existing equipment handling the same materials. Materials of construction have been satisfactory in resisting corrosion in these existing tanks.*

(3) For new tank systems or components in which the external shell of a metal tank or any external metal component of the tank system will be in contact with the soil or with water, a determination by a corrosion expert of:

(i) Factors affecting the potential for corrosion, including but not limited to:
> (A) Soil moisture content;
> (B) Soil pH;
> (C) Soil sulfides level;
> (D) Soil resistivity;

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> (E) Structure to soil potential;
> (F) Influence of nearby underground metal structures (e.g., piping);
> (G) Existence of stray electric current;
(H) Existing corrosion-protection measures (e.g., coating, cathodic protection), and
(ii) The type and degree of external corrosion protection that are needed to ensure the integrity of the tank system during the use of the tank system or component, consisting of one or more of the following:>

(A) Corrosion-resistant materials of construction such as special alloys, fiberglass reinforced plastic, etc.;
(B) Corrosion-resistant coating (such as epoxy, fiberglass, etc.) with cathodic protection (e.g., impressed current or sacrificial anodes); and
(C) Electrical isolation devices such as insulating joints, flanges, etc.
[Note: The practices described in the National Association of Corrosion Engineers (NACE) standard, ``Recommended Practice (RP-02-85) -- Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems,'' and the American Petroleum Institute (API) Publication 1632, ``Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems,'' may be used, where applicable, as guidelines in providing corrosion protection for tank systems.]
REPLY: *N/A- Tank shell does not contact soil and/or water.*

(4) For underground tank system components that are likely to be adversely affected by vehicular traffic, a determination of design or operational measures that will protect the tank system against potential damage;
REPLY: *N/A- Tank shell does not contact soil and/or water.*

(5) Design considerations to ensure that:
(i) Tank foundations will maintain the load of a full tank;
REPLY: *Design satisfactory for loading.*

(ii) Tank systems will be anchored to prevent flotation or dislodgment where the tank system is placed in a saturated zone, or is located within a seismic fault zone subject to the standards of Sec. 264.18(a);
REPLY: *N/A*

(iii) Tank systems will withstand the effects of frost heave.
REPLY: *N/A*

(b) The owner or operator of a new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to the system

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6/04/2007

during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of tank systems or components, must inspect the system for the presence of any of the following items:

(1) Weld breaks;
(2) Punctures;
(3) Scrapes of protective coatings;
(4) Cracks;
(5) Corrosion;
(6) Other structural damage or inadequate construction/installation.

REPLY: *Inspection to be performed before and after installation to assure that the design requirements and integrity of the tank are intact.*

Reviewed by

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.

STATE OF TEXAS
WILLIAM A. PHILLIPS
45851
REGISTERED
PROFESSIONAL ENGINEER

June 4, 2007

W.A. Phillips, P.E.
Chief Engineer

M.V.ATCHISON & ASSOC.
9894 Bissonnet Ste. 110
Houston, Texas 77036
(713) 541-9674 off.
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6/04/2007

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(1) Weld breaks;
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(4) Cracks;
(5) Corrosion;
(6) Other structural damage or inadequate construction/installation.

REPLY: *Inspection to be performed before and after installation to assure that the design requirements and integrity of the tank are intact.*

Reviewed by

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.

STATE OF TEXAS
WILLIAM A. PHILLIPS
45651
REGISTERED
PROFESSIONAL ENGINEER

June 4, 2007

W.A. Phillips, P.E.
Chief Engineer

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS

(Alternative Form for Single Chamber, Completely Shop or Field Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured and certified by Simmons Fabricators, LTD, 2418 Beverly Rd., Pasadena, Texas 7503 (Name and address of manufacture,)

2. Manufactured for CLEAN HARBORS 500 BATTLEGROUND RD. LAPORTE TEXAS (Name and address of purchaser)

3 Location of installation UNKNOWN (Name and address)

4. Type VERT. (Horiz. or Vert., Tank) | 270361 (Mfgr's serial No.) | --- (CRN) | 270361-1 (Drawing No.) | 186 (Nat'l. Bd. No.) | 2007 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 2004 year to 2006 Addenda (Date)

6. Shell: sa-240-316/316l (Mat'l. (Spec. No., Grade,)) | .250 (Nom. Thk. (in.)) | 0.0 (Corr. Allow. (in.)) | --- (Code Case Nos.) | Lethal (Special Service per UG-120(d))

7. Seams: SNGL. (Long. (Welded, Dbl., Sngl. Lap, Butt)) | FULL (R.T. (Spot or Full)) | 100 (Eff %) | -- (H.T. Temp. (°F)) | -- (Time (hr.)) | 2'-1 1/2" (Diam. I.D. (ft. & in.)) | 3'-7 1/2" (Length (overall) (ft. & in.))

8. Heads: (a) Mat'l SA-240-316/316L (Spec. No., Grade) (b) Mat'l SA 182-F316/316L (Spec. No., Grad,)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex, Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex - Concave)
(a)	TOP	.187	0.0	--	--	F&D	--	--	--	concave
(b)	BOTTOM	.187	0.0	--	--	F&D	--	--	--	CONCAVE

Girth (Welded, Dbl., Sngl. Lap, Butt): SNGL. | RT (Spot or Full): FULL | Eff. %: 100 | No of Courses: 1

If removable, bolts used (describe other fastenings) ---------- (Mat'l, Spec. No., Gr., Size, No.)

9. MAWP 190 (Internal) 15 (External) psi at max. temp 200 (Internal) 200 (External) °F

Min. design metal temp. -20 °F at 190 psi. Hydro., XXXXXXX. test pressure 248 psi.

10. Nozzles, inspection and safety valve openings - Safety Relief Per UG-125 to be provided by user.

Purpose (Outlet, Drain)	No.	Diam. or Size	Type	Mat'l.	Nom. Thk	Reinforcement mat'l	How Attached	Location
VAPOR OUTLET	1	1" 150	RFWN	SA182/312-316/316L	.133	----------	WELD	HEAD
INLET/OUTLET	1	2" 150	RFWN	SA182/312-316/316L	.154	---	WELD	HEAD
NITROGEN BL'NKT	1	1" 150"	RFWN	SA182/312-316/316L	.133	---	WELD	HEAD
INLET/PRESS.	1	1" 150	RFWN	SA182/312-316/316L	.133	---	WELD	HEAD
VAPOR OUTLET	1	2" 150#	RFWN	SA182/312-316/316L	.154	---	WELD	shell
MANWAY	1	18" 150	RFWN	SA182/312-316/316L	.375	SA240- 316/316L	WELD	shell
-------	------	-------	-------	----------	------	----------	------	-------
-------	---	-------	-------	----------	------	----------	------	-------
----------	----	------	-------	----------	------	----------	------	-------

11. Supports: Skirt ------ (Yes or no) Lugs --- (No.) Legs 4 (No.) Other -- (Describe) Attached WELD/SHELL (Where and How)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: ALL WORK PER CUSTOMER'S SPECIFICATIONS., Full radiography (Name of part, item number, Mfgr's. name and identifying stamp)

CERTIFICATE OF SHOP/FIELD COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel Conform to the ASME Code for Pressure Vessels, Section VIII Division 1. "U" Certificate of Authorization No. 25,444 expires 03/08/2009

Date 7-2-07 Co. name Simmons Fabricators, LTD (Manufacture) Signed [signature] (Representative)

CERTIFICATE OF SHOP/FIELD INSPECTION

Vessel constructed by Simmons Fabricators, LTD at 2418 Beverly Rd., Pasadena, Texas 77503

I, the undersigned holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of Texas and employed by SENECA INSURANCE COMPANY.

have inspected the component described in this Manufacturer's Data Report on 6/30 2007 and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or loss of any kind arising from or connected with this inspection.

Date 7-2-2007 Signed [signature] (Authorized Inspector) Commissions NB 7280 BE TX1033 (Nat'l Board (Incl. endorsements), State, Prov., and No.)

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

76020

Page 1 of 1

CUSTOMER: SIMMONS FABRICATORS IRISNDT#: DATE: JUNE 27, 2007

LOCATION: PASADENA, TX. JOB#: Z703601 P.O.#: PART#:

MATERIAL: S/S CODE: ASME VIII DIV. 1 ORIG. FILM ✓ REPAIR FILM

TESTING VARIABLES

Ir_{192} ☑ Co_{60} ☐ X-Ray ☐ : Ci 47 kV N/A mA N/A EFSS: 0.142"

PROCESSING: MANUAL ☐ AUTOMATIC ☑ SINGLE FILM ☐ COMPOSITE FILM ☑

EXPOSURE: DWE/SWV ☐ DWE/DWV ☐ SWE/SWV ☑

FILM: TYPE FUJI-80 CLASS I SENSITIVITY 2-2T

FILM USAGE: 3½ x 8½ ____ 3½ x 10 ____ 3½ x 17 ____ 4½ x 10 1 4½ x 17 20 14 x 17 ____

7 x 8½ ____ 7 x 17 ____ 8 x 10 ____ 70 mm ____ Other ____

	FILM I.D.	INTERVAL	I.Q.I.	SHIM	MAT'L THK	SOD Inches	OFD Inches	DENSITY	IRISNDT Proc.	DIA.	DISCONTINUITIES	ACCEPT	REJECT
1	RS-1	1-2	1B	—	.25"	12.6"	.3"	2.4	RT-1	24"	P		X
2		2-3										✓	
3		3-4											
4		4-5									P		X
5		5-6									P		X
6		6-1									P		X
7											P		X
8	RS-2	1-2											
9		2-3										✓	
10		3-4										✓	
11		4-5										✓	
12		5-6										✓	
13		6-1										✓	
14												✓	
15	LS-1	1-2											
16		2-3										✓	
17		3-4										✓	
18		4-5										✓	
19												✓	
20	MW1												
21													
22	RS-1	1-2			.375"	17"	.4"		RT-6	18"			
23		2-3										✓	
24		3-4										✓	
25		4-1										✓	
26												✓	
27	LS-1	1-2							RT-2				
28												✓	
29													
30													

IRISNDT Procedure:
RT 1, 2, 2A, 6, 7 - Single Wall Exposure
RT 3, 3A, 4, 5, 8 - Double Wall Exposure

S.O.D. = Source-to-object distance
O.F.D. = Object-to-film distance
S.O.D. + O.F.D. = S.F.D.

TERMS AND ABBREVIATIONS

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
IQI - Image Quality Indicator (Penetrameter)
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
P - Porosity
S - Slag
RS - Round Seam
LS - Long Seam

Unit # 316 Miles:

In Out Hrs.

In Out Hrs.

Personnel: M. CAGLE / D. HINZE

Interpretation by:

MARK S. CAGLE (Print) ASNT SNT-TC-1A II (Level)

Mark S. Cagle (Signature) CERT. # 6631

Client Representative:

1729 Brittmoore Road #D
Houston, TX 77043
Ph. (713) 722-7177 Fax (713) 722-7677

1115 W. 41st Street
Tulsa, OK 74107
Ph. (918) 446-8773 Fax (918) 446-8777

ORIGINAL

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

76022

Page 2 of 2

CUSTOMER: SIMMONS FABRICATORS IRISNDT#: DATE: JUNE 28, 2007

LOCATION: PASADENA, TX. JOB#: 270361 P.O.#: PART#:

MATERIAL: S/S CODE: ASME VIII DIV. 1 ORIG. FILM REPAIR FILM ✓

TESTING VARIABLES

Ir_{192} ☑ Co_{60} ☐ X-Ray ☐ : Ci 45. kV N/A mA N/A EFSS: 0.142"

PROCESSING: MANUAL ☑ AUTOMATIC ☐ SINGLE FILM ☑ COMPOSITE FILM ☐

EXPOSURE: DWE/SWV ☐ DWE/DWV ☐ SWE/SWV ☑

FILM: TYPE FUJI-80 CLASS I SENSITIVITY 2-2T

FILM USAGE: 3½ x 8½ ____ 3½ x 10 ____ 3½ x 17 ____ 4½ x 10 ____ 4½ x 17 Co 14 x 17 ____

7 x 8½ ____ 7 x 17 ____ 8 x 10 ____ 70 mm ____ Other ____

	FILM I.D.	INTERVAL	I.Q.I.	SHIM	MAT'L THK	SOD Inches	OFD Inches	DENSITY	IRISNDT Proc.	DIA.	DISCONTINUITIES	ACCEPT	REJECT
1	RSIR1	1-2	1B	-	.25"	12.7"	.3"	2-4	RT-1	2½"		✓	
2		2-3										✓	
3		3-4										✓	
4		4-5										✓	
5		5-6										✓	
6		6-1										✓	
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20											RSR		
21													
22											6-30-07		
23													
24													
25													
26													
27													
28													
29													
30													

IRISNDT Procedure:
RT 1, 2, 2A, 6, 7 - Single Wall Exposure
RT 3, 3A, 4, 5, 8 - Double Wall Exposure

S.O.D. = Source-to-object distance
O.F.D. = Object-to-film distance
S.O.D. + O.F.D. = S.F.D.

TERMS AND ABBREVIATIONS

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
IQI - Image Quality Indicator (Penetrameter)
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
P - Porosity
S - Slag
RS - Round Seam
LS - Long Seam

Unit # 316 Miles:

In ____ Out ____ Hrs. ____

In ____ Out ____ Hrs. ____

Personnel: M. CAGLE / D. HINZE

Interpretation by:

MARK S. CAGLE (Print) ASNT SNT-TC-1A II (Level)

(Signature) CERT. # 6051

Client Representative:

1729 Brittmoore Road #D
Houston, TX 77043
Ph. (713) 722-7177 Fax (713) 722-7677

1115 W. 41st Street
Tulsa, OK 74107
Ph. (918) 446-8773 Fax (918) 446-8777

ORIGINAL

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

76021

Page 1 of 2

CUSTOMER: SIMMONS FABRICATORS IRISNDT#: DATE: JUNE 28, 2001

LOCATION: PASADENA, TX. JOB#: 270361 P.O.#: PART#:

MATERIAL: S/S CODE: ASME VIII DIV. 1 ORIG. FILM ✓ REPAIR FILM

TESTING VARIABLES

Ir_{192} ☑ Co_{60} ☐ X-Ray ☐ : Ci 45 kV N/A mA N/A EFSS: 0.142"

PROCESSING: MANUAL ☑ AUTOMATIC ☐ SINGLE FILM ☐ COMPOSITE FILM ☐

EXPOSURE: DWE/SWV ☐ DWE/DWV ☑ SWE/SWV ☐

FILM: TYPE FUJI-50 CLASS I SENSITIVITY 2-2T

FILM USAGE: 3½ x 8½ ____ 3½ x10 15 3½ x17 ____ 4½ x 10 ____ 4½ x 17 ____ 14 x 17 ____

7 x 8½ ____ 7 x 17 ____ 8 x 10 ____ 70 mm ____ Other ____

	FILM I.D.	INTERVAL	I.Q.I.	SHIM	MAT'L THK	SOD Inches	OFD Inches	DENSITY	IRISNDT Proc.	DIA.	DISCONTINUITIES	ACCEPT	REJECT
1	N1	1	12	.40"	.154"	19"	24"	2.4	RT-5	2"		✓	
2		2		↓	↓	↓	↓	↓	↓	↓		✓	
3		3		↓	↓	↓	↓	↓	↓	↓		✓	
4													
5	N2	1		.50"	.135"	20"	1.4			1"		✓	
6		2		↓	↓	↓	↓			↓		✓	
7		3		↓	↓	↓	↓			↓		✓	
8													
9	N3	1											
10		2										✓	
11		3										✓	
12												✓	
13	N4	1											
14		2									LF		X
15		3		↓	↓	↓	↓			↓		✓	
16												✓	
17	N5	1		.40"	.154"	19"	24"			2"			
18		2		↓	↓	↓	↓			↓		✓	
19		3	↓	↓	↓	↓	↓	↓	↓	↓		✓	
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

159
L= 30'-0"

IRISNDT Procedure:
RT 1, 2, 2A, 6, 7 - Single Wall Exposure
RT 3, 3A, 4, 5, 8 - Double Wall Exposure

S.O.D. = Source-to-object distance
O.F.D. = Object-to-film distance
S.O.D. + O.F.D. = S.F.D.

TERMS AND ABBREVIATIONS

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CK - Crack
EP - Excessive Penetration
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
IQI - Image Quality Indicator (Penetrameter)
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
P - Porosity
S - Slag
RS - Round Seam
LS - Long Seam

Unit # 376 Miles:

In Out Hrs.

In Out Hrs.

Personnel: M. CAGLE / D. HINZE

Interpretation by:

MARK S. CAGLE (Print)

(Signature)

ASNT SNT-TC-1A II (Level)

CERT. # 6231

Client Representative:

1729 Brittmoore Road #D
Houston, TX 77043
Ph. (713) 722-7177 Fax (713) 722-7677

1115 W. 41st Street
Tulsa, OK 74107
Ph. (918) 446-8773 Fax (918) 446-8777

ORIGINAL

IRISNDT

RADIOGRAPHIC INSPECTION REPORT

092661

Page 1 of 1

CUSTOMER: Thomas FAB

IRISNDT#:

DATE: 6/29/07

LOCATION: Deer Park, TX JOB#:

P.O.#: 27036/1 PART#:

MATERIAL: S/S CODE: Asme see VIII ORIG. FILM ✓ REPAIR FILM

TESTING VARIABLES

Ir_{192} ☑ Co_{60} ☐ X-Ray ☐: Ci 83 kV mA EFSS: 0.146

PROCESSING: MANUAL ☑ AUTOMATIC ☐ SINGLE FILM ☑ COMPOSITE FILM ☐

EXPOSURE: DWE/SWV ☑ DWE/DWV ☐ SWE/SWV ☐

FILM: TYPE FUJI 80 CLASS 1 SENSITIVITY 2T

FILM USAGE: 3½ x 8½ 3½ x 10 3 3½ x 17 4½ x 10 4½ x 17 14 x 17

7 x 8½ 7 x 17 8 x 10 70mm Other

FILM I.D.	INTERVAL	I.Q.I.	SHIM	MAT'L THK	SOD Inches	OFD Inches	DENSITY	IRISNDT Proc.	DIA.	DISCONTINUITIES	ACCEPT	REJECT
W-4	1	1025	74	.133	15"	.133	2-4	RT-5	1.3			
2	2	1	1	1	1	1	1	1	1			
3	3	1	1	1	1	1	1	1	1		✓	
4												
5												
6												
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KSS

6-30-07

IRISNDT Procedure:
RT 1, 2, 2A, 6, 7 - Single Wall Exposure
RT 3, 3A, 4, 5, 8, - Double Wall Exposure

S.O.D. = Source-to-object distance
O.F.D. = Object-to-film distance
S.O.D. + O.F.D. = S.F.D

TERMS AND ABBREVIATIONS

AB - Arc Burns
BT - Burn Through
CK - Crack
EP - Excessive Penetration
EUC - External Undercut
IUC - Internal Undercut
HB - Hollow Bead
IP - Incomplete Penetration
IQI - Image Quality Indicator (Penetrameter)
IC - Internal Concavity
LF - Lack of Fusion
LC - Low Cover
MA - Misalignment
P - Po
S -
RS
I

Unit # 396 Miles:

Out Hrs.

Out Hrs.

Personnel: TR AK

Interpretation by:

(Print)

(Signature)

Client Representativ

Tulsa
1115 W. 41st Street
Tulsa, OK 74107
Ph (918) 446-8773 Fax (918) 446-8777

Deer Park
905 Georgia Ave.
Deer Park, TX 77536
Ph (281) 476-4444 Fax (281) 476-4450

ACESITA

Plant: Praça 1º de Maio, nº 9 - Centro - Timóteo - MG - 35180-018 - Brazil

ACESITA S.A. ASSOCIADA À ARCELOR

Head Office: Av. João Pinheiro, nº 390 - Centro - Belo Horizonte - MG - 30130-180 - Brazil

PACKING LIST/TEST REPORT

Number: 266032
ACESITA Order: 62858402
Date: 22/11/2006
Invoice: 3251E06

Customer:

A

Ship to:

Part Number: 0,25" x 48

Steel grade: AISI 316L Finish: NR1 Product: COIL
Dimensions: 6,35 mm x 1219 mm - 0,250 in x 48,00 in
Marks:

Chemical composition

Heat nr.	C %	Mn %	Si %	P %	S %	Cr %	Ni %	Mo %	N2 PPM	Ti %	Cu %	Co %				
643849C	0,015	1,34	0,390	0,028	0,003	16,56	10,01	2,000	374	0,0046	0,0970	0,044				

Results

Test/Variable	Unit	643849C2200B		643849C2300B									
		H	T	H	T	H	T	H	T	H	T	H	T
Tensile Strength	KSI		87,02		87,02								
Yield Strength 0,2%	KSI		50,33		50,33								
Elongation 2"	%		53,00		53,00								
Grain Size			07/08		07/08								
Hardness RB	HRB	86,00	86,00	86,00	86,00								
Net Weight	LB	17.570		17.383									
Gross Weight	LB	17.725		17.537									

Heat & Lot identification: Ok
Surface quality / dimensions: Ok
Heat treatment: Minimun Solution anneal temp.1900 F
Standards: ASME SA480/SA480M 04 ASTM A240/A240M 06C ASTM A480/A480M 06B
ASME SA240/SA240M 04 NACE MR0175 01

Remarks: AISI 316/316L DUAL CERTIFIED

a) Free from mercury contamination.
b) Certify that the results above are correct and in acc. with the specifications or accepted concession.
c) Quality management system certified acc to standard ISO 9001:2000 - Certificate ABS QE Nº 30071.
d) Quality management system certified acc to standard ISO/TS 16949:2002 - Certificate ABS QE Nº 38324.
e) Environmental management system certified acc to standard ISO 14001:1996 - Certificate ABS QE Nº 65989.

Reginaldo Pinto Barbosa
Qualified Inspector
ACESITA S.A.

NAS NORTH AMERICAN STAINLESS

METALLURGICAL TEST REPORT

6870 Highway 42 East
Ghent, KY 41045-9615
(502) 347-6000

Certificate: 344112 01

Customer: 1520 003

Mail To:
METALS INC. - GARLAND
2805 MARKET STREET, STE. 150
GARLAND, TX 75041

Ship To:
METALS INC. - GARLAND
C/O TSA PROCESSING
1625 W. SAM HOUSTON PARKWAY N.
HOUSTON, TX 77047

Date: 1/14/2007 Page: 1

Steel: 316/316L

Finish: NRAP

Your Order: 825458

NAS Order: AN 0361594 02

Corrosion: ASTM A262/02aE:180Bend-OK

PRODUCT DESCRIPTION:

STAINLESS STEEL COIL, HOT ROLLED, ANNEALED AND PICKLED.
ASTMA240/06a,480/06,666/03,ASMESA240/04-A06,480/04-A06,SA666/04
QQS766D-A X MG PERM,AMS5507F/AMS5524K X MRK

REMARKS:

Mat'l free of Hg contam. No weld repairs. RoHS-Compliant.
EN 10204 3.1 PED 97/23/EC Annex1, Para. 4.3 QQS763F Cond A
Melted & Manufactured in the USA EN 10204 3.1.B

Product ID #	Coil #	Thickness	Width	Weight	Length	Mark	Pieces
071RP7 B	* 071RP7 B	.2500	48.0000	18,060 COIL	450.80	11	1

CHEMICAL ANALYSIS

CM(Country of Melt) ES(Spain) US(United States) ZA(South Africa)

PT 5 →

Heat	CM	C	CR	CU	MN	MO	N	NI	P	S	SI
1RP7	US	.021	16.697	.399	1.481	2.177	.042	10.290	.030	.002	.108

MECHANICAL PROPERTIES

Product ID #	Coil #	Loc	Dir	UTS KSI	.2% YS KSI	ELONG %-2"	Hard RB	Tail Hard
071RP7 B	071RP7	F	T	86.97	46.61	51.36	82.00	83.50

NAS hereby certifies that the analysis on this certification is correct and the material meets the specifications stated.

QC ENGINEER _____ 2/12/2007
ERIC BESS

TÜV CERT EN ISO 9001 : 2000 Certificate : 01760281170 RWTÜV

APPROVED AD 2000 WO PED 97/23/EC MANUFACTURER

VIRAJ Forgings

(A Division of Viraj Profiles Ltd.)

INSPECTION CERTIFICATE & MILL TEST REPORT - EN 10204 3.1

CUSTOMER :

TEXAS PIPE & SUPPLY
2330 HOLMES ROAD
HOUSTON , TX 77051

MANUFACTURER'S SYMBOL

MTR NO.	FRG/25152 - D
DATE	30.05.2007
MATERIAL SPECIFICATION	ASTM A182/A182M- 06
	ASME SA182/SA182M - 06
GRADE	F316/316L
DIMENSIONAL SPECIFICATION	ASME B16.5 2003
MATERIAL CONFORMS TO NACE MR0 103 - 2005	
STAINLESS STEEL FORGED FLANGES	

ORDER NO.: 81493 - 00 / HOU

CHEMICAL ANALYSIS

SL NO	ITEM DESCRIPTION			HEAT NO	QTY	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	N2 PPM		
1	1"	WNRF S40S	150#	74059	65	0.022	1.84	0.44	0.012	0.042	16.80	10.06	2.00	725		
2	2"	WNRF S40S	150#	74496	125	0.020	1.95	0.46	0.012	0.038	16.74	10.14	2.05	875		
3	3"	WNRF S10S	300#	74024	40	0.027	1.89	0.44	0.026	0.042	16.70	10.14	2.04	710		
4	6"	WNRF S40S	150#	73999	50	0.023	1.93	0.47	0.016	0.039	16.70	10.10	2.06	710		
5	8"	WNRF S10S	150#	74320	30	0.022	1.85	0.44	0.007	0.038	16.95	10.10	2.03	685		
6	8"	WNRF S40S	300#	13008	20	0.026	1.72	0.45	0.018	0.032	16.57	10.03	2.02	730		
7	10"	WNRF S40S	300#	12715	6	0.016	1.71	0.45	0.010	0.031	16.58	10.05	2.05	610		

MECHANICAL PROPERTIES

HEAT NO	ITEM DESCRIPTION			TENSILE STRENGTH (Mpa)	YIELD STRENGTH (Mpa)	ELONGATION % Lo=4D	REDUCTION OF AREA %	IMPACT TEST CHARPY V-NOTCH 10x10mm (JOULES)				HARDNE (BHN)
								1	2	3	AVG	
74059	1"	WNRF S40S	150#	581.65	264.46	57.40	69.61	-	-	-	-	163
74496	2"	WNRF S40S	150#	548.26	289.13	61.00	66.59	-	-	-	-	151
74024	3"	WNRF S10S	300#	581.65	264.86	60.60	67.98	-	-	-	-	152
73999	6"	WNRF S40S	150#	557.38	224.39	53.60	65.88	-	-	-	-	145
74320	8"	WNRF S10S	150#	587.03	267.22	60.40	67.72	-	-	-	-	159
13008	8"	WNRF S40S	300#	599.88	278.89	59.80	65.21	-	-	-	-	165
12715	10"	WNRF S40S	300#	556.59	260.59	60.80	67.72	-	-	-	-	144

MELTING PROCESS	: INDUCTION / AOD (SRB) / CONCAST
HEAT TREATMENT	: SOLUTION ANNEALED AT 1050°C AND WATER QUENCHED
DIMENSIONAL INSPECTION	: CONFORM WITH THE SPECIFICATION (100% INSPECTED)
SURFACE INSPECTION	: SATISFACTORY
PMI	: NO OBJECTION(100% TESTED WITH MOBILE SPECTRO)
MICRO OBSERVATION	: NO CARBIDE PRECIPITATION OBSERVED ON GRAIN BOUNDARIES
RADIOACTIVITY TEST	: ALL THE ABOVE MATERIAL IS TESTED FOR RADIOACTIVITY AND FOUND WITH IN THE LIMIT OF BACKGROUND RADIATION

WE CERTIFY THAT THE MATERIAL DESCRIBED ABOVE HAS BEEN TESTED AND COMPLIES WITH THE ORDER/CONTRACT AND IS OF INDIAN ORIGIN.

VIRAJ FORGINGS Quality Assurance

WORKS INSPECTOR

OFFICE : 10, Imperial Chambers, 1st Floor, Wilson Road, Ballard Estate, Mumbai - 400 038, INDIA. Tel. : (+91-22) 2261 4327, 2261 4284, 2265 7678, 2261 3056 Fax : (+91-22) 2261 2980/2265 9713
FACTORY : C 75, MIDC Tarapur Industrial Area, Dist. Thane, Maharashtra - 401 506, I Tel.: (+91-2525) 279 018 - 24, Fax : (+91-2525) 274 444, 275 587 ❖ IL · vfl@viraj.com
y No. 140/1, Boisar - Palghar Road, Saravali, Tarapur. Tal Palghar, Dist. Thane arashtra, India.

VIRAJ FORGINGS

(A DIVISION OF VIRAJ PROFILES LTD.)

G-75 MIDC , TARAPUR, MAHARASHTRA, INDIA

TUV NORD

INSPECTION CERTIFICATE & MILL TEST REPORT - EN 10204 3.1

CUSTOMER :

TEXAS PIPE & SUPPLY
2200 - A WOLFRIDGE ROAD
MOBILE , AL 36612

ORDER NO.:79026 - 00 / MOBILE

MANUFACTURER'S SYMBOL

MTR NO.	FRG/24964 - J
DATE	31.03.2007
MATERIAL SPECIFICATION	ASTM A182/A182M- 06
	ASME SA182/SA182M - 06
GRADE	F316/316L
DIMENSIONAL SPECIFICATION	ASME B16.5 2003
MATERIAL CONFORMS TO NACE MR0 103 - 2005	
STAINLESS STEEL FORGED FLANGES	

CHEMICAL ANALYSIS

ORDER NO	ITEM DESCRIPTION			HEAT NO	QTY	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	N2 PPM		
1	10"	WNRF S10S	150#	74190	2	0.029	1.80	0.48	0.011	0.035	16.85	10.10	2.04	650		
2	12"	WNRF S10S	150#	12543	5	0.024	1.80	0.46	0.012	0.043	16.56	10.10	2.05	780		
3	3"	WNRF S10S	150#	72132	15	0.023	1.74	0.48	0.021	0.039	16.53	10.17	2.05	645		
4	1"	WNRF S40S	150#	74059	10	0.022	1.84	0.44	0.012	0.042	16.80	10.06	2.00	725		
5	2"	WNRF S40S	150#	72687	20	0.023	1.75	0.49	0.021	0.039	16.50	10.00	2.05	910		
6	2"	WNRF S40S	300#	73996	20	0.022	1.65	0.53	0.011	0.035	16.95	10.10	2.08	725		
7	3"	WNRF S40S	150#	72132	5	0.023	1.74	0.48	0.021	0.039	16.53	10.17	2.05	645		
8	3"	WNRF S40S	300#	70470	10	0.023	1.73	0.46	0.016	0.040	16.61	10.19	2.00	750		

MECHANICAL PROPERTIES

HEAT NO	ITEM DESCRIPTION			TENSILE STRENGTH (Mpa)	YIELD STRENGTH (Mpa)	ELONGATION % Lo=4D	REDUCTION OF AREA %	IMPACT TEST CHARPY V-NOTCH 10x10mm (JOULES) 1	2	3	AVG	HARDNESS (BHN)
74190	10"	WNRF S10S	150#	564.87	234.23	60.20	66.26	-	-	-	-	153
12543	12"	WNRF S10S	150#	599.33	269.56	60.80	65.71	-	-	-	-	159
72132	3"	WNRF S10S	150#	570.74	275.08	59.60	73.00	-	-	-	-	152
74059	1"	WNRF S40S	150#	581.65	264.46	57.40	69.61	-	-	-	-	163
72687	2"	WNRF S40S	150#	527.88	257.33	60.14	67.80	-	-	-	-	166
73996	2"	WNRF S40S	300#	601.90	283.29	60.40	69.51	-	-	-	-	163
72132	3"	WNRF S40S	150#	570.74	275.08	59.60	73.00	-	-	-	-	152
70470	3"	WNRF S40S	300#	554.30	298.01	56.60	73.95	-	-	-	-	156

MELTING PROCESS	: INDUCTION / ADD (IRS) / CONCAST
HEAT TREATMENT	: SOLUTION ANNEALED AT 1050°C AND WATER QUENCHED
DIMENSIONAL INSPECTION	: CONFORM WITH THE SPECIFICATION (100% INSPECTED)
SURFACE INSPECTION	: SATISFACTORY
PMI	: NO OBJECTION(100% TESTED WITH MOBILE SPECTRO)
MICRO OBSERVATION	: NO CARBIDE PRECIPITATION OBSERVED ON GRAIN BOUNDARIES
RADIOACTIVITY TEST	: ALL THE ABOVE MATERIAL IS TESTED FOR RADIOACTIVITY AND FOUND WITH IN THE LIMIT OF BACKGROUND RADIATION

WE CERTIFY THAT THE MATERIAL DESCRIBED ABOVE HAS BEEN TESTED AND COMPLIES WITH THE ORDER/CONTRACT AND IS OF INDIAN ORIGIN.

WORKS INSPECTOR

OFFICE:10,Imperial Chambers, 1st Floor, Wilson Road, Ballard Estate, Mumbai-400 038,INDIA TEL: 91-22-2613058/2614284 FAX: 91-22-2612980
FACTORY:G-75 MIDC,Tarapur,Thane(Dist),Maharashtra,INDIA TEL: 91-02525-70143/71365 to 71370 FAX: 91-02525-70431 E-MAIL: viraj@viraj.com

INSPECTION CERTIFICATE AND MILL TEST REPORT

According to

EN 10204/3.1

Jiangyin Tianfeng Flange Co.,LTD
Address:Xujiawan, Xinjing Village, Chengjiang Town
Jiangyin City, Jiangsu Province,China
Tel: +86-510-86130768 Fax: +86-510-86130707

Customer: Texas Pipe and Supply Co.

Order No: SC-1541 (HOU)

L/C number:	
Date of issue:	10-Feb-2007
Material Specification:	ASTM A182
Dimensional Specification:	ANSI B16.5

Chemical Analysis

Item No.	Item Description	Material	Sch.	Heat No.	QTY	%C	%Mn	%P	%S	%Si	%Ni	%Cr
		316/L				≤0.030	≤2.00	≤0.045	≤0.030	≤1.00	10.00~15.00	16.00~18.00
1	20" WELD NECK FLANGE RF		300LB SCH40S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
2	20" WELD NECK FLANGE RF		300LB SCH80S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
3	24" WELD NECK FLANGE RF		300LB SCH80S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
4	24" WELD NECK FLANGE RF		300LB SCH40S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
5	18" WELD NECK FLANGE RF		150LB SCH40S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
6	18" WELD NECK FLANGE RF		300LB SCH40S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
7	18" WELD NECK FLANGE RF		300LB SCH80S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
8	20" WELD NECK FLANGE RF		150LB SCH10S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
9	24" WELD NECK FLANGE RF		150LB SCH10S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
10	14" WELD NECK FLANGE RF		150LB SCH40S	70226	6	0.021	1.38	0.038	0.015	0.30	10.10	16.58
11	16" WELD NECK FLANGE RF		150LB SCH40S	70226	6	0.021	1.38	0.038	0.015	0.30	10.10	16.58
12	14" WELD NECK FLANGE RF		300LB SCH40S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
13	16" WELD NECK FLANGE RF		300LB SCH40S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
14	14" WELD NECK FLANGE RF		300LB SCH80S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
15	16" WELD NECK FLANGE RF		300LB SCH80S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
16	16" WELD NECK FLANGE RF		150LB SCH10S	70226	3	0.021	1.38	0.038	0.015	0.30	10.10	16.58
17	18" WELD NECK FLANGE RF		150LB SCH10S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
					43							

Mechanical Properties

Heat No.	Item Description	Sample specificatio	Lab Temperature ℃	Tensile MPa	Yield MPa	Elong. %	Red. Area %	Hardness HB	Impact Test	PT Test	UT Test	Visual & Dimension
		12.5*50	25℃	≥485	≥170	≥30	≥50	–	–	–	–	ok
31175	20" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	20" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	24" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	24" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	18" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	18" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	18" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	20" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	24" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
70228	14" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
70226	16" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	14" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	16" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	14" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	16" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	16" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	18" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok

Delivery Condition: SOLUTION TREATED, 1050℃ Water Quenched

WE CERTIFY THIS MATERIAL HAS BEEN MANUFACTURED AND EXAMINED IN ACCORDING WITH ALL REQUIREMENTS OF THE SPECIFICATION(S) AND THE RESULTS OF ALL EXAMINATIONS ARE ACCEPTABLE.

Inspector:

Q.C Manager:

Supplier Stmp:

Date: 2007-3-27

INSPECTION CERTIFICATE AND MILL TEST REPORT

According to
DIN 50049 3. 1. B / EN 10204

WENZHOUSHI DONGNAN PIPE MADE FACOTRY
/ DBA OF SC MFG. GROUP INC.
No. 315 -4 , GONGYE BEIJIE, YONGZHONG TOWN, WENZHOU CITY, P. R. CHINA
Tel.: 86-22-27319741 Fax.: 86-22-27319749

Customer:
Texas Pipe and Supply Co.,
2330 Holmes Road
Houston
Texas 77051-1098

Order No.71228-00

Manufacturer's Symbol
SCDN

SC MFG PO No.SC-1541(HOU

MTR No.	SC-1541
Date of issue:	17-Aug-2006
Grade:	316L
Made From:	
Material Specification:	ASTM A182
Dimensional Specification:	ASME B16.5

Chemical Analysis

Item No.	Item Description	Sch.	Heat No.	QTY	%C	%Mn	%P	%S	%Si	%Ni	%Cr	%Mo
1	14" SLIP ON FLANGE RF	150LB	60962	15	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
2	16" SLIP ON FLANGE RF	150LB	60962	10	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
3	18" SLIP ON FLANGE RF	150LB	60962	5	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
4	20" SLIP ON FLANGE RF	150LB	60962	5	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
5	16" BLIND FLANGE RF	150LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
6	14" WELD NECK FLANGE RF	150LB SCH40S	60962	6	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
7	24" SLIP ON FLANGE RF	150LB	60962	5	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
8	18" BLIND FLANGE RF	150LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
9	20" BLIND FLANGE RF	150LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
10	24" BLIND FLANGE RF	150LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
11	16" WELD NECK FLANGE RF	150LB SCH10S	60962	3	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
12	18" WELD NECK FLANGE RF	150LB SCH10S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
13	20" WELD NECK FLANGE RF	150LB SCH10S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
14	24" WELD NECK FLANGE RF	150LB SCH10S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
15	16" WELD NECK FLANGE RF	150LB SCH40S	60962	6	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
16	18" WELD NECK FLANGE RF	150LB SCH40S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
17	14" SLIP ON FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
18	16" SLIP ON FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
19	18" SLIP ON FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30

20	20" SLIP ON FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
21	14" BLIND FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
22	16" BLIND FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
23	18" BLIND FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
24	14" WELD NECK FLANGE RF	300LB SCH40S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
25	16" WELD NECK FLANGE RF	300LB SCH40S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
26	18" WELD NECK FLANGE RF	300LB SCH40S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
27	14" WELD NECK FLANGE RF	300LB SCH80S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
28	16" WELD NECK FLANGE RF	300LB SCH80S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
29	18" WELD NECK FLANGE RF	300LB SCH80S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30

Mechanical Properties

Heat No.	Item Description	Tensile MPa	Yield MPa	Elong. %	Red. Area %	Bend Test	Flattening Test	Hardness HB	Impact Test	Hydrostat. Test	Xray Test	Visual & Dimension
60962	14" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	20" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	24" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	20" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	24" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	20" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	24" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok

60962	20" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok

Heat Treatment: SOLUTION TREATED, 1060 °C (20 Minutes) Water Quenched **Steel Making Process:** Electric Furnace

Misc: Material in accordance with NACE MR0175-2001

Free from Mercury contamination

Addition of filler metal? ☑ No ☐ Yes

WE CERTIFY THIS MATERIAL HAS BEEN MANUFACTURED AND EXAMINED IN ACCORDANCE WITH ALL REQUIREMENTS OF THE SPECIFICATION(S) AND THE RESULTS OF ALL EXAMINATIONS ARE ACCEPTABLE.

☐ ☐

TÜV CERT EN ISO 9001 : 2000 RWTÜV

APPROVED AD 2000 WO PED 97/23/EC MANUFACTURER

VIRAJ Forgings

(A Division of Viraj Profiles Ltd.)

INSPECTION CERTIFICATE & MILL TEST REPORT - EN 10204 3.1

CUSTOMER :

TEXAS PIPE & SUPPLY
2330 HOLMES ROAD
HOUSTON , TX 77051

ORDER NO.: 81493 - 00 / HOU

MANUFACTURER'S SYMBOL

MTR NO.	FRG/25152 - D
DATE	30.05.2007
MATERIAL SPECIFICATION	ASTM A182/A182M- 06
	ASME SA182/SA182M - 06
GRADE	F316/316L
DIMENSIONAL SPECIFICATION	ASME B16.5 2003
MATERIAL CONFORMS TO NACE MR0 103 - 2005	
STAINLESS STEEL FORGED FLANGES	

CHEMICAL ANALYSIS

SL NO	ITEM DESCRIPTION		HEAT NO	QTY	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	N2 PPM		
1	1"	WNRF S40S 150#	74059	65	0.022	1.84	0.44	0.012	0.042	16.80	10.06	2.00	725		
2	2"	WNRF S40S 150#	74496	125	0.020	1.95	0.46	0.012	0.038	16.74	10.14	2.05	875		
3	3"	WNRF S10S 300#	74024	40	0.027	1.89	0.44	0.026	0.042	16.70	10.14	2.04	710		
4	6"	WNRF S40S 150#	73999	50	0.023	1.93	0.47	0.016	0.039	16.70	10.10	2.06	710		
5	8"	WNRF S10S 150#	74320	30	0.022	1.85	0.44	0.007	0.038	16.95	10.10	2.03	685		
6	8"	WNRF S40S 300#	13008	20	0.026	1.72	0.45	0.018	0.032	16.57	10.03	2.02	730		
7	10"	WNRF S40S 300#	12715	5	0.016	1.71	0.45	0.010	0.031	16.58	10.05	2.05	610		

MECHANICAL PROPERTIES

HEAT NO	ITEM DESCRIPTION		TENSILE STRENGTH (Mpa)	YIELD STRENGTH (Mpa)	ELONGATION % Lo=4D	REDUCTION OF AREA %	IMPACT TEST CHARPY V-NOTCH 10x10mm (JOULES)				HARDNESS (BHN)
							1	2	3	AVG	
74059	1"	WNRF S40S 150#	581.65	264.46	57.40	69.61	-	-	-	-	163
74496	2"	WNRF S40S 150#	548.26	289.13	61.00	66.59	-	-	-	-	151
74024	3"	WNRF S10S 300#	581.65	264.86	60.60	67.98	-	-	-	-	152
73999	6"	WNRF S40S 150#	557.38	224.39	53.60	65.88	-	-	-	-	146
74320	8"	WNRF S10S 150#	587.03	267.22	60.40	67.72	-	-	-	-	159
13008	8"	WNRF S40S 300#	599.88	278.89	59.80	65.21	-	-	-	-	165
12715	10"	WNRF S40S 300#	556.59	260.59	60.60	67.72	-	-	-	-	144

MELTING PROCESS	: INDUCTION / AOD (IRS) / CONCAST
HEAT TREATMENT	: SOLUTION ANNEALED AT 1050°C AND WATER QUENCHED
DIMENSIONAL INSPECTION	: CONFORM WITH THE SPECIFICATION (100% INSPECTED)
SURFACE INSPECTION	: SATISFACTORY
PMI	: NO OBJECTION(100% TESTED WITH MOBILE SPECTRO)
MICRO OBSERVATION	: NO CARBIDE PRECIPITATION OBSERVED ON GRAIN BOUNDARIES
RADIOACTIVITY TEST	: ALL THE ABOVE MATERIAL IS TESTED FOR RADIOACTIVITY AND FOUND WITH IN THE LIMIT OF BACKGROUND RADIATION

WE CERTIFY THAT THE MATERIAL DESCRIBED ABOVE HAS BEEN TESTED AND COMPLIES WITH THE ORDER/CONTRACT AND IS OF INDIAN ORIGIN.

VIRAJ FORGINGS Quality Assurance

WORKS INSPECTOR

OFFICE : 10, Imperial Chambers, 1st Floor, Wilson Road, Ballard Estate, Mumbai - 400 038, INDIA. Tel. : (+91-22) 2261 4327, 2261 4284, 2265 7678, 2261 3056 Fax : (+91-22) 2261 2980/2265 9713
FACTORY : G-75, MIDC Tarapur Industrial Area, Dist. Thane, Maharashtra - 401 506, IN... Tel.: (+91-2525) 279 018 - 24, Fax : (+91-2525) 274 444, 275 587 ❖ F ...IL : vfl@viraj.com
...y No. 140/1, Boisar - Palghar Road, Saravali, Tarapur. Tal Palghar, Dist. Thane... arashtra, India.

VIRAJ FORGINGS

(A DIVISION OF VIRAJ PROFILES LTD.)

G-75 MIDC , TARAPUR, MAHARASHTRA, INDIA

INSPECTION CERTIFICATE & MILL TEST REPORT - EN 10204 3.1

CUSTOMER :

TEXAS PIPE & SUPPLY
2200 - A WOLFRIDGE ROAD
MOBILE , AL 36612

ORDER NO.:79026 - 00 / MOBILE

MANUFACTURER'S SYMBOL

MTR NO.	FRG/24964 - J
DATE	31.03.2007
MATERIAL SPECIFICATION	ASTM A182/A182M- 06
	ASME SA182/SA182M - 06
GRADE	F316/316L
DIMENSIONAL SPECIFICATION	ASME B16.5 2003
MATERIAL CONFORMS TO NACE MR0 103 - 2005	
STAINLESS STEEL FORGED FLANGES	

CHEMICAL ANALYSIS

ORDER NO	ITEM DESCRIPTION			HEAT NO	QTY	%C	%Mn	%Si	%S	%P	%Cr	%Ni	%Mo	N2 PPM		
1	10"	WNRF S10S	150#	74190	2	0.029	1.80	0.48	0.011	0.035	16.85	10.10	2.04	650		
2	12"	WNRF S10S	150#	12543	5	0.024	1.80	0.46	0.012	0.043	16.56	10.10	2.05	780		
3	3"	WNRF S10S	150#	72132	15	0.023	1.74	0.48	0.021	0.039	16.53	10.17	2.05	645		
4	1"	WNRF S40S	150#	74059	10	0.022	1.84	0.44	0.012	0.042	16.80	10.06	2.00	725		
5	2"	WNRF S40S	150#	72687	20	0.023	1.75	0.49	0.021	0.039	16.50	10.00	2.05	910		
6	2"	WNRF S40S	300#	73996	20	0.022	1.65	0.53	0.011	0.035	16.95	10.10	2.08	725		
7	3"	WNRF S40S	150#	72132	5	0.023	1.74	0.48	0.021	0.039	16.53	10.17	2.05	645		
8	3"	WNRF S40S	300#	70470	10	0.023	1.73	0.46	0.016	0.040	16.61	10.19	2.00	750		

MECHANICAL PROPERTIES

HEAT NO	ITEM DESCRIPTION			TENSILE STRENGTH (Mpa)	YIELD STRENGTH (Mpa)	ELONGATION % Lo=4D	REDUCTION OF AREA %	IMPACT TEST CHARPY V-NOTCH 10x10mm (JOULES) 1	2	3	AVG	HARDNESS (BHN)
74190	10"	WNRF S10S	150#	564.87	234.23	60.20	66.26	-	-	-	-	153
12543	12"	WNRF S10S	150#	599.33	269.56	60.80	65.71	-	-	-	-	159
72132	3"	WNRF S10S	150#	570.74	275.08	59.60	73.00	-	-	-	-	152
74059	1"	WNRF S40S	150#	581.65	264.46	57.40	69.61	-	-	-	-	163
72687	2"	WNRF S40S	150#	527.88	257.33	60.14	67.80	-	-	-	-	166
73996	2"	WNRF S40S	300#	601.90	283.29	60.40	69.51	-	-	-	-	163
72132	3"	WNRF S40S	150#	570.74	275.08	59.60	73.00	-	-	-	-	152
70470	3"	WNRF S40S	300#	554.30	298.01	56.60	73.95	-	-	-	-	156

MELTING PROCESS	: INDUCTION / AOD (IRS) / CONCAST
HEAT TREATMENT	: SOLUTION ANNEALED AT 1050°C AND WATER QUENCHED
DIMENSIONAL INSPECTION	: CONFORM WITH THE SPECIFICATION (100% INSPECTED)
SURFACE INSPECTION	: SATISFACTORY
PMI	: NO OBJECTION(100% TESTED WITH MOBILE SPECTRO)
MICRO OBSERVATION	: NO CARBIDE PRECIPITATION OBSERVED ON GRAIN BOUNDARIES
RADIOACTIVITY TEST	: ALL THE ABOVE MATERIAL IS TESTED FOR RADIOACTIVITY AND FOUND WITH IN THE LIMIT OF BACKGROUND RADIATION

WE CERTIFY THAT THE MATERIAL DESCRIBED ABOVE HAS BEEN TESTED AND COMPLIES WITH THE ORDER/CONTRACT AND IS OF INDIAN ORIGIN.

WORKS INSPECTOR

OFFICE:10,Imperial Chambers, 1st Floor, Wilson Road, Ballard Estate, Mumbai-400 038,INDIA TEL: 91-22-2613058/2614284 FAX: 91-22-2612940
FACTORY:G-75 MIDC,Tarapur,Thane(Dist),Maharashtra.INDIA TEL: 91-02525-70143/71365 to 71370 FAX: 91-02525-76431 E-MAIL: viraj@viraj.com

INSPECTION CERTIFICATE AND MILL TEST REPORT

According to

EN 10204/3.1

Jiangyin Tianfeng Flange Co.,LTD
Address:Xujiawan, Xinjing Village, Chengjiang Town
Jiangyin City, Jiangsu Province,China
Tel: +86-510-86130768 Fax: +86-510-86130707

Customer: Texas Pipe and Supply Co.

Order No: SC-1541 (HOU)

LAC number:	
Date of Issue:	10-Feb-2007
Material Specification:	ASTM A182
Dimensional Specification:	ANSI B16.5

Chemical Analysis

Item No.	Item Description	Material	Sch.	Heat No.	QTY	%C	%Mn	%P	%S	%Si	%Ni	%Cr
		316/L				≤0.030	≤2.00	≤0.045	≤0.030	≤1.00	10.00~15.00	16.00~18.00
1	20" WELD NECK FLANGE RF		300LB SCH40S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
2	20" WELD NECK FLANGE RF		300LB SCH80S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
3	24" WELD NECK FLANGE RF		300LB SCH80S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
4	24" WELD NECK FLANGE RF		300LB SCH40S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
5	18" WELD NECK FLANGE RF		150LB SCH40S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
6	18" WELD NECK FLANGE RF		300LB SCH40S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
7	18" WELD NECK FLANGE RF		300LB SCH80S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
8	20" WELD NECK FLANGE RF		150LB SCH10S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
9	24" WELD NECK FLANGE RF		150LB SCH10S	31175	2	0.023	0.86	0.038	0.002	0.40	10.05	16.11
10	14" WELD NECK FLANGE RF		150LB SCH40S	70226	6	0.021	1.38	0.038	0.015	0.30	10.10	16.58
11	16" WELD NECK FLANGE RF		150LB SCH40S	70226	6	0.021	1.38	0.038	0.015	0.30	10.10	16.58
12	14" WELD NECK FLANGE RF		300LB SCH40S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
13	16" WELD NECK FLANGE RF		300LB SCH40S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
14	14" WELD NECK FLANGE RF		300LB SCH80S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
15	16" WELD NECK FLANGE RF		300LB SCH80S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
16	16" WELD NECK FLANGE RF		150LB SCH10S	70226	3	0.021	1.38	0.038	0.015	0.30	10.10	16.58
17	18" WELD NECK FLANGE RF		150LB SCH10S	70226	2	0.021	1.38	0.038	0.015	0.30	10.10	16.58
					43							

Mechanical Properties

Heat No.	Item Description	Sample specification	Lab Temperature ℃	Tensile MPa	Yield MPa	Elong. %	Red. Area %	Hardness HB	Impact Test	PT Test	UT Test	Visual & Dimension
		12.5*50	25℃	≥485	≥170	≥30	≥50	–	–	–	–	ok
31175	20" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	20" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	24" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	24" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	18" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	18" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	18" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	20" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
31175	24" WELD NECK FLANGE RF			528	229	48	70	–	–	–	–	ok
70226	14" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	18" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	14" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	16" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	14" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	16" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	16" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok
70226	18" WELD NECK FLANGE RF			536	227	49	67	–	–	–	–	ok

Delivery Condition: SOLUTION TREATED, 1050℃ Water Quenched

WE CERTIFY THIS MATERIAL HAS BEEN MANUFACTURED AND EXAMINED IN ACCORDING WITH ALL REQUIREMENTS OF THE SPECIFICATION(S) AND THE RESULTS OF ALL EXAMINATIONS ARE ACCEPTABLE.

Inspector:

Q.C Manager:

Supplier Stmp:

Date: 2007-3-27

INSPECTION CERTIFICATE AND MILL TEST REPORT

According to
DIN 50049 3. 1. B / EN 10204

WENZHOUSHI DONGNAN PIPE MADE FACOTRY
/ DBA OF SC MFG. GROUP INC.
No. 315 -4 , GONGYE BEIJIE, YONGZHONG TOWN, WENZHOU CITY, P. R. CHINA
Tel.: 86-22-27319741 Fax.: 86-22-27319749

Customer:
Texas Pipe and Supply Co.,
2330 Holmes Road
Houston
Texas 77051-1098

Order No.71228-00

Manufacturer's Symbol
SCDN

SC MFG PO No.SC-1541(HOU

MTR No.	SC-1541
Date of issue:	17-Aug-2006
Grade:	316L
Made From:	
Material Specification:	ASTM A182
Dimensional Specification:	ASME B16.5

Chemical Analysis

Item No.	Item Description	Sch.	Heat No.	QTY	%C	%Mn	%P	%S	%Si	%Ni	%Cr	%Mo
1	14" SLIP ON FLANGE RF	150LB	60962	15	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
2	16" SLIP ON FLANGE RF	150LB	60962	10	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
3	18" SLIP ON FLANGE RF	150LB	60962	5	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
4	20" SLIP ON FLANGE RF	150LB	60962	5	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
5	16" BLIND FLANGE RF	150LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
6	14" WELD NECK FLANGE RF	150LB SCH40S	60962	6	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
7	24" SLIP ON FLANGE RF	150LB	60962	5	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
8	18" BLIND FLANGE RF	150LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
9	20" BLIND FLANGE RF	150LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
10	24" BLIND FLANGE RF	150LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
11	16" WELD NECK FLANGE RF	150LB SCH10S	60962	3	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
12	18" WELD NECK FLANGE RF	150LB SCH10S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
13	20" WELD NECK FLANGE RF	150LB SCH10S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
14	24" WELD NECK FLANGE RF	150LB SCH10S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
15	16" WELD NECK FLANGE RF	150LB SCH40S	60962	6	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
16	18" WELD NECK FLANGE RF	150LB SCH40S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
17	14" SLIP ON FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
18	16" SLIP ON FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
19	18" SLIP ON FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30

20	20" SLIP ON FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
21	14" BLIND FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
22	16" BLIND FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
23	18" BLIND FLANGE RF	300LB	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
24	14" WELD NECK FLANGE RF	300LB SCH40S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
25	16" WELD NECK FLANGE RF	300LB SCH40S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
26	18" WELD NECK FLANGE RF	300LB SCH40S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
27	14" WELD NECK FLANGE RF	300LB SCH80S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
28	16" WELD NECK FLANGE RF	300LB SCH80S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30
29	18" WELD NECK FLANGE RF	300LB SCH80S	60962	2	0.020	1.30	0.032	0.010	0.44	10.09	16.65	1.30

Mechanical Properties

Heat No.	Item Description	Tensile MPa	Yield MPa	Elong. %	Red. Area %	Bend Test	Flattening Test	Hardness HB	Impact Test	Hydrostat. Test	Xray Test	Visual & Dimension
60962	14" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	20" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	24" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	20" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	24" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	20" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	24" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok

60962	20" SLIP ON FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" BLIND FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	14" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	16" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok
60962	18" WELD NECK FLANGE RF	510	200	64	-	ok	ok	-	ok	ok	-	ok

Heat Treatment: SOLUTION TREATED, 1060 °C (20 Minutes) Water Quenched **Steel Making Process:** Electric Furnace

Misc: Material in accordance with NACE MR0175-2001

Free from Mercury contamination

Addition of filler metal? ☑ No ☐ Yes

WE CERTIFY THIS MATERIAL HAS BEEN MANUFACTURED AND EXAMINED IN ACCORDANCE WITH ALL REQUIREMENTS OF THE SPECIFICATION(S) AND THE RESULTS OF ALL EXAMINATIONS ARE ACCEPTABLE.

☐ ☐

Clean Harbors Environmental Services, Inc.
609 Pleasant Street Weymouth, MA 02189

VC-21

Appendix V-1 J R-1

Date Printed: 10/30/2003

VESSEL DESCRIPTION

Chemical Treatment Reactor

Vessel designed with Advanced Pressure Vessel, Version: 8.1.1
Vessel is ASME Code Stamped

Job No: High Haz Group
Vessel Number: R-1

NAMEPLATE INFORMATION

MAWP: 100.00 PSI
MDMT: -20 °F at 100.00 PSI
Serial Number(s): Reactor Vessel R-1
National Board Number(s): _____
Year Built: 2002
Radiography: NONE
Postweld Heat Treated: NONE

Signatures

_____ Date: ____/____/____

Table of Contents

Clean Harbors Environmental Services, Inc.
Shell 1

Job No: High Haz Group
Number: 1

Vessel Number: R-1
Mark Number: S1

Date Printed: 10/30/2003

Cylindrical Shell Design Information

Design Pressure:	100.00	PSI	Design Temperature:	200	°F
Static Head:	2.00	PSI	Joint Efficiency:	70	%
Shell Material:	SA-240 316L, High		Factor B Chart:	HA-4	
			Material Stress (hot):	16700	PSI
Shell Length:	48.0000	in.	Material Stress (cold):	16700	PSI
Corrosion Allowance:	0.0625	in.	Actual Circumferential Stress:	11599	PSI
External Corrosion Allowance:	0.0000	in.	Actual Longitudinal Stress:	5727	PSI
Outside Diameter (new):	30.0000	in.	Extreme Fiber Elongation:	0.85	%
Outside Diameter (corroded):	30.0000	in.	Specific Gravity:	1.00	
Shell Surface Area:	31.42	Sq. Ft.	Weight of Fluid:	1186.62	lb.
Shell Estimated Volume:	142.04	Gal.	Total Flooded Shell Weight:	1511.87	lb.
			Shell Weight:	325.25	lb.

Minimum Design Metal Temperature Data

Minimum Design Metal Temperature: -20 °F
Material is exempt from UCS-66 calculations

Design Thickness Calculations

Longitudinal Stress Calculations per Paragraph UG-27(c)(2)

$$t = \frac{PR}{2SE + 0.4P} = \frac{102.00 * 14.8125}{2 * 16700 * 0.70 + 0.4 * 102.00} = 0.0645 + 0.0625 \text{ (corrosion)} + 0.0000 \text{ (ext. corrosion)}$$ = minimum of **0.1270** in.

Circumferential Stress Calculations per Appendix 1-1(a)(1)

$$t = \frac{PR_o}{SE + 0.4P} = \frac{102.00 * 15.0000}{16700 * 0.70 + 0.4 * 102.00} = 0.1305 + 0.0625 \text{ (corrosion)} + 0.0000 \text{ (ext. corrosion)}$$ = minimum of **0.1930** in.

External loads do not control design.

Nominal Shell Thickness Selected = **0.2500** in.

Clean Harbors Environmental Services, Inc.

Head 1

Job No: High Haz Group
Number: 1

Vessel Number: R-1
Mark Number: H1

Date Printed: 10/30/2003

ASME F&D Head Design Information

Design Pressure:	100.00	PSI	Design Temperature:	200	°F
Static Head:	2.00	PSI	Joint Efficiency:	85	%
Head Material:	SA-240 316L, High		Factor B Chart:	HA-4	
Corrosion Allowance:	0.0625	in.	Material Stress (hot):	16700	PSI
External Corrosion Allowance:	0.0000	in.	Material Stress (cold):	16700	PSI
Head Location:	Bottom		Actual Head Stress:	16699	PSI
Outside Diameter :	30.0000	in.	Straight Flange :	1.5000	in.
Thin Out :	0.0625	in.	Knuckle (r) :	1.8000	in.
Crown Radius (Lo) :	30.0000	in.	$M = \frac{1}{4}[3 + \sqrt{L/r}]$:	1.7492	
Extreme Fiber Elongation:	12.00	%			
Head Surface Area:	6.59	Sq. Ft.	Specific Gravity:	1.00	
Head Estimated Volume:	14.10	Gal.	Weight of Fluid:	117.57	lb.
Head Weight:	86.00	lb.	Total Flooded Head Weight:	203.57	lb.

Minimum Design Metal Temperature Data

Minimum Design Metal Temperature: -20 °F
Material is exempt from UCS-66 calculations

Design Thickness Calculations

Design Thickness Calculations per Appendix 1-4(d)

$$t = \frac{PL_oM}{2SE + P(M - 0.2)} = \frac{102.00 * 30.0000 * 1.7492}{2 * 16700 * 0.85 + 102.00 (1.7492 - 0.2)}$$

$= 0.1875 + 0.0625$ (corrosion) $+ 0.0000$ (ext. corrosion) $+ 0.0625$ (thin out)

External loads do not control design.

= minimum of **0.3125** in.

Minimum Head Thickness Selected = **0.3125** in.
Minimum Thickness after forming = **0.2500** in.

Clean Harbors Environmental Services, Inc.

Job No: High Haz Group

Vessel Number: R-1

Date Printed: 10/30/2003

MDMT Report by Components

Design MDMT is -20 °F

Component	Material	Curve	Pressure	MDMT
Shell 1	SA-240 316L, High			Exempt from UCS-66
Head 1	SA-240 316L, High			Exempt from UCS-66.

The required design MDMT of -20 °F has been met or exceeded.

ANSI Flanges Are Not Included in MDMT Calculations.

Clean Harbors Environmental Services, Inc.
Chemical Treatment Reactor

Job No: High Haz Group

Vessel Number: R-1

Date Printed: 10/30/2003

MAWP Report by Components

Component	Design Pressure	Static Head	Vessel MAWP New & Cold UG-98(a)	Component MAWP Hot & Corroded UG-98(b)	Vessel MAWP Hot & Corroded UG-98(a)
Shell 1	100.00 PSI	2.00 PSI	194.14 PSI	146.86 PSI	144.86 PSI
Head 1	100.00 PSI	2.00 PSI	133.02 PSI	102.00 PSI	100.00 PSI

NC = Not Calculated Inc = Incomplete

Summary

Component with the lowest vessel MAWP(New & Cold) : **Head 1**
The lowest vessel MAWP(New & Cold) : **133.02 PSI**

Component with the lowest vessel MAWP(Hot & Corroded) : **Head 1**
The lowest vessel MAWP(Hot & Corroded) : **100.00 PSI**

Pressures are exclusive of any external loads.

Clean Harbors Environmental Services, Inc.

Job No: High Haz Group

Vessel Number: R-1

Date Printed: 10/30/2003

Summary Information

	Dry Weight	Flooded Weight
Shell	325.25 lb.	1511.87 lb.
Head	86.00 lb.	203.57 lb.
Totals	411.25 lb.	1715.43 lb.

	Volume
Shell	142.04 Gal.
Head	14.10 Gal.
Totals	156.14 Gal.

	Area
Shell	31.42 Sq. Ft.
Head	6.59 Sq. Ft.
Totals	38.01 Sq. Ft.

Hydrostatic Test Information (UG-99)

Gauge at Top

Component with controlling ratio is : Shell 1
Component with controlling pressure is : Shell 1

$$\text{Calculated Test Pressure} = P * 1.3 * \frac{\text{Cold Stress}}{\text{Hot Stress}} = 100.00 * 1.3 * \frac{16700}{16700} =$$ **130.00 PSI**

Specified Test Pressure : **130.00 PSI**

Clean Harbors Environmental Services, Inc.
609 Pleasant Street Weymouth, MA 02189

Date Printed: 10/30/2003

Appendix V-I, R1-A

VESSEL DESCRIPTION

Chemical Treatment Reactor

Vessel designed with Advanced Pressure Vessel, Version: 8.1.1
Vessel is ASME Code Stamped

Job No: High Haz Group
Vessel Number: R-1A
Purchase Order Number: n/a

NAMEPLATE INFORMATION

MAWP:	200.00 PSI and Full Vacuum at 200 °F
MDMT:	-20 °F at 200.00 PSI
Serial Number(s):	Reactor Vessels R-1A
National Board Number(s):	
Year Built:	2003
Radiography:	NONE
Postweld Heat Treated:	NONE

Signatures

_____ Date: ____/____/____

Table of Contents

Clean Harbors Environmental Services, Inc.
Shell 1

Job No: High Haz Group
Number: 1

Vessel Number: R-1A
Mark Number: S1

Date Printed: 10/30/2003

Cylindrical Shell Design Information

Design Pressure:	200.00	PSI	Design Temperature:	200	°F
Static Head:	3.00	PSI	Joint Efficiency:	70	%
Shell Material:	SA-240 316L, High		Factor B Chart:	HA-4	
			Material Stress (hot):	16700	PSI
Shell Length:	84.0000	in.	Material Stress (cold):	16700	PSI
Corrosion Allowance:	0.0625	in.	Actual Circumferential Stress:	15793	PSI
External Corrosion Allowance:	0.0000	in.	Actual Longitudinal Stress:	7751	PSI
Outside Diameter (new):	48.0000	in.	Extreme Fiber Elongation:	1.06	%
Outside Diameter (corroded):	48.0000	in.	Specific Gravity:	1.30	
Shell Surface Area:	87.96	Sq. Ft.	Weight of Fluid:	6852.41	lb.
Shell Estimated Volume:	630.96	Gal.	Total Flooded Shell Weight:	8669.98	lb.
			Shell Weight:	1817.57	lb.

Minimum Design Metal Temperature Data

Minimum Design Metal Temperature: -20 °F
Material is exempt from UCS-66 calculations

External Pressure Data

Design Pressure (Pa):	15.00	PSI	Design Temperature:	200	°F
Dimension L:	84.0000	in.			
Ext. Minimum t:	0.2555	in.	Ext. Nominal t:	0.5000	in.
Minimum L/Do:	1.7500		Nominal L/Do:	1.7500	
Minimum Do/t:	248.7050		Nominal Do/t:	109.7140	
Minimum Factor A:	0.0002057		Nominal Factor A:	0.0007253	
Minimum Factor B:	2797	PSI	Nominal Factor B:	7863	PSI

Design Thickness Calculations

Longitudinal Stress Calculations per Paragraph UG-27(c)(2)

$$t = \frac{PR}{2SE + 0.4P} = \frac{203.00 * 23.5625}{2 * 16700 * 0.70 + 0.4 * 203.00} = 0.2039 + 0.0625 \text{ (corrosion)} + 0.0000 \text{ (ext. corrosion)}$$ = minimum of **0.2664** in.

Circumferential Stress Calculations per Appendix 1-1(a)(1)

$$t = \frac{PR_o}{SE + 0.4P} = \frac{203.00 * 24.0000}{16700 * 0.70 + 0.4 * 203.00} = 0.4139 + 0.0625 \text{ (corrosion)} + 0.0000 \text{ (ext. corrosion)}$$ = minimum of **0.4764** in.

Maximum External Pressure Calculation per Paragraph UG-28

$$Pa \text{ (using } nominal \text{ t)} = \frac{4B}{3(D_o / t)} = \frac{4 * 7863}{3 * (48.0000 / 0.4375)}$$ = maximum external pressure of **95.56** PSI

External loads do not control design.

Nominal Shell Thickness Selected = 0.5000 in.

Clean Harbors Environmental Services, Inc.
Head 1

Job No: High Haz Group
Number: 1

Vessel Number: R-1A
Mark Number: H1

Date Printed: 10/30/2003

ASME F&D Head Design Information

Design Pressure:	200.00	PSI	Design Temperature:	200	°F
Static Head:	3.00	PSI	Joint Efficiency:	70	%
Head Material:	SA-240 316L, High		Factor B Chart:	HA-4	
			Material Stress (hot):	16700	PSI
Corrosion Allowance:	0.0625	in.	Material Stress (cold):	16700	PSI
External Corrosion Allowance:	0.0000	in.	Actual Head Stress:	16025	PSI
Head Location:	Bottom		Straight Flange :	1.5000	in.
Outside Diameter :	48.0000	in.	Knuckle (r) :	2.8800	in.
Thin Out :	0.0625	in.			
Crown Radius (Lo) :	48.0000	in.	$M = \frac{1}{4}[3 + \sqrt{L/r}]$:	1.7511	
Extreme Fiber Elongation:	19.80	%			
Head Surface Area:	15.70	Sq. Ft.	Specific Gravity:	1.30	
Head Estimated Volume:	48.65	Gal.	Weight of Fluid:	527.49	lb.
Head Weight:	573.66	lb.	Total Flooded Head Weight:	1101.16	lb.

Minimum Design Metal Temperature Data

Minimum Design Metal Temperature: -20 °F
Material is exempt from UCS-66 calculations

External Pressure Data

Design Pressure (Pa):	15.00	PSI	Design Temperature:	200	°F
Ext. Minimum t:	0.2676	in.	Ext. Nominal t:	0.8750	in.
Minimum t - Ca - ext. Ca - Thin Out:	0.1426	in.	Nominal t - Ca - ext. Ca. - Thin Out:	0.7500	in.
Minimum Factor A:	0.0003714		Nominal Factor A:	0.0019531	
Minimum Factor B:	5050	PSI	Nominal Factor B:	9625	PSI

Design Thickness Calculations

Design Thickness Calculations per Appendix 1-4(d)

$$t = \frac{PL_oM}{2SE + P(M - 0.2)} = \frac{203.00 * 48.0000 * 1.7511}{2 * 16700 * 0.70 + 203.00\,(1.7511 - 0.2)}$$

= 0.7201 + 0.0625 (corrosion) + 0.0000 (ext. corrosion) + 0.0625 (thin out) = minimum of **0.8451** in.

Maximum External Pressure Calculation per Paragraph UG-33

$$Pa\ (using\ nominal\ t) = \frac{B}{\frac{Ro}{t}} = \frac{9625}{\frac{48.0000}{0.7500}}$$

= maximum external pressure of **150.39** PSI

External loads do not control design.

Nominal Head Thickness Selected = **0.8750** in.
Minimum Thickness after forming = **0.8125** in.

Clean Harbors Environmental Services, Inc.

Job No: High Haz Group

Vessel Number: R-1A

Date Printed: 10/30/2003

MDMT Report by Components

Design MDMT is -20 °F

Component	Material	Curve	Pressure	MDMT
Shell 1	SA-240 316L, High			Exempt from UCS-66
Head 1	SA-240 316L, High			Exempt from UCS-66.

The required design MDMT of -20 °F has been met or exceeded.

ANSI Flanges Are Not Included in MDMT Calculations.

Clean Harbors Environmental Services, Inc.
Chemical Treatment Reactor

Job No: High Haz Group

Vessel Number: R-1A

Date Printed: 10/30/2003

MAWP Report by Components

Component	Design Pressure	Static Head	Vessel MAWP New & Cold UG-98(a)	Component MAWP Hot & Corroded UG-98(b)	Vessel MAWP Hot & Corroded UG-98(a)
Shell 1	200.00 PSI	3.00 PSI	242.59 PSI	214.66 PSI	211.66 PSI
Head 1	200.00 PSI	3.00 PSI	225.12 PSI	211.55 PSI	208.55 PSI

NC = Not Calculated Inc = Incomplete

Summary

Component with the lowest vessel MAWP(New & Cold) : **Head 1**
The lowest vessel MAWP(New & Cold) : **225.12** PSI

Component with the lowest vessel MAWP(Hot & Corroded) : **Head 1**
The lowest vessel MAWP(Hot & Corroded) : **208.55** PSI

Pressures are exclusive of any external loads.

Clean Harbors Environmental Services, Inc.

Job No: High Haz Group

Vessel Number: R-1A

Date Printed: 10/30/2003

Summary Information

	Dry Weight	Flooded Weight
Shell	1817.57 lb.	8669.98 lb.
Head	573.66 lb.	1101.16 lb.
Totals	2391.23 lb.	9771.14 lb.

	Volume
Shell	630.96 Gal.
Head	48.65 Gal.
Totals	679.61 Gal.

	Area
Shell	87.96 Sq. Ft.
Head	15.70 Sq. Ft.
Totals	103.66 Sq. Ft.

Hydrostatic Test Information (UG-99)

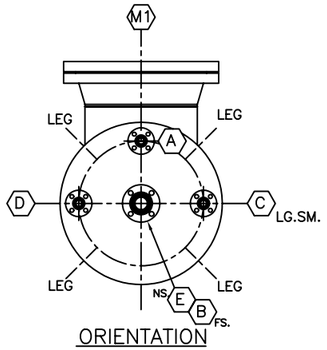
Gauge at Top

Component with controlling ratio is : Shell 1

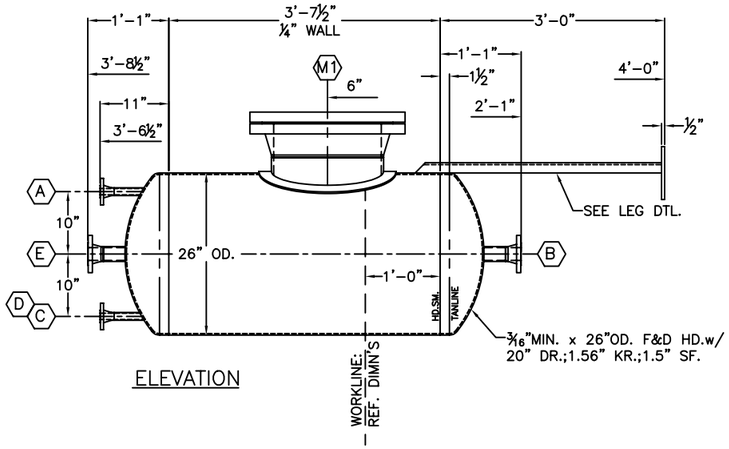
Component with controlling pressure is : Shell 1

Calculated Test Pressure = $P * 1.3 * \frac{\text{Cold Stress}}{\text{Hot Stress}} = 200.00 * 1.3 * \frac{16700}{16700} =$ **260.00 PSI**

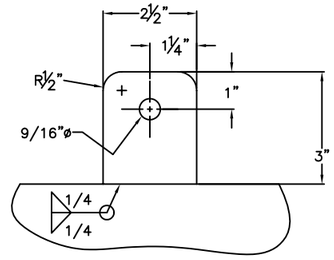
Specified Test Pressure : **260.00 PSI**



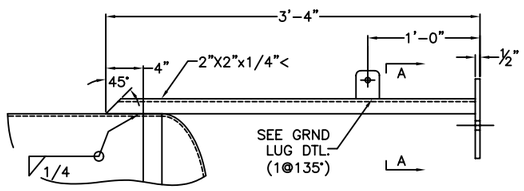
ORIENTATION



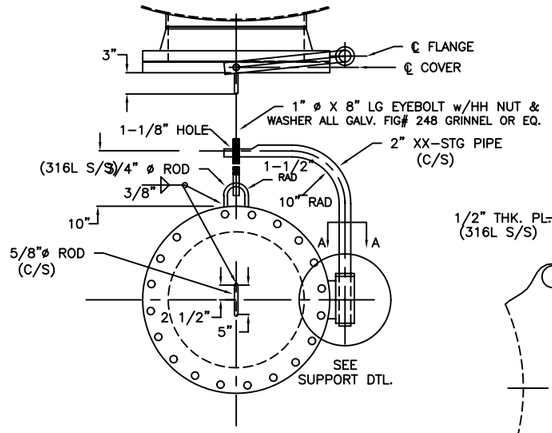
ELEVATION



GRND LUG DTL.

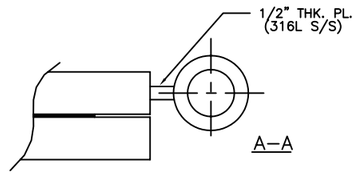


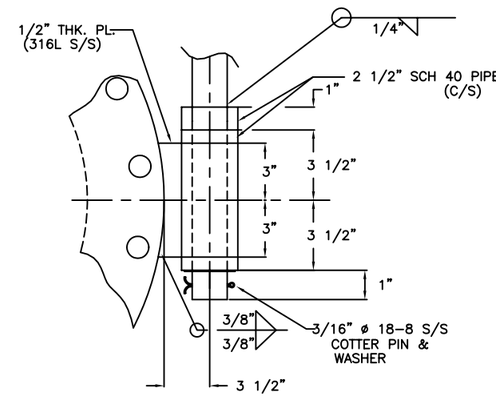
LEG DTL.
(4-REQ'D)



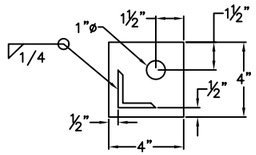
DAVIT DETAIL

NOTE: DAVIT ARM TO BE
HOT DIPPED GALVANIZED





SUPPORT DETAIL



A--A

BILL OF MATERIAL

MK NO	QTY	DESCRIPTION	MATERIAL
1	2	3/16" MIN. x 26" OD. F&D 20"DR;1.56"KR;1.5"SF.	SA 240-316L
2	1	1/4" x 26" OD. x 3'-7 1/2" LG. CYL. "SHELL"	SA 240-316L
3	1	18"-150# RFWN (STD WT. BORE)	SA 182-F316L
4	1	18"-150# RF BLIND	SA 182-F316L
5	1	BOLTING FOR 20"-150#	SA 193-B7/2H
6	1	18"-150# S.W. GRAFOIL FILL'D	316L S/S
7	1	18" STD WT PIPE x 8" LG. "M1"	SA 312-TP316L
8	1	18" DAVIT ARM ASSMBLY	S/S-CS.(GALV)
9	1	5/8" x 3.5" ID. x 7.52" OD. "PAD @ M1"	SA 240-316L
10	2	2"-150# RFWN (STD BORE) "B,E"	SA 182-F316L
11	2	2" STD WT PIPE x 6" LG. "E,B"	SA 312-TP316L
12	3	1"-150# RFWN "A,C,D,"	SA 182-F316L
13	3	1" STD WT PIPE x 6" LG. "A,C,D"	SA 312-TP316L
14	1	1/4" x 2 1/2" x 3" LG. "GRND. LUG"	SA 240-316L
15	3	1/4" x 4" x 8" LG. "PAD @ LEG"	SA 240-316L
16	3	2"x2"x1/4" < ANGLE x 40" LG.	SA 240-304L
17	3	1/2" x 4"x 4" "BASE PL."	SA 240-304L
18	1	1/4" x 2 1/2" x 3" LG. "GRND. LUG"	SA 240-316L
19			
20			
21			
22			
23			
24			
25			
26			
27	1	ASME CODE NAME PL.	S/S
28	1	NAME PL. BRKT	S/S

CERTIFIED BY: JIMMY SIMMONS

For most recent sealed version please see Section V.C.i.

SHOP NOTES

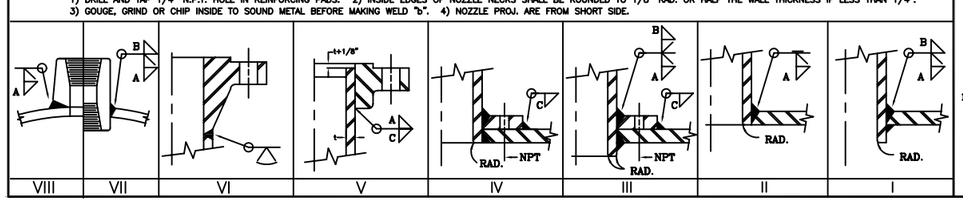
1. ALL BOLT HOLES STRADDLE NORMAL VESSEL CENTER LINES, EXCEPT WHERE NOTED.
2. INSIDE OF ALL VESSELS SHALL BE FREE OF ALL WELD SPLATTER, GRIT, SLAG, ETC. & COMPLETELY DRY BEFORE SHIPMENT.
3. ALL FLANGES TO BE ANSI B16.5 w/125-250 AARH GASKET FINISH UNLESS NOTED.
4. VESSEL IS FOR LETHAL SERVICE, ALL PIPE PRODUCTS TO BE SEAMLESS.
5. PT ALL FINISHED WELDS INSIDE & OUTSIDE.

WORK LINE
ALL TAIL DIMS. ARE TO THIS LINE

MARK	REQ'D.	SIZE	RATING & TYPE	SERVICE	NECK O.D.	NECK SCH.	O.S. PROJECTION	I.S. PROJECTION	REINF. PAD SIZE	WELDING DETAIL NO.	WELD SIZE A	WELD SIZE B	WELD SIZE C	BOM ITEM NO.'S
A	1	1"	150# RFWN	VAPOR OUTLET	1.32"	STD WT	ELEV	FLSH	----	VI,II	1/4	--	--	12,13
B	1	2"	150# RFWN	INLET/OUTLET	2.38"	STD WT	ELEV.	FLSH	----	VI,II	3/8	--	--	10,11
C	1	1"	150# RFWN	NITROGEN BL'NKT	1.32"	STD WT	ELEV	FLSH	----	VI,II	1/4	--	--	12,13
D	1	1"	150# RFWN	INLET/PRESS.	1.32"	STD WT	ELEV	FLSH	----	VI,II	1/4	--	--	12,13
E	1	2"	150# RFWN	VAPOR OUTLET	2.38"	STD WT	ELEV	FLSH	----	VI,II	3/8	--	--	10,11
M1	1	18"	150# RFWN	MANWAY w/BLD.	18"	STD. WT.	8"	1"	1/4" x 2" WD.	VI,III	1/4	1/4	1/4	3 THRU 9

NOZZLE NOTES
1) DRILL AND TAP 1/4" N.P.T. HOLE IN REINFORCING PADS. 2) INSIDE EDGES OF NOZZLE NECKS SHALL BE ROUNDED TO 1/8" RAD. OR HALF THE WALL THICKNESS IF LESS THAN 1/4".
3) GOUGE, GRIND OR CHIP INSIDE TO SOUND METAL BEFORE MAKING WELD "b". 4) NOZZLE PROJ. ARE FROM SHORT SIDE.

NOZZLE SCHEDULE & WELDING DETAILS

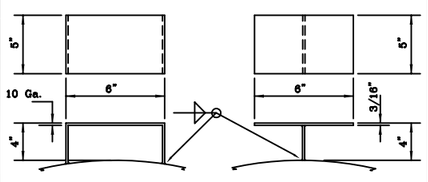


U

W
RT-1
L

CERTIFIED BY
SIMMONS FABRICATORS LTD
PASADENA, TEXAS

M.A.W.P.	190 PSI	@	200 °F
M.A.E.P.	15 PSI	@	200 °F
MIN. DESIGN METAL TEMP.	-20 °F	@	150 PSI
MFG S/N	270361	YR. BUILT	2007
X-1		WT. EMPTY	835



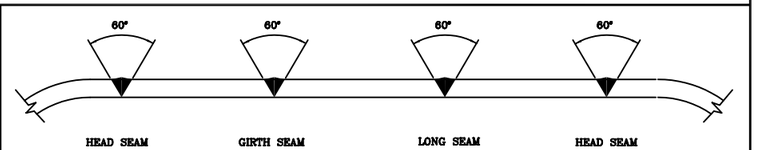
DESIGN DATA

CONSTRUCTION IN ACCORDANCE WITH THE 2005 EDITION OF ASME CODE SECTION VIII, DIV. 1

CODE STAMP YES REQ'D.
DESIGN PRESS. (INT) 50 P.S.I.G. TEMP. 200 °F
DESIGN PRESS. (EXT) 15 P.S.I.G. TEMP. 200 °F
M.A.W.P. 190 P.S.I.G. LIMITED BY HEAD
M.A.P. (N.&C.) 190 P.S.I.G. LIMITED BY HEAD
HYDROSTATIC TEST (N.&C.) 248 P.S.I.G.
CORROSION ALLOW. SHELL 0 HEAD 0 NOZZ. 0
P.W.H.T. (STRESS RELIEVE) N/A MINUTES N/A °F
RADIOGRAPH FULL JOINT EFF. 100 %
INSPECTION BY SENECA INSURANCE CO.
EST. WEIGHT EMPTY 835 LBS.
EST. WEIGHT FULL OF WATER 2250 LBS.

MATERIAL

SHELL SA 240-316L FLANGES SA 182-F316L
HEADS SA 240-316L SUPTS. SA 304
CPLG NONE INTERNALS N/A
STUDS SA 193-B7 REINF. PADS SA 240-316L
NUTS SA 194-2H NOZZ. NECKS SA 312-TP316L
GSKT'S SW GRAPHITE 316 FITTINGS NONE



WELD PROCEDURES:

NO.	BY	REVISION	DATE
0	CA	FOR APPROVAL	4/1/07
1	CA	AS BUILT	7/1/07
2			
3			

270361 | (1) REQ'D. ITM# R-1

SIMMONS FABRICATORS, LTD.
2418 BEVERLY RD.
Pasadena, Texas 77508
Phone No. (281) 487-1396 Fax. No. (281) 487-9556

CUSTOMER: CLEAN-HARBORS
P.O. #: ----
LOCATION: LA PORTE, TEXAS
TITLE: 26" OD. x 3'-7 1/2" S/S VERTICAL OXIDIZER REACTOR R-1

DRAWN BY	DATE	CHECKED BY	DATE	APPROVED	DATE	SCALE
MVA	4/07					NONE

DRAWING NO. 270361-1 | SHEET NO. 1 OF 1 | REVISION 1

TABLE OF CONTENTS

I

PERMIT COMPLIANCE CERTIFICATE

M.V.ATCHISON & ASSOC.
9714 New Kent
SugarLand, Texas 77478
(281) 530-9674 off.
(281) 530-3344 fax

04/18/05

INSTALLATION CERTIFICATION
For
GW6726 NEW PROCESS VESSEL
UNDER PERMIT No. HW-50225-001

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I certify that the installation of this unit for Clean Harbors La Porte, LP located at 500 Battleground Rd. La Porte, TX meets all applicable design requirements of 40 CFR 264.192.

Respectfully Submitted,

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.

STATE OF TEXAS
WILLIAM A. PHILLIPS
45651
REGISTERED
PROFESSIONAL ENGINEER

April 20, 2005

W.A. Phillips, P.E.
Chief Engineer

M.V.ATCHISON & ASSOC.
9714 New Kent
SugarLand, Texas 77478
(281) 530-9674 off.
(281) 530-3344 fax

04/18/05

This is to certify that the construction and installation of the GW-6726 Pressure Vessel, authorized or required by Hazardous Waste Permit 50225, has been completed, and that construction has been performed in accordance with and in compliance with good engineering practices and the design and construction specifications of HW Permit 50225.

REF: 40 CFR 264.192. Installation of new tank systems or components.

(b) The owner or operator of a new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to the system during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of tank systems or components, must inspect the system for the presence of any of the following items:
(1) Weld breaks; (2) Punctures; (3) Scrapes of protective coatings; (4) Cracks; (5) Corrosion; (6) Other structural damage or inadequate construction/installation.
REPLY: *Inspection was performed before and after installation and the integrity of the tank is intact. Installation was performed satisfactorily.*

(c) New tank systems or components that are placed underground and that are backfilled must be provided with a backfill material that is a noncorrosive, porous, homogeneous substance and that is installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully; and uniformly supported.
REPLY: *N/A, Place above ground on existing slab.*

(d) All new tanks and ancillary equipment must be tested for tightness prior to being covered, enclosed, or placed in use. If a tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being covered, enclosed, or placed in use.
REPLY: *Inspection was performed of an ASME Code required hydrostatic test. The Authorized Inspector signed the necessary data report verifying that there were no leaks.*

(e) Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.
REPLY: *All associate piping was found to be adequately installed and supported.*

M.V.ATCHISON & ASSOC.
9714 New Kent
SugarLand, Texas 77478
(281) 530-9674 off.
(281) 530-3344 fax

04/18/05

(f) & (g)
REPLY: *Response by owner/operator Clean Harbors*

Inspected and Reviewed by

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.

STATE OF TEXAS
WILLIAM A. PHILLIPS
45651
REGISTERED
PROFESSIONAL ENGINEER

April 20, 2005

W.A. Phillips, P.E.
Chief Engineer

M.V.ATCHISON & ASSOC.
9714 New Kent
SugarLand, Texas 77478
(281) 530-9674 off.
(281) 530-3344 fax

04/12/05

DOCUMENT CERTIFICATION STATEMENT
For
GW6726 NEW PROCESS VESSEL
UNDER PERMIT No. HW-50225-001

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I certify that the vessel meets all applicable design requirements of 40 CFR 264.192 for Clean Harbors La Porte, LP located at 500 Battleground Rd. La Porte, TX.

Respectfully Submitted,

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.

STATE OF TEXAS
WILLIAM A. PHILLIPS
45651
REGISTERED
PROFESSIONAL ENGINEER

April 13, 2005

W.A. Phillips, P.E.
Chief Engineer

M.V.ATCHISON & ASSOC.
9714 New Kent
SugarLand, Texas 77478
(281) 530-9674 off.
(281) 530-3344 fax

04/12/05

REF: 40 CFR 264.192. Design and installation of new tank systems or components.

Comments & Review

> (a) Owners or operators of new tank systems or components must obtain and submit to the Regional Administrator, at time of submittal of part B information, a written assessment, reviewed and certified by an independent, qualified registered professional engineer, in accordance with Sec. 270.11(d), attesting that the tank system has sufficient structural integrity and is acceptable for the storing and treating of hazardous waste. The assessment must show that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure that it will not collapse, rupture, or fail. This assessment, which will be used by the Regional Administrator to review and approve or disapprove the acceptability of the tank system design, must include, at a minimum, the following information:
REPLY: *The tank design has been reviewed & found acceptable.*

(1) Design standard(s) according to which tank(s) and/or the ancillary equipment are constructed;
REPLY: *ASME Code Section VIII, Div. 1 was used and is applicable*

(2) Hazardous characteristics of the waste(s) to be handled;
REPLY: *Waste materials to be handled are those from other working tanks. Materials of construction are equal to existing equipment handling the same materials. Materials of construction have been satisfactory in resisting corrosion in these existing tanks.*

(3) For new tank systems or components in which the external shell of a metal tank or any external metal component of the tank system will be in contact with the soil or with water, a determination by a corrosion expert of:

(i) Factors affecting the potential for corrosion, including but not limited to:
> (A) Soil moisture content;
> (B) Soil pH;
> (C) Soil sulfides level;
> (D) Soil resistivity;

M.V.ATCHISON & ASSOC.
9714 New Kent
SugarLand, Texas 77478
(281) 530-9674 off.
(281) 530-3344 fax

04/12/05

> (E) Structure to soil potential;
> (F) Influence of nearby underground metal structures (e.g., piping);
> (G) Existence of stray electric current;
(H) Existing corrosion-protection measures (e.g., coating, cathodic protection), and
(ii) The type and degree of external corrosion protection that are needed to ensure the integrity of the tank system during the use of the tank system or component, consisting of one or more of the following:>

(A) Corrosion-resistant materials of construction such as special alloys, fiberglass reinforced plastic, etc.;
(B) Corrosion-resistant coating (such as epoxy, fiberglass, etc.) with cathodic protection (e.g., impressed current or sacrificial anodes); and
(C) Electrical isolation devices such as insulating joints, flanges, etc.
[Note: The practices described in the National Association of Corrosion Engineers (NACE) standard, ``Recommended Practice (RP-02-85) -- Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems," and the American Petroleum Institute (API) Publication 1632, ``Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems," may be used, where applicable, as guidelines in providing corrosion protection for tank systems.]
REPLY: *N/A- Tank shell does not contact soil and/or water.*

(4) For underground tank system components that are likely to be adversely affected by vehicular traffic, a determination of design or operational measures that will protect the tank system against potential damage;
REPLY: *N/A- Tank shell does not contact soil and/or water.*

(5) Design considerations to ensure that:
(i) Tank foundations will maintain the load of a full tank;
REPLY: *Design satisfactory for loading.*

(ii) Tank systems will be anchored to prevent flotation or dislodgment where the tank system is placed in a saturated zone, or is located within a seismic fault zone subject to the standards of Sec. 264.18(a);
REPLY: *N/A*

(iii) Tank systems will withstand the effects of frost heave.
REPLY: *N/A*

(b) The owner or operator of a new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to the system

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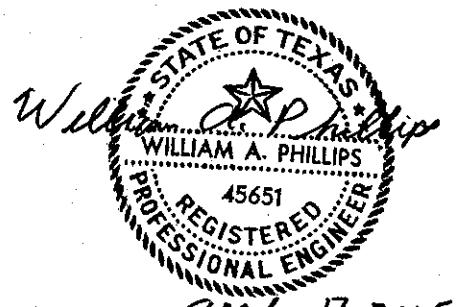
during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of tank systems or components, must inspect the system for the presence of any of the following items:

(1) Weld breaks;
(2) Punctures;
(3) Scrapes of protective coatings;
(4) Cracks;
(5) Corrosion;
(6) Other structural damage or inadequate construction/installation.

REPLY: *Inspection to be performed before and after installation to assure that the design requirements and integrity of the tank are intact.*

Reviewed by

Martin V. Atchison, Jr. BSME
MV. Atchison & Assoc.



April 13, 2005

W.A. Phillips, P.E.
Chief Engineer

II

CODE DATA REPORT

Figure V.C.22

CLIENT: Clean Harbors

PRESSURE VESSEL SPECIFICATION SHEET CHEMICAL TREATMENT REACTOR

Item No.: R-1A
Job No:
Inquiry No :
P. O. No:
Spec'd by: KLF Date: 09-3-03 Rev: 0
Checked by: Date:

REV

FACILITY: CHES (LaPorte), TX
LOCATION: LaPorte, Texas
SERVICE: Chemical Treatment
MFR:
QUANTITY: 1

UNIT DESCRIPTION

DESIGN DATA		MATERIAL SPECIFICATIONS	
VESSEL DIMENSIONS (DIAMETER x HEIGHT :	4'-0" x 7'-0"	SHELL:	SA240 TP 316L
DESIGN INTERNAL PRESSURE (psig):	200	TOP HEAD	SA240 TP 316L
DESIGN EXTERNAL PRESSURE (psig):	Full Vacuum	BOTTOM HEAD:	SA240 TP 316L
NORMAL OPERATING PRESSURE (psig):	0	JACKET:	N/A
DESIGN TEMP (°F):	200	REINF. PADS:	SA240 TP 316L
NORMAL OPERATING TEMP (°F):	AMB	LIFTING LUGS:	*
LIQUID SPECIFIC GRAVITY:	1.3	TRAY SUPPORTS:	N/A
		INTERNALS:	SA240 TP 316L
LETHAL CONTENTS?:	NO	NOZZLE NECKS:	SA312 TP 316L
		FLANGES:	SA182 F 316L
M.A.W.P (psig):	By Vendor	MANHOLE COVER:	SA182 F 316L
		COUPLINGS:	SA182 F 316L
WIND DESIGN BASIS:	N/A	SUPPORTS:	*
EARTHQUAKE DESIGN BASIS:	N/A	ATTACHMENTS:	SA240 TP 316L
HYDROSTATIC TEST (psig):	Per Code	BOLTS/STUDS:	SA-193 GR B7
CORROSION ALLOWANCE, SHELL / HEADS (in):	0 "	NUTS:	SA-194 GR 2H
CORROSION ALLOWANCE, NOZZLES (in):	0 "	BLIND FLANGES:	SA182 F 316L
JOINT EFFICIENCY (SHELL / HEADS) %:	*	LADDER:	N/A
CODE STAMPED?:	Yes	GASKETS:	1/8" Thk Spiral Wound, 316L SS w/Grafoil Filler Flexitalic Style CG or equal
DESIGN CODE:	ASME VIII Div 1		
STRESS RELIEVE?:	By Code		
RADIOGRAPH?:	By Code		
MDMT (°F):	AMB		

DESIGN DETAILS	
INSULATION:	N/A
FIREPROOFING:	N/A
SURFACE PREP. & PAINT:	N/A
LIFTING LUGS:	*
MANHOLE:	*
LADDER CLIPS:	N/A
PLATFORM CLIPS:	N/A
INSULATION RINGS:	N/A
PIPE GUIDE CLIPS:	N/A
PIPE SUPPORT CLIPS:	N/A
VESSEL SUPPORT:	*
BAFFLES:	N/A
GROUNDING CLIP:	(2) Required
INTERNAL LADDER:	N/A
EMPTY WT. (lbs):	*
SHIPPING WT. (lbs):	*
OPERATING WT. (lbs):	*
VOLUME (Gallons):	700

NOZZLE SCHEDULE

SERVICE	MARK	QTY.	SIZE	DRILLING	FACE	TYPE
Inlet	A	1	2"	150#	RF	FLG.
Outlet	B	1	2"	150#	RF	FLG.
Nitrogen Blanket	C	1	2"	150#	RF	FLG.
Reagent	D	1	2"	150#	RF	FLG.
Vent	E	1	2"	150#	RF	FLG.
Manway	F	1	18"	150#	RF	FLG.
Pressure/Temperature	G	2	2"	150#	RF	FLG.

SKETCH

SEE ATTACHED PAGE 2

Notes:
1. * INFORMATION TO BE FURNISHED BY VENDOR

FIGURE V.C-22

TANK SKETCH

Item No.: R-1A Chemical Treatment Reactor

Job No:

Inquiry No :

Spec'd by: KLF

Checked by:

P.O. No.

Date: 09-03-03

Date:

Rev. 0

REV

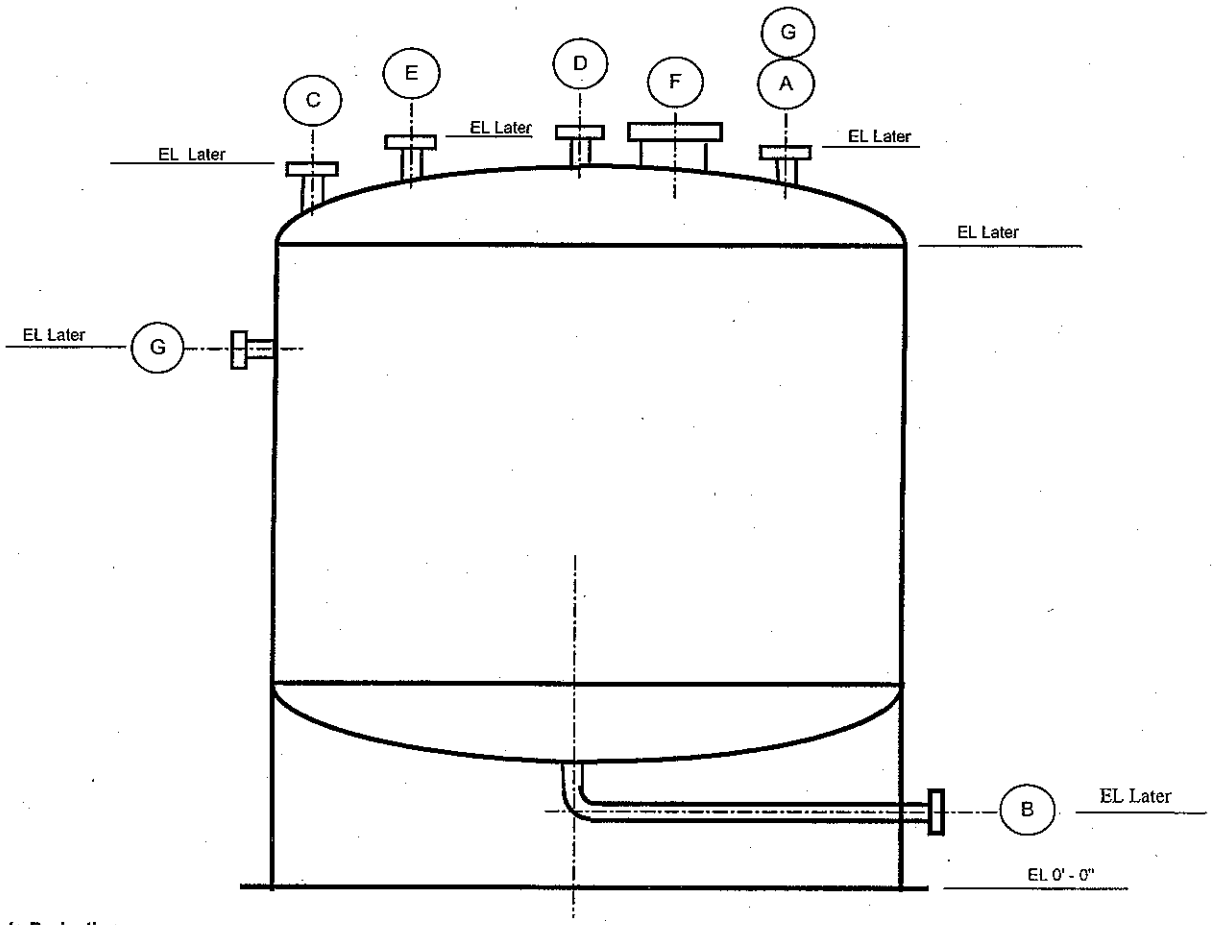
FACILITY: CHES (LaPorte), TX

LOCATION: LaPorte, TX

SERVICE: Chemical Treatment

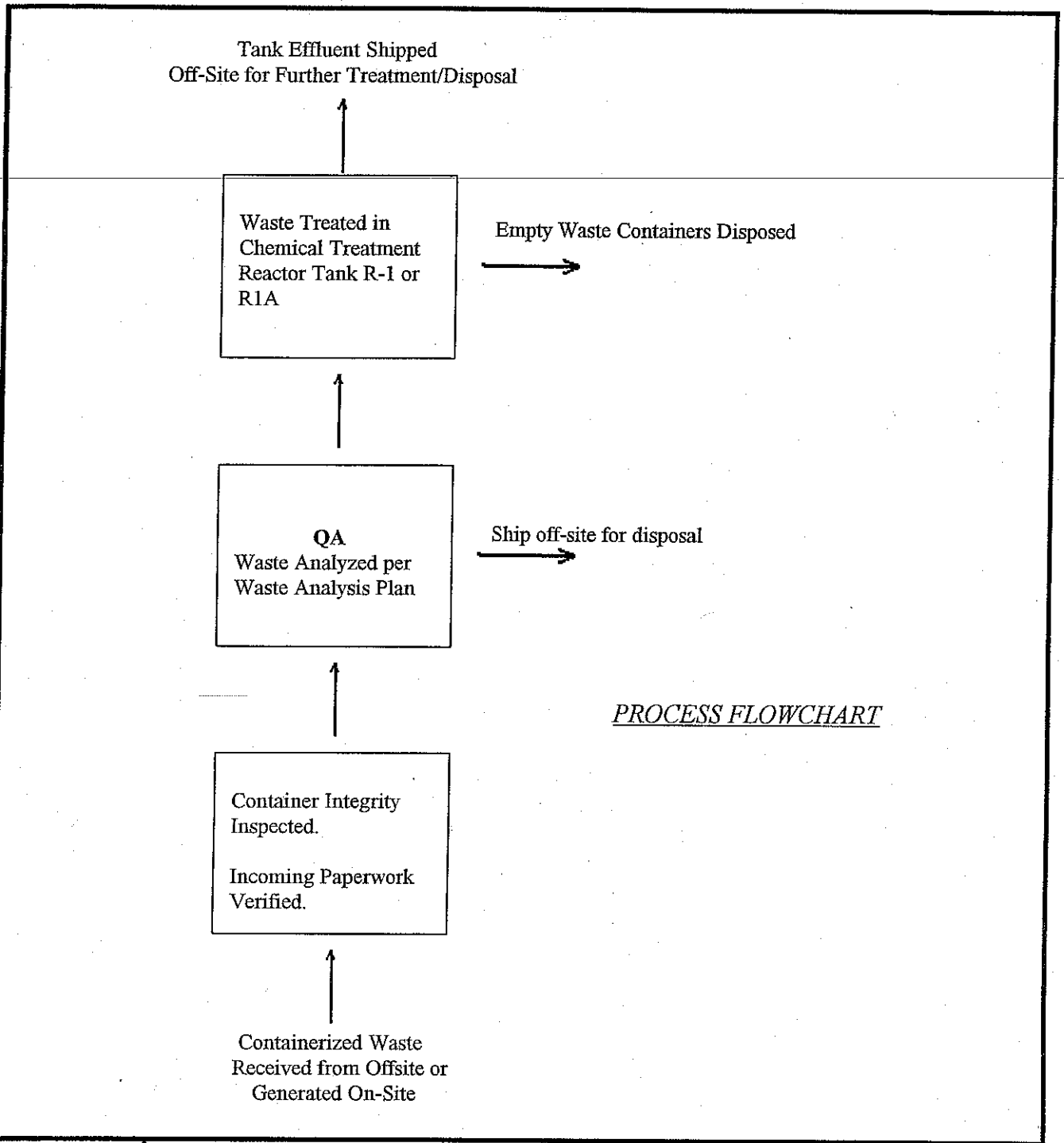
MFR:

Quanity: One



Nozzle Projections:

6" and smaller -	6"
Over 6" -	8"



	Clean Harbors La Porte, LP 500 Battleground Road La Porte, TX 77571 Phone: (281) 476-0645		
	TITLE: PROCESS FLOWCHART FOR CONTAINERIZED WASTES RECEIVED FOR PROCESSING IN CHEMICAL TREATMENT REACTOR TANKS R-1 AND R-1A		
	DWN: DT	SCALE: **AS SHOWN**	DWG No.: Figure V.C-23	REV 0.0
FILE: Section VC Figure VC-23.doc			

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
(Alternative Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured and certified by CLEAN HARBORS ENVIRONMENTAL SERVICES, INC., 609 PLEASANT STREET WEYMOUTH, MASSACHUSETTS 02189
(Name and address of manufacturer)

2. Manufactured for Clean Harbors Environmental Services, 1501 Washington Street, Braintree, MA 02184
(Name and address of purchaser)

3. Location of installation Clean Harbors Environmental Services, 500 Battleground Road, Laporte, TX 77571
(Name and address)

4. Type: Vertcal (Horiz. or vert. tank) | GW6726 (Mfgr's serial No.) | - (CRN) | 6726-M-01, Rev. 0 (Drawing no.) | 11 (Nat'l Bd. No.) | 2005 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1

COPY

to 2003 (Addenda (Date)) - (Code Case Nos.) 2001 (Year)

6. Shell: SA-240, 316L (Matl. (Spec No., Grade)) | .25" (Nom. Thk. (in.)) | 0 (Corr. Allow. (in.)) | 47.5" (Diam. I.D. (ft. & in.)) | 4'-0" (Length (overall) (ft. & in.)) | Lethal Service (Special Service per UG 120(d))

7. Seams: Welded Type 1 (Long. (Welded, Dbl., Sngl., Lap, Butt)) | Full (R.T. (Spot or Full)) | 100 (Eff. (%)) | - (H.T. Temp (F)) | - (Time (hr)) | Welded Type 1 (Girth (Welded, Dbl., Sngl., Lap, Butt)) | Full (R.T. (Spot, Partial, or Full)) | 1 (No. of Courses)

8. Heads: (a) Matl. SA-240, 316L (Spec No., Grade) (b) Matl. SA-240, 316L (Spec No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	Top	.375	0	48	2.88	-	-	-	-	Concave
(b)	Bottom	.375	0	48	2.88	-	-	-	-	Concave

If removable, bolts used (describe other fastenings) -

9. MAWP 100 (Matl., Spec. No., Gr., Size, No.) psi at max. temp. 200 °F

Min. design metal temp. -20 °F at 100 psi. Hydro., ~~Pneum.~~, ~~Combnd~~ test pressure 130 psi.

10. Nozzles, inspection and safety valve openings:

Purpose (Inlet, Outlet, Drain)	No.	Diam. or Size	Type	Matl.	Nom. Thk.	Reinforcement Matl.	How Attached	Location
Inspection	1	8"	RFWN Flg	SA-182 F316L/SA-312 316L	150#/sch40	-	UW16.1 (c)	Head
-	4	2"	RFWN Flg	SA-182 F316L/SA-312 316L	150#/sch40	-	UW16.1 (c)	Head
-	2	1"	RFWN Flg	SA-182 F316L/SA-312 316L	150#/sch40	-	UW16.1 (c)	Head
-	-	-	-	-	-	-	-	-

11. Supports: Skirt No (Yes or no) Lugs 3 (No.) Legs 4 (No.) Other Name Plate Bracket (Describe) Attached Head and Shell- Welded (Where and how)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: -
Exempt from Impact Testing per UHA-51(d)
(Name of part, item number. Mfgr's name and identifying stamp)

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1. "U" Certificate of Authorization No. 25996 expires 12/11, 2006

Date 04/01/2005 Co. Name CLEAN HARBORS ENVIRONMENTAL SERVICES, INC. (Manufacturer) Signed [signature] (Representative)

CERTIFICATE OF SHOP INSPECTION

Vessel constructed by Clean Harbors Environmental Services at Weymouth, MA

I, the undersigned, holding a valid commission issued by The National Board of Boiler and Pressure Vessel Inspectors and the State or Province of New York and employed by OneBeacon America Insurance have inspected the component described in this Manufacturer's Data Report on 04/01, 2005, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 04/01/2005 Signed [signature] (Authorized Inspector) Commissions NB11002(NB) NY2001 (Nat'l Board. (incl. endorsements) State, Prov. and No.)

III

CALCULATIONS

Clean Harbors Environmental Services, Inc.
609 Pleasant Street Weymouth, MA 02189

Date Printed: 4/7/2005

CUSTOMER

Clean Harbors Environmental Service

LaPorte, TX

VESSEL DESCRIPTION

Reactor Vessel R-1A

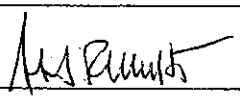
Vessel designed with Advanced Pressure Vessel, Version: 9.0.1
Vessel is ASME Code Stamped

Job No: GW6726
Vessel Number: Reactor R-1A

NAMEPLATE INFORMATION

Vessel MAWP:	100.00 PSI at 200 °F
MDMT:	-20 °F at 100.00 PSI
Serial Number(s):	GW6726
National Board Number(s):	11
Year Built:	2005
Radiography:	RT 1
Postweld Heat Treated:	NONE
Special Type:	L

Signatures



Date: 4/7/05

Clean Harbors Environmental Services, Inc.
609 Pleasant Street Weymouth, MA 02189

Date Printed: 4/7/2005

Project Description

Reactor Vessel for Laporte Tx, High Haz Group

Table of Contents

Clean Harbors Environmental Services, Inc.

Shell 1

Customer: Clean Harbors Environmental Service
Job No: GW6726
Number: 1

Vessel Number: Reactor R-1A
Mark Number: S1

Date Printed: 4/7/2005

Cylindrical Shell Design Information

Design Pressure:	100.00 PSI	Design Temperature:	200 °F
Static Head:	2.00 PSI	Joint Efficiency:	100 %
Shell Material:	SA-240 316L, Low	Factor B Chart:	HA-4
Shell Length:	48.0000 in.	Material Stress (hot):	14200 PSI
Corrosion Allowance:	0.0000 in.	Material Stress (cold):	16700 PSI
External Corrosion Allowance:	0.0000 in.	Actual Circumferential Stress:	13015 PSI
Outside Diameter (new):	48.0000 in.	Actual Longitudinal Stress:	6457 PSI
Outside Diameter (corroded):	48.0000 in.	Extreme Fiber Elongation:	0.39 %
Shell Surface Area:	50.27 Sq. Ft.	Specific Gravity:	1.00
Shell Estimated Volume:	370.20 Gal.	Weight of Fluid:	3092.69 lb.
		Total Flooded Shell Weight:	3484.73 lb.
		Shell Weight:	392.04 lb.

Minimum Design Metal Temperature Data

Minimum Design Metal Temperature: -20 °F
Material is exempt from impact testing per UHA-51(d)

Design Thickness Calculations

Longitudinal Stress Calculations per Paragraph UG-27(c)(2)

$$t = \frac{PR}{2SE + 0.4P} = \frac{102.00 * 23.8125}{2 * 14200 * 1.00 + 0.4 * 102.00} = 0.0854 + 0.0000_{\text{(corrosion)}} + 0.0000_{\text{(ext. corrosion)}}$$ = minimum of **0.0854** in.

Circumferential Stress Calculations per Appendix 1-1(a)(1)

$$t = \frac{PR_o}{SE + 0.4P} = \frac{102.00 * 24.0000}{14200 * 1.00 + 0.4 * 102.00} = 0.1719 + 0.0000_{\text{(corrosion)}} + 0.0000_{\text{(ext. corrosion)}}$$ = minimum of **0.1719** in.

External loads do not control design.

Nominal Shell Thickness Selected = **0.1875** in. ✓

Work with 1/4"
Alm 4/7/05

Clean Harbors Environmental Services, Inc.

Head 1

Customer: Clean Harbors Environmental Service
Job No: GW6726
Number: 1

Vessel Number: Reactor R-1A
Mark Number: H1

Date Printed: 4/7/2005

ASME F&D Head Design Information

Design Pressure:	100.00 PSI	Design Temperature:	200 °F
Static Head:	2.00 PSI	Joint Efficiency:	100 %
Head Material:	SA-240 316L, Low	Factor B Chart:	HA-4
Corrosion Allowance:	0.0000 in.	Material Stress (hot):	14200 PSI
External Corrosion Allowance:	0.0000 in.	Material Stress (cold):	16700 PSI
Head Location:	Bottom	Actual Head Stress:	13759 PSI
Outside Diameter :	48.0000 in.	Straight Flange :	1.5000 in.
Thin Out :	0.0625 in.	Knuckle (r) :	2.8800 in.
Crown Radius (Lo) :	48.0000 in.	$M = \frac{1}{4}[3 + \sqrt{L/r}]$:	1.7666
Extreme Fiber Elongation:	9.17 %		
Head Surface Area:	16.02 Sq. Ft.	Specific Gravity:	1.00
Head Estimated Volume:	51.77 Gal.	Weight of Fluid:	431.78 lb.
Head Weight:	250.84 lb.	Total Flooded Head Weight:	682.62 lb.

Minimum Design Metal Temperature Data

Minimum Design Metal Temperature: -20 °F
Material is exempt from impact testing per UHA-51(d)

Design Thickness Calculations

Design Thickness Calculations per Appendix 1-4(d)

$$t = \frac{PL_oM}{2SE + P(M - 0.2)} = \frac{102.00 * 48.0000 * 1.7666}{2 * 14200 * 1.00 + 102.00 (1.7666 - 0.2)}$$

$= 0.3029 + 0.0000_{(corrosion)} + 0.0000_{(ext.\ corrosion)} + 0.0625_{(thin\ out)}$

= minimum of 0.3654 in.

Nominal Head Thickness Selected = **0.3750** in. ✓
Minimum Thickness after forming = **0.3125** in. ✓ Kim 4/7/05

Customer: Clean Harbors Environmental Service
Job No: GW6726
Number: 1
ID Number: 1

Vessel Number: Reactor R-1A
Mark Number: N1

Date Printed: 4/7/2005

Nozzle Design Information

Design Pressure:	100.00 PSI	Design Temperature:	200 °F
Static Head:	2.00 PSI	Nozzle Efficiency (E):	100 %
Nozzle Material:	SA-312 TP316 SMLS, Low	Joint Efficiency (E_1):	1.00
External Projection:	6.0000 in.	Factor B Chart:	HA-2
Internal Projection:	0.0000 in.	Allowable Stress at Design Temperature (S_n):	17300 PSI
Inside Corrosion Allowance:	0.0000 in.	Allowable Stress at Ambient Temperature:	20000 PSI
External Corrosion Allowance:	0.0000 in.	Correction Factor (F):	1.00
Nozzle Pipe Size:	2	Passes through a Category A Joint:	No
Nozzle ID (new):	2.0670 in.	Nozzle Pipe Schedule:	40
Nozzle ID (corroded):	2.0670 in.	Nozzle Wall Thickness(new):	0.1540 in.
Outer "h" Limit:	0.3850 in.	Nozzle Wall Thickness(corroded):	0.1540 in.
Internal "h" Limit:	0.3850 in.	Upper Weld Leg Size(Weld 41):	0.1540 in.
OD, Limit of Reinforcement:	4.1340 in.	Internal Weld Leg Size(Weld 43):	0.0000 in.
		Outside Groove Weld Depth:	0.3750 in.

Minimum Design Metal Temperature

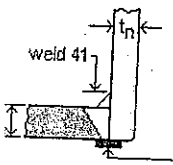
Minimum Design Metal Temperature: -20 °F
Material is exempt from impact testing per UHA-51(d)

Host Component: Head 1 - Head 1

Material:	SA-240 316L, Low	Head wall thickness(new):	0.3750 in.
Material Stress(S_v):	14200 PSI	Head wall thickness - thin out (corroded):	0.3125 in.

Nozzle Detail Information

Backing strip if used may be removed after welding



Upper Weld Leg Size(Weld 41): 0.1540 in.

Nozzle Wall Thickness(t_n): 0.1540 in.

Outside Groove Weld Depth: 0.3750 in.

Fig. UW-16.1 (c)

Nozzle passes through the vessel, attached by a groove weld.
Pipe Size: 2 Schedule: 40
Nozzle is adequate for UG-45 requirements.
Opening is adequately reinforced for Internal Pressure.
Reinforcement calculations are not required per UG-36(c)(3)(a)See Uw-14 for exceptions.
Weld Strength Paths are adequate.

Required Head Thickness per Paragraph UG-37(a)

$$tr = \frac{PLoM}{(2SE + P * (M - 0.2))} = \frac{102.00 * 48.0000 * 1.0000}{(2 * 14200 * 1 + 102.00 * (1.0000 - 0.2))}$$

= 0.1719 in.

Nozzle Required Thickness Calculations

Required Nozzle Thickness for Internal Pressure per Paragraph UG-37(a)

$$trn = \frac{PRn}{SE - 0.6P} = \frac{102.00 * 1.0335}{17300 * 1 - 0.6 * 102.00}$$

= 0.0061 in.

Strength Reduction Factors

$$fr1 = \frac{Sn}{Sv} = \frac{17300}{14200} = 1.0000 \qquad fr2 = \frac{Sn}{Sv} = \frac{17300}{14200} = 1.0000 \qquad fr3 = \frac{Sn}{Sv} = \frac{17300}{14200} = 1.0000$$

UG-45 Thickness Calculations

Nozzle Thickness for Pressure Loading (plus corrosion) per Paragraph UG-45(a)

$$t = \frac{PRn}{SE - 0.6P} + Ca + \text{ext. } Ca = \frac{102.00 * 1.0335}{17300 * 1.00 - 0.6 * 102.00} + 0.0000 + 0.0000$$

= 0.0061 in.

Nozzle Thickness for Internal Pressure (plus corrosion) per Paragraph UG-45(b)(1)

$$t = \frac{PLoM}{(2SE + P * (M - 0.2))} + Ca + \text{ext. } Ca = \frac{102.00 * 48.0000 * 1.7666}{(2 * 14200 * 1 + 102.00 * (1.7666 - 0.2))} + 0.0000 + 0.0000$$

= 0.3028 in.

Minimum Thickness of Standard Wall Pipe (plus corrosion) per Paragraph UG-45(b)(4)

t = minimum thickness of standard wall pipe + Ca + ext. Ca

= 0.1347 in.

Nozzle Minimum Thickness per Paragraph UG-45(b)

t = Smallest of UG-45(b)(1) or UG-45(b)(4)

= 0.1347 in.

Customer: Clean Harbors Environmental Service
Job No: GW6726
Number: 2
ID Number: 2

Vessel Number: Reactor R-1A
Mark Number: N2

Date Printed: 4/7/2005

Nozzle Design Information

Design Pressure:	100.00 PSI	Design Temperature:	200 °F
Static Head:	2.00 PSI	Nozzle Efficiency (E):	100 %
Nozzle Material:	SA-312 TP316 SMLS, High	Joint Efficiency (E_1):	1.00
External Projection:	6.0000 in.	Factor B Chart:	HA-2
Internal Projection:	0.0000 in.	Allowable Stress at Design Temperature (S_n):	20000 PSI
Inside Corrosion Allowance:	0.0000 in.	Allowable Stress at Ambient Temperature:	20000 PSI
External Corrosion Allowance:	0.0000 in.	Correction Factor (F):	1.00
Nozzle Pipe Size:	1	Passes through a Category A Joint:	No
Nozzle ID (new):	1.0490 in.	Nozzle Pipe Schedule:	40
Nozzle ID (corroded):	1.0490 in.	Nozzle Wall Thickness(new):	0.1330 in.
Outer "h" Limit:	0.3325 in.	Nozzle Wall Thickness(corroded):	0.1330 in.
Internal "h" Limit:	0.3325 in.	Upper Weld Leg Size(Weld 41):	0.1330 in.
OD, Limit of Reinforcement:	2.0980 in.	Internal Weld Leg Size(Weld 43):	0.0000 in.
		Outside Groove Weld Depth:	0.3750 in.

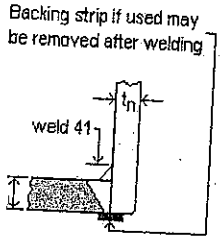
Minimum Design Metal Temperature

Minimum Design Metal Temperature: -20 °F
Material is exempt from impact testing per UHA-51(d)

Host Component: Head 1 - Head 1

Material:	SA-240 316L, Low	Head wall thickness(new):	0.3750 in.
Material Stress(S_v):	14200 PSI	Head wall thickness - thin out (corroded):	0.3125 in.

Nozzle Detail Information



Upper Weld Leg Size(Weld 41): 0.1330 in.

Nozzle Wall Thickness(t_n): 0.1330 in.

Outside Groove Weld Depth: 0.3750 in.

Fig. UW-16.1 (c)

Nozzle passes through the vessel, attached by a groove weld.
Pipe Size: 1 Schedule: 40
Nozzle is adequate for UG-45 requirements.
Opening is adequately reinforced for Internal Pressure.
Reinforcement calculations are not required per UG-36(c)(3)(a)See Uw-14 for exceptions.
Weld Strength Paths are adequate.

Required Head Thickness per Paragraph UG-37(a)

$$tr = \frac{PLoM}{(2SE + P * (M - 0.2))} = \frac{102.00 * 48.0000 * 1.0000}{(2 * 14200 * 1 + 102.00 * (1.0000 - 0.2))}$$

= 0.1719 in.

Nozzle Required Thickness Calculations

Required Nozzle Thickness for Internal Pressure per Paragraph UG-37(a)

$$trn = \frac{PRn}{SE - 0.6P} = \frac{102.00 * 0.5245}{20000 * 1 - 0.6 * 102.00}$$

= 0.0027 in.

Strength Reduction Factors

$$fr1 = \frac{Sn}{Sv} = \frac{20000}{14200} = 1.0000 \qquad fr2 = \frac{Sn}{Sv} = \frac{20000}{14200} = 1.0000 \qquad fr3 = \frac{Sn}{Sv} = \frac{20000}{14200} = 1.0000$$

UG-45 Thickness Calculations

Nozzle Thickness for Pressure Loading (plus corrosion) per Paragraph UG-45(a)

$$t = \frac{PRn}{SE - 0.6P} + Ca + \text{ext. } Ca = \frac{102.00 * 0.5245}{20000 * 1.00 - 0.6 * 102.00} + 0.0000 + 0.0000$$

= 0.0027 in.

Nozzle Thickness for Internal Pressure (plus corrosion) per Paragraph UG-45(b)(1)

$$t = \frac{PLoM}{(2SE + P * (M - 0.2))} + Ca + \text{ext. } Ca = \frac{102.00 * 48.0000 * 1.7666}{(2 * 14200 * 1 + 102.00 * (1.7666 - 0.2))} + 0.0000 + 0.0000$$

= 0.3028 in.

Minimum Thickness of Standard Wall Pipe (plus corrosion) per Paragraph UG-45(b)(4)

t = minimum thickness of standard wall pipe + Ca + ext. Ca

= 0.1164 in.

Nozzle Minimum Thickness per Paragraph UG-45(b)

t = Smallest of UG-45(b)(1) or UG-45(b)(4)

= 0.1164 in.

Clean Harbors Environmental Services, Inc.

8" Sight Glass

Customer: Clean Harbors Environmental Service
Job No: GW6726
Number: 3
ID Number: 3

Vessel Number: Reactor R-1A
Mark Number: N3

Date Printed: 4/7/2005

Nozzle Design Information

Design Pressure:	100.00 PSI	Design Temperature:	200 °F
Static Head:	2.00 PSI	Nozzle Efficiency (E):	100 %
Nozzle Material:	SA-312 TP316 WLD, High	Joint Efficiency (E_1):	1.00
		Factor B Chart:	HA-2
External Projection:	6.0000 in.	Allowable Stress at Design Temperature (S_n):	17000 PSI
Internal Projection:	0.0000 in.	Allowable Stress at Ambient Temperature:	17000 PSI
Inside Corrosion Allowance:	0.0000 in.	Correction Factor (F):	1.00
External Corrosion Allowance:	0.0000 in.	Passes through a Category A Joint:	No
Nozzle Pipe Size:	8	Nozzle Pipe Schedule:	40
Nozzle ID (new):	7.9810 in.	Nozzle Wall Thickness(new):	0.3220 in.
Nozzle ID (corroded):	7.9810 in.	Nozzle Wall Thickness(corroded):	0.3220 in.
Outer "h" Limit:	0.7813 in.	Upper Weld Leg Size(Weld 41):	0.3125 in.
Inner "h" Limit:	0.7813 in.	Internal Weld Leg Size(Weld 43):	0.0000 in.
OD, Limit of Reinforcement:	15.9620 in.	Outside Groove Weld Depth:	0.3750 in.

Minimum Design Metal Temperature

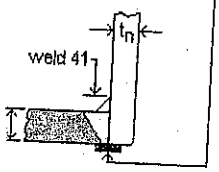
Minimum Design Metal Temperature: -20 °F
Material is exempt from impact testing per UHA-51(d)

Host Component: Head 1 - Head 1

Material:	SA-240 316L, Low	Head wall thickness(new):	0.3750 in.
Material Stress(S_v):	14200 PSI	Head wall thickness - thin out (corroded):	0.3125 in.

Nozzle Detail Information

Backing strip if used may be removed after welding



Upper Weld Leg Size(Weld 41): 0.3125 in.

Nozzle Wall Thickness(t_n): 0.3220 in.

Outside Groove Weld Depth: 0.3750 in.

Fig. UW-16.1 (c)

Nozzle passes through the vessel, attached by a groove weld.
Pipe Size: 8 Schedule: 40
Nozzle is adequate for UG-45 requirements.
Opening is adequately reinforced for Internal Pressure.
Weld Strength Paths are adequate.

Required Head Thickness per Paragraph UG-37(a)

$$tr = \frac{PLoM}{(2SE + P * (M - 0.2))} = \frac{102.00 * 48.0000 * 1.0000}{(2 * 14200 * 1 + 102.00 * (1.0000 - 0.2))}$$

= 0.1719 in.

Nozzle Required Thickness Calculations

Required Nozzle Thickness for Internal Pressure per Paragraph UG-37(a)

$$trn = \frac{PRn}{SE - 0.6P} = \frac{102.00 * 3.9905}{17000 * 1 - 0.6 * 102.00}$$

= 0.0240 in.

Strength Reduction Factors

$$fr1 = \frac{Sn}{Sv} = \frac{17000}{14200} = 1.0000 \qquad fr2 = \frac{Sn}{Sv} = \frac{17000}{14200} = 1.0000 \qquad fr3 = \frac{Sn}{Sv} = \frac{17000}{14200} = 1.0000$$

UG-45 Thickness Calculations

Nozzle Thickness for Pressure Loading (plus corrosion) per Paragraph UG-45(a)

$$t = \frac{PRn}{SE - 0.6P} + Ca + \text{ext. } Ca = \frac{102.00 * 3.9905}{17000 * 1.00 - 0.6 * 102.00} + 0.0000 + 0.0000$$

= 0.0240 in.

Nozzle Thickness for Internal Pressure (plus corrosion) per Paragraph UG-45(b)(1)

$$t = \frac{PLoM}{(2SE + P * (M - 0.2))} + Ca + \text{ext. } Ca = \frac{102.00 * 48.0000 * 1.7666}{(2 * 14200 * 1 + 102.00 * (1.7666 - 0.2))} + 0.0000 + 0.0000$$

= 0.3028 in.

Minimum Thickness of Standard Wall Pipe (plus corrosion) per Paragraph UG-45(b)(4)

t = minimum thickness of standard wall pipe + Ca + ext. Ca

= 0.2817 in.

Nozzle Minimum Thickness per Paragraph UG-45(b)

t = Smallest of UG-45(b)(1) or UG-45(b)(4)

= 0.2817 in.

Nozzle Reinforcement Calculations

Area Required for Internal Pressure

A = d tr F + 2 tn tr F (1 - fr1) = (7.9810 * 0.1719 * 1.00) + (2 * 0.3220 * 0.1719 * 1.00 * (1 - 1.0000)) = **1.3719** sq. in.

Area Available - Internal Pressure

A1 Formula 1 = d(E1 t - F tr) - 2tn(E1 t - F tr)(1 - fr1) =
7.9810 * (1.00 * 0.3125 - 1.00 * 0.1719) - 2 * 0.3220 * (1.00 * 0.3125 - 1.00 * 0.1719) * (1 - 1.0000) = *1.1221* sq. in.

A1 Formula 2 = 2(t + tn)(E1 t - F tr) - 2tn(E1 t - F tr)(1 - fr1) =
2 * (0.3125 + 0.3220)(1.00 * 0.3125 - 1.00 * 0.1719) - 2 * 0.3220 * (1.00 * 0.3125 - 1.00 * 0.1719) * (1 - 1.0000)
= *0.1784* sq. in.

A1 = Larger value of *A1 Formula 1* and *A1 Formula 2* = **1.1221** sq. in.

A2 Formula 1 = 5(tn - tm) fr2 t = 5(0.3220 - 0.0240) * 1.0000 * 0.3125 = *0.4656* sq. in.
A2 Formula 2 = 5(tn - tm) fr2 tn = 5(0.3220 - 0.0240) * 1.0000 * 0.3220 = *0.4798* sq. in.
A2 = Smaller value of *A2 Formula 1* and *A2 Formula 2* = **0.4656** sq. in.

A3 = Smaller value of the following :
5 * t * t_i * f_{r2} = 5 * 0.3125 * 0.3220 * 1.0000 = 0.5031 sq. in.
5 * t_i * t_i * f_{r2} = 5 * 0.3220 * 0.3220 * 1.0000 = 0.5184 sq. in.
2 * h * t_i * f_{r2} = 2 * 0.0000 * 0.3220 * 1.0000= 0.0000 sq. in.

A41 = (leg)² * fr2 = (0.3125)² * 1.0000 = **0.0000** sq. in.

A43 = (leg)² * fr2 = 0 * 1.0000 = **0.0977** sq. in.

Area Available (Internal Pressure) = A1 + A2 + A3 + A41 + A43 = 1.6854 sq. in., which is greater than A (1.3719) = **0.0000** sq. in.

Customer: Clean Harbors Environmental Services, Inc.
Job No: GW6726

Date Printed: 4/7/2005

Vessel Number: Reactor R-1A

MDMT Report by Components

Design MDMT is -20 °F

Component	Material	Curve	Pressure	MDMT
Shell 1	SA-240 316L, Low			Exempt per UHA-51(d)
Head 1	SA-240 316L, Low			Exempt per UHA-51(d)
2" Vent	SA-312 TP316 SMLS,			Exempt per UHA-51(d)
1" Waste In	SA-312 TP316 SMLS,			Exempt per UHA-51(d)
8" Sight Glass	SA-312 TP316 WLD, H			Exempt per UHA-51(d)

The required design MDMT of -20 °F has been met or exceeded for the calculated MDMT values.

ANSI Flanges Are Not Included in MDMT Calculations.

MAWP Report by Components

Component	Design Pressure	Static Head	Vessel MAWP New & Cold UG-98(a)	Component MAWP Hot & Corroded UG-98(b)	Vessel MAWP Hot & Corroded UG-98(a)
Shell 1	100.00 PSI	2.00 PSI	128.88 PSI	111.29 PSI	109.29 PSI
Head 1	100.00 PSI	2.00 PSI	121.80 PSI	105.27 PSI	103.27 PSI
2" Vent	100.00 PSI	2.00 PSI	216.62 PSI	185.89 PSI	183.89 PSI
1" Waste In	100.00 PSI	2.00 PSI	216.62 PSI	185.89 PSI	183.89 PSI
8" Sight Glass	100.00 PSI	2.00 PSI	131.22 PSI	113.51 PSI	111.51 PSI

NC = Not Calculated Inc = Incomplete

Summary

Component with the lowest vessel MAWP(New & Cold) : **Head 1**
The lowest vessel MAWP(New & Cold) : **121.80 PSI**

Component with the lowest vessel MAWP(Hot & Corroded) : **Head 1**
The lowest vessel MAWP(Hot & Corroded) : **103.27 PSI**

Pressures are exclusive of any external loads.

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
GENERAL WELDING & DESIGN
609 Pleasant Street P.O. Box 22
WEYMOUTH, MASSACHUSETTS 02189
(617) 331-5600 FAX (617) 335-2675

JOB GW6726 NEW REACTOR VESSEL R-1A
SHEET NO. 1 OF 2
CALCULATED BY ALAN F. MOUNT DATE 1/26/05
CHECKED BY DATE
SCALE

(1) REVIEW OF LEG & LUG DESIGN

VERIFY THE LEGS ARE ADEQUATE TO SUPPORT THE VESSEL (WHEN FULL) AND THAT THEY ARE ADEQUATELY ATTACHED TO THE SHELL OF THE VESSEL:

APPROX. FLOODED WEIGHT OF VESSEL = 5,000 #'s (SEE P. 14 CALCS)
LOAD CARRIED BY EACH LEG = 5,000/4 = 1,250 #'s
LEG MATERIAL = 4x4x3/8" ANGLE
MAXIMUM UNSUPPORTED LENGTH OF COLUMN = 24"
[1] ASSUME THEORETICAL K VALUE = 1.0
EFFECTIVE LENGTH IN FEET = KL = 2'-0"

USING THE TABLE ON P. 3-62., AND ASSUMING THE LOADING WAS CONCENTRIC, A DOUBLE ANGLE LEG COULD SUPPORT 110,000 # LOAD AT AN EFFECTIVE LENGTH EQUAL TO 4'-0". ASSUMING THE LOAD WOULD BE SHARED EQUALLY BETWEEN THE TWO ANGLES, EACH ANGLE COULD TAKE APPROX. 55,000 # LOAD > 1,250 # ACTUAL. DUE TO THE LARGE FACTOR OF SAFETY (44), THE TECHNIQUE USED ABOVE IS SUFFICIENT TO SHOW THE LEGS ARE ADEQUATELY DESIGNED TO SUPPORT THE LOAD.

2. NOW CHECK TO SEE THERE IS SUFFICIENT WELDMENT BETWEEN THE LEG AND SHELL OF THE TANK:

BASE CALCULATIONS ON A MINIMUM OF 15" LINEAR INCHES OF WELD PER LEG (TREATING THE WELD AS A LINE)

$$\text{VERTICAL SHEAR} = \frac{?}{\#} = \frac{V}{A_W} = \frac{1{,}250\ \#}{15"} = 83.33\ \#/"$$

$$\text{REQ'D WELD SIZE} = W = \frac{\text{ACTUAL FORCE}}{\text{ALLOWABLE}} = \frac{83.33\ \#/"}{9{,}600\ \#/in^2} = .0087" < .125"$$

∴ EVEN A 1/8" FILLET WELD WOULD BE OK.

[1] REFERENCE TABLE C-C2.1, "AISC MANUAL OF STEEL CONSTRUCTION", NINTH EDITION

2. REFERENCE "DESIGN OF WELDED STRUCTURES" BY OMER W. BLODGETT, SECTION 7.4

CLEAN HARBORS ENVIRONMENTAL SERVICES, INC.
GENERAL WELDING & DESIGN
609 Pleasant Street P.O. Box 22
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(617) 331-5600 FAX (617) 335-2675

JOB GW6726 NEW REACTOR VESSEL R-1A
SHEET NO. 2 OF 2
CALCULATED BY ALAN F. MONT DATE 1/26/05
CHECKED BY DATE
SCALE

REVIEW OF LUG & LUG DESIGN (CONTINUED)

(2.) VERIFY THE LIFTING LUG DESIGN IS ADEQUATE - ASSUMING THE TANK WILL ONLY BE LIFTED WHEN EMPTY

TOTAL WT. TO BE HANDLED BY LIFTING LUGS = 1,000#S
LOAD PER LIFTING LUG = 1,000#/3 = 333#S PER LUG

3 ULTIMATE SHEAR STRENGTH = .75 × ULTIMATE TENSILE STRENGTH
= .75 × 70,000 PSI
= 52,500

USING S.F. = 4, ALLOWABLE SHEAR STRESS = 52,500/4 = 13,125 PSI
CROSS SECTIONAL AREA RESISTING THE SHEAR = 1/2" × 7/8" = .4375 IN²
ACTUAL SHEAR STRESS = $\frac{333\#}{.4375\ in^2}$ = 761 PSI < 13,125 PSI

∴ LIFTING LUG IS SUFFICIENT TO TAKE THE LOAD.

2. NOW VERIFY THERE IS SUFFICIENT WELD BETWEEN THE LUG AND THE TOP HEAD, BASIC CALCULATIONS ON A MINIMUM OF 8" OF WELD (CREATING THE WELD AS A LINE)

$$\text{TENSION } f = \frac{P}{A_W} = \frac{333\#}{8"} = 41.6\ \#/"$$

$$\text{REQUIRED WELD SIZE} = "W" = \frac{\text{ACTUAL FORCE}}{\text{ALLOWABLE}} = \frac{41.6\ \#/"}{9{,}600\ psi} = .0043$$

∴ EVEN A 1/8" FILLET WOULD BE OK

3. REFERENCE "DESIGN OF WELDED STRUCTURES" BY OMER W. BLODGETT SECTION 2.1-5

IV

NDE REPORTS

A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

RECORD OF RADIOGRAPHIC EXAMINATION

TO *Clean Harbors*
General Welding & Design Co.
P.O. Box 22
609 Pleasant St
Weymouth, MA 02189

Client's Order No. *verbal*
ABC Project No. *023805*
Date *February 8, 2005*
Drawing No.
Contract No.

Location Involved *ABC Testing Laboratory* Date *February 8, 2005*
Object or Part Radiographed *stainless steel vessel* Approved proc. No. *RT1/1* rev. *2*
Joint Type *circumferential, butt* Coverage *full* Penetrameter Location *film side*
Type of Material *stainless steel* Group No. *1* Penetrameter *10* Group No. *1*
Wall Thickness *.25to.375 in* Total Exposure Thickness *.75 inches* Shim(s)/Reinforcement *.062* *inches*
Source of Radiation *Ir^{192}* Curies *80* No of Exp *4* per weld *12* Total
Focal Spot *.160 inches* KV *N/A* MA *N/A* Angle of Source *90* Degrees
Mfr of Machine *N/A* Exposure Type *single* wall Location of Markers *film side*
Standard *ASME V* Object to Film Distance *.375 inches* Film to source Distance *48 inches*
Time of Exposure *13:00 minutes* Type of film *Agfa D4* No. of film *1* Screens *Pb.010 x .010 in*
Acceptance Standard *ASME,8* Radiograph Status *original* View Type *single*
Remarks:

Serial and Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
A-B	X														Weld #1
B-C	X														
C-D	X														
D-E	X														
E-F	X														
F-G	X														
G-H	X														
H-I	X														

Radiographed By *Jeff Rodrigues, Michael Medeiros*

Reported By [signature]
Michael Medeiros, Level II

Owner / Manufacturers Review By [signature] - Q.C. Manager Date: 2/9/05

A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

RECORD OF RADIOGRAPHIC EXAMINATION

CLIENT *Clean Harbors*

Date *8-Feb-05*

ABC Project No. *023805*

Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
I-J	X														Weld #1
J-K	X														
K-L	X														
L-A	X														

A B C Testing Inc.
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RECORD OF RADIOGRAPHIC EXAMINATION

TO *Clean Harbors*
General Welding & Design Co.
P.O. Box 22
609 Pleasant St
Weymouth, MA 02189

Client's Order No. *verbal*
ABC Project No. *023805*
Date *February 8, 2005*
Drawing No.
Contract No.

Location Involved *ABC Testing Laboratory* Date *February 8, 2005*
Object or Part Radiographed *stainless steel vessel* Approved proc. No. *RTI/1* rev. *2*
Joint Type *circumferential, butt* Coverage *full* Penetrameter Location *film side*
Type of Material *stainless steel* Group No. *1* Penetrameter *10* Group No. *1*
Wall Thickness *.25to.375in* Total Exposure Thickness *.375 inches* Shim(s)/Reinforcement *.062 inches*
Source of Radiation *Ir 192* Curies *80* No of Exp *1* per weld *1* Total
Focal Spot *.160 inches* KV *N/A* MA *N/A* Angle of Source *90* Degrees
Mfr of Machine *N/A* Exposure Type *single* wall Location of Markers *film side*
Standard *ASME V* Object to Film Distance *.375 inches* Film to source Distance *24 inches*
Time of Exposure *3:00 minutes* Type of film *Agfa D4* No. of film *1* Screens *Pb.010 x .010 in*
Acceptance Standard *ASME,8* Radiograph Status *original* View Type *single*
Remarks:

Serial and Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
1-2		X		X											
2-3		X		X											Weld #2
3-4	X														
4-5	X														
5-6	X														
6-7		X		X											
7-8		X		X											
8-9	X														

Radiographed By *Jeff Rodrigues, Michael Medeiros*

Reported By *Michael Medeiros, Level II*

Owner / Manufacturers Review By *[illegible] - Q.C. MANAGER* Date: *3/3/05*

A B C Testing Inc.
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TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

RECORD OF RADIOGRAPHIC EXAMINATION

CLIENT *Clean Harbors*

Date *8-Feb-05*

ABC Project No. *023805*

Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
9-10		X		X											Weld #2
10-11		X		X											
11-12		X		X											
12-1	X														

A B C Testing Inc.
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TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

RECORD OF RADIOGRAPHIC EXAMINATION

TO *Clean Harbors*
General Welding & Design Co.
P.O. Box 22
609 Pleasant St
Weymouth, MA 02189

Client's Order No. *verbal*
ABC Project No. *023805*
Date *February 24, 2005*
Drawing No.
Contract No.

Location Involved *ABC Testing Laboratory* Date *February 24, 2005*
Object or Part Radiographed *stainless steel vessel* Approved proc. No. *RTI/1* rev. *2*
Joint Type *circumferential, butt* Coverage *full* Penetrameter Location *film side*
Type of Material *stainless steel* Group No. *1* Penetrameter *12* Group No. *1*
Wall Thickness *.25to.375in* Total Exposure Thickness *.375in* Shim(s)/Reinforcement *.062in.*
Source of Radiation *Ir^{192}* Curies *80* No of Exp *1* per weld *3* Total
Focal Spot *.160 inches* KV *N/A* MA *N/A* Angle of Source *90* Degrees
Mfr of Machine *N/A* Exposure Type *single* wall Location of Markers *film side*
Standard *ASME V* Object to Film Distance *.375 inches* Film to source Distance *24 inches*
Time of Exposure *3:00 minutes* Type of film *Agfa D4* No. of film *1* Screens *Pb.010 x .010 in*
Acceptance Standard *ASME,8* Radiograph Status *1st repair* View Type *single*
Remarks:

Serial and Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
1-2	X														
2-3	X														Weld #2
6-7	X														
7-8	X														
9-10	X														
10-11	X														
11-12	X														

Radiographed By *Jeff Rodrigues, Michael Medeiros*

Reported By *Michael Medeiros, Level II*

Owner / Manufacturers Review By *MARK MILLETT - Q.C. MANAGER* Date: *3/3/05*

A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

RECORD OF RADIOGRAPHIC EXAMINATION

TO *Clean Harbors*
General Welding & Design Co.
P.O. Box 22
609 Pleasant St
Weymouth, MA 02189

Client's Order No. *verbal*
ABC Project No. *023805*
Date *February 9, 2005*
Drawing No.
Contract No.

Location Involved *ABC Testing Laboratory* Date *February 8, 2005*
Object or Part Radiographed *stainless steel vessel* Approved proc. No. *RT1/1* rev. *2*
Joint Type *longitudinal, butt* Coverage *full* Penetrameter Location *film side*
Type of Material *stainless steel* Group No. *1* Penetrameter *#10* Group No. *1*
Wall Thickness *.25 inches* Total Exposure Thickness *.75 inches* Shim(s)/Reinforcement *.0625 inches*
Source of Radiation *Ir^{192}* Curies *80* No of Exp *2* per weld *4* Total
Focal Spot *.160 inches* KV *N/A* MA *N/A* Angle of Source *90* Degrees
Mfr of Machine *N/A* Exposure Type *double* wall Location of Markers *film side*
Standard *ASME V* Object to Film Distance *.375 inches* Film to source Distance *48 inches*
Time of Exposure *13:00 minutes* Type of film *Agfa D4* No. of film *1* Screens *Pb.010 x .010 in*
Acceptance Standard *ASME, 8* Radiograph Status *original* View Type *single*
Remarks:

Serial and Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
13-14	X														
14-15	X														Weld#3
15-16	X														
16-17	X														
18-19	X														
19-20	X						X								Weld #4
20-21	X														
21-22	X						X								

Radiographed By *Jeff Rodrigues, Michael Medeiros*

Reported By *Michael Medeiros, Level II*

Owner / Manufacturers Review
By *Q.C. MANAGER* Date: *2/10/05*

A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

RECORD OF RADIOGRAPHIC EXAMINATION

TO *Clean Harbors*
General Welding & Design Co.
P.O. Box 22
609 Pleasant St
Weymouth, MA 02189

Client's Order No. *verbal*
ABC Project No: *023805*
Date *February 8, 2005*
Drawing No:
Contract No.

Location Involved *ABC Testing Laboratory* Date *February 8, 2005*
Object or Part Radiographed *stainless steel vessel* Approved proc. No. *RT1/1* rev. *2*
Joint Type *circumferential, butt* Coverage *full* Penetrameter Location *film side*
Type of Material *stainless steel* Group No. *1* Penetrameter *12* Group No. *1*
Wall Thickness *.375 inches* Total Exposure Thickness *.500 inches* Shim(s)/Reinforcement *.062 inches*
Source of Radiation *Ir 192* Curies *80* No of Exp *1* per weld *2* Total
Focal Spot *.160 inches* KV *N/A* MA *N/A* Angle of Source *90* Degrees
Mfr of Machine *N/A* Exposure Type *single* wall Location of Markers *film side*
Standard *ASME V* Object to Film Distance *.500 inches* Film to source Distance *60 inches*
Time of Exposure *17:00 minutes* Type of film *Agfa D4* No. of film *1* Screens *Pb:010 x .010 in*
Acceptance Standard *ASME,8* Radiograph Status *original* View Type *single*
Remarks:

Serial and Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
23-24	X						X								
25-26	X					X									Weld#5
															Weld#6

Radiographed By *Jeff Rodrigues, Michael Medeiros*

Reported By *Michael Medeiros, Level II*

Owner / Manufacturers Review
By *A. F. Minst - Q.C. MANAGER* Date: *2/10/05*

A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

COPY

RECORD OF RADIOGRAPHIC EXAMINATION

TO *Clean Harbors*
General Welding & Design Co.
P.O. Box 22
609 Pleasant St
Weymouth, MA 02189

Client's Order No. *verbal*
ABC Project No. *013205*
Date *January 11, 2005*
Drawing No.
Contract No.

Location Involved *ABC Testing Laboratory* Date *January 11, 2005*
Object or Part Radiographed *8 inch pipe* Approved proc. No. *RT1/1* rev. *2*
Joint Type *circumferential, butt* Coverage *full* Penetrameter Location *film side*
Type of Material *stainless* Group No. *1* Penetrameter *12* Group No. *1*
Wall Thickness *.322 inches* Total Exposure Thickness *.382 inches* Shim(s)/Reinforcement *.06 inches*
Source of Radiation *Ir^{192}* Curies *106* No of Exp *3* per weld *3* Total
Focal Spot *0.160 inches* KV *N/A* MA *N/A* Angle of Source *90* Degrees
Mfr of Machine *N/A* Exposure Type *double* wall Location of Markers *film side*
Standard *ASME V* Object to Film Distance *.322 inches* Film to source Distance *9 inches*
Time of Exposure *:15 seconds* Type of film *Agfa D5* No. of film *1* Screens *Pb.010x.010inches*
Acceptance Standard *ASME,8* Radiograph Status *original* View Type *single*
Remarks:

Serial and Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
A-B	X														
B-C	X												X		Weld #1
C-A	X												X		
													X		

Radiographed By *Jeff Rodrigues*

Reported By *Michael Medeiros, Level II*

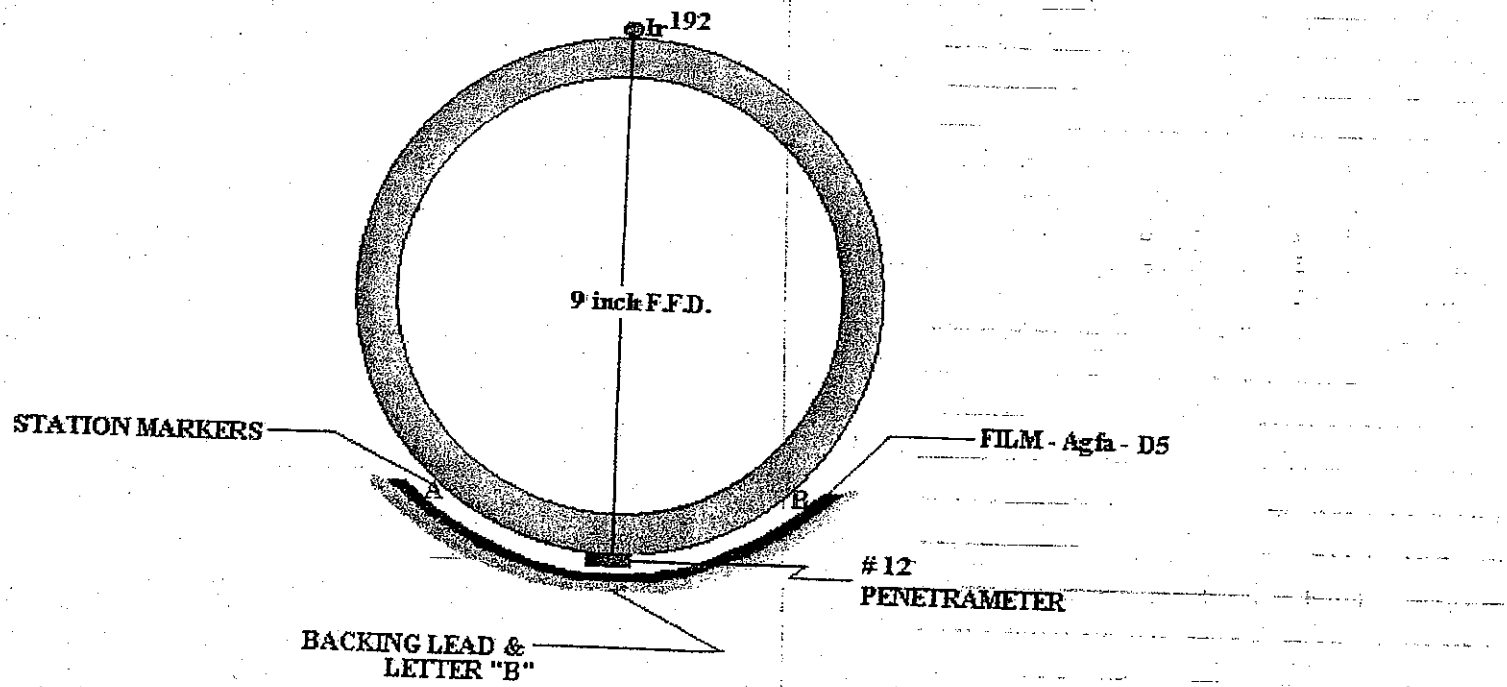
Owner / Manufacturers Review By *AA/QC MGMT - Q.C. MANAGER*

Date: *3/3/05*

A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

CLEAN HARBORS

PURCHASE ORDER: VERBAL
ABC TESTING PROJECT: 013205
TYPICAL RT TECHNIQUE UTILIZED ON
8 inch PIPING WELDS
RT DATE: JANUARY 11, 2005



A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

RECORD OF RADIOGRAPHIC EXAMINATION

TO *Clean Harbors*
General Welding & Design Co.
P.O. Box 22
609 Pleasant St
Weymouth, MA 02189

Client's Order No. *verbal*
ABC Project No. *013205*
Date *January 12, 2005*
Drawing No.
Contract No.

Location Involved *ABC Testing Laboratory* Date *January 11, 2005*
Object or Part Radiographed *1 inch pipe* Approved proc. No. *RTI/1* rev. *2*
Joint Type *circumferential, butt* Coverage *full* Penetrameter Location *source side*
Type of Material *stainless* Group No. *1* Penetrameter *12* Group No. *1*
Wall Thickness *.133 inches* Total Exposure Thickness *.326 inches* Shim(s)/Reinforcement *.06 inches*
Source of Radiation *X-ray* Curies *N/A* No of Exp *2* per weld *4* Total
Focal Spot *4.0mm* KV *200* MA *10* Angle of Source *75* Degrees
Mfr of Machine *Philips* Exposure Type *double* wall Location of Markers *film side*
Standard *ASME V* Object to Film Distance *1.326 inches* Film to source Distance *36 inches*
Time of Exposure *.6 minutes* Type of film *Agfa D4* No. of film *1* Screens *Pb.005x.010ins.*
Acceptance Standard *ASME,8* Radiograph Status *original* View Type *single*
Remarks:

Serial and Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
0°	X						X						X		
90°	X						X						X		Weld#1
0°	X												X		
90°	X												X		Weld#2
													X		

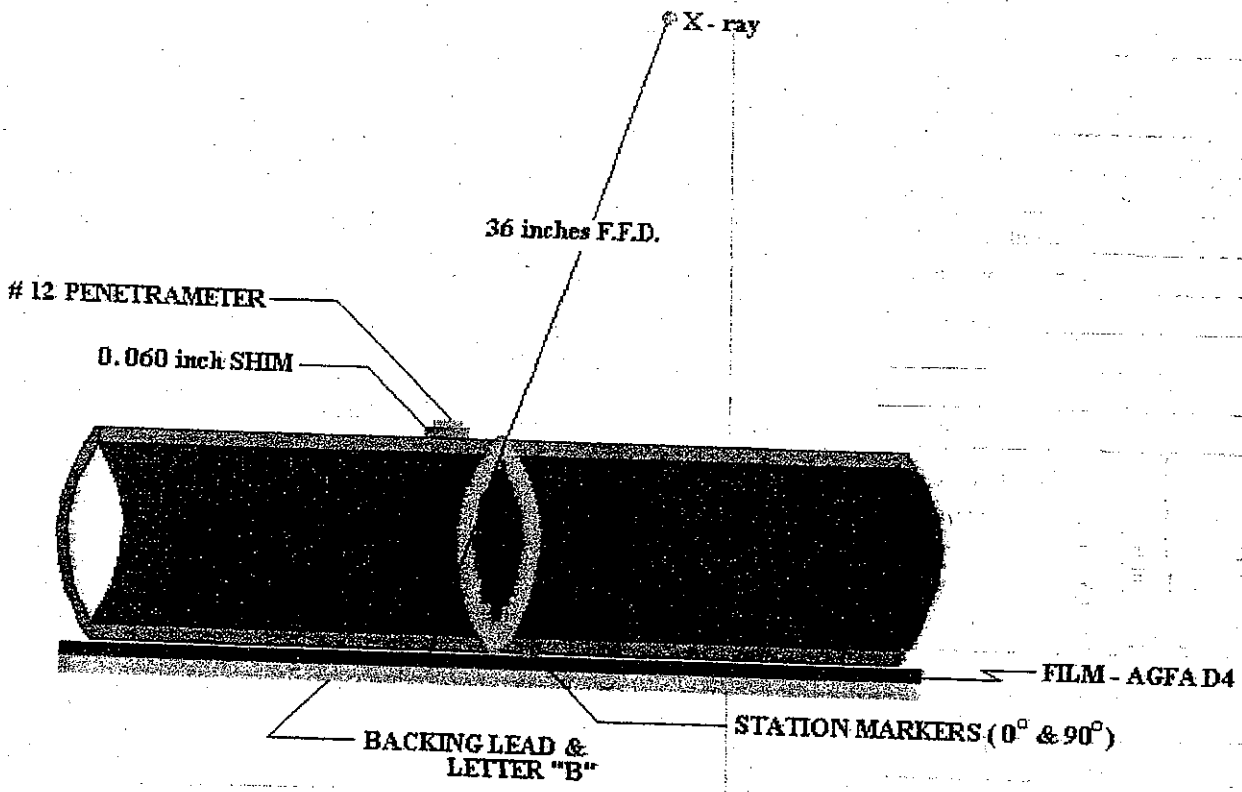
Radiographed By *Jeff Rodrigues*
Reported By *Michael Medeiros, Level II*

Owner / Manufacturers Review
By *Mark F. Mwst - Q.C. Manager* Date: *3/3/05*

A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

CLEAN HARBORS

PURCHASE ORDER: VERBAL
ABC TESTING PROJECT: 013205
TYPICAL RT TECHNIQUE UTILIZED
TO SHOOT 1 INCH PIPE
RT DATE: JANUARY 11, 2005



A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

RECORD OF RADIOGRAPHIC EXAMINATION

TO *Clean Harbors*
General Welding & Design Co.
P.O. Box 22
609 Pleasant St
Weymouth, MA 02189

Client's Order No. *verbal*
ABC Project No. *013205*
Date *January 12, 2005*
Drawing No.
Contract No.

Location Involved *ABC Testing Laboratory* Date *January 11, 2005*
Object or Part Radiographed *2 inch pipe* Approved proc. No. *RT1/1* rev. *2*
Joint Type *circumferential, butt* Coverage *full* Penetrameter Location *source side*
Type of Material *stainless* Group No. *1* Penetrameter *12* Group No. *1*
Wall Thickness *.154 inches* Total Exposure Thickness *.368 inches* Shim(s)/Reinforcement *.06 inches*
Source of Radiation *X-ray* Curies *N/A* No of Exp *2* per weld *4* Total
Focal Spot *4.0mm* KV *200* MA *10* Angle of Source *75* Degrees
Mfr of Machine *Philips* Exposure Type *double* wall Location of Markers *film side*
Standard *ASME V* Object to Film Distance *2.368 inches* Film to source Distance *36 inches*
Time of Exposure *.8 minutes* Type of film *Agfa D4* No. of film *1* Screens *Pb.005x.010ins.*
Acceptance Standard *ASME,8* Radiograph Status *original* View Type *single*
Remarks:

Serial and Film Number	Acceptable	Rejectable	Cracks	Lack of Pent.	Lack of Fusion	Slag Inclusion	Porosity	Suck - up	Burn Through	Undercutting	Tungsten	Film Artifacts	2-2t Sensitivity	Retake	Remarks
0°	X												X		Weld#1
90°	X												X		
0°	X												X		Weld#2
90°	X												X		
0°	X												X		Weld#3
90°	X												X		
0°	X						X						X		Weld#4
90°	X												X		

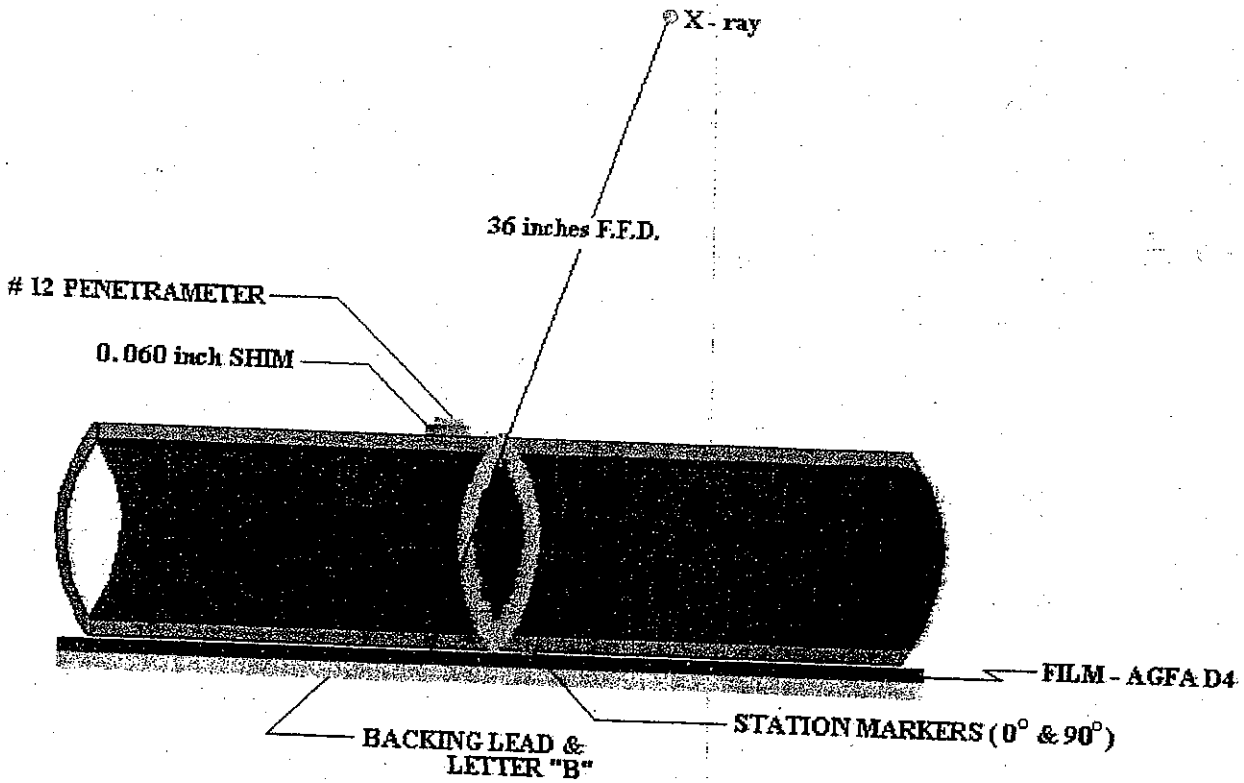
Radiographed By *Jeff Rodrigues*
Reported By *Michael Medeiros, Level II*

Owner / Manufacturers Review By *ANF MGMT - Q.C. MANAGER* Date: *3/3/05*

A B C Testing Inc.
95 FIRST STREET • P.O. BOX 868 • BRIDGEWATER, MASSACHUSETTS 02324
TELEPHONE 508 - 697-6068 • FAX # 508 - 697-6154

CLEAN HARBORS

PURCHASE ORDER: VERBAL
ABC TESTING PROJECT: 013205
TYPICAL RT TECHNIQUE UTILIZED
TO SHOOT 2 INCH PIPE
RT DATE: JANUARY 11, 2005



V

HYDROSTATIC TEST REPORT

CleanHarbors
ENVIRONMENTAL SERVICES, INC.
GENERAL WELDING AND DESIGN
609 PLEASANT STREET • P.O. BOX 22 • WEYMOUTH, MA 02189
(781) 331-5600 • FAX (781) 335-2675
Visit our Website at www.cleanharbors.com

Hydrostatic/Pneumatic Test Record

Job #: GW6726 Date: 4/1/05

Customer: CHES High Haz

Item being tested: REACTOR VESSEL

Applicable Code Specification: COPY

Hydrostatic Test ✓ Pneumatic Test ____
Procedure No. ____ Revision No. ____

TEST PREPARATION:

- ✓ Joints accessible
- N/A Relief Valves in place
- ✓ Valve and blank test boundary
- ✓ System vented properly
- ✓ Test gauges in proper place
- N/A Low Pressure equipment isolated
- ✓ System supported sufficiently
- ✓ Connections expansion joints checked
- N/A Precautions of UW-50 for pneumatic test
- N/A Pipe bladders properly inflated/secured

TEST PARAMETERS:

Gauge Range 0 PSIG to 300 PSIG (must be 1-1/2 to 4 times the test pressure)
Gauge calibration 1. I.D. # PG311 Due date: 6-24-05 Condition: Good
2. I.D. # PG313 Due date: 6-24-05 Condition: Good
3. I.D. # ____ Due date: ____ Condition: ____
Test Pressure - Internal 130 PSIG External ____ PSIG
Test Medium: H_2O Condition: ____
Test Temperature: 65° 'F Ambient Temperature: 65° 'F

TEST PROCEDURE:

- ✓ Vent open during fill for hydrostatic/closed for pneumatic
- ✓ Test Item full and vent closed
- ✓ Preliminary Test for leaks (50 PSIG)
- ✓ Time at test pressure (10:45)
- ✓ Hold for 0 Hours 15 Minutes
- N/A Drop in pressure: Observed ____ Allowable ____
- ____ Release test pressure by opening vent
- ____ Drain with proper venting to prevent collapse

RESULTS:

Accept ✓ Reject ____ Retest ____

Comments: ____

Test Conducted by: [signature] QC Witness: [signature] 4/1/05

VI

MATERIAL TEST REPORTS (MTR'S)

Commerical Metal Forming
304 East Mcleroy
Saginaw, TX 76179
PHONE: 817.232.1040
FAX:

PACKING LIST

SHIPMENT NO. 43129
PAGE NO. 1

ALES ORDER	CUSTOMER NO.	P.O. NUMBER	P.O. DATE	S.O. DATE	PLANT
784603	11016	1521	11/01/04	11/01/04	SMD

SOLD TO: CLEAN HARBORS ENVIRONMENTAL
P O BOX 22
WEYMOUTH, MA 02189

SHIP DATE: 11/15/04

PREPAID-FOB OUR PLAN

B/L NO. 38814

SHIP TO: CLEAN HARBORS ENVIRONMENTAL
609 PLEASANT ST
WEYMOUTH, MA 02189

ITEM	PART NO.	DESCRIPTION	REL	REQ DATE	DUE QTY	SHIP QTY
1	5198504800380	48"OD X .375"NOM ASME F&D (0.313"MIN) X 1.50"SF. SA240-316L 48.0"IDR. 3.0"IKR. WT:271.0 LBS. HEADS ARE COLD FORMED; COMPLY TO UG-79, UCS-79 & UG-81 SECT. VIII DIV.I & WERE NOT HEAT TREATED UNLESS STATED. CERTS ATTACHED TO PACKING LIST.	1	11/15/04	2	2

HEAT: CODE;6MP SLAB:

End of Pack Slip

NORTH AMERICAN STAINLESS

METALLURGICAL TEST REPORT

6870 Highway 42 East
Ghent, KY 41045-9615
(502) 347-6000

Certificate: 229391 01

Customer: 0515 009

Your Order: 26336

Mail To:
METALS INCORPORATED
C/O TSA PROCESSING
1625 W. SAM HOUSTON PKWY. NORTH
HOUSTON, TX 77043

Ship To:
METALS INCORPORATED
C/O TSA PROCESSING
1625 W. SAM HOUSTON PKWY. NORTH
HOUSTON, TX 77043

3/8" x 60" x Coil T316/316L Ht# 43D9

NAS Order: AN 0290477 13

Date: 7/16/2004 Page: 1

Steel: 316/316L

Finish: HRAP

Corrosion: ASTM A262/02aB;180Bend-ok

PRODUCT DESCRIPTION:

STAINLESS STEEL COIL, HOT ROLLED, ANNEALED AND PICKLED.
ASTMA240/03c,480/03b,666/03,ASMESA240/01,SA480/01,SA666/01-02adn
QQS766D-A X MG PERM,AMS5507F/AMS5524K X MRK
NACE MR-01-75, January, 1983

REMARKS:

Material free from mercury contamination. No weld repairs.
* Melted & Manufactured in the USA * EN 10204 3.1.B
ASTM 240/A 240M

Product ID #	Coil #	Thickness	Width	Weight	Length	Mark	Pieces	COMMODITY CODE
0143D9 A	* 0143D9 A	.3750	60.0000	20,040 COIL	260.50	17	1	

CHEMICAL ANALYSIS

Heat	C ✓	CR ✓	CU	MN ✓	MO ✓	N ✓	NI ✓	P ✓	S ✓	SI ✓
43D9	.025	17.078	.367	1.627	2.216	.044	10.252	.029	.003	.332

6MP

MECHANICAL PROPERTIES

Product ID #	Coil #	Loc	Dir	UTS KSI	.2% YS KSI	%ELONG -2"	Hard RB	Tail H Tail
0143D9 A	0143D9	F	T	87.58 ✓	43.32 ✓	45.13 ✓	85.50	87.50

THIS MATERIAL MEETS OR EXCEEDS ASME
SECTION II 01 EDITION, 03 ADDENDA
FOR: SA240 316/316L
APPROVED BY M.J. Cruz DATE 11/9/04

JOY 11.8.04

QC ENGINEER

7/24/2004

ThyssenKrupp Nirosta
Ein Unternehmen der ThyssenKrupp Stainless

ABNAHMEPRUEFZEUGNIS B
INSPECTION CERTIFICATE B
CERTIFICAT DE RECEPTION B
BESCHEINIGUNG 3.1.B
NACH EN 10204

Zeugnis-Nr. / Certificate No. / N° du certificat: 041498932

Datum / Date / Date: 29.06.2004

47794 Krefeld Postfach
THYSSENKRUPP NIROSTA
2275 HALF DAY ROAD, SUITE 160
USA- BANNOCKBURN, IL 60015
USA

Kunden-Nr. / Purchaser No. / Commande n°: THYSSENKRUPP NIROSTA

Bestell-Nr. / Order No. / Commande n°: OC 000017xx - PO L11024

Unser Auftrag Nr. / Our Order No. / Notre commande: 251903

Lieferschein-Nr. / Delivery Note No. / Avis d'expédition N°: 86307770

Bezeichnung des Erzeugnisses / Product / Produit: Blech/Sheet/Tole

Werkstoff-Qualität / Material Quality / Nuance: TYPE 316 / 316 L ✓

Lieferbedingungen / Terms of delivery / Conditions de livraison:
ASTM A 240/A 240M-03c ASME SA 240 A02 ✓
ASTM A 480/A 480M-03b ASME SA 480/SA-480M 01
ASTM A 666
SAE AMS 5507 E
SAE AMS 5524 J

Position Item Poste	Stückzahl Quantity Nombre	Gewicht/Maßeinheit Wert Lbs	Maße/Produkt-Dimensions/Dimensions du produit Inch			Bearbeitungsart Mat. form. Mode de fab.	Schmelzen-Nr. Cast-No. Coulée N°	Los-Nummer Lot/Cast-No. Lot Numéro	Ausführung Finish Fini
1	36	11587	0,2520	x 48,0000	x 95,9843	AOD	482498	398	2A1D

Schmelzen-Nr. Cast-No. Coulée N°	C % ✓	Si % ✓	Mn % ✓	P % ✓	S % ✓	Cr % ✓	Mo % ✓	Ni % ✓	N % ✓	Cu %
✓ 482498	0,022	0,5	1,24	0,028	0,001	16,6	2,01	10,5	0,044	0,21

Proben Nummer Test No. Num.N°	Los-Nummer Lot/Cast-No. Lot-Numéro N°	Rp0,2 Psi	Rp1% Psi	Rm Psi	A5 %	HRB
124 A	398 00	52060	57704	89746	56,5	83,0
124 E	398 00	52194	57849	89746	52,7	83,0

Probenlage zur Wärmebehandlung: QUER

Verwechslungsprüfung (Spektralanalyse)/Test of identity (spectrum analysis)/Contrôle d'identification (analyse spectrale): I.O.
Maße - Oberfläche/Dimensions - Surface/Dimensions - Surface: I.O.
Prüfung auf Interkristallkorrosion/Test of intercrystal corrosion/Test de corrosion intercristalline: EN ISO 3651-2 O.B.

ThyssenKrupp Nirosta GmbH

DIESES ZEUGNIS WURDE VOM RECHNER ERSTELLT WERK KREFELD, ABNAHME

SUTZEN

WERKSSACHVERSTAENDIGER
TEL.02151-833447
FAX.02151-834106

WAERMEBEHANDLUNG / TRAITEMENT THERMIQUE / HEAT - TREATMENT : 1060 GRAD C / LUFT / 1060 GRAD C / AIR / 1060 DEGREE / AIR

YARDE METALS, INC. CERTIFIES THAT THIS IS A TRUE COPY OF THE ORIGINAL MILL TEST REPORT NOW ON FILE.
RECEIVED AND INSPECTED

SEP 09 2004

BY Melissa Gagnier
MELISSA GAGNIER CERTIFICATION PROCESSOR

HEAT CODE "FM"

MATERIAL MEETS OR EXCEEDS ASME
EDITION '01, EDITION '03 ADDEND.
CAR: SA 240 316/316L
APPROVED BY [signature] DATE 11/16/04

05-6-

22UJ012-1 CLEAN HARBORS ENVMTL PO: L T GENERIC Part #: YARDE METALS I

NOTICE OF SHIPMENT

Allegheny Ludlum
An Allegheny Technologies Company

CERTIFICATE OF TEST

AL 6168-11 300

CUST. ORDER NO. & DATE		CUST. CODE	ACCEPTING MILL	SHIPPER NO.	PRODUCT CODE	MILL ORDER NUMBER	DATE SHIPPED
55A4114	01/16/03	889350	NEW CASTLE, IN.	456581	13020102020000	30-013-599	02/28/03

FORMS DISTRIBUTION: SOLD TO → | SHIP TO → | SPEC 2

REPEAT ORDER	DO RATE	PRIORITY	GOV'T. CONTRACT	MAT'L	SHIPPING LOCATION		INVOICE
90753-0 PRIME	25 SEC.			1237	NEW CASTLE	IN	073276

McCarty & Sons, Inc.
Westbrook Industrial Park
Westbrook, Ct. 06498

CARRIER - CLAY TRANSPORT, INC.

GRADE AND SPECIFICATIONS:
ALLEGHENY STAINLESS STEEL TYPE 316-L SHEET C R COILS ANNEALED 2B FIN 3 EDGE (7548-C) (ASME SA240) (AMS 5604) (P-100) (L-100) (K-325) (05/15/01 EXCEPTIONS TO P-100) (ASTM-A-262-02 PR E) (B-40) (02/28/02 EXCEPTIONS TO B-40) (K-325 WITH ADDENDUM) (P-100) (08/01/00 EXCEPT. TO K325) (07/02/93 EXCEPTIONS TO P-100) (06/12/98 EXCEPTS. TO 7548-C) (ASME-SA-240-A02) (ASTM-A-240-02) -- DUAL CERTIFICATION TS16/316L

ITEM	PCS	DIMENSIONS W/G/L	HEAT #	COIL #	TEST #	GROSS	TARE	NET	THRU	TAG # / ID SKID #
001M	1	48./.120/1050+LF	811418	0102SH320	7696745	19900		19700		926126
VENDOR #303000										
C CUST IDENTITY 744017										
1 COIL						19900		19700		

DIST: MAIL ORIGINAL INVOICE TO SOLD-TO "ATTN: ACCOUNTS PAYABLE"

TYPE HEAT/TEST

HEAT	C	MN	P	S	SI	CR	NI	MO	CU	N
811418	.016 ✓	1.86 ✓	.029 ✓	.0002 ✓	.40 ✓	16.42 ✓	10.15 ✓	2.10 ✓	.42	.05 ✓

ITEM TEST NO

	YIELD PSI *	TENSILE PSI	% ELONG IN 2"	% R/A	HARDNESS	BEND	CORROSION A 262 PR E	GRAIN SIZE	HARDENABILITY
0010 7696745	T 41600. ✓	86500. ✓	53. ✓	NR	82.HRB 83.HR3	T PASS	PASS	NR	NR

* Y.S. BY 0.2% OFFSET METHOD

ITEM TEST NO
0010 7696745

MELT SOURCE
1.

NR = DATA NOT REQUIRED

THIS MATERIAL MEETS OR EXCEEDS ASME
SECTION II '01, EDITION, '03 ADDENDA
FOR: SA240 316L
APPROVED BY AAF. Maint DATE 1/11/05

02/28/03 11:42:43

CONSIGNEE—Please Note—This consignment was turned over to carrier in first class condition, being correctly loaded, at which time our responsibility for loss or damage in shipment ceased. For your protection please examine shipment as it arrives. If any shortage or damage is discovered, have a full description made by transportation agent on waybill before signing.

WARNING
Material Safety Data Sheets for this product have been supplied to your Purchasing Department. For an additional copy phone 724-845-0679. CAUTION: Processing that makes fumes, dust, or solutions may cause lung disease. See Material Safety Data Sheets for further information.

Les fiches d'information—sécurité de ce produit ont été fournies à votre département chargé des achats. Pour obtenir des exemplaires supplémentaires veuillez téléphoner au numéro suivant 724-845-0679 Attention: les traitements entraînant la production de vapeurs, poussières, ou solutions peuvent, être cause de maladies pulmonaires. Pour plus de renseignements se référer aux fiches d'information-sécurité

The above is a true copy of data on file. The material and test results conform to the sales contract and specification(s) as set forth in Allegheny Ludlum's Order Acknowledgement.

CM Napoli

1

VIRAJ IMPOEXPO LIMITED

F/QAD/08

10 IMPERIAL CHAMBERS, 1ST FLOOR,
WILSON ROAD, BALLARD ESTATE,
MUMBAI 400038, INDIA

MILL'S CERTIFICATE

CUSTOMER :
Yarde Metals, Inc.
45 Newell Street
Southington, CT 06489

ORDER NO. L08769

PACKING LIST NO. IMP/12076

INSPECTION NO IMP/12076/9

DATE 29/08/2003

BUNDLE NO. 164036,164040,164046,164047,164070

GRADE T-316/316L ✓

DESCRIPTION :
STAINLESS STEEL ANGLE BARS

HOT ROLLED ANNEALED & PICKLED

SIZE (INC)	SHAPE	TOLERANCE	LENGTH (INC)	PIECES	WEIGHT (LBS)
4" X 4" X 3/8" ✓	ANGLE	ASTM A484	20' - 22'	23	4752

CHEMICAL ANALYSIS

HEAT NO 64108 ✓

C	Mn	Si	S	P	Ni	Cr	Mo	Cu	N
0.022 ✓	1.61 ✓	0.49 ✓	0.015 ✓	0.038 ✓	10.14 ✓	16.71 ✓	2.13 ✓	0.44	0.072 ✓

TEST RESULT

.2% YIELD STRENGTH KSI	TENSILE STRENGTH KSI	ELONGATION %	REDUCTION OF AREA %	HARDNESS BHN	GRAIN SIZE
42 ✓	90 ✓	48 ✓	60	184	8

Specification :
MATERIAL CONFORMS TO ASTM A276-02a COND. A, ASTM-A182-01 COND.A, ASME-SA182-01 COND. A, ASTM-A479/A479M-01 COND. A, ASME-SA479/479M-00, COND. A, QQS-763-JUNE'98,COND A, ASTM-A484/A484M-00, TABLE-12, AMS-5648-96/AMS-5653-96, UNS-S-31600/UNS-S-31603, MATERIAL PASSES IGC TEST AS PER ASTM A262-98, PRACTICE "E". GRAIN SIZE AS PER ASTM E112-96 e1

Remarks :
MATERIAL IS FREE FROM MERCURY CONTAMINATION, WELDING & WELD REPAIRS. MACRO - SATISFACTORY. MICROSTRUCTURE - AUSTENITIC COLOUR CODE - WHITE. SOLUTION ANNEALING TEMP: 1050C. TREATED FOR 45 MINUTES & WATER QUENCHED.

We hereby certified that the material described above has been tested and complies with the terms of order/contract.

WORKS INSPECTOR

YARDE METALS, INC. CERTIFIED THAT THIS IS A TRUE COPY OF THE ORIGINAL MILL TEST REPORT NOW ON FILE. RECEIVED AND INSPECTED

OCT 28 2004

BY Melissa Gagnier
MELISSA GAGNIER CERTIFICATION PROCESSOR

HEAT CODE "FP"

THIS MATERIAL MEETS OR EXCEEDS ASME
SECTION II '01, EDITION, '03 ADDENDA
FOR: SA-479 316L
APPROVED BY: [signature] DATE 11/9/04

16-04

22UJ013-1 CLEAN HARBORS ENVMTL PO: L T GENERIC Part #: YARDE METALS Inc

HEADQUARTERS:
1001 EAST WATERFRONT DR.
MUNHALL, PA 15120
PHONE (412) 462-2185
FAX (412) 462-4160

HEAT CODE "FR"

CERTIFICATE OF TEST

MILL ORDER NO.	206521-01
PURCHASE ORDER NO.	WEBB31804 102 9776
DATE SHIPPED	04/06/2004

SOLD TO: MCCARTER ALLOYS, 128 RED LION ROAD, VINCENTOWN, NJ 08088

SHIP TO: SAME

SPECIFICATIONS: ASTM A312-03 AND ASME SA312-98 EDITION/99 ADDENDA WELDED

OTHER SPECIFICATIONS: WE CERTIFY THAT THIS MATERIAL IS FREE FROM MERCURY CONTAMINATION & CONTINUOUS CARBIDE NETWORK DURING ITS MANUFACTURE AND PROCESSING, BRIGHT ANNEALED

FLAR	HYDRO	FLAT	FLAN	EDDY	RBND	RFLT
OK		OK		OK		

ADDITIONAL INFO.
TAG: WEBB31804

ITEM	TYPE	O.D./W.S.	GA./SCH.	HEAT NO.	CARBON	MANG.	PHOS.	SULPHUR	SILICON	CHROMIUM	NICKEL	MOLY.	COPPER	COBALT	TI
01	TP316/TP316L	1-1/2"	10	221103	.022	1.41	.028	.010	.47	17.15	10.18	2.06	.26	.43	
03	TP316/TP316L	1/2"	40	421083	.023	1.38	.027	.016	.50	17.16	10.19	2.08	.28	.14	
04	TP316/TP316L	1"	40	330220	✓.024	✓1.40	✓.026	.009 ✓	.48 ✓	17.21 ✓	10.16 ✓	2.09 ✓	.30	.46	
07	TP304/TP304L	2-1/2"	10	816051	✓.021	✓1.49	✓.033	.013 ✓	.56 ✓	18.34 ✓	8.44 ✓	.54 ✓	.46	.29	

ITEM	ROCKWELL HARDNESS	YIELD STRENGTH (PSI)	TENSILE STRENGTH (PSI)	ELONGATION	HYDRO PSI (IF APPLICABLE)	MELT SOURCE (IF APPLICABLE)	PIECES	FOOTAGE
01	B81	50,200	90,900	59%		D	72	1522'
03	B80	50,400	90,500	60%		D	96	1020'
04 ✓	B80	49,800 ✓	89,800 ✓	59% ✓		D	48	1038'
07	B80	50,200	90,800	61%		D	16	336'

THIS MATERIAL MEETS OR EXCEEDS ASME
SECTION II '01, EDITION, '03 ADDENDA
FOR: SA312 TP316L/316
APPROVED BY [signature] DATE 1/7/05

WE CERTIFY THAT THE CHEMICAL, PHYSICAL OR MECHANICAL TESTS REPORTED HEREIN ARE CORRECT AS SHOWN ON OUR RECORDS.

Chris J. [illegible]nik
Q.C. MANAGER

3970-B (Rev.

CERTIFIED MATERIAL REPORT

HEAT CODE "FQ"

CMTR SEARCH RESULTS - ICMTR.COM
Heat# 430482

REPORT DATE: 1/4/2005

FELKER BROS. CORP.

FELKER BROTHERS CORPORATION
22 NORTH CHESTNUT AVE
MARSHFIELD, WI. USA
54449
(800) 826-2304

CUSTOMER NAME:

CERTIFIED DATE: 12/18/2003

PRODUCT

PART DESCRIPTION	PIPE A312-316L 2 SCH40S
PRIMARY SPECIFICATION	ASTM A312 03
GRADE	316/316L
OTHER SPECIFICATIONS	ASME SA312 03 NACE MR0175

CHEMICAL COMPOSITION

	Test A
CARBON	0.023 ✓
CHROMIUM	17.380 ✓
COPPER	0.260
MANGANESE	1.400 ✓
MOLYBDENUM	2.120 ✓
NICKEL	10.190 ✓
NITROGEN	0.030
PHOSPHORUS	0.028 ✓
SILCON	0.500 ✓
SULFUR	0.012 ✓

MECHANICAL PROPERTIES

ELONGATION-TRANS	2 IN	56 ✓
HARDNESS TEST	RB	78
TENSILE STRENGTH	PSI	85200 ✓
YIELD STRENGTH	PSI	43200 ✓

MANUFACTURER STEPS

BEND/REVERSE BEND TEST		PASS
CORROSION TEST		PASS
DIMENSIONAL/VISUAL		PASS
EDDY CURRENT - WELD		PASS
ETCHING TEST		PASS
HYDROSTATIC PRESSURE TEST	PSI	01900
PICKLING/PASSIVATION		YES

COMMENTS

316/316L DUAL CERTIFICATION
DIN 50049 3.1.b / EN 10204 3.1.b
FELKER BROTHERS CORP DOES NOT USE MERCURY IN THE PRODUCTION NCR THE TESTING OF ITS PRODUCTS.
SOLUTION ANNEALED AT 1900 F

CERTIFICATION

IT IS CERTIFIED THAT ALL FIGURES ARE CORRECT AS CONTAINED IN THE RECORDS OF THE COMPANY.

SCOTT MARTINEK
QUALITY MANAGER

THIS MATERIAL MEETS OR EXCEEDS ASME
SECTION II '01, EDITION, '03 ADDENDA
FOR: SA312, TP 316L/316
APPROVED BY AMF MWNT DATE 1/7/05

10/26/2004 From:MARMON/KEYSTONE
M/K OR:80
C P.O.:61-646099
INIT. :PJL
To: CLEAN HARBOR / GEN. WELDING
BR OR :85-07444

MEETS OR EXCEEDS ASME
SEC. VIII '01, EDITION, '03 ADDEND.
FOR: SA312 TP316L/316
APPROVED BY: [signature] DATE 11/16/04

HEAT CODE
"FN"

CERTIFICATE NO.A4M4-147 | NO. MD00/2862/0001/4 | CERTIFICATE SH09697

MILL INSPECTION CERTIFICATE

CHANGSHU WALSIN SPECIALTY STEEL CO.,LTD
(TO EN 10204. 3.1.B)

TÜV CERT EN ISO9001 NO. 09 100 81166 | TÜV European Directive 97/23/EC NO. 01 202 CHI/Q-02 0021 | TÜV AD 2000-Merkblatt NO. 01 202 CHI/Q-02 0021

CUSTOMER: MARMON/KEYSTONE CORPORATION
WLSN [illegible]6/03

COMMODITY: STAINLESS STEEL SEAMLESS PIPE

HEAT NO.: 2A523
CONDITION:COLD FINISHED, ANNEALED, PICKLED, PLAIN END
CERTIFICATE NO.: 200406023934019
GRADE: TP316/316L

CHEMICAL COMPOSITION (WT%)

ELEMENTS		C	Si	Mn	P	S	Ni	Cr	Mo	N	Cu	Ti	Cb+Ta	Co	Al	V	B		
SPECIFICATION	min						10	16	2										
	max	0. 035	1	2	0.045	0.03	14	18	3										
RESULTS (LADLE)		0.020	0.34	1.34	0.021	0.002	12.11	17.23	2.14										
RESULTS(PRODUCT)		0.019	0.33	1.39	0.024	0.002	12.18	17.25	2.11										

SIZE OD(") ×WT(")	CASE NO.	PIECES	WEIGHT FT	WEIGHT (kg)	TS KSI (MPa)	YS 0.002 KSI (MPa)	YS 0.01 MPa	EL %	HANDNESS HRB	FLATTENING TEST	FLARING TEST	I.C. TEST	GRAIN SIZE	HYDROSTATIC TEST	EDDY CURRENT TEST	ULTRASONIC TEST
8*SCH40	31-27#	3	60	793	81(555)	38(260)	/	60	/	GOOD	/	GOOD	/	/	/	GOOD
8*SCH40	31-28#	2	41	562	81(555)	38(260)	/	60	/	GOOD	/	GOOD	/	/	/	GOOD
TOTAL:		5	101	1355												

REMARK:
AS PER ASTM A312-02/ASME SA312-02
ALL ABOVE MATERIAL
ARE FREE FROM MERCURY CONTAMINATION
AEL ABOVE MATERIAL WAS PRODUCED IN CHINA
I.C. TEST PER MILP 24691/3
LENGTH : .17-24FT
P.O.:80-7014

1.WE HEREBY CERTIFY THAT THE [illegible] DESCRIBED HEREIN BEEN MADE IN ACCORDANCE WITH THE RESULTS OF THE CONTRACT, AND CONFORM TO THE [illegible] ABOVE.

2.THE CERTIFICATE SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN APPROVAL OF THE COMPANY.

Huazian Wang
DIRECTOR · TECHNOLOGY

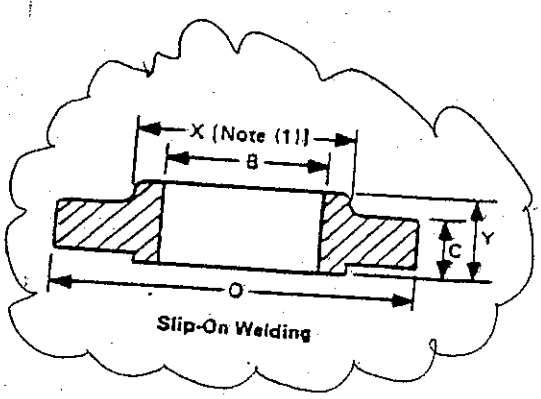
Q.C. REVIEWED 7/12/04 PJL

WLCS-QP-T24-06

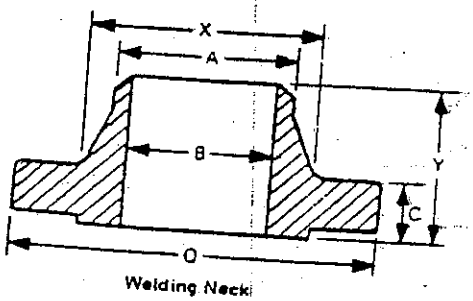
CleanHarbors®
ENVIRONMENTAL SERVICES, INC.

RECEIVING INSPECTION REPORT

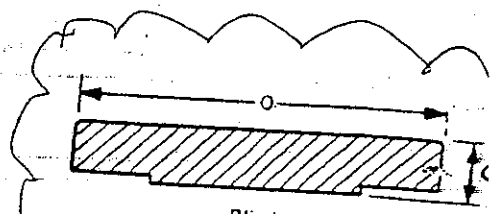
JOB #GW6726 PURCHASE ORDER # 1538 ITEM # 1 & 2 DATE 11-16-04



Slip-On Welding



Welding Neck



Blind

Not used

Item	Spec	Type	Heat #	NPS	CLASS	B	A	O	X	C	Y	ACC	REJ
~~1~~	~~SA182~~	~~Slip-On~~	~~458~~	~~8"~~	~~150#~~	~~8 3/4"~~	—	~~13 1/2"~~	—	~~1.162"~~	~~1.770"~~	✓	
2	SA182	BLIND	G3J2	8"	150#	—	—	13 1/2"	—	1.178"	—	✓	

COMMENTS: MATERIAL: DUAL GRADE 316L/316

THESE ITEMS ARE STANDARD PRESSURE PARTS

NONCONFORMANCES

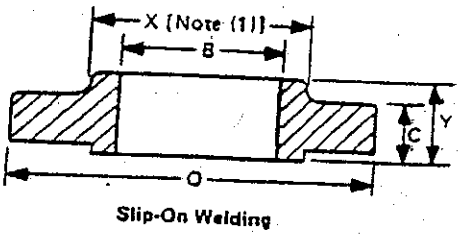
QC Inspector [signature] 11/16/04

CleanHarbors®
ENVIRONMENTAL SERVICES, INC.

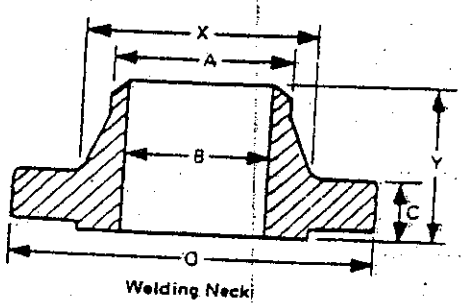
COPY

RECEIVING INSPECTION REPORT

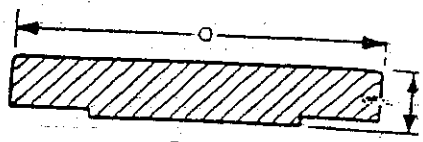
JOB #GW6726 PURCHASE ORDER # 1631 ITEM #4 & 5 DATE 1/5/05



Slip-On Welding



Welding Neck



Blind

Item	Spec	Type	Heat #	NPS	CLASS	B	A	O	X	C	Y	ACC	REJ
4A	SA182	BLIND	HAJS	2"	150#	–	–	6 1/16"	–	.0752"	–	✓	
4B	SA182	BLIND	HAJS	2"	150#	–	–	6 1/16"	–	.0754"	–	✓	
4C	SA182	BLIND	HAJS	2"	150#	–	–	6 1/16"	–	.0755"	–	✓	
4D	SA182	BLIND	HAJS	2"	150#	–	–	6 1/16"	–	.0753"	–	✓	
5A	SA182	BLIND	1N8	1"	150#	–	–	4 5/16"	–	.0505"	–	✓	
5B	SA182	BLIND	1N8	1"	150#	–	–	4 5/16"	–	.0526"	–	✓	

COMMENTS: MATERIAL: DUAL GRADE 316L/316 STAINLESS
THESE ITEMS ARE STANDARD PRESSURE PARTS
ALL BLIND FLANGES

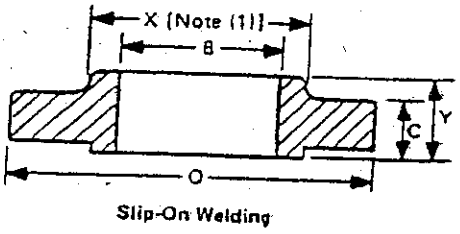
NONCONFORMANCES

QC Inspector [signature] 1/5/05

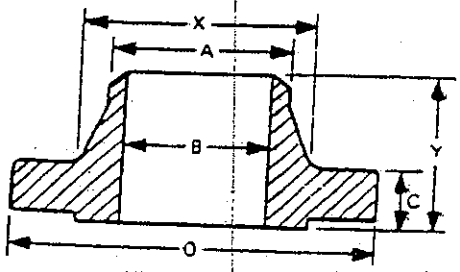
CleanHarbors®
ENVIRONMENTAL SERVICES, INC.

RECEIVING INSPECTION REPORT

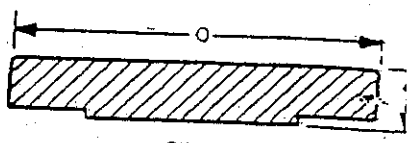
JOB #GW6726 PURCHASE ORDER # 1631 ITEM #1,2,&3 DATE 1/5/05



Slip-On Welding



Welding Neck



Blind

Item	Spec	Type	Heat #	NPS	CLASS	B	A	O	X	C	Y	ACC	REJ
1	SA182	WELDNECK	H7474	8"	150#	8"	–	13 9/16"	–	1 1/8"	4"	✓	
2A	SA182	WELDNECK	EA0891	2"	150#	2.073"	–	6"	–	0.711"	2 5/8"	✓	
2B	SA182	WELDNECK	61770	2"	150#	2.049"	–	6 1/16"	–	0.726"	2 1/4"	✓	
2C	SA182	WELDNECK	EA0891	2"	150#	2.055"	–	6 1/16"	–	0.717"	2 1/2"	✓	
2D	SA182	WELDNECK	61770	2"	150#	2.041"	–	6 1/16"	–	0.725"	2 1/4"	✓	
3A	SA182	WELDNECK	A67600	1"	150#	1.044"	–	4 5/16"	–	0.532"	2"	✓	
3B	SA182	WELDNECK	A67600	1"	150#	1.041"	–	4 5/16"	–	0.514"	2"	✓	

COMMENTS: ALL WELDNECK FLANGES, DUPLEX GRADE F316/316L

THESE ITEMS ARE STANDARD PRESSURE PARTS

NONCONFORMANCES

QC Inspector [signature] 1/5/05

VII

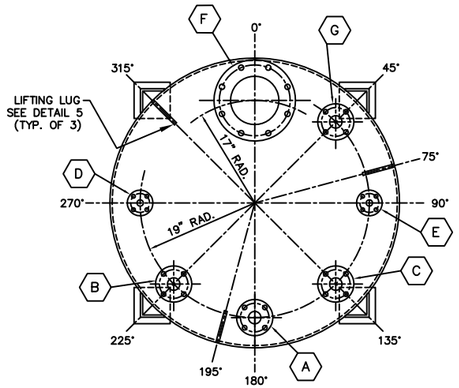
DRAWINGS

LIST OF MATERIAL

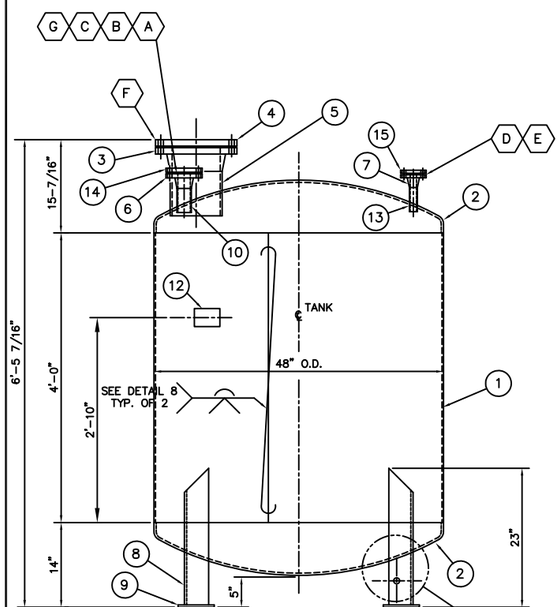
ITEM NO.	QTY. REQ'D.	DESCRIPTION	MATERIAL SPEC.	MAT'L.	REMARKS	HEAT NO. OR SERIAL NO.
1	1	SHELL PLATE – 1/4" x 48" x 12'–6"	SA 240	316L S.S.	ROLL TO 48" O.D.	482498
2	2	48" O.D. x 3/8" THK. NOM. ASME F & D HEAD	SA 240	316L S.S.		6MP
3	1	8"–150# WELDING NECK FLANGE, R.F.	SA 182	F316L S.S.		H7474
4	1	8"–150# BLIND FLANGE, R.F.	SA 182	F316L S.S.		G3J2
5	1	8" SCH. 40 PIPE, SMLS x 7–3/8" LONG	SA 312	316L S.S.		2A523
6	4	2"–150# WELDING NECK FLANGE, R.F.	SA 182	F316L S.S.		E40891 & 61770
7	2	1"–150# WELDING NECK FLANGE, R.F.	SA 182	F316L S.S.		A67600
8	8 FT.	4" x 4" x 3/8" THICK ANGLE (CUT TO SUIT)	SA 479	316L S.S.		64108
9	4	6" x 6" x 3/8" THICK PLATE	SA 240	304L S.S.		209920
10	2 FT.	2" SCH. 40 PIPE, SMLS	SA 312	316L S.S.	CUT TO SUIT NOZZLE	430482
11	3	LIFTING LUGS 1/2" THICK PLATE	SA 240	316L S.S.		BJ20
12	1	11 GAUGE x 4" x 6" NAME PLATE BRACKET	SA 240	316L S.S.		811418
13	1 FT.	1" SCH. 40 PIPE, SMLS	SA 312	316L S.S.	CUT TO SUIT NOZZLE	330220
14	4	2"–150# BLIND FLANGE, R.F.	SA 182	F316L S.S.		HAJS
15	2	1"–150# BLIND FLANGE, R.F.	SA 182	F316L S.S.		1N8

NOZZLE SCHEDULE

MARK	SIZE	SERVICE	LOCATION
A	2"	VENT	TOP HEAD
B	2"	REAGENT	TOP HEAD
C	2"	PRODUCT	TOP HEAD
D	1"	WASTE IN	TOP HEAD
E	1"	NITROGEN PURGE	TOP HEAD
F	8"	SITE GLASS	TOP HEAD
G	2"	WET SCRUBBER	TOP HEAD

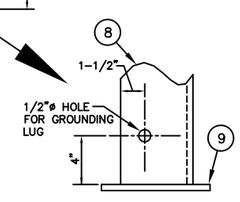


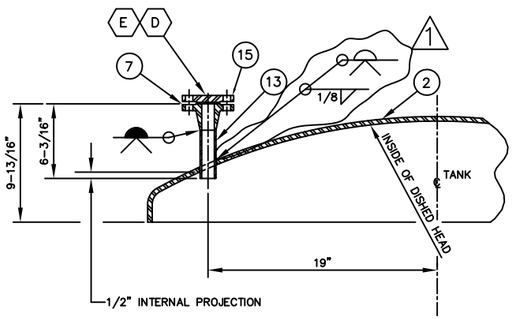
PLAN



ELEVATION

SEE PLAN FOR NOZZLE ORIENTATION

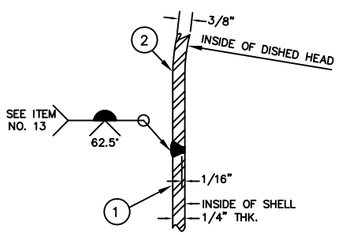




ELEVATION

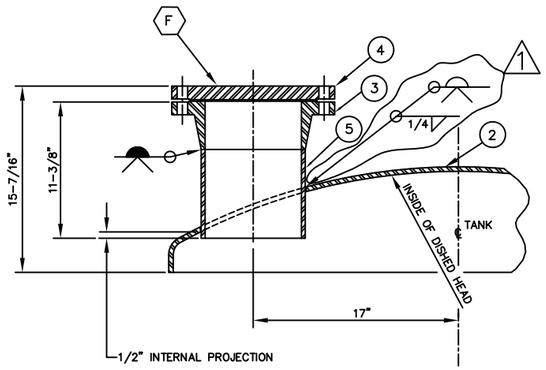
DETAIL 3

1" WASTE IN NOZZLE (D) TO TOP HEAD
1" NITROGEN PURGE NOZZLE (E) TO TOP HEAD
SCALE: 2"=1'–0"



DETAIL 7

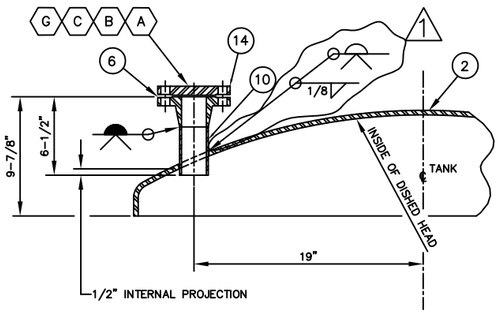
WELDING OF SHELL TO TOP & BOTTOM HEADS
SCALE: NONE



ELEVATION

DETAIL 1

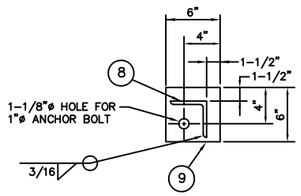
8" SITE GLASS NOZZLE (F) TO TOP HEAD
SCALE: 2"=1'–0"



ELEVATION

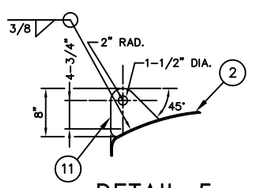
DETAIL 2

2" VENT NOZZLE (A) TO TOP HEAD
2" REAGENT NOZZLE (B) TO TOP HEAD
2" PRODUCT NOZZLE (C) TO TOP HEAD
2" WET SCRUBBER NOZZLE (G) TO TOP HEAD
SCALE: 2"=1'–0"



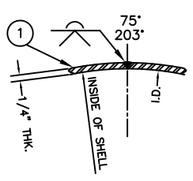
DETAIL 4

LEG & BASE PLAN DETAIL (TYP. OF 4)
SCALE: 1–1/2"=1'–0"



DETAIL 5

LIFTING LUG (TYP. OF 3)
SCALE: 1" = 1'–0"



DETAIL 8

LONGITUDINAL SEAM ON SHELL
SCALE: NONE

GENERAL NOTES:

1. THIS DRAWING IS DEVELOPED FOR FABRICATION OF VESSEL SHOWN. BUILT IN ACCORDANCE WITH ASME SECTION VIII, 2001 EDITION WITH 2003 ADDENDUM.
2. COMPLETED VESSEL SHALL BE CLEANED OF ALL WELD SPLATTER, SLAG, SCRATCHES, GREASE, OIL AND DIRT. INSIDE NOZZLE EDGES TO BE CHAMFERED 1/16" MIN. OR ROUNDED 1/8" MIN. RADIUS AS REQUIRED. TOLERANCES TO BE 1/8".
3. ALL WELDING SHALL BE ACCOMPLISHED BY WELDERS CERTIFIED TO ASME PRESSURE VESSEL CODE, SECTION IX. THE ACTUAL WELDERS/ PROCEDURES USED SHALL BE IDENTIFIED ON THE SPECIAL WELDING SEQUENCE.
4. ALL NOZZLE FLANGES ARE TO BE INSTALLED WITH BOLT HOLES POSITIONED TO STRADDLE MAJOR CENTERLINES.
5. DIMENSIONAL LOCATIONS FOR ALL NOZZLES ARE TO CENTERLINE AND FACE OF FLANGES.
6. ALL GASKETS TO BE 1/8" THICK PTFE.
7. VESSEL DESIGNED FOR LETHAL SERVICE (UW–2).

DESIGN SPECIFICATIONS

DESIGN PRESSURE	100 psig @ –20°F TO 200°F
HYDRO TEST PRESSURE	130 psi
MINIMUM DESIGN METAL TEMPERATURE	–20°F
VESSEL SERIAL NO.	GW6726
NATIONAL BOARD NO.	11
YEAR BUILT	2005
NOMINAL CAPACITY	400 gal.
CORROSION ALLOWANCE	NONE
RADIOGRAPH	FULL

DETAIL 6

TANK NAME PLATE
SCALE: 1"=1"

For most recent sealed version please see Section V.C.ii.

ISSUE	DESCRIPTION	DRWN.	CHKD.	APPR.	DATE
1	REVISED WELD SYMBOLS & REACTOR TAG	K.M.C.	A.F.M.	A.F.M.	4/8/05
0	ISSUED FOR CONSTRUCTION	K.M.C.	A.F.M.	A.F.M.	3/3/05

CleanHarbors
ENVIRONMENTAL SERVICES
REMEDIATION AND ENVIRONMENTAL CONSTRUCTION
1501 Washington Street
Braintree, Massachusetts 02185
Telephone (781) 849–1800

JOB NO. – GW–6726

APPROVED – QC MANAGER

ACCEPTED – AUTHORIZED INSPECTOR

TITLE

CHES HIGH HAZ GROUP
LaPORTE, TEXAS

CHEMICAL TREATMENT REACTOR LAYOUT & DETAILS

1 / R–1A

PROJECT NO.	DRAWING NO.
GW–6726	6726–M–01
SCALE 1" = 1'–0"	

Exhibit V.C-2 Sample Chemical Reaction Equations

Process Unit Chemical Reaction Equations:

1. Hydrogen Chloride, anhydrous

   1.1 lbs. Anhydrous Hydrogen Chloride/per pound Sodium Hydroxide will yield Sodium Chloride and water.

   HCL + NaOH------NaCl + H20

2. Hydrogen Bromide

   2.02 lbs. Anhydrous Hydrogen Bromide/per pound Sodium Hydroxide will yield Sodium Bromide and water.

   HBr + NaOH------NaBr + H2O

3. Hydrogen Iodide

   1.1 lbs. Anhydrous Hydrogen Iodide/per pound Sodium Hydroxide will yield Sodium Iodide and water.

   HI + NaOH-------NaI + H20

4. Boron Trichloride

   1.7 lbs. Boron Trichloride/per pound Sodium Hydroxide will yield Sodium Borates and Sodium Chloride.

   BCl3 + 3H2O-----H2BO3 + 3HCl
   H2BO3 + 3HCl + 5NaOH------NaBO2 * 4H2O or NaCl

5. Boron Trifluoride

   0.61 lbs. Boron Trifluoride/per pound Calcium Hydroxide will yield Calcium Fluoride and Boric Oxide.

   2BF3 + 3Ca[OH]2---------3CaF2 + 2H2O

6. Chlorine

   1.13 lbs. Chlorine/per pound Sodium Hydroxide will yield Sodium Hypochlorite and Sodium Chloride.

   Cl2 + 2NaOH------NaOCl + NaCl+H2O

7. Sulfur Dioxide

   1.17 lbs. Sulfur Dioxide/per pound Sodium Hydroxide will yield Sodium Sulfite and water.

   SO2 + H20-----H2S03
   H2SO3 + NaOH-----NaSO3 + H2O

8. Carbon Dioxide

   2.23 lbs. Carbon Dioxide/per pound Sodium Hydroxide will yield Sodium Carbonate and water.

$CO2 + 2NaOH \text{----------} Na2CO3 + H2O$

9. Sulfur Tetrafluoride

   0.41 lbs. Sulfur Tetrafluoride/per pound Sodium Hydroxide will yield Sodium Fluoride, Sodium Sulfite and water.

   $SF4 + 6NaOH \text{----------} 4NaF + Na2SO3 + 3H2O$

10. Anhydrous Ammonia

    0.087 lbs. Anhydrous Ammonia/per pound Sulfuric Acid ($25\%_{wt}$ aqueous sol'n) will yield Ammonium Sulfate (aqueous).

    $2(NH_3) + H_2SO_4\,(aq) \text{----------} (NH_4)_2SO_4\,(aq)$

11. Arsine (D001,D004)

    Arsine and Potassium Permanganate will yield Manganese Oxide and Potassium Arsenate.

    $AsH3 + 2KMnO4 \text{----------} MnO2 + K3AsO4 + H2O$

12. Hydrogen Selenide, anhydrous (D001,D010)

    Hydrogen Selenide and Sodium Hydroxide in excess 10% Sodium Hypochlorite will yield Sodium Selenate, Sodium Chloride and water.

    $H2Se + 2NaOH + 4NaOCl \text{----------} Na2SeO4 + 4NaCl + 2H20$

13. Diborane, compressed (D001)

    Diborane and Potassium Permanganate will yield Manganese Oxides, potassium metaborate and water.

    $B2H6 + KMnO4 \text{----------} MnO2 + K2B2O4 + H2O$

14. Germane (D001)

    Germane and Potassium Permanganate will yield Manganese Oxides and potassium Germanates.

    $2GeH4 + 2KMnO4 \text{----------} MnO2 + K2Ge2\ (O2,O3\ \&\ O9) + 2H2O$

15. Phosphine (P096)

    Phosphine and Potassium Permanganate will yield Manganese Oxides, Potassium Phosphites or Phosphates

    $PH3 + 2KMnO4 \text{----------} MnO2 + (K2HPO4, KH2PO4, K3PO4, KH2PO4) + H2O$

Cyanide Bearing Gases:

16. Cyanogen Chloride, Stabilized (P033)

Cyanogen Chloride and Sodium Hydroxide will yield Sodium Cyanate, Sodium Chloride and water.

ClCN + 2 NaOH----------NaOCN + NaCl + H2O

17. Cyanogen (P031)

Cyanogen and Sodium Hydroxide in excess 10% Sodium Hypochlorite will yield Sodium Cyanate, Sodium Chloride and water.

C2N2 + 2NaOH + 2NaOCl----------2NaOCN + 2NaCl + H2O

18. Hydrogen Cyanide, Stabilized (P063)

Hydrogen Cyanide and Sodium Hydroxide in excess 10% Sodium Hypochlorite will yield Sodium Cyanate, Sodium Chloride and water.

HCN + NaOH +NaOCl----------NaOCN + NaCl + H2O

"*Non-Oxidizers / Non-Flammable"*

19. Hydrogen Fluoride, Anhydrous (U134)

Hydrogen Fluoride and Calcium Hydroxide will yield Calcium Fluoride and water.

2HF + Ca{OH}2----------CaF2 + 2H2O

20. Tungsten Hexafluoride (D003, D002)

Tungsten Hexafluoride and Calcium Hydroxide will yield Calcium Fluoride and Tungsten Oxides.

WF6 + Ca{OH}----------3CaF2 + WO2

21. Carbonyl Chloride (P095)

Carbonyl Chloride and Sodium Hydroxide will yield Sodium Bicarbonate, Sodium Chloride and Water.

COCl2 + 3NaOH----------NaHCO3 + 2NaCl + H2O

22. Carbonyl Fluoride, Compressed (U033)

Carbonyl Fluoride and Sodium Hydroxide will yield Sodium Fluoride and Sodium Bicarbonate.

COF2 + 3NaOH----------2NaF + NaHCO3

23. Silicone Tetrachloride (D002, D003)

Silicone Tetrachloride and Sodium Hydroxide will yield Silicon Dioxide, Sodium Chloride and

Water.

SiCl4 + 4NaOH----------SiH2O + 4NaCl + 2H2O

24. Nitrosyl Fluoride (D002,D003)

Nitrosyl Fluoride and Sodium Hydroxide will yield Sodium Fluoride, Sodium Nitrite and Water.

NOF + 2NaOH----------NaF + NaNO2 + H2O

25. Nitrosyl Chloride (D002,D003)

Nitrosyl Chloride and Sodium Hydroxide will yield Sodium Chloride, Sodium Nitrite and Water.

NOF + 2NaOH----------NaCl + NaNO2 + H2O

26. Dinitrogen Tetroxide (P078)

Dinitrogen Tetroxide and Sodium Hydroxide will yield Sodium Nitrate, Sodium Nitrite and Water.

N2O4 + 2NaOH----------NaNO2 + NaNO3 + H2O

27. Nitric Oxide, Compressed (P076)

Nitric Oxide and Potassium Permanganate will yield Potassium Nitrate and Manganese Oxide

NO + KMnO4----------KNO3 + MnO2

28. Perchloryl Fluoride (D001)

Perchloryl Fluoride and Sodium Hydroxide will yield Sodium Fluoride, Sodium Perchlorate and Water.

ClO3F + 2NaOH----------NaF + NaClO4 + H20

29. Fluorine, Compressed (P056)

Fluorine and Activated Alumina & Calcium Hydroxide will yield Aluminum Fluoride, Oxygen, Calcium Fluoride and Water.

Stage 1: 3F2 + Al2O3 ‘monobasic’----------2AlF3 ‘Aluminum Fluoride’ + O3
Stage 2: F2 + Ca(OH2) ‘Calcium Hydroxide’-------CaF2 ‘Calcium Fluoride’ + H2O

30. Oxygen Difluoride (D001, D003)

Oxygen Difluoride and Activated Alumina & Calcium Hydroxide will yield Aluminum Fluoride, Oxygen, Calcium Fluoride and Water

Stage 1: 3OF2 + Al2O3 ‘monobasic’----------2AlF3 ‘Aluminum Fluoride’ + 3O2
Stage 2: F2 + Ca(OH2) ‘Calcium Hydroxide’-------CaF2 ‘Calcium Fluoride’ + H2O

31. Tetrafluorohydrazine, Compressed Gas (D001)

Tetrafluorohydrazine and Activated Alumina and Sodium Hydroxide will yield Aluminum Fluoride, Sodium Nitrate / Nitrite and water.

Stage 1: $N_2F_4 + Al_2O_3$ 'monobasic' → $2AlF_2$ 'Aluminum Fluoride' + N_2O_3
Stage 2: $N_2O_3 + 2NaOH \rightarrow 2NaNO_2 + H_2O$

32. Ethylene Oxide (U115)

Ethylene Oxide reacts with water to form polyglycols.

$C_2H_4O + H_2O$----------$H(OCH_2CH_2)OH$

33. Hydrogen Sulfide (U135)

Hydrogen Sulfide and Sodium Hydroxide and Sodium Hypochlorite will yield Sodium Sulfate, Sodium Chloride and Water.

$H_2S + 2NaOH + 4NaOCl$----------$Na_2SO_4 + 4NaCl + 2H_2O$

34. Carbonyl Sulfide (D001)

Carbonyl Sulfide in excess Sodium Hydroxide and Water will yield Sodium Formates, Sodium Sulfites and Water.

COS + NaOH----------Na_2 SO_3, $NaHCO_2$, $NaSO_4$, H_2O

35. Carbon Monoxide, Compressed (D001)

Carbon Monoxide and Sodium Hydroxide will yield Sodium Formate and other Formate Salts.

CO + NaOH----------HCOONa

36. Dichlorosilane (D001,D003)

Dichlorosilane and Sodium Hydroxide will yield Silicone Dioxide, Sodium Chloride and Water.

$SiH_2Cl_2 + 2NaOH$----------$SiH_2O + 2NaCl + H_2O$
$SiH_2O + O_2$----------$SiO_2 + H_20$

37. Trichlorosilane (D001,D003)

Trichlorosilane and Sodium Hydroxide will yield Silicone Dioxide, Sodium Chloride and Water.

$SiHCl_3 + 3NaOH$----------$SiH_2O + 3NaCl + H_2O$
$SiH_2O + O_2$---------$SiO_2 + H_20$

38. Hexafluoroacetone (NR)

Hexafluoroacetone & Water will yield Hexafluoroacetone sesquihydrate
Hexafluoroacetone sesquihydrate & Sodium Hydroxide will yield Sodium Fluoride, Sodium Formate and water.

$C_3F_6O + 6H_2O + 9NaOH \rightarrow 6NaF + 3HCOONa + 6H_2O$

39. Sulfur Hexafluoride (NR)

Sulfur Hexafluoride & Sodium Hydroxide will yield Sodium Fluoride, Sodium Bisulfate and water.

$SF_6 + 7\ NaOH \rightarrow 6NaF + NaHSO_4 + 3\ H_2O$

40. Phosphorous Trifluoride (NR)

Phosphorous Trifluoride & Sodium Hydroxide will yield Sodium Phosphate, Sodium Fluoride and water

$PF_3 + 5NaOH \rightarrow Na_2HPO_3 + 2H_2O$

41. Phosphorous Pentafluoride, compressed (NR)

Phosphorous Pentafluoride & Sodium Hydroxide will yield Sodium Phosphate, Sodium Fluoride and water.

$PF_5 + 7NaOH \rightarrow Na_2HPO_4 + 5NaF + 3H_2O$

42. Sulfuryl Fluoride (NR)

Sulfuryl Fluoride & Sodium Hydroxide will yield Sodium Sulfate, Sodium Fluoride and water.

$SO_2F_2 + 4NaOH \rightarrow 2NaF + Na_2SO_4 + 2\ H_2O$

43. Acetyl Chloride (U006)

Acetyl Chloride & water will yield Acetic Acid and Hydrogen Chloride.

$C_2H_3ClO + H_2O \rightarrow HCl + CH_3COOH \rightarrow$
$HCl + NaOH \rightarrow$ NaCl (Sodium Chloride) + H_2O (Water)
$CH_3COOH + NaOH \rightarrow NaC_2H_3O_2$ (Sodium Acetate)

44. Acetyl Fluoride (D002)

Acetyl Fluoride & water will yield Acetic Acid and Hydrogen Fluoride

$C_2H_3FO + H_2O \rightarrow CH_3COOH + HF \rightarrow$
$HF + NaOH \rightarrow$ NaF (Sodium Fluoride) + H_2O (Water)
$CH_3COOH + NaOH \rightarrow NaC_2H_3O_2$) (Sodium Acetate)

45. Titanium Tetrachloride (D002,D003)

Titanium Tetrachloride and Sodium Hydroxide will yield Sodium Chloride, Titanium Oxide and water.

$TiCl4 + 4NaOH \rightarrow 4NaCl + TiO2 + H2O$

46. Arsenic Pentafluoride, Compressed Gas (D004)

Arsenic Pentafluoride and Sodium Hydroxide will yield Sodium Arsenate, Sodium Fluoride, and water.

$AsF5 + 8NaOH \rightarrow Na3AsO4 + 5NaF + 4H2O$

47. Bromine (D001,D002,D003)

Bromine and Sodium Hydroxide will yield Sodium Bromite, Sodium Bromide, and water.

$4Br + 4NaOH \rightarrow NaBrO2 + 3NaBr + 2H2O$

48. Bromine Chloride (D001,D002,D003)

Bromine Chloride and Sodium Hydroxide will yield Sodium Hypochlorite, Sodium Bromide and water.

$BrCl + 2NaOH \rightarrow NaOCl + NaBr + H2O$

49. Bromine Trifluoride (D001,D002,D003)

Bromine Trilfuoride and Sodium Hydroxide will yield Sodium Fluoride, Sodium Bromite / Bromate and water.

$BrF3 + 4NaOH \rightarrow 3NaF + NaBrO2 + 2H2O$

50. Bromine Pentafluoride (D001,D002,D003)

Bromine Pentafluoride and Sodium Hydroxide will yield Sodium Fluoride, Sodium Bromate / Bromite and water.

$BrF5 + 6NaOH \rightarrow 5NaF + NaBrO3 + 3H2O$

51. Chlorine Monofluoride, Compressed Gas (D001)

Chlorine Monofluoride and Sodium Hydroxide will yield Sodium Hypochlorite, Sodium Fluoride and water.

$ClF + 2NaOH \rightarrow NaOCl + NaF + H2O$

52. Nitrogen Trioxide (P078)

Nitrogen Trioxide and Sodium Hydroxide will yield Sodium Nitrite / Nitrate and water.

$N2O3 + 2NaOH \rightarrow 2NaNO2 + H2O$

53. Molybdenum Hexafluoride (D002,D003)

Molybdenum Hexafluoride and Sodium Hydroxide will yield Sodium Fluoride, Molybdenum Trioxide and water.

$MoF6 + 6NaOH \rightarrow 6NaF + MoO3 + 3H20$

54. Sulfuryl Chloride (D002,D003)

Sulfuryl Chloride and Sodium Hydroxide will yield Sodium Bisulfate, Sodium Chloride, and water.

$SO2Cl2 + 3NaOH \rightarrow NaSO4 + 2NaCl + H2O$

55. Trifluoromethylhypofluorite (Compressed Gas (D001)

Trifluoromethylhypofluorite and Sodium Hydroxide will yield Sodium Percarbonate, Sodium Bifluoride, Sodium Fluoride and water.

$F3COF + 5NaOH \rightarrow Na2CO4 + 2NaF + NaHF2 + 2H2O$

56. Dimethylamine (U092)

2 Moles of Amine + 1 Mole of Sulfuric Acid → 1 Mole of Amine Sulfate + Heat
$2\ [R3N] + [H2SO4] \rightarrow [R3NH]2\ [SO4] + Heat$

57. Ethylamine (D001,D002)

2 Moles of Amine + 1 Mole of Sulfuric Acid → 1 Mole of Amine Sulfate + Heat
$2\ [R3N] + [H2SO4] \rightarrow [R3NH]2\ [SO4] + Heat$

58. Methylamine, Anhydrous (D001,D002)

2 Moles of Amine + 1 Mole of Sulfuric Acid → 1 Mole of Amine Sulfate + Heat
$2\ [R3N] + [H2SO4] \rightarrow [R3NH]2\ [SO4] + Heat$

59. Trimethylamine, Anhydrous (D001,D002)

2 Moles of Amine + 1 Mole of Sulfuric Acid → 1 Mole of Amine Sulfate + Heat
$2\ [R3N] + [H2SO4] \rightarrow [R3NH]2\ [SO4] + Heat$

60. Hydrazine, Anhydrous (U133)

Hydrazine and Sulfuric Acid will yield Hydrazine Sulfate and water.

$N2H4 + H2SO4 \rightarrow N2H4SO3 + H2O$

61. 2,2'-Dichlorodiethylsulfide and water will yield thiodiglycol, hydrochloric acid and heat. (D002)

$C4H8C12S + 2H2O \rightarrow S(CH2CH20H)2 + HCl$
$HCl + NaOH \rightarrow NaCl + H2O$

62. 1,1' Dimethylhydrazine and sulfuric acid will yield dimethylsulfate, hydrazine sulfate and water. (U098)

$(CH3)2NNH2 + 2\ H2SO4 \rightarrow (CH3)2SO4 + N2H4S03 + H2O$

63. 1,2-Dimethylhydrazine and sulfuric acid will yield dimethylsulfate, hydrazine sulfate and water. (U099)

$(CH3)2NNH2 + 2\ H2S04 \rightarrow (CH3)2SO4 + N2H4S03 + H2O$

64. O-isopropylmethylphosphonofluoric acid and sodium hydroxide will yield.
(D002)

Isopropylmethyl Phosphonic Acid and Sodium Fluoride.

$C4H10FO2P + NaOH \rightarrow NaF + C4H1103P$

65. Dimethylphosphoramidocyanidic acid, ethyl ester and sodium hydroxide will yield.
(N/R)

Dimethylphosphoramidate and Sodium Cyanide.

$C5H11N202P + NaOH \rightarrow C4H12NO3P + NaCN$

Sodium Cyanide and Sodium Hypochlorite yields Sodium Cyanate & Sodium Chloride.

$NaCN + NaOCl \rightarrow NaOCN + NaCl$

66. O-Pinacolylmethylphosphonofluoridic acid and sodium hydroxide will yield.
(D002)

O-Pinacolyl Methylphosphonate and Sodium Fluoride.

$C7H16FO2P + NaOH \rightarrow C7H1703P + NaF$

67. Sodium Potassium Alloy (NaK) and propylene glycol will yield.
(D003)

Sodium / potassium alcoholates (Potassium / Sodium Propanediols) and hydrogen

$2NaK2 + 6(C3H8O2) \rightarrow 2Na\ (C3H7O2 + 4K\ (C3H7O2) + 3H2$

68. Iodine Pentafluoride and sodium hydroxide will yield. (D001, D003)

$IF5 + 6(NaOH) \rightarrow 5(NaF) + NaIO3 + 3(H2O)$

Resulting solution is inorganic salt (Sodium Fluoride & Sodium Iodates) entrained in high pH solution.

69. Sulfur Trioxide and sodium hydroxide will yield Sodium Sulfite and water.
(D003)

$SO3 + H2O\text{----}H2S04$

$H2SO4(aq) + 2NaOH(aq) + \rightarrow Na2SO4(aq) + 2H2O(l)$

70. Dichloro-(2-Chlorovinyl) arsine
(D004)

Dichloro(2-Chlorovinyl) arsine and Sodium Hydroxide / Sodium Hypochlorite yield Sodium Arsenite,
Sodium Chloride, Sodium Formate and water.

$C2H2AsCl3 + 6NaOH + 3NaOCl \rightarrow NaAsO2 + 6NaCl + 2NaHCO2 + 3H2O$

71. Pentaborane (D001
D003)

Pentaborand and water yield Boric Oxide & Hydrogen.

$2B_5H_9 + 15H_2O \rightarrow 5B_2O_3 + 24H_2$

72. Trichloromethyl Chloroformate
(NR)

Trichloromethyl Chloroformate and Sodium Hydroxide yield Sodium Bicarbonate, Sodium Hypochlorite, Sodium Chloride, and water.

$ClCOOCl_3 + 5NaOH \rightarrow NaHCO_3 + NaOCl + 3NaCl + 2H_2O$

73. Bis-2-Chloroethyl-ethylamine
(NR)

Bix-2-Chloroethyl-ethylamine and water yield Hydroxyl Derivatives and HCl.

Stage I $C_6H_{13}C_{12}N + H_2O \rightarrow NH_2OH$ / $HOCH_2CH_2NH_2$ / $(HOCH_2CH_2)_2NH + HCl$
State II $HCl + NaOH \rightarrow NaCl + H_2O$ (With Hydroxyl Derivatives in Solution)

****Derivatives will vary as hydroxylamine and ethanolamines****

74. Nitrogen Trifluoride
(D001)

Nitrogen Trifluoride and Activated Alumina (stage 1) and Sodium Hydroxide (stage 2) will yield Aluminum Fluoride, Sodium Nitrate and Water.

Stage I $NF_3 + Al_2F_3 \rightarrow 2AlF_3 + NO_3$
Stage II $NO_3 + NaOH \rightarrow NaNO_2 + H_2O$

75. Chlorine Trifluoride
(D001)

Chlorine Trifluoride (vapor) and Sodium Hydroxide will yield Calcium Fluoride, Calcium Chloride, and water.

$2ClF_3 + 4Ca(OH_2) \rightarrow 3CaF_2 + CaCl_2 + 4H_2O$

76. Germanium Tetrachloride
(NR)

Germanium Tetrachloride, Water, and Sodium Hydroxide will yield Sodium Chloride, Water, and Germanium Oxide

Stage I $GeCl_4 + 2H_2O \rightarrow 4HCl + GeO_2$
Stage II $4HCl + 4NaOH \rightarrow 4NaCl + 4H_2O$

77. Phosphorous Oxychloride
(NR)

Phosphorous Oxychloride and Sodium Hydroxide will yield Sodium Phosphate (monobasic) Sodium
Chloride, and Water.

$POCl_3 + 4NaOH \rightarrow NaH_2PO_4 + 3NaCl + H_2O$

78. Methyl Iodide
(U138)

Methyl Iodide and Sodium Hydroxide will yield Methanol and Sodium Iodide

$CH3I + NaOH \rightarrow CH3OH + NaI$

References:

Matheson Gas Data Book
Scott Specialty Gases
Solkatronic Specialty Gas Emergency Response
Handbook of Compressed Gases

Table V.C. - Tanks and Tank System

Permit Unit No.	Tank	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable, Reactive, or Incompatible waste (state all that apply)
024	R-1	026	Processing	See Table IV.B.2	200 gallons	2.2' by 4.5'	69,300	Ignitable – No Reactive – Yes Incompatible – Yes
025	R-1A	027	Processing	See Table IV.B.2	500 gallons (Proposed 1500 gallons)	4.0' by 5.5' (Proposed 6.0' by 8.0')	69,300	Ignitable – No Reactive – Yes Incompatible – Yes
Proposed 027	R2	030	Processing	See Table IV.B.2	500 gallons	4.0' by 5.0'	69,300	Ignitable – Yes Reactive – Yes Incompatible – Yes

Appendix V.D

RESERVED

Appendix V.E

RESERVED

Appendix V.F

RESERVED

Appendix V.G

RESERVED

Appendix V.H

RESERVED

Appendix V.I

RESERVED

Appendix V.J

RESERVED

Professional Engineer Certification

The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature  Date 05/20/20

J. W. Caldwell
Texas PE # 94038

ENGINEERING REPORT - CYLINDER RELEASE UNIT

This Miscellaneous Unit Engineering Report applies to the Cylinder Release Unit (Permitted Unit # 026). The information in this report is that required by 40 CFR 264.600-264.602, and 270.23. The location of the Cylinder Release Unit is as shown in Appendix V.A – General Engineering Report. The details of the Cylinder Release Unit are shown on the Process Flowchart for Containerized Wastes Received for Processing in the Cylinder Release Unit (Figure V.K-3) and the Piping & Instrumentation Diagram Cylinder Release (Drawing No. L-201-PI-002-D) attached to this Miscellaneous Units Engineering Report.

Table V.K lists the miscellaneous units covered by this application, the waste managed in each unit, and the rated capacity.

The Cylinder Release Unit is related to the environment as described in this paragraph. Containerized atmospheric gases are processed as described on the process flow diagram presented on Figure V.K-3, attached below. Gases received in containers are stored in one of the container storage areas prior to processing for final disposal in the permitted Cylinder Release Unit # 026. Containerized atmospheric gases will be secured within the Unit and connected to a ¼ inch stainless steel braided hose which discharges to a ½ inch inner diameter tube (stack) that vents at an elevation of twenty feet above the ground. The gas will be released using the following criteria:

Maximum Line Pressure – 2000 pounds per square inch (psi)
Discharge Line – ¼" inner diameter or smaller, braided stainless steel
Vent Line – ½" inner diameter or smaller, copper or stainless steel
Maximum Flow Rate – 200 standard cubic feet per minute (scfm)

An operator will be present at all times during the releasing of the gas. If at any time the process is disrupted, the operator will close the valve on the release hose and the valve on the container.

Wastes processed in this unit are materials which are gases at atmospheric pressure. These are received in pressurized cylinders. After verification of paperwork and inspection of container integrity, the waste contained in the cylinder is analyzed following the procedures outlined in the Waste Analysis Plan. Wastes that cannot be discharged at this facility are shipped off-site for disposal. Wastes that can be processed in this unit are discharged to the atmosphere. Cylinders are purged with nitrogen and residual waste also discharged to the atmosphere.

The types of materials to be processed in this unit include compressed atmospheric gases; hydrogen, air, oxygen, nitrogen and noble gases; neon, argon, krypton, and xenon. Additionally, mixtures of the inert gases listed above with various compounds

(<500 ppm) often used as calibration gases may be processed through this unit. Some examples include:

Butane, ethane, ethylene, butene, pentane, ethanol, isobutane, methane (U154), propane, propylene, toluene (U220), vinyl chloride (D043/U043).

At <500 ppm, these compounds will not be considered ignitable but may be EPA listed hazardous wastes. Where applicable, the waste code has been noted next to the compound.

Emissions, resulting from the release of these compounds, is negligible. These gases will be received in various sized containers. Empty containers will be devalved and shipped to an authorized reclaimer or disposal facility.

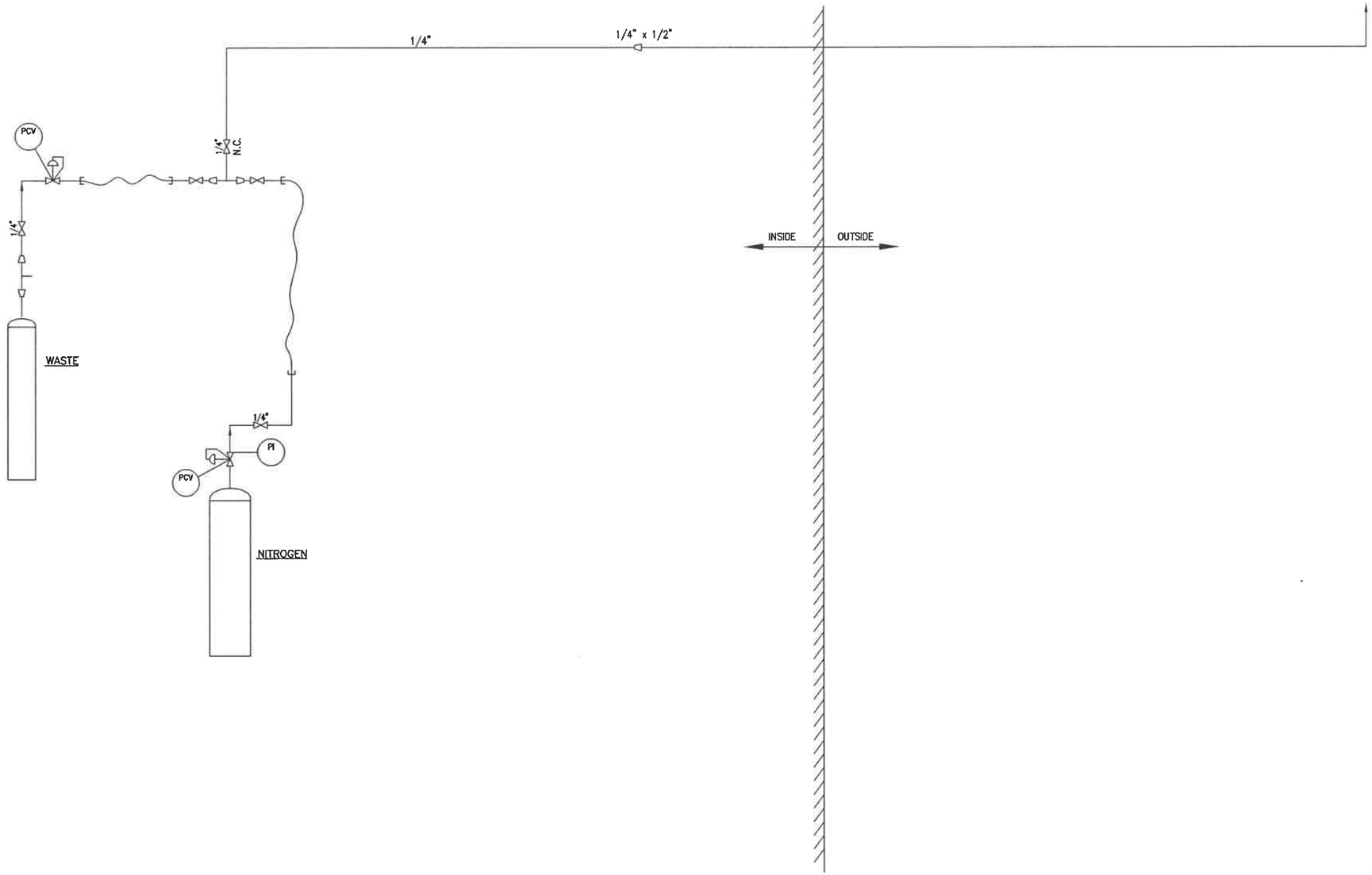
This unit is located in Container Storage Warehouse I. Containers to be processed will be secured within a room located in the Warehouse. The containers are connected to a manifold attached to 1/4th inch stainless steel braided hoses. One hose has a fitting at that can be changed to adapt to the container being processed. A second hose is attached to an inert gas (typically nitrogen). A third hose leads to the release system exhaust piping. Downstream from the container connection is a regulator that will be used to control the flow of gas and monitor the pressure on the cylinder. The manifold includes valves to; isolate the inert gas cylinder, the container being processed and the exhaust piping. Once the connection to the container is made, the flow control valve will be verified closed. At this point, the inert gas will be introduced into the manifold and the connections will be checked for leaks. Once the system is determined to be leak free, the inert gas valve is closed and the container and flow control valves opened. Once empty (as determined by a zero pressure reading on the pressure gauge), the cylinder will be flushed with inert gas, disconnected and the container's valve will be removed. The removal will be done in such a manner as to allow the operator to check for pressure as it is turned out. This piping and instrumentation drawing L-201-PI-002-D. Design specification and PE certification for the existing cylinder release unit is found in Exhibit V.C.1 of this application and is identical to what was submitted and approved in the Class 3 Modification done in 2003 for the unit.

The Cylinder Release Unit does not involve combustion, therefore no emissions data or trial burn plan are applicable. Because this unit does not involve combustion, tables such as those similar to Tables V.H.1-5 and Tables V.I.1-5 are also not applicable.

The current Cylinder Release Unit #026 is located within Warehouse I secondary containment. Containment for this Unit will be shared with this Container Storage Area. The Container Storage Area has sufficient secondary containment to allow this

unit within its boundaries. The floor of the unit is constructed of reinforced concrete with a six (6)-inch-high perimeter secondary containment curb. The containment berm is precautionary only and is not required for liquid release control, since the wastes managed in the cylinder release unit do not contain free liquids and thus this section is not applicable.

DRAWINGS



STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/15/20

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
F	PERMIT RENEWAL 2020	KMC	3/31/20	DAD
E	REVISED TITLE BLOCK	KMC	7/30/09	MAR
D	FOR PERMIT APPROVAL	JWC	4/25/05	

REFERENCE DRAWINGS

CleanHarbors
LAPORTE

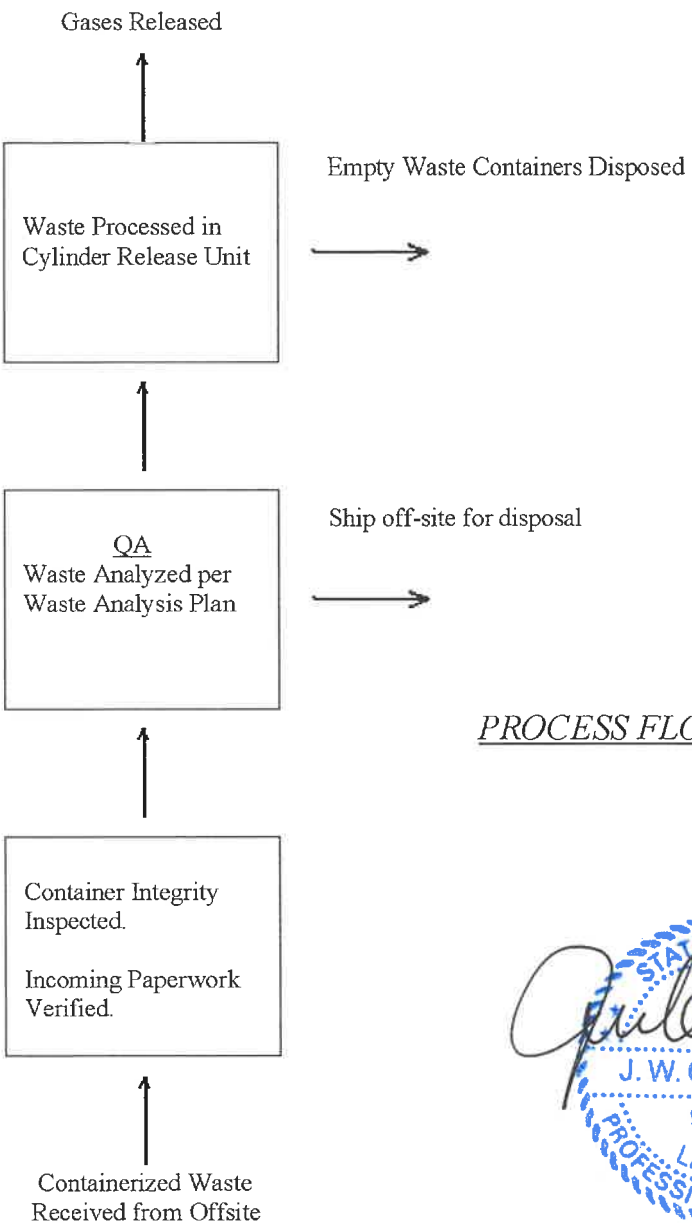
DRAWN	CHECKED	SCALE	DATE
WDS		NTS	8/8/03

L201PI001

TITLE
CLEAN HARBORS LAPORTE
PIPING & INSTRUMENT DIAGRAM
CYLINDER RELEASE

DRAWING NO. L-201-PI-002-D

REV. F



PROCESS FLOWCHART

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED PROFESSIONAL ENGINEER
05/26/20

	Clean Harbors La Porte, LP 500 Independence Parkway South, La Porte, TX 77571, Phone: (281) 727-7600		
	TITLE: PROCESS FLOWCHART FOR CONTAINERIZED WASTES RECEIVED FOR PROCESSING IN CYLINDER RELEASE UNIT		
	SCALE: AS SHOWN	DWG No.: **Figure V.K-3**	REV 0.0

Professional Engineer Certification

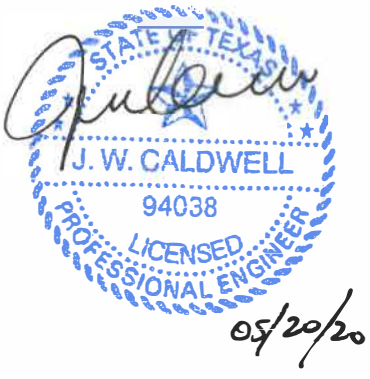
The engineering seal affixed below provides assurance that the document sections have been reviewed by me, the information presented is consistent with the engineering drawings and that the work is consistent with accepted engineering principles and practices.

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature _____ Date 05/20/20

J. W. Caldwell
Texas PE # 94038



ENGINEERING REPORT - PROPOSED CYLINDER RELEASE UNIT 2

This Miscellaneous Unit Engineering Report applies to the proposed Cylinder Release Unit 2 (Permitted Unit # 028). The information in this report is that required by 40 CFR 264.600-264.602, and 270.23. The location of the proposed Cylinder Release Unit 2 is as shown in Appendix V.A – General Engineering Report.

Table V.K lists the miscellaneous units covered by this application, the waste managed in each unit, and the rated capacity.

The proposed Cylinder Release Unit 2 is related to the environment as described in this paragraph. Gases received in containers are stored in one of the container storage areas prior to processing for final disposal in the permitted proposed Cylinder Release Unit # 028. Containerized atmospheric gases will be secured within the Unit and connected to a ¼ inch stainless steel braided hose which discharges to a ½ inch inner diameter tube (stack) that vents at an elevation of twenty feet above the ground. The gas will be released using the following criteria:

Maximum Line Pressure – 2000 pounds per square inch (psi)
Discharge Line – ¼" inner diameter or smaller, braided stainless steel
Vent Line – ½" inner diameter or smaller, copper or stainless steel
Maximum Flow Rate – 200 standard cubic feet per minute (scfm)

An operator will be present at all times during the releasing of the gas. If at any time the process is disrupted, the operator will close the valve on the release hose and the valve on the container.

Wastes processed in this unit are materials which are gases at atmospheric pressure. These are received in pressurized cylinders. After verification of paperwork and inspection of container integrity, the waste contained in the cylinder is analyzed following the procedures outlined in the Waste Analysis Plan. Wastes that cannot be discharged at this facility are shipped off-site for disposal. Wastes that can be processed in this unit are discharged to the atmosphere. Cylinders are purged with nitrogen, with nitrogen and residual waste also discharged to the atmosphere.

The types of materials to be processed in this unit include compressed atmospheric gases; hydrogen, air, oxygen, nitrogen and noble gases; neon, argon, krypton, and xenon. Additionally, mixtures of the inert gases listed above with various compounds (<500 ppm) often used as calibration gases may be processed through this unit. Some examples include:

Butane, ethane, ethylene, butene, pentane, ethanol, isobutane, methane (U154), propane, propylene, toluene (U220), vinyl chloride (D043/U043).

At <500 ppm, these compounds will not be considered ignitable but may be EPA listed hazardous wastes. Where applicable, the waste code has been noted next to the compound.

Emissions, resulting from the release of these compounds, is negligible. These gases will be received in various sized containers. Empty containers will be devalved and shipped to an authorized reclaimer or disposal facility.

This unit will be located in Container Storage Warehouse III. Containers to be processed will be secured within a room located in the Warehouse. The containers are connected to a manifold attached to 1/4th inch stainless steel braided hoses. One hose has a fitting at that can be changed to adapt to the container being processed. A second hose is attached to an inert gas (typically nitrogen). A third hose leads to the release system exhaust piping. Downstream from the container connection is a regulator that will be used to control the flow of gas and monitor the pressure on the cylinder. The manifold includes valves to; isolate the inert gas cylinder, the container being processed and the exhaust piping. Once the connection to the container is made, the flow control valve will be verified closed. At this point, the inert gas will be introduced into the manifold and the connections will be checked for leaks. Once the system is determined to be leak free, the inert gas valve is closed and the container and flow control valves opened. Once empty (as determined by a zero pressure reading on the pressure gauge), the cylinder will be flushed with inert gas, disconnected and the container's valve will be removed. The removal will be done in such a manner as to allow the operator to check for pressure as it is turned out.

The Cylinder Release Unit 2 will not involve combustion, therefore no emissions data or trial burn plan are applicable. Because this unit does not involve combustion, tables such as those similar to Tables V.H.1-5 and Tables V.I.1-5 are also not applicable.

The proposed Cylinder Release Unit #028 is located within Container Storage secondary containment. Containment for these Units will be shared with this Container Storage Area. The Container Storage Area has sufficient secondary containment to allow this unit within its boundaries. The floor of the unit is constructed of reinforced concrete with a six (6)-inch-high perimeter secondary containment curb. The containment berm is precautionary only and is not required for liquid release control, since the wastes managed in the cylinder release unit do not contain free liquids and thus this section is not applicable.

The proposed additional cylinder release unit (#032 Cylinder release Unit 2 – Next # available on NOR chosen for identification) will be identical to the existing permitted unit in design, specification and operation but will be located in the permitted storage

area designated as Warehouse III in the current NOR. Its location is reflected on the facility maps found in Section V.A of this application. Design specification and PE certification for the existing cylinder release unit is found in Appendix V.K.i of this application and is identical to what was submitted and approved in the Class 3 Modification done in 2003 for the unit.

Table V.K. - Miscellaneous Units

Permit Unit No.*	Miscellaneous Unit	N.O.R. No.	Storage, Processing, and/or Disposal	Waste Nos.[1]	Rated Capacity	Dimensions	Unit will manage Ignitable, Reactive, or Incompatible Waste (state all that apply)
026	Cylinder Release Unit	028	Processing	See Table IV.B.3	N/A	N/A	Ignitable and Reactive
028	Proposed Cylinder Release Unit 2	032	Processing	See Table IV.B.3	N/A	N/A	Ignitable and Reactive

*If the unit is already permitted, use the established "Permit Unit No." If the unit is not yet permitted, the number given here for the unit will become the "Permit Unit No." The numbers should be in an order that will be convenient for the facility operator

Appendix V.L

RESERVED

Appendix VI Geology Report

This section is not applicable because this application is not for a new hazardous waste management facility; areal and/or capacity expansions of the existing hazardous waste management facility; or an existing hazardous waste management facility that stores, processes, or disposes of hazardous wastes in surface impoundments, landfills, land treatment units, waste piles, or tank or drip pads which require a contingent post-closure plan.

Table VII.A. - Unit Closure

For each unit to be permitted, list the facility components to be decontaminated, the possible methods of decontamination, and the possible methods of disposal of wastes and waste residues generated during unit closure:

Equipment or HWM Unit	Possible Methods of Decontamination[1]	Possible Methods of Disposal[1]
Warehouse I:		
Waste Containers	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Secondary Containment Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Container Storage Racks	Disassembly and hydroblasting	Landfill, Recycling
Wooden pallets	send offsite with containers	Incineration, Landfill, Recycling
Loading/Unloading Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Solid Decontamination Waste	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Warehouse II:		
Waste Containers	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Secondary Containment Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Container Storage Racks	Disassembly and hydroblasting	Landfill, Recycling
Wooden Pallets	send offsite with containers	Incineration, Landfill, Recycling
Solid Decontamination Waste	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Warehouse III:		
Waste Containers	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Secondary Containment Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Container Storage Racks	Disassembly and hydroblasting	Landfill, Recycling
Wooden Pallets	send offsite with containers	Incineration, Landfill, Recycling
Loading/Unloading Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Solid Decontamination Waste	Solid Decontamination Waste	Incineration, Landfill, Off-site Treatment

Equipment or HWM Unit	Possible Methods of Decontamination[1]	Possible Methods of Disposal[1]
Waste Treatment Tanks & ancillary equipment	Landfill, Recycling	
Waste Liquids	Pump liquids and remove for off-site disposal	Incineration, Landfill, Off-site Treatment
Tank Surfaces (interior and exterior)	Initial rinse followed by hydroblasting	Incineration, Landfill, Off-site Treatment
Secondary Containment Area	Hydroblasting	Incineration, Landfill, Off-site Treatment
Solid Decontamination Waste	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Miscellaneous Areas:	Incineration, Landfill, Off-site Treatment	
Drum Staging Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Cylinder Release Units	Disassembly and hydroblasting	Incineration, Landfill, Recycling

Section VII. – Appendix VII.A. (Closure Plan)

CLEAN HARBORS LA PORTE, LLC
CLOSURE PLAN
TABLE OF CONTENTS

INTRODUCTION

In accordance with federal regulations, under 40 CFR Part 264 Subpart G, and state regulations, under 30 TAC 335.8, all owners and operators of hazardous waste management must have a written closure plan that allows the facility to be closed in a manner that: "(a) minimizes the need for further maintenance; and (b) controls, minimizes or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere;..."

The closure plan must identify the steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least:

(1) A description of how each hazardous waste management unit at the facility will be closed in accordance with 264.111;

A description of how final closure of the facility will be conducted in accordance with 264.111. The description must identify the maximum extent of the operations which will be unclosed during the active life of the facility; and

(3) An estimate of the maximum inventory of hazardous waste ever on-site over the active life of the facility and a detailed description of the methods to be used during partial closures and final closure, including, but not limited to, methods for removing, transporting, treating, storing, or disposing of all hazardous waste, and identification of the type(s) of off-site hazardous waste management units to be used, if applicable; and

(4) A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure, including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard; and

(5) A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, ground-water monitoring, leachate collection, and run-on and run-off control; and

(6) A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure.

This Closure Plan has been developed for the Facility in accordance with these requirements. Upon closure of the site, the Facility will implement the activities listed in this plan under the oversight of an independent third-party engineer.

1.0 GENERAL INFORMATION

1.1 General Site Information and Maximum Capacities

Clean Harbors La Porte, LP (Facility), located at 500 Independence Parkway South in La Porte, Texas, operates as commercial hazardous and industrial solid waste transfer and storage facility. The Facility is permitted to receive hazardous waste in containers for storage, bulking, processing or disposal. Hazardous waste is stored on-site in containers, then processed or disposed on-site or shipped off-site for treatment or disposal.

The Facility consists of three container storage areas, two treatment tanks, a cylinder release unit and upon construction one modified waste treatment tank and a second cylinder release unit. Each waste storage and management area is equipped with a secondary containment system designed to contain any leaks or spills and prevent run-on. All waste storage and management areas are covered to protect them from weather and to prevent the accumulation of rainwater. Waste loading and unloading areas are also bermed and covered.

The Facility can store up to 1,064,270 gallons of waste in containers. Waste containers may also be temporarily staged prior to acceptance for storage or shipment off-site for treatment or disposal. The Facility may stage 8,800 gallons of containerized waste in each of its three temporary staging areas (26,400 gallons total). The Facility also has two tanks and a wet scrubber with a total of 2,150 gallons of waste liquid capacity. The modified tank will add 1,000 gallons capacity.

1.2 Compliance With Risk Reduction Standards

In addition to meeting the federal requirements for closure, hazardous and industrial solid waste facilities in Texas must be closed in accordance with the Texas Risk Reduction Standards given in 30 TAC Chapter 335, Subchapter S. This closure plan has been developed to document compliance with this requirement. In particular, the site will be closed in accordance with Risk Reduction Standard Number 1 as given in 30 TAC 335.554. This involves closure and decontamination of the site to background levels. Detailed descriptions of the procedures that will take place during closure in order to attain compliance with Risk Reduction Standard Number 1 are given in subsequent sections of this plan. If it is found that the site cannot meet Risk Reduction Standard Number 1, it will amend its plan to correspond to the selected closure standard.

With the Facility meeting Risk Reduction Standard Number 1, the site does not anticipate encountering soil contamination requiring excavation and backfilling. The facility operates in a way to minimize spill events and immediately repair concrete cracking. Therefore, this plan does not include costs or schedules for soil remediation. If soil contamination is found during closure, the plan will be amended to encompass the situation. In the event a release of constituents of concern (COC"s) is found in

surrounding environmental media has occurred, remediation per 30 TAC 350 is applicable.

The Facility can be divided into three distinct components: the container storage areas, the chemical treatment reactor tanks and the cylinder release system. For practical purposes, closure of the Facility shall be undertaken by considering the closure of these components as separate and distinct activities.

2.0 GENERAL STANDARDS FOR CLOSURE

All closure activities undertaken at this facility shall be conducted in accordance with the following general standards.

2.1 Commencement of Closure

Facility closure will commence upon the following conditions:

1. Upon the direction of the TCEQ for violation of the permit, TCEQ rules or State Statutes.

2. Upon suspension, cancellation or revocation of the terms and conditions of the permit concerning the authorization to receive and store waste materials.

3. Upon abandonment of the facility.

4. Upon direction of the TCEQ for failure to secure and maintain an adequate bond or other financial assurance mechanism in accordance with the permit.

5. When necessary to comply with Provision VIII.D of the permit (relating to Incorporated Application Materials).

6. At the request of the permittee.

Partial closure of the Facility will involve closure of a single or several waste management units. Partial closure will commence upon the application of one of the conditions stated above or when a reduction in waste management capacity is deemed necessary by the permittee.

2.2 Completion of Closure

All closure activities shall be completed within 180 days of commencement of closure of the Facility or waste management unit.

2.3 Changes to the Closure Plan

Whenever a change in the Closure Plan is necessary, the Facility shall submit a written request for permit amendment or modification. Changes in the Closure Plan shall be made whenever:

1. Changes in the operating plans or facility design affect the closure plan.

2. There is a change in the expected year of closure, if applicable.

3. In conducting partial or final closure activities, unexpected events require amendment or modification of the closure plan.

4. It is requested by the Executive Director.

2.4 Notification Requirements

Whenever closure activities begin or are completed, or a change in the proposed closure activities is deemed necessary, the Facility will submit a written notification to the TCEQ in accordance with the following conditions:

1. A written notification will be submitted to the Executive Director at least 45 days prior to the date final Facility closure is expected to begin.

2. A written request for a permit amendment or modification when changes in the closure plan are necessary will be submitted:

    a. At least 60 days prior to the proposed change in Facility design or operation which will affect the closure plan.

    b. No later than 60 days after an unexpected event has occurred this has affected the closure plan.

    c. No later than 30 days after an unexpected event has occurred, if the unexpected event occurs during the partial or final closure period.

    d. Within 60 days of the Executive Director's request for a change in the Closure Plan, or within 30 days if the change in the Facility conditions occurs during partial or final closure.

3. Within 60 days of completion of closure of the Facility or waste management unit, a written notification and certification of completion of the closure shall be submitted to the Executive Director. The certification will state that the closure was done in accordance with all applicable rules and terms of the permit. The certification also shall include certification by an independent registered professional engineer. This certification shall include the following documents:

a. A detailed description of waste removal and decontamination procedures performed during closure.

b. The results of all analyses conducted to document decontamination of hard surface areas within the storage and processing areas.

c. A scaled, plan-view drawing of the storage and processing Facility unit areas depicting all sampling locations and depths (if necessary).

d. Descriptions of procedures and conclusions of any investigations to characterize the nature, extent, direction, rate of movement, volume, composition, and concentration of any site contamination that may be found during closure.

e. The results of all analyses of waste, waste residues, rinseate and/or soil remaining in the clean storage and processing areas at closure.

d. Documentation of final disposition for any waste residues, rinseates, contaminated soils and facility components removed from the site to accomplish closure.

3.0 CLOSURE OF THE CONTAINER STORAGE AREAS

The Facility container management facility consists of three separate and distinct container storage warehouses. Each permitted container storage unit is further subdivided into smaller self-contained areas. Containers are stored in these areas on pallets in three-tiered steel storage racks. Adjacent to two of the storage areas are loading and unloading areas where drums may be temporarily staged prior to acceptance for storage or shipment off-site. The loading and unloading areas are covered to protect them from accumulating stormwater. Drum staging areas are equipped with full secondary containment. Truck staging areas are contained on three sides and are sloped downward so that spills run towards blind sumps.

Closure of the container storage areas will consist of removing all wastes to a permitted off-site facility; decontaminating the storage and staging areas; collecting and removing decontamination rinsewaters for off-site disposal; and sampling to verify that decontamination has taken place. After closure of each of these units is completed, the buildings and associated concrete structures are intended to remain in place for future use as non-RCRA units by a successor business.

Under "worst case" assumptions, all storage and staging areas will be at maximum capacity. The "worst case" assumptions used by the TCEQ provide that the permittee is in compliance with its permit at the time of closure. In addition, for the purposes of developing the closure plan, it is assumed that closure is conducted by the permittee. Therefore, the trained and experienced on-site personnel will be responsible for conducting the activities which occur during closure. Closure activities to be conducted are detailed below.

3.1 Closure Activities

Closure of the container storage areas shall proceed in accordance with the steps outlined below. The steps are presented in approximate chronological order. The order of precedence may vary and some steps may occur concurrently.

1. The permittee will notify the TCEQ regional office in writing at least 10 days prior to commencing closure. The notification will include the estimated date that closure will commence.

2. Waste containers will be loaded onto either trucks or railcars for transport to permitted off-site disposal facilities. The equipment normally used by facility personnel will be used to load the containers. The waste will be transported off-site to authorized disposal facilities using trailers and/or railcars. Leftover wooden pallets used to store containers will be broken up and shipped off-site for disposal.

3. The cleaning of the container storage areas will consist of the following steps:

   a. Container storage area floors will be scraped to remove any visible signs of contamination. Accumulated residues will be analyzed for characterization and disposal.

   b. Drum storage racks will be dismantled in each containment area. They will then be scraped to remove any signs of contamination. Accumulated residues will be analyzed for characterization and disposal.

   c. Any surface cracks or gaps in floors or berms will be examined by the independent engineer to determine potential for penetration to soil. Any cracks and gaps in floors and berms will be repaired.

   d. The racks will then be hydroblasted before being removed from the containment areas. Once cleaned, the racks will be sold or recycled as scrap steel.

   e. Container storage area building floors, walls and ceilings will be hydroblasted with an appropriate cleaning solution.

   f. During hydroblasting operations, precautions will be taken to prevent overspray and contain liquids. Precautions may include vacuuming the wash waters, erecting overspray curtains or other similar methods.

4. A qualified cleaning contractor specializing in hydroblasting or equivalent cleaning methods will be used to clean all surfaces which have or may have been in contact with materials. The contractor will take measures to ensure that all rinseates will be contained to prevent runoff from the container storage areas.

5. After completion of the cleaning of each unit, a final rinse sample will be collected

from each secondary containment area. Each sample will be analyzed for the list of contaminants given in Table 1 of this plan at a laboratory using EPA approved methods and quality control procedures. The samples will be compared against a "blank", uncontaminated sample of the rinseate to ensure that the contaminants have been removed from the contaminated areas. Decontamination shall be considered complete when the contaminant levels in the rinseate do not exceed the contaminant levels given in Table 1, as documented by the independent engineer. The background contaminant levels given in Table 1 may be adjusted to account for variances in constituent levels inherently present in the uncontaminated "blank" rinseate sample or the media that is being decontaminated (i.e., any compounds found to be naturally occurring in the concrete used for floors and berms). This adjustment would be done with the knowledge and prior approval of the TCEQ.

6. If unacceptable concentrations of contaminants are present in the final rinse water from any secondary containment area, the area will be cleaned again. The rinse water will be sampled again and analyzed for the contaminants previously detected.

7. If contaminants are still present, the area will either be cleaned by alternative methods and the cleaning agent sampled and analyzed again or the closure plan will be amended and submitted for approval to the TCEQ to provide for a more effective means of removal.

8. All washwaters and residues generated from closure activities will be collected and transported by truck or railcar to permitted off-site facilities for disposal.

9. Once decontamination of the secondary containment is completed, at least one boring will be made in the flooring of each secondary containment area. Particular attention will be paid to penetrating cracks noted in Item 3.c. above. The boring location will be determined by the independent engineer. The engineer will make this determination by personally examining the area in question looking for any existing/repaired cracks, gaps, or other areas where a leak could have penetrated, as well as any slopes or trenches in the area. This physical examination will be combined with the independent engineer's review of spill history in the unit. Using all parts of this information, the independent engineer will make the determination as to the location of the boring. Through each boring, a surface sample will be collected. Each sample will be analyzed for the list of contaminants given in TRRP Tier 1 tables found @ 30 TAC 350 at a laboratory using EPA approved methods and quality control procedures. The soils shall be considered uncontaminated if the contaminant levels in the samples taken do not exceed the contaminant levels given in TRRP Tier 1 tables, as documented by the independent engineer.

10. Background soil levels for the site will be determined by taking a statistically valid number of samples per 30 TAC 350.51. The samples will be analyzed for the contaminants listed in TRRP Tier 1 tables and the average contaminant concentrations found shall be considered the background levels for the site. Alternatively, the facility may use the background table found in 30 TAC 350.51. This adjustment would be done with the knowledge and prior approval of the TCEQ.

Figure 1
CONTAMINANTS REASONABLY EXPECTED TO BE PRESENT

The analyses indicated in the Closure Plan, used to determine when proper decontamination has taken place, will be performed following the test methods outline in the latest edition of Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) or an equivalent test method. Rinseates collected from each unit will be analyzed for the list of contaminants and must be less than or equal to background or the 30 TAC Chapter 350 – Texas Risk Reduction Program Critical PCL for groundwater (whichever is higher)

Analysis	Method
Volatile Organics Analysis	SW-846 8260
Semi-Volatile Organics Analysis	SW-846 8270
Organochlorine Pesticides and Polychlorinated Biphenyls	SW-846 8151
Herbicides	SW-846 8140
Dioxins	SW-846 8280
Total Metals	EPA 200.7 & 245.1, SW-846
Flashpoint	SW-846 1010
Reactivity:	
Total Cyanide	SW-846 9010
Total Sulfide	SW-846 9030
Corrosivity	SW-846 5.2; Aqueous liquid
Toxicity Characteristics:	
Arsenic	SW-846 7061
Barium	SW-846 7080
Cadmium	SW-846 7130
Chromium	SW-846 7190
Lead	SW-846 7470
Mercury	SW-846 7470
Selenium	SW-846 7741
Silver	SW-846 7760
Endrin	SW-846 8080
Lindane	SW-846 8080
Methoxychlor	SW-846 8080
Toxaphene	SW-846 8080
2,4-D	SW-846 8140
2,4,5-TP (Silvex)	SW-846 8140

Analysis	Method
Benzene	SW-846 8240
Carbon Tetrachloride	SW-846 8240
Chlordane	SW-846 8080
Chlorobenzene	SW-846 8240
Chloroform	SW-846 8240
o-Cresol	SW-846 8250
n-Cresol	SW-846 8250
p-Cresol	SW-846 8250
Cresol	SW-846 8250
1,4-Dichlorobenzene	SW-846 8240
1,2-Dichloroethane	SW-846 8240
1,1-Dichloroethylene	SW-846 8240
2,4-Dinitrotoluene	SW-846 8240
Heptachlor	SW-846 8080
Hexachlorobenzene	SW-846 8250
Hexachlorobutadiene	SW-846 8250
Hexachloroethane	SW-846 8240
Methyl Ethyl Ketone	SW-846 8240
Nitrobenzene	SW-846 8250
Pentachlorophenol	SW-846 8250
Pyridine	SW-846 8250
Tetrachloroethylene	SW-846 8240
Trichloroethylene	SW-846 8240
2,4,5-Trichlorophenol	SW-846 8250
2,4,6-Trichlorophenol	SW-846 8240
Vinyl Chloride	SW-846 8240

11. Soils and surrounding areas will be visibly inspected by the independent engineer for any signs of potential contamination. Particular attention will be paid to areas where known spills (if any) have occurred in the past.

12. If soil contamination is found in any area, the Facility will submit a revised contingent closure plan to TCEQ to propose a sampling plan that will fully define the extent of contamination in the soil.

3.2 Estimated Closure Schedule

Activity	Cumulative Time (Weeks)
Remove waste containers from site	6
Clean buildings and containment areas	10
Sample and analyze rinsewater	16
Inspect soils and surrounding areas	18
Removal of any contaminated soils	22
Provide certification	26

3.3 Partial Closure of Container Storage Areas

Partial closure of the container storage areas will involve the closure of one or more of the permitted container storage areas. Partial closure will proceed using the same procedures and time line given in Sections 3.1 and 3.2.

4.0 CLOSURE OF CHEMICAL REACTOR TANKS AND ANCILLARY COMPONENTS

The Chemical Reactor Tank system consists of two waste treatment tanks and a wet scrubber. Storage and processing areas are located within the existing Container Storage Area 001 (Warehouse I). Therefore, these units will be provided with secondary containment and covered to prevent the accumulation of rainwater.

Closure of the Chemical Reactor Tank system will consist of the following activities: for tanks and ancillary equipment, emptying all waste storage and processing tanks into trucks or other suitable containers; shipment of the waste to a permitted off-site facility for treatment and disposal; decontaminating all tanks and ancillary equipment; decommissioning and decontaminating all processing and ancillary equipment; collecting and removing all decontaminating rinsewaters and media for off-site disposal; and sampling to verify that proper decontamination has taken place.

Under "worst case" assumptions, all tanks, processing and loading/unloading areas will be at maximum capacity. The "worst case" assumptions used by the TCEQ provide that the Permittee is in compliance with its permit at the time of closure. in addition, for the purposes of developing the closure plan, it is assumed that closure is conducted by the Permittee. Therefore, the trained and experienced on-site personnel will be responsible

for conducting the activities which occur during closure. Closure activities to be conducted are detailed below.

4.1 Closure Activities

Closure of the Chemical Reactor Tank system area shall proceed in accordance with the steps outlined below. The steps are presented in approximate chronological order. The order of precedence may vary and some steps may occur concurrently.

1. The Permittee will notify the TCEQ regional office in writing 10 days prior to commencing closure. The notification will include the estimated date that closure will commence.

2. All tanks and ancillary equipment will be emptied into suitable containers for transport to off-site disposal. Suitable containers for transport will include tanker trucks, railcars, portable tanks or drums depending on the type and quantity of waste. The equipment normally used by facility personnel will be used to empty the tanks. The Permittee will prevent the mixing of incompatible materials during this process. The waste will be transported off-site to permitted disposal facilities utilizing trailers and/or railcars.

3. The interiors of the tanks will be stripped or scraped to remove any sludge or visible residues. The residues will be collected into suitable containers and transported off-site for recycling or reuse at another facility.

4. The floors, walls and berms of the secondary containment areas for all of the tanks, processing areas and loading and unloading areas will be stripped to remove any visible signs of contamination. Any cracks or gaps found in these areas will be repaired and sealed. The residues generated will be collected and placed in appropriate containers for off-site disposal.

5. A qualified cleaning contractor specializing in hydroblasting or equivalent cleaning methods will be used to clean all surfaces which have or may have come in contact with waste materials. These surfaces will include all tanks and processing equipment interiors and the floors, walls and berms of all secondary containment. When possible, tank rinseates will be flushed through existing piping to remove any contaminants from the pipes. The contractor will take measures necessary to ensure that all rinseates will be contained to prevent runoff.

6. All piping, valves and processing equipment will be disassembled and washed with an appropriate solvent or cleaning solution to remove any contamination. If upon disassembly it is found that decontamination is infeasible or impracticable, the piping or equipment will be managed as hazardous waste and disposed off-site at a permitted facility. Once cleaned, tanks and ancillary equipment will be sold or recycled for the scrap steel value.

7. After completion of the cleaning of each unit, a final rinse sample will be collected from each unit and secondary containment area. Each sample will be analyzed for the list of contaminants given in Table 1 of this plan at a laboratory using EPA approved methods and quality control procedures. The samples will be compared against a "blank", uncontaminated sample of the rinseate to ensure that the contaminants have been removed from the contaminated areas. Decontamination shall be considered complete when the contaminant levels in the rinseate do not exceed the contaminant levels given in Table 1, as documented by the independent engineer. The background contaminant levels given in Table 1 may be adjusted to account for variances in constituent levels inherently present in the uncontaminated "blank" rinseate sample or the media that is being decontaminated (i.e., any compounds found to be naturally occurring in the concrete used for floors and berms). This adjustment would be done with the knowledge and prior approval of the TCEQ.

8. If unacceptable concentrations of contaminants are present in the final rinse water from any tank or area, the area will be cleaned again. The rinse water will be sampled again and analyzed for the contaminants previously detected.

9. If contaminants are still present, the area will either be cleaned by alternative methods and the cleaning agent sampled and analyzed again or the closure plan will be amended to provide for a more effective means of removal.

10. All wash waters and residues generated from closure activities will be collected and transported by truck or railcar to permitted off-site facilities for disposal.

11. Once decontamination of the secondary containment area is completed, at least one boring will be made in the flooring of each secondary containment area. Particular attention will be paid to penetrating cracks and stains. The boring location will be determined by the independent engineer. The engineer will make this determination by personally examining the area in question looking for any existing/repaired cracks, gaps, or other areas where a leak could have penetrated, as well as any slopes or trenches in the area. This physical examination will be combined with the independent engineer's review of spill history in the unit. Using all parts of this information, the independent engineer will make the determination as to the location of the boring. Through each boring, a surface sample will be analyzed for the list of contaminants given in TRRP Tier 1 tables at a laboratory using EPA approved methods and quality control procedures. The soils shall be considered uncontaminated if the contaminant levels in the samples taken do not exceed the contaminant levels given in TRRP Tier 1 tables, as documented by the independent engineer.

13. Soils and surrounding areas will be visually inspected by the independent engineer for any signs of potential contamination. Special attention will be paid to areas where known spills have occurred in the past.

14. If soil contamination is found in any area, the Facility will submit a revised contingent closure plan to TCEQ to propose a sampling plan that will fully define the extent of contamination in the soil.

4.2 Estimated Closure Schedule

Activity	Cumulative Time (Weeks)
Empty tanks	4
Clean tanks, containment areas and buildings	8
Disassemble and clean ancillary equipment	10
Sample and analyze rinse water	16
Inspect soils and surrounding areas	18
Removal of any contaminated soils	24
Provide certification	26

4.3 Partial Closure of the Tanks and Processing Areas

Partial closure of the tanks and processing areas will involve the closure of one or more tanks or processing areas. Partial closure will proceed using the same procedures and time line given in Sections 4.1 and 4.2, with the following exceptions.

1. For partial closure of one or more tank, piping to the tank undergoing closure will be isolated to prevent mixing of rinseates with active waste streams.

2. Inspection and removal of contaminated soils from surrounding areas will not be conducted, as waste activities will continue in adjacent areas. Therefore partial closure of a tank or process area will take approximately eight weeks less time than full closure of the area.

5.0 CLOSURE OF CYLINDER RELEASE SYSTEMS AREA

The two Cylinder Release Systems each consists of an inert gas cylinder for line purging and ancillary equipment. Storage and processing areas are located within the existing Container Storage Area 001 (Warehouse I). Therefore, these units will be provided with secondary containment and covered to prevent the accumulation of rainwater.

Closure of the Cylinder Release Systems will consist of the following activities: removal of two cylinders; shipment of the waste to a permitted off-site facility for treatment and disposal; decontaminating all ancillary equipment; decommissioning and decontaminating all ancillary equipment; collecting and removing all decontaminating rinse waters and media for off-site disposal; and sampling to verify that proper decontamination has taken place.

Under "worst case" assumptions, the processing areas will be at maximum capacity. The "worst case" assumptions used by the TCEQ provide that the Permittee is in compliance with its permit at the time of closure. In addition, for the purposes of developing the closure plan, it is assumed that the Permittee conducts closure. Therefore, the trained and experienced on-site personnel will be responsible for conducting the activities, which occur during closure. Closure activities to be conducted are detailed below.

5.1 Closure Activities

Closure of the Cylinder Release System area shall proceed in accordance with the steps outlined below. The steps are presented in approximate chronological order. The order of precedence may vary and some steps may occur concurrently.

1. The Permittee will notify the TCEQ regional off ice in writing 10 days prior to commencing closure. The notification will include the estimated date that closure will commence.

2. All wastes and ancillary equipment will be removed and shipped or dismantled and placed into suitable containers for transport to off-site disposal. Suitable containers for transport will include drums or other containers depending on the type and quantity of waste. The equipment normally used by facility personnel will be used to remove wastes from the area. The Permittee will prevent the mixing of incompatible materials during this process. The waste will be transported off-site to permitted disposal facilities utilizing trailers and/or railcars.

3. The floors, walls and berms of the secondary containment areas for all of the tanks, processing areas and loading and unloading areas will be stripped to remove any visible signs of contamination. Any cracks or gaps found in these areas will be repaired and sealed. The residues generated will be collected and placed in appropriate containers for off-site disposal.

4. A qualified cleaning contractor specializing in hydroblasting or equivalent cleaning methods will be used to clean all surfaces, which have or may have come in contact with waste materials. These surfaces will include all processing equipment and the floors, walls and berms of all secondary containment. When possible, rinseates will be flushed through existing piping to remove any contaminants from the pipes. The contractor will take measures necessary to ensure that all rinseates will be contained to prevent runoff.

5. All piping, valves and processing equipment will be disassembled and washed with an appropriate solvent or cleaning solution to remove any contamination. If upon disassembly it is found that decontamination is infeasible or impracticable, the piping or equipment will be managed as hazardous waste and disposed off-site at a permitted facility.

6. After completion of the cleaning of the units, a final rinse sample will be collected from each unit and secondary containment area. Each sample will be analyzed for the list of contaminants given in Table 1 of this plan at a laboratory using EPA approved methods and quality control procedures. The samples will be compared against a "blank", uncontaminated sample of the rinseate to ensure that the contaminants have been removed from the contaminated areas. Decontamination shall be considered complete when the contaminant levels in the rinseate do not exceed the contaminant levels given in Table 1, as documented by the independent engineer. The background contaminant levels given in Table 1 may be adjusted to account for variances in constituent levels inherently present in the uncontaminated "blank" rinseate sample or the media that is being decontaminated (i.e., any compounds found to be naturally occurring in the concrete used for floors and berms). This adjustment would be done with the knowledge and prior approval of the TCEQ.

7. If unacceptable concentrations of contaminants are present in the final rinse water from any tank or area, the area will be cleaned again. The rinse water will be sampled again and analyzed for the contaminants previously detected.

8. If contaminants are still present, the area will either be cleaned by alternative methods and the cleaning agent sampled and analyzed again or the closure plan will be amended to provide for a more effective means of removal.

9. All wash waters and residues generated from closure activities will be collected and transported by truck or railcar to permitted off-site facilities for disposal.

10. Once decontamination of the secondary containment area is completed, at least one boring will be made in the flooring of each secondary containment area. Particular attention will be paid to penetrating cracks and stains. The boring location will be determined by the independent engineer. The engineer will make this determination by personally examining the area in question looking for any existing/repaired cracks, gaps, or other areas where a leak could have penetrated, as well as any slopes or trenches in the area. This physical examination will be combined with the independent engineer's review of spill history in the unit. Using all parts of this information, the independent engineer will make the determination as to the location of the boring. Through each boring, a surface sample will be analyzed for the list of contaminants given in TRRP Tier 1 tables at a laboratory using EPA approved methods and quality control procedures. The soils shall be considered uncontaminated if the contaminant levels in the samples taken do not exceed the contaminant levels given in TRRP Tier 1 tables, as documented by the independent engineer.

11. Soils and surrounding areas will be visually inspected by the independent engineer for any signs of potential contamination. Special attention will be paid to areas where known spills have occurred in the past.

12. If soil contamination is found in any area, the Facility will submit a revised contingent closure plan to TCEQ to propose a sampling plan that will fully define the extent of contamination in the soil.

5.2 Estimated Closure Schedule

Activity	Cumulative Time (Weeks)
Clean containment areas and buildings	8
Disassemble and clean ancillary equipment	10
Sample and analyze rinse water	16
Inspect soils and surrounding areas	18
Removal of any contaminated soils	24
Provide certification	26

6.0 FACILITY CLOSURE

Final facility closure will involve closure of both the container storage areas and the tanks and processing areas. The procedures and time lines for closure of these areas were given in Sections 3.0, 4.0 and 5.0, respectively. As the activities listed in these sections may occur concurrently, the expected time for full facility closure could be less than the cumulative total for closure of both of these components. The expected schedule for facility is given below.

Activity	Cumulative Time (Weeks)
Empty tanks	4
Clean tanks, containment areas and buildings	8
Disassemble and clean ancillary equipment	10
Sample and analyze rinse waters	16
Inspect soils and surrounding areas	18
Removal of any contaminated soils	24
Provide certification	26

TABLE VII.A UNIT CLOSURE

For each unit to be permitted, list the facility components to be decontaminated, the possible methods of decontamination, and the possible methods of disposal of waste and waste residues generated during unit closure.

Equipment of HWM Unit	Possible Methods of Decontamination[1]	Possible Methods of Disposal[1]
Warehouse 1:		
Waste Containers	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Secondary Containment Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Container Storage Racks	Disassembly and hydroblasting	,Landfill, Recycling
Wooden pallets	send offsite with containers	Incineration, Landfill, Recycling
Loading/Unloading Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Solid Decontamination Waste	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Warehouse II:		
Waste Containers	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Secondary Containment Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Container Storage Racks	Disassembly and hydroblasting	Landfill, Recycling
Wooden Pallets	send offsite with containers	Incineration, Landfill, Recycling
Solid Decontamination Waste	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Warehouse III:		
Waste Containers	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Secondary Containment Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Container Storage Racks	Disassembly and hydroblasting	Landfill, Recycling
Wooden Pallets	send offsite with containers	Incineration, Landfill, Recycling
Loading/Unloading Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Solid Decontamination Waste	Solid Decontamination Waste	Incineration, Landfill, Off-site Treatment
Waste Treatment Tanks & ancillary equipment		Landfill, Recycling
Waste Liquids	Pump liquids and remove for off-site disposal	Incineration, Landfill, Off-site Treatment
Tank Surfaces (interior and exterior)	Initial rinse followed by hydroblasting	Incineration, Landfill, Off-site Treatment
Secondary Containment Area	Hydroblasting	Incineration, Landfill, Off-site Treatment
Solid Decontamination Waste	Removal for off-site disposal	Incineration, Landfill, Off-site Treatment
Miscellaneous Areas:		Incineration, Landfill, Off-site Treatment
Drum Staging Areas	Hydroblasting	Incineration, Landfill, Off-site Treatment
Cylinder Release Units	Disassembly and hydroblasting	Incineration, Landfill, Recycling

[1]Applicants may list more than one appropriate method.

TABLE VII.B FACILITY CLOSURE COST ESTIMATE

Under 30 TAC 335.7, the authority to store, process or dispose of industrial solid waste or municipal hazardous waste under a permit issued by the TCEQ is contingent upon the execution and maintenance of a surety bond or other financial assurance, acceptable to the executive director, which provides sufficient funds for the closing of the facility. In order to determine the amount of money needed, the permit applicant must provide an estimate of the cost for closure of the facility. This closure cost estimate must be based on certain conditions defined by the TCEQ.

Under 30 TAC 335.178, the closure cost estimate must be based on the costs to the owner or operator of hiring a third party, who is neither a parent nor a subsidiary of the owner or operator, to close the facility. The estimate must also include the cost of third party removal, shipment and off-site processing and disposal of all waste. Additionally, the estimate must assume that the facility is at the maximum inventory of waste in all storage and processing units and must address the waste generated as a result of closure activities and any potential contaminated stormwater and leachate.

Technical Guidance Document number 10, published by the TCEQ, recommends that the following assumptions be considered in the closure cost estimate.

1. All motorized equipment is inoperable.

2. All surface impoundments are full (10% sludge, 90% liquid).

3. Open below-grade landfill excavations are one-half full of waste.

4. All storage tanks are full.

5. Containerized waste storage areas are filled with the maximum permitted number of waste containers.

6. A volume of contaminated water resulting from the total average rainfall of the wettest two consecutive months is contained in each open landfill excavation and within each diked or bermed area used as secondary containment for storage tanks or containers.

7. All landfarm areas have recently received the maximum permitted application of waste.

8. All waste piles contain maximum inventory.

9. The facility components do not have salvage value.

Table VII.B. - Unit Closure Cost Estimate

Task	Cost
Warehouse I	
Initial Waste Inventory and Related Reporting 32 hours @ $57.55/hr	$1,841.60
Removal of Drummed Waste 7342 drums @ $3.91/drum Disposal Decontamination Water – 17299 gal @ $0.63/gal Disposal Solid Drums – 2259 drums @ $271.20/dm Disposal Liquid Drums – 5083 drums @ $186.03/dm	$1,597,836.88
Dry Sweep Container Areas 22,018 ft² = 22.018 MSF @ $23.40/MSF Pressure Wash Container Area (22,018 ft²) 701 hrs @ $75.70/hr	53580.92
Transportation 7342 drums @ $7.63/drum Transportation Bulk liquid – 17300 gal @ $0.09/gal	57576.46
Decontamination Water Sampling 1 sample @ $158.63/sample Water Analysis 1 sample @ $2197.26/sample Drilling & Subsurface Soil Sampling 1 core @ $1549.25/core Soil Analysis 1 sample @ $2183.45/sample	$6,088.59
Engineering Costs Certification 1 unit @ $3,554.86/unit	$130,761.81
Subtotal	$1,847,686.26
Contingency (10% minimum)	$184,768.63
Total Unit Closure Cost	$2,032,454.89

Task	Cost
Warehouse II	
Initial Waste Inventory and Related Reporting 21 hours @ $57.55/hr	$1,208.55
Removal of Drummed Waste 4816 drums @ $3.91/drum Disposal Decontamination Water – 11,226 gal @ $0.63/gal Disposal Solid Drums – 1486 drums @ $271.20/dm Disposal Liquid Drums – 3330 drums @ $186.03/dm	$1,048,386.04
Dry Sweep Container Area 14,288 ft² = 14.288 MSF @ $23.40/MSF Pressure Wash Container Area (14,288 ft²) 455 hrs @ $75.70/hr	34777.84
Transportation 4816 drums @ $7.63/drum Transportation Bulk liquid – 11,226 gal @ $0.09/gal	37756.42
Decontamination Water Sampling 1 sample @ $158.63/sample Water Analysis 1 sample1 @ $2197.26/sample Drilling & Subsurface Soil Sampling 1 core @ $1549.25/core Soil Analysis 1 sample @ $2183.45/sample	$6,088.59

Task	Cost
Engineering Costs Certification 1 unit @ $3,554.86/unit	$78,599.42
Subtotal	$1,206,816.86
Contingency (10% minimum)	$120,681.69
Total Unit Closure Cost	$1,327,498.55

Task	Cost
Warehouse III	
Initial Waste Inventory and Related Reporting 43 hours @ $57.55/hr	$2,474.65
Removal of Drummed Waste 7,188 drums @ $3.91/drum Disposal Decontamination Water – 23,319 gal @ $0.63/gal Disposal Solid Drums – 2116 drums @ $271.20/dm Disposal Liquid Drums – 5222 drums @ $186.03/dm	$1,588,103.91
Dry Sweep Container Areas29,678 ft² = 29.678 MSF @ $23.40/MSF Pressure Wash Container Areas (29,678 ft²) 945 hrs @ $75.70/hr	72230.97
Transportation 7,188 drums @ $7.63/drum Transportation Bulk liquid – 23319 gal @ $0.09/gal	56943.15
Decontamination Water Sampling 1 sample @ $158.63/sample Water Analysis 1 sample @ $2197.26/sample Drilling & Subsurface Soil Sampling 1 core @ $1549.25/core Soil Analysis 1 sample @ $2183.45/sample	$6,088.59
Engineering Costs Certification 1 unit @ $3,554.86/unit	$127,938.61
Subtotal	$1,853,779.88
Contingency (10% minimum)	$185,377.99
Total Unit Closure Cost	$2,039,157.87

Task	Cost
Outdoor Storage Area	

Task	Cost
Initial Waste Inventory and Related Reporting 24 hours @ $57.55/hr	$1,381.20
Removal of Drummed Waste 3305 drums @ $3.91/drum Disposal Decontamination Water – 12,964 gal @ $0.63/gal Disposal Solid Drums – 974 drums @ $271.20/dm Disposal Liquid Drums – 2331 drums @ $186.03/dm	$718,874.60
Dry Sweep Container Areas 16,500 ft² = 16.5 MSF @ $23.40/MSF Pressure Wash Container Areas (16,500 ft²) 525 hrs @ $75.70/hr	40128.60
Transportation 3305 drums @ $7.63/drum Transportation Bulk liquid – 12,964 gal @ $0.09/gal	26383.91
Decontamination Water Sampling 1 sample @ $158.63/sample Water Analysis 1 sample @ $2197.26/sample Drilling & Subsurface Soil Sampling 1 core @ $1549.25/core Soil Analysis 1 sample @ $2183.45/sample	$6,088.59
Engineering Costs Certification 1 unit @ $3,554.86/unit	$69,640.18
Subtotal	$862,497.08
Contingency (10% minimum)	$86,249.71
Total Unit Closure Cost	$948,746.78

Task	Cost
Tank R-1	
Removal of Waste Flush Tank and Piping Pressure Wash Tank	$799.18
Disassemble Piping Remove Tank	$333.60
Sample Collection 1 sample = $52.56 Sample Analysis 1 samples = $1681.61	$1,734.17
Disposal tank & piping = $124.31 Decontamination Water = $346.835 Tank contents = $688.68	$1,159.82
Transportation Tank Contents, Decontamination Water, Tanks & Piping = $649.16	$649.16
Engineering Certification 1 tank @ $1579.94/tank	$3,925.70
Subtotal	$8,601.63

Task	Cost
Contingency (10% minimum)	$860.16
Total Unit Closure Cost	$9,461.78

Task	Cost
Tank R-1A	
Removal of Waste Flush Tank and Piping Pressure Wash Tank	$1,997.94
Disassemble Piping Remove Tank	$834.00
Sample Collection 1 sample = $52.56 Sample Analysis 1 samples = $1681.61	$1,734.17
Disposal tank & piping Decontamination Water Tank contents	$2,899.56
Transportation Tank Contents, Decontamination Water, Tanks & Piping	$1,622.91
Engineering Certification 1 tank @ $1579.94/tank	$6,415.48
Subtotal	$15,504.06
Contingency (10% minimum)	$1,550.41
Total Unit Closure Cost	$17,054.46

Task	Cost
Tank R2	
Removal of Waste Flush Tank and Piping Pressure Wash Tank	$1,997.94
Disassemble Piping Remove Tank	$834.00
Sample Collection 1 sample = $52.56 Sample Analysis 1 samples = $1681.61	$1,734.17

Task	Cost
Disposal tank & piping Decontamination Water Tank contents	$2,899.56
Transportation Tank Contents, Decontamination Water, Tanks & Piping	$1,622.91
Engineering Certification 1 tank @ $1579.94/tank	$6,415.48
Subtotal	15504.06
Contingency (10% minimum)	$1,550.41
Total Unit Closure Cost	$17,054.46

Task	Cost
Cylinder Release Unit 1	
Disassembly and Disposal of Unit 1 units @ $1,266.1/ unit	$1,226.10
Verbal description of task (waste amount generated x disposal cost/unit amount)	
Verbal description of task (waste amount generated x disposal cost/unit amount)	
Verbal description of task (waste amount generated x disposal cost/unit amount)	
Other tasks (such as labor, lab analysis, transportation, certifications, etc.)	
Other tasks	
Subtotal	$1,226.10
Contingency (10% minimum)	$122.61
Total Unit Closure Cost	$1,348.71

Task	Cost
Cylinder Release Unit 2	

Task	Cost
Disassembly and Disposal of Unit 1 unit @ $1,266.1/ unit	$1,226.10
Verbal description of task (waste amount generated x disposal cost/unit amount)	
Verbal description of task (waste amount generated x disposal cost/unit amount)	
Verbal description of task (waste amount generated x disposal cost/unit amount)	
Other tasks (such as labor, lab analysis, transportation, certifications, etc.)	
Other tasks	
Subtotal	$1,226.10
Contingency (10% minimum)	$122.61
Total Unit Closure Cost	$1,348.71

Note: The following assumptions will be made with regard to estimating the cost for closure of the facility.

1.1 The facility will be at the maximum permitted capacity at the time of closure. This will include the following:

- 1,064,270 gallons of waste in stored containers.
- 2,200 gallons of bulk liquid waste in three treatment tanks and one wet scrubber.
- An additional 26,400 gallons of waste in containers will be staged in the loading/unloading areas.

All containers are hazardous liquids and solids in the following ratios.

- RCRA solids – 30%
- RCRA liquids – 70%

1.2 All costs were calculated using CostPro 6.0.

1.3 The cost for off-site disposal of containerized waste is listed below and is based on the 2009 CostPro 6.0 costs for T&D and adjusted for inflation.

1.4 All floors, berms and secondary containment systems will be pressure washed.

1.5 All containers stored and staged at the facility will be placed on pallets and shipped off-site.

1.6 The three treatment tanks will contain minimal solids that can be slurried when the liquid in emptied.

1.7 The decontamination of the tanks will be accomplished by a preliminary wash, followed by pressure washing of the tank interior.

1.8 Tanks are located in an existing warehouse. Containment area decontamination is covered in the container areas costs.

1.9 Once cleaned, the tanks will be shipped offsite for disposal.

1.10 Tanks consist of R1 @ 200 gal, R1A @ 1500 gal & R2 @ 500 gal

Appendix

VII.C

RESERVED

Appendix

VII.D

RESERVED

Table VII.E.1. - Permitted Unit Closure Cost Summary

Existing Unit Closure Cost Estimate	
Unit	Cost
Tank R-1 (In 2020 Dollars)	$9,461.78
Tank R-1A (In 2020 Dollars)	$17,054.46
Cylinder Release Unit 1 (In 2020 Dollars)	$1,348.71
Container Storage Area I (In 2020 Dollars)	$2,032,454.89
Container Storage Area II (In 2020 Dollars)	$1,327,498.55
Container Storage Area III (In 2020 Dollars)	$2,039,157.87
Total Existing Unit Closure Cost Estimate[1]	$5,426,976.26

Proposed Unit Closure Cost Estimate	
Unit	Cost
Outdoor Storage Area (In 2020 Dollars)	$948,746.78
Tank R-2 (In 2020 Dollars)	$17,054.46
Cylinder Release Unit 2 (In 2020 Dollars)	$1,348.71

As units are added or deleted from these tables through future permit amendments or modifications, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

VII.E.2 Post Closure Cost Estimate

This section is not applicable to Clean Harbors La Porte, LLC under 40 CFR 264.144.

Section VIII – FINANCIAL ASSURANCE

Introduction

This section is intended to document that Clean Harbors LaPorte, LP (CHL) has sufficient financial resources to construct, safely operate, properly close and provide adequate liability coverage for the operations described in this permit renewal application. The information provided here is intended to document compliance with the RCRA financial assurance requirements listed in Section VIII of the Part B permit application and all other regulatory citations referred to in that section.

CHL is a distinct entity that is incorporated within the State of Texas. CHL also is a wholly owned subsidiary of Clean Harbors Environmental Services, Inc. and thus, the financial disclosure statements provided in Section VIII.B are under name of the parent company.

VIII.A -Financial Assurance Information for All Applicants

1. Financial Assurance for Closure

Under 40 CFR §264.143, the owner or operator of a hazardous waste management facility must establish a financial assurance mechanism to ensure that there are sufficient funds for proper closure of the facility. For CHL, this is provided in the form of liability insurance. A copy of the current closure insurance certificate is provided in Attachment VIII.A.1. A signed statement from an authorized signatory, in accordance with 30 TAC §305.44, is addressed in Section VIII.B.1.

Please note that the dollar amounts provided within these documents are based on the currently approved closure cost estimate for the facility. Should this amount change upon approval of this permit renewal application, these documents will be amended for the new amount.

2. Financial Assurance for Post Closure Care

No disposal of waste occurs on-site at CHL and thus, post closure care is not applicable at this site.

3. Liability Requirements

Under 40 CFR §264.147, the owner or operator of a hazardous waste management facility must maintain liability coverage for sudden accidental occurrences in the amount of at least $1 million per occurrence with an annual aggregate of at least $2 million. Provided in Attachment VIII.A.2 is a copy the most current "Hazardous Waste Facility Certificate of Liability Insurance" documenting compliance with this requirement. A signed statement from an authorized signatory, in accordance with 30 TAC §305.44, is addressed in Section VIII.B.1.

VIII.B -Applicant Financial Disclosure Statements

1. Financial Disclosure Statement

In accordance with the Part B permit application instructions, a permit renewal application must be accompanied by a signed statement by an authorized signatory per 30 TAC 305.44 (for a corporation, this shall mean a responsible corporate officer). This statement should explain in detail how the applicant demonstrates sufficient financial resources to construct, safely operate, properly close and provide adequate liability coverage for the facility. This is provided in Attachment VIII.B.1.

2. Audited Financial Statements

As per the instructions provided in the Part B permit application, applicant for permit renewal must include audited financial statements for the last two years and the most current quarterly financial statement prepared according to generally accepted accounting principles. This documentation is provided as Attachment VIII.B.2.

3. SEC Forms 10-K and 10-Q

As per the instructions provided in the Part B permit application, publicly traded companies must provide copies of the Securities and Exchange Commission ("SEC") Form 10-K for the last two years and the most current Form 10-Q. These are provided in Attachment VIII.B.2.

ATTACHMENT VIII.A.1
CERTIFICATE OF CLOSURE INSURANCE

Clean Harbors Environmental Services, Inc.
610 131st Place
Hammond, IN 46327
219-746-5050
800.282.0058
www.cleanharbors.com

VIA FEDERAL EXPRESS TRK #776178906007

September 6, 2019

Mr. Mark Stoebner
TCEQ - Financial Assurance Section, MC-184
12100 Park 35 Circle
Austin, Texas 78753

RE: **Insurance Policy Renewal and Annual Inflation Increases**
Clean Harbors Deer Park, LLC - EPA ID No. TXD055141378 / SWR Permit No. 50089
Clean Harbors La Porte, LLC - EPA ID No. TXD982290140 / SWR Permit No. 50225
Disposal Properties, LLC - EPA ID No. TXD 052649027 / SWR Permit No.
Altair Disposal Services, LLC - EPA ID No. TXD980624274 / MSW Permit No. 203-A

Dear Mr. Stoebner:

Please find enclosed three (3) original signed insurance policy endorsements for the Clean Harbors facilities referenced above. This is a new Insurance Policy, number CPC E496983 00, issued by Great American Insurance Company. The policy is effective July 31, 2019 – July 31, 2020 and the endorsements are effective September 6, 2019. Additionally, the endorsements reflect the annual inflation increases.

The annual inflation increases were calculated by multiplying the existing 2018 closure coverage amount by Inflation factor 1.023 obtained on July 29, 2019 from TCEQ website:
https://www.tceq.texas.gov/agency/financial/financial-assurance/annual_inflation_factors.html

Altair Closure: $4,060,301 x 1.023 = $4,153,688
Altair Post Closure: $7,377,204 x 1.023 = $7,546,880

Deer Park Closure: $23,289,038 – (recent permit renewal per TCEQ)
Deer Park Post-Closure: $6,270,707 x 1.023 = $6,414,933
Deer Park Corrective Action: $5,577,622 x 1.023 - $5,705,907

La Porte Closure: $6,250,904 x 1.023 = $6,394,675

Disposal Properties Closure: $471,683 x 1.023 = $482,532

The third endorsement is for the used oil closure amounts at Deer Park, La Porte and Royse City. If you have any questions regarding this submittal, please feel free to contact me at 219-746-5050 or Harvey.Pamela@cleanharbors.com.

Sincerely,

Pamela K. Harvey

Pamela K. Harvey, CHMM
Environmental Compliance Manager

Enclosures

GREAT AMERICAN
INSURANCE GROUP
ENVIRONMENTAL DIVISION

CPC MANUS (09 19)

ENDORSEMENT # 5

This endorsement, effective 12:01 a.m., 9/6/2019, forms a part of Policy No. CPC E496983 00 issued to CLEAN HARBORS, INC. AND ANY AND ALL SUBSIDIARIES AND AFFILIATES By Great American Insurance Company

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY ENDORSEMENT FOR CLOSURE, POST-CLOSURE, TSCA CLOSURE, OR CORRECTIVE ACTION

This endorsement modifies the insurance provided under the following:

Name and Address of Insurer (herein called the "Insurer"):

Great American Insurance Company, 301 E. 4th Street, Cincinnati, OH 45202

Endorsement No. 5

Face Amount of the Policy: $54,714,749

Attached to and forming part of Policy No. CPC E496983 00 (the "Policy")

Effective Date of Endorsement: September 6, 2019

Name and Physical and Mailing Addresses of Insured (herein called the "Insured"): Altair Disposal Services, LLC

Physical and Mailing Address:
2 Miles North of Altair, West Side of Highway 71, Altair, TX 77412

P.O. Box 226, Altair, TX 77412

Facility(ies) covered (for each facility list the following information):

Facility Name: Altair Disposal Services, LLC

Permit or other authorization number: MSW Permit #203-A

Facility Physical Address: 2 Miles North of Altair, West Side of Highway 71, Altair, TX 77412
Facility Mailing Address: P.O. Box 226, Altair, TX 77412

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INSURANCE GROUP
ENVIRONMENTAL DIVISION

CPC MANUS (09 19)

Coverage Amount:

$4,153,688	each CLAIM for CLOSURE COSTS
$7,546,880	each CLAIM for POST-CLOSURE COSTS

The Insurer has issued to the Insured the insurance coverage identified above to provide financial assurance for closure, post closure, or corrective action for the facilities identified above. It is understood and agreed that this Policy either already includes or is hereby amended to include the following provisions. If any provision in the Policy, other endorsement, or other exclusion conflicts with this endorsement, this endorsement controls. All other terms and conditions of this Policy remain unchanged.

1. The Policy is hereby amended to guarantee that the above reflected amount of funds shall be available to provide for closure, post closure, or corrective action of the facility(ies) identified above should the Texas Commission on Environmental Quality (TCEQ) executive director or his designee notify the Insurer that the Insured has failed to perform closure, post-closure, or corrective action when required; failed to provide an alternate financial assurance mechanism acceptable to the TCEQ executive director or his designee when required; or failed to provide continuous financial assurance coverage. The above reflected coverage amounts available for closure, post closure or corrective action are exclusive of legal defense costs or retained limits. The insurer is liable for the payment of amounts within any deductible applicable to the policy, with the right or reimbursement by the Insured for any such payment made by the Insurer.
2. A demand for reimbursement for closure, post closure or corrective action may be submitted by the TCEQ executive director or his designee to the insurer. Such a demand shall not be affected by any failure of the insured to submit notice of a claim to the Insurer or failure to do so within a time parameter.
3. The Policy is hereby amended to guarantee that once closure, post closure, or corrective action begins, the Insurer shall pay out funds, up to an amount equal to the respective coverage amounts listed above in this endorsement, upon the direction of the executive director or his designee, to such party or parties as the executive director or his designee specifies.
4. The Policy is hereby amended to provide that the Insurer cannot cancel, terminate, or fail to renew the Policy except for failure to pay the premium. The automatic renewal of the Policy shall, at a minimum, provide the Insured with the option of renewal at the face amount of the expiring Policy. If there is a failure to pay the premium, the Insurer may elect to cancel, terminate, or fail to renew the policy by sending notice by certified mail to the Insured and the TCEQ. Cancellation, termination, or failure to renew shall not occur, however, during 120 days beginning with the date of receipt of the notice by both the TCEQ and the Insured, as evidenced by the return receipts.
5. The Policy is hereby amended to provide that any notice sent to the TCEQ shall be sent via certified mail to the following address:

   Texas Commission on Environmental Quality
   Financial Assurance Unit, MC-184
   P.O. Box 13087
   Austin, Texas 78711-3087
6. The Policy is hereby amended to provide that cancellation, termination, or failure to renew shall not occur and the Policy shall remain in full force and effect in the event that on or before the date of expiration:

   (a) the executive director or his designee deems the facility abandoned;
   (b) the permit expires, is terminated, is revoked, or a new or renewal permit is denied;

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CPC MANUS (09 19)

(c) closure is ordered by the executive director of the commission, his designee or by a United States district court or other court of competent jurisdiction;
(d) the Insured is named as debtor in a voluntary or involuntary proceeding under Title 11 (Bankruptcy), United States Code; or
(e) the premium due is paid.

To the extent the provisions of Paragraph 4 of this endorsement may be deemed in conflict with the provisions of Paragraph 6, the provisions of Paragraph 6 of this endorsement control.

7. The Policy is hereby amended to contain a provision allowing assignment of the Policy to a successor Insured. Such assignment may be conditional upon consent of the Insurer, provided such consent is not unreasonably refused.

8. The Policy is hereby amended to provide that whenever requested by the TCEQ executive director or his designee, the Insurer agrees to furnish to the executive director or his designee a duplicate original of the complete Policy listed above, including all endorsements and amendments thereon.

9. The Policy is hereby amended to provide that for insurance policies providing coverage for post closure, commencing on the date that liability to make payments pursuant to the policy accrues, the insurer will thereafter annually increase the face amount of the policy. Such increase must be equivalent to the face amount of the policy, less any payments made, multiplied by an amount equivalent to 85% of the most recent investment rate or of the equivalent coupon issue yield announced by the United States Treasury for 26-week Treasury securities.

   The provisions of Paragraph 9 of this endorsement control over any other provisions found in this endorsement that are or appear to be in conflict.

10. The Policy is hereby amended to provide that this endorsement shall not be amended, nullified or affected in any way as a result of any other subsequent Policy changes, endorsement(s), or exclusions that adversely affects the requirements in this endorsement. In the event of a conflict between the terms and conditions of this subject endorsement and other existing or subsequent Policy provisions, other endorsement(s) or exclusions, this subject endorsement shall control.

11. The Insurer agrees that this is a "full prior acts" claims made policy with no retroactive date.

(Authorized signature of Insurer) _____

(Name of person signing): Richard Ringenwald

(Title of person signing): Divisional VP

(Signature of witness or notary) _____

(Date) 9/5/2019

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Patrick J. Mahoney, Notary Public
Uwchlan Twp., Chester County
My Commission Expires Sept. 27, 2021
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

GREAT AMERICAN
INSURANCE GROUP
ENVIRONMENTAL DIVISION

CSP MANUS (09 19)

ENDORSEMENT # 6

This endorsement, effective 12:01 a.m., 9/6/2019, forms a part of Policy No. CPC E496983 00 issued to CLEAN HARBORS, INC. AND ANY AND ALL SUBSIDIARIES AND AFFILIATES By Great American Insurance Company

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY ENDORSEMENT FOR CLOSURE, POST-CLOSURE, TSCA CLOSURE, OR CORRECTIVE ACTION

This endorsement modifies the insurance provided under the following:

Name and Address of Insurer (herein called the "Insurer"):

Great American Insurance Company, 301 E. 4th Street, Cincinnati, OH 45202

Endorsement No. 6

Face Amount of the Policy: $54,714,749

Attached to and forming part of Policy No. CPC E496983 00 (the "Policy")

Effective Date of Endorsement: September 6, 2019

Name and Physical and Mailing Addresses of Insured (herein called the "Insured"): Clean Harbors Deer Park, LLC; Clean Harbors La Porte, LLC; Disposal Properties, LLC

Physical and Mailing Address:
2027 Independence Parkway South, Deer Park, TX 77536
500 Independence Parkway South, La Porte, TX 77571
4303 Profit Drive, San Antonio, TX 78219

Facility(ies) covered (for each facility list the following information):

Facility Name: Clean Harbors Deer Park, LLC

Permit or other authorization number: SWR Permit #50089

Facility Physical Address: 2027 Independence Parkway South, Deer Park, TX 77536
Facility Mailing Address: 2027 Independence Parkway South, Deer Park, TX 77536

GREAT AMERICAN
INSURANCE GROUP
ENVIRONMENTAL DIVISION

CSP MANUS (09 19)

Coverage Amount:

$23,289,038	each CLAIM for CLOSURE COSTS
$6,414,933	each CLAIM for POST-CLOSURE COSTS
$5,705,907	each CLAIM for CORRECTIVE ACTION COSTS

Facility Name: Clean Harbors La Porte, LLC

Permit or other authorization number: SWR Permit #50225

Facility Physical Address: 500 Independence Parkway South, La Porte, TX 77571
Facility Mailing Address: 500 Independence Parkway South, La Porte, TX 77571

Coverage Amount:

$6,394,675	each CLAIM for CLOSURE COSTS

Facility Name: Disposal Properties, LLC

Permit or other authorization number: SWR Permit #31905

Facility Physical Address: 4303 Profit Drive, San Antonio, TX 78219
Facility Mailing Address: 4303 Profit Drive, San Antonio, TX 78219

Coverage Amount:

$482,532	each CLAIM for CLOSURE COSTS

The Insurer has issued to the Insured the insurance coverage identified above to provide financial assurance for closure, post closure, or corrective action for the facilities identified above. It is understood and agreed that this Policy either already includes or is hereby amended to include the following provisions. If any provision in the Policy, other endorsement, or other exclusion conflicts with this endorsement, this endorsement controls. All other terms and conditions of this Policy remain unchanged.

1. The Policy is hereby amended to guarantee that the above reflected amount of funds shall be available to provide for closure, post closure, or corrective action of the facility(ies) identified above should the Texas Commission on Environmental Quality (TCEQ) executive director or his designee notify the Insurer that the Insured has failed to perform closure, post-closure, or corrective action when required; failed to provide an alternate financial assurance mechanism acceptable to the TCEQ executive director or his designee when required; or failed to provide continuous financial assurance coverage. The above reflected coverage amounts available for closure, post closure or corrective action are exclusive of legal defense costs or retained limits. The insurer is liable for the payment of amounts within any deductible applicable to the policy, with the right or reimbursement by the Insured for any such payment made by the Insurer.
2. A demand for reimbursement for closure, post closure or corrective action may be submitted by the TCEQ executive director or his designee to the insurer. Such a demand shall not be affected by any failure of the insured to submit notice of a claim to the Insurer or failure to do so within a time parameter.
3. The Policy is hereby amended to guarantee that once closure, post closure, or corrective action begins, the Insurer shall pay out funds, up to an amount equal to the respective coverage amounts listed above in this

endorsement, upon the direction of the executive director or his designee, to such party or parties as the executive director or his designee specifies.

4. The Policy is hereby amended to provide that the Insurer cannot cancel, terminate, or fail to renew the Policy except for failure to pay the premium. The automatic renewal of the Policy shall, at a minimum, provide the Insured with the option of renewal at the face amount of the expiring Policy. If there is a failure to pay the premium, the Insurer may elect to cancel, terminate, or fail to renew the policy by sending notice by certified mail to the Insured and the TCEQ. Cancellation, termination, or failure to renew shall not occur, however, during 120 days beginning with the date of receipt of the notice by both the TCEQ and the Insured, as evidenced by the return receipts.

5. The Policy is hereby amended to provide that any notice sent to the TCEQ shall be sent via certified mail to the following address:

   Texas Commission on Environmental Quality
   Financial Assurance Unit, MC-184
   P.O. Box 13087
   Austin, Texas 78711-3087

6. The Policy is hereby amended to provide that cancellation, termination, or failure to renew shall not occur and the Policy shall remain in full force and effect in the event that on or before the date of expiration:

   (a) the executive director or his designee deems the facility abandoned;
   (b) the permit expires, is terminated, is revoked, or a new or renewal permit is denied;
   (c) closure is ordered by the executive director of the commission, his designee or by a United States district court or other court of competent jurisdiction;
   (d) the Insured is named as debtor in a voluntary or involuntary proceeding under Title 11 (Bankruptcy), United States Code; or
   (e) the premium due is paid.

   To the extent the provisions of Paragraph 4 of this endorsement may be deemed in conflict with the provisions of Paragraph 6, the provisions of Paragraph 6 of this endorsement control.

7. The Policy is hereby amended to contain a provision allowing assignment of the Policy to a successor Insured. Such assignment may be conditional upon consent of the Insurer, provided such consent is not unreasonably refused.

8. The Policy is hereby amended to provide that whenever requested by the TCEQ executive director or his designee, the Insurer agrees to furnish to the executive director or his designee a duplicate original of the complete Policy listed above, including all endorsements and amendments thereon.

9. The Policy is hereby amended to provide that for insurance policies providing coverage for post closure, commencing on the date that liability to make payments pursuant to the policy accrues, the insurer will thereafter annually increase the face amount of the policy. Such increase must be equivalent to the face amount of the policy, less any payments made, multiplied by an amount equivalent to 85% of the most recent investment rate or of the equivalent coupon issue yield announced by the United States Treasury for 26-week Treasury securities.

   The provisions of Paragraph 9 of this endorsement control over any other provisions found in this endorsement that are or appear to be in conflict.

GREAT AMERICAN
INSURANCE GROUP
ENVIRONMENTAL DIVISION

CSP MANUS (09 19)

10. The Policy is hereby amended to provide that this endorsement shall not be amended, nullified or affected in any way as a result of any other subsequent Policy changes, endorsement(s), or exclusions that adversely affects the requirements in this endorsement. In the event of a conflict between the terms and conditions of this subject endorsement and other existing or subsequent Policy provisions, other endorsement(s) or exclusions, this subject endorsement shall control.

11. The Insurer agrees that this is a "full prior acts" claims made policy with no retroactive date.

(Authorized signature of Insurer) _____

(Name of person signing): Richard Ringenwald

(Title of person signing): Divisional VP

(Signature of witness or notary) _____

(Date) 9/5/2019

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Patrick J. Mahoney, Notary Public
Uwchlan Twp., Chester County
My Commission Expires Sept. 27, 2021
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

GREAT AMERICAN
INSURANCE GROUP
ENVIRONMENTAL DIVISION

CSP MANUS (09 19)

ENDORSEMENT # 7

This endorsement, effective 12:01 a.m., 9/6/2019, forms a part of Policy No. CPC E496983 00 issued to CLEAN HARBORS, INC. AND ANY AND ALL SUBSIDIARIES AND AFFILIATES By Great American Insurance Company

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY ENDORSEMENT FOR CLOSURE, POST-CLOSURE, TSCA CLOSURE, OR CORRECTIVE ACTION

This endorsement modifies the insurance provided under the following:

Name and Address of Insurer (herein called the "Insurer"):

Great American Insurance Company, 301 E. 4th Street, Cincinnati, OH 45202

Endorsement No. 7

Face Amount of the Policy: $54,714,749

Attached to and forming part of Policy No. CPC E496983 00 (the "Policy")

Effective Date of Endorsement: September 6, 2019

Name and Physical and Mailing Addresses of Insured (herein called the "Insured"): Clean Harbors Deer Park, LLC; Clean Harbors La Porte, LLC; and Clean Harbors Environmental Services, Inc.

Physical and Mailing Address:
2027 Independence Parkway South, Deer Park, TX 77536
500 Independence Parkway South, La Porte, TX 77571
1410-A Industrial Drive, Royse City, TX 75189

Facility(ies) covered (for each facility list the following information):

Facility Name: Clean Harbors Deer Park, LLC

Permit or other authorization number: #A85951

Facility Physical Address: 2027 Independence Parkway South, Deer Park, TX 77536
Facility Mailing Address: 2027 Independence Parkway South, Deer Park, TX 77536

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ENVIRONMENTAL DIVISION

CSP MANUS (09 19)

Coverage Amount:

$3,977 each CLAIM for CLOSURE COSTS

Facility Name: Clean Harbors La Porte, LLC

Permit or other authorization number: #A85635

Facility Physical Address: 500 Independence Parkway South, La Porte, TX 77571
Facility Mailing Address: 500 Independence Parkway South, La Porte, TX 77571

Coverage Amount:

$37,643 each CLAIM for CLOSURE COSTS

Facility Name: Clean Harbors Environmental Services, Inc.

Permit or other authorization number: #A85468

Facility Physical Address: 1410-A Industrial Drive, Royse City, TX 75189
Facility Mailing Address: 1410-A Industrial Drive, Royse City, TX 75189

Coverage Amount:

$10,480 each CLAIM for CLOSURE COSTS

The Insurer has issued to the Insured the insurance coverage identified above to provide financial assurance for closure, post closure, or corrective action for the facilities identified above. It is understood and agreed that this Policy either already includes or is hereby amended to include the following provisions. If any provision in the Policy, other endorsement, or other exclusion conflicts with this endorsement, this endorsement controls. All other terms and conditions of this Policy remain unchanged.

1. The Policy is hereby amended to guarantee that the above reflected amount of funds shall be available to provide for closure, post closure, or corrective action of the facility(ies) identified above should the Texas Commission on Environmental Quality (TCEQ) executive director or his designee notify the Insurer that the Insured has failed to perform closure, post-closure, or corrective action when required; failed to provide an alternate financial assurance mechanism acceptable to the TCEQ executive director or his designee when required; or failed to provide continuous financial assurance coverage. The above reflected coverage amounts available for closure, post closure or corrective action are exclusive of legal defense costs or retained limits. The insurer is liable for the payment of amounts within any deductible applicable to the policy, with the right or reimbursement by the Insured for any such payment made by the Insurer.
2. A demand for reimbursement for closure, post closure or corrective action may be submitted by the TCEQ executive director or his designee to the insurer. Such a demand shall not be affected by any failure of the insured to submit notice of a claim to the Insurer or failure to do so within a time parameter.
3. The Policy is hereby amended to guarantee that once closure, post closure, or corrective action begins, the Insurer shall pay out funds, up to an amount equal to the respective coverage amounts listed above in this endorsement, upon the direction of the executive director or his designee, to such party or parties as the executive director or his designee specifies.
4. The Policy is hereby amended to provide that the Insurer cannot cancel, terminate, or fail to renew the Policy except for failure to pay the premium. The automatic renewal of the Policy shall, at a minimum, provide the Insured with the option of renewal at the face amount of the expiring Policy. If there is a failure to pay the

premium, the Insurer may elect to cancel, terminate, or fail to renew the policy by sending notice by certified mail to the Insured and the TCEQ. Cancellation, termination, or failure to renew shall not occur, however, during 120 days beginning with the date of receipt of the notice by both the TCEQ and the Insured, as evidenced by the return receipts.

5. The Policy is hereby amended to provide that any notice sent to the TCEQ shall be sent via certified mail to the following address:

   Texas Commission on Environmental Quality
   Financial Assurance Unit, MC-184
   P.O. Box 13087
   Austin, Texas 78711-3087

6. The Policy is hereby amended to provide that cancellation, termination, or failure to renew shall not occur and the Policy shall remain in full force and effect in the event that on or before the date of expiration:

   (a) the executive director or his designee deems the facility abandoned;
   (b) the permit expires, is terminated, is revoked, or a new or renewal permit is denied;
   (c) closure is ordered by the executive director of the commission, his designee or by a United States district court or other court of competent jurisdiction;
   (d) the Insured is named as debtor in a voluntary or involuntary proceeding under Title 11 (Bankruptcy), United States Code; or
   (e) the premium due is paid.

   To the extent the provisions of Paragraph 4 of this endorsement may be deemed in conflict with the provisions of Paragraph 6, the provisions of Paragraph 6 of this endorsement control.

7. The Policy is hereby amended to contain a provision allowing assignment of the Policy to a successor Insured. Such assignment may be conditional upon consent of the Insurer, provided such consent is not unreasonably refused.

8. The Policy is hereby amended to provide that whenever requested by the TCEQ executive director or his designee, the Insurer agrees to furnish to the executive director or his designee a duplicate original of the complete Policy listed above, including all endorsements and amendments thereon.

9. The Policy is hereby amended to provide that for insurance policies providing coverage for post closure, commencing on the date that liability to make payments pursuant to the policy accrues, the insurer will thereafter annually increase the face amount of the policy. Such increase must be equivalent to the face amount of the policy, less any payments made, multiplied by an amount equivalent to 85% of the most recent investment rate or of the equivalent coupon issue yield announced by the United States Treasury for 26-week Treasury securities.

   The provisions of Paragraph 9 of this endorsement control over any other provisions found in this endorsement that are or appear to be in conflict.

10. The Policy is hereby amended to provide that this endorsement shall not be amended, nullified or affected in any way as a result of any other subsequent Policy changes, endorsement(s), or exclusions that adversely affects the requirements in this endorsement. In the event of a conflict between the terms and conditions of this subject endorsement and other existing or subsequent Policy provisions, other endorsement(s) or exclusions, this subject endorsement shall control.

GREAT AMERICAN
INSURANCE GROUP
ENVIRONMENTAL DIVISION

CSP MANUS (09 19)

11. The Insurer agrees that this is a "full prior acts" claims made policy with no retroactive date.

(Authorized signature of Insurer) _____

(Name of person signing): Richard Ringenwald

(Title of person signing): Divisional VP

(Signature of witness or notary) _____

(Date) 9/5/2019

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Patrick J. Mahoney, Notary Public
Uwchlan Twp., Chester County
My Commission Expires Sept. 27, 2021
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

ATTACHMENT VIII.A.2
CERTIFICATE OF LIABILITY INSURANCE

Clean Harbors Environmental Services, Inc.
610 131st Place
Hammond, IN 46327
219-746-5050
800.282.0058
www.cleanharbors.com

VIA FEDERAL EXPRESS TRK #776840329213

October 29, 2019

Mr. Mark Stoebner
Revenue Section, Financial Assurance
Texas Commission on Environmental Quality
Building A/3, MC-184
12100 Park 35 Circle
Austin, TX 78753

RE: Hazardous Waste Facility Liability Insurance Policy Renewal
Safety-Kleen Systems, Inc – Multiple locations
Altair Disposal Services, LLC – EPA ID # TXD980624274
Disposal Properties, LLC – EPA ID # TXD052649027
Clean Harbors Deer Park, LLC – EPA ID # TXD055141378
Clean Harbors San Leon, Inc. – EPA ID # TXD981053770
Clean Harbors LaPorte, LLC – EPA ID # TXD982290140
Clean Harbors Industrial Services, Inc. – EPA ID # TXR000025791

Dear Mr. Stoebner:

Please find enclosed an Endorsement for Liability State of Texas and a State of Texas Underground Storage Tank Endorsement for the facilities referenced above. The endorsements are issued by Indian Harbor Insurance Company under policy number PEC0042039. The renewed policy number is PEC004203906 and the renewed policy period is November 1, 2019 – November 1, 2020.

The endorsements are currently in the process of being finalized. The completion date is expected to be within the next one (1) to two (2) months and an original signed copy of the completed Endorsement will be submitted to your attention at that time.

If you have any questions or concerns regarding this submittal please feel free to contact me at harvey.pamela@cleanharbors.com or at 219-746-5050.

Sincerely,

Pamela K. Harvey

Pamela K. Harvey, CHMM
Environmental Compliance Manager

Enclosures

ENDORSEMENT #

This endorsement, effective 12:01 a.m., November 1, 2019 forms a part of Policy No. PEC004203906 issued to Clean Harbors, Inc. by Indian Harbor Insurance Company.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY

ENDORSEMENT FOR LIABILITY
STATE OF TEXAS

This endorsement modifies insurance provided under the following:

POLLUTION AND REMEDIATION LEGAL LIABILITY POLICY

It is agreed the policy is amended as follows:

1. This endorsement certifies that the policy to which the endorsement is attached provides liability insurance covering bodily injury and property damage in connection with the insured's obligation to demonstrate financial responsibility under 30 TAC §37.404 (relating to Liability Requirements for Sudden and Nonsudden Accidental Occurrences). The coverage applies at (list permit number, name, and physical and mailing addresses for each facility)

Permit Number	Name	Address (Physical and Mailing)
Sudden Accidental Occurrences $1,000,000 each occurrence and $2,000,000 annual aggregate		
TXD062287883	Safety-Kleen Systems, Inc.	4234 Oil Belt Lane Abilene, TX 79605
TXD000747386	Safety-Kleen Systems, Inc.	3329 Federal Road Pasadena, TX 77504
TXD000729400	Safety-Kleen Systems, Inc.	5243 Sinclair Road San Antonio, TX 78222
TXD980876015	Safety-Kleen Systems, Inc.	22006 Woodway Drive Waco, TX 76712
TXD000747428	Safety-Kleen Systems, Inc.	1606 Missle Road Wichita Falls, TX 76306
TXR000031799	Safety-Kleen Systems, Inc.	1750 W Loop 335 S Amarillo, TX 79110
TXD000747402	Safety-Kleen Systems, Inc.	3820 & 3822 Bratton Road Corpus Christi, TX 78413
TXD988032595	Safety-Kleen Systems, Inc.	6000 N. Pompano Avenue El Paso, TX 79924
TXD000747394	Safety-Kleen Systems, Inc.	900 S Hawkins Blvd., Bldg A & B1 El Paso, TX 79938
TXR000077693	Safety-Kleen Systems, Inc.	4050 Flager Road El Paso, TX 79938
TXR000001933	Safety-Kleen Systems, Inc.	10272 Hicks Field Road Fort Worth, TX 76179
TXD981052061	Safety-Kleen Systems, Inc.	2130 E. Grauwyler Road "A" Irving, TX 75061
TXD000747378	Safety-Kleen Systems, Inc.	202 Michael Place Longview, TX 75603
TXD000747436	Safety-Kleen Systems, Inc.	1301 N. Redwood Avenue Lubbock, TX 74903-9531
TXD083145656	Safety-Kleen Systems, Inc.	1311 East Tamarack

		McAllen, TX 78501
TXD981056690	Safety-Kleen Systems, Inc.	10607 West County Road 127 Midland, TX 79711
TXD010803203	Safety-Kleen Systems, Inc.	1580 Industrial Road Missouri City, TX 77459
TXD061290276	Safety-Kleen Systems, Inc.	3454 Womack Road Orange, TX 77632
TXD000055045	Safety-Kleen Systems, Inc.	Highway 84 (Sec 27, Block S) Lubbock, TX
TXD077603371	Safety-Kleen Systems, Inc.	1722 Cooper Creek Road Denton, TX 76208
TXD052649027	Disposal Properties, LLC	4303 Profit Drive San Antonio, TX 78219
TXD981053416	Safety-Kleen Systems, Inc.	6529 Midway Road Fort Worth, TX 76117
Sudden and Nonsudden Accidental Occurrences $4,000,000 each occurrence and $8,000,000 annual aggregate		
H0225 USEPA ID No. TXD982290140 UGH-A85951	Clean Harbors LaPorte LLC	500 Independent Parkway South LaPorte, TX 77571
H0203 USEPA ID No. TXD055141378 UOH-A85951	Clean Harbors Deer Park, LLC	2027 Independence Parkway South, Deer Park, TX 77536
HW-50355 US EPA ID No. TXD981053770 SWR-34814	Clean Harbors San Leon, Inc.	2700 Avenue South San Leon, TX 77539
HO203 USEPA ID No. TXD980624274	Altair Disposal Services, LLC	2 Miles North of Altair, West Side of Hwy 71, Altair, TX 77412

for (sudden accidental occurrences, nonsudden accidental occurrences, or sudden and nonsudden accidental occurrences; if coverage is for multiple facilities and the coverage is different for different facilities, indicate which facilities are insured for sudden accidental occurrences, which are insured for nonsudden accidental occurrences, and which are insured for both). The limits of liability are $ "each occurrence" and $ "annual aggregate" limits of the Insurer's liability, exclusive of legal defense costs.

2. The insurance afforded with respect to such occurrences is subject to all of the terms and conditions of the policy; provided, however, that any provisions of the policy inconsistent with subsections (a) through (e) of this Paragraph are hereby amended to conform with subsections (a) through (e):

(a) Bankruptcy or insolvency of the insured shall not relieve the Insurer of its obligations under the policy to which this endorsement is attached.

(b) The Insurer is liable for the payment of amounts within any deductible applicable to the policy, with a right of reimbursement by the insured for any such payment made by the Insurer. This provision does not apply with respect to that amount of any deductible for which coverage is demonstrated as specified in 30 TAC §37.541 (relating to Financial Test for Liability).

(c) Whenever requested by the TCEQ executive director, the Insurer agrees to furnish to the executive director a signed duplicate original of the policy and all endorsements.

(d) Cancellation of this endorsement, whether by the Insurer, the Insured, or a parent corporation providing insurance coverage for its subsidiary, or by a firm having an insurable interest in and obtaining liability insurance on behalf of the owner or operator of the facility, will be effective only upon written notice and only after the expiration of 60 days after a copy of such written notice is received by the TCEQ executive director.

(e) Any other termination of this endorsement will be effective only upon written notice and only after the expiration of 30 days after a copy of such written notice is received by the TCEQ executive director.

Attached to and forming part of policy number PEC004203906 issued by Indian Harbor Insurance Company, herein called the Insurer, of 505 Eagleview Blvd, Suite 100, Exton, PA 19341-0636 to Clean Harbors, Inc. of 42 Longwater Drive, Norwell, MA 02061 and entities named above this 1st day of November 1, 2019. The effective date of said policy is November 1, 2019.

I hereby certify that the wording of this endorsement is identical to the wording specified in 30 TAC §37.641 as such regulation was constituted on the date first above written, and that the Insurer is licensed to transact the business of insurance, or eligible to provide insurance as an excess or surplus lines insurer, (in Texas or in one or more States).

(Signature of Authorized Representative of Insurer) Date: 10-28-19

Mary Ann Susavidge, Vice President Authorized Representative of Indian Harbor Insurance Company

c/o AXA XL
505 Eagleview Boulevard
Exton, PA 19341-0636

All other terms and conditions remain the same.

MANUS

ENDORSEMENT #

This endorsement, effective 12:01 a.m., November 1, 2019 forms a part of Policy No. PEC004203906 issued to CLEAN HARBORS, INC. by Indian Harbor Insurance Company.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

STATE OF TEXAS
UNDERGROUND STORAGE TANK ENDORSEMENT

This endorsement modifies insurance provided under the following:

POLLUTION AND REMEDIATION LEGAL LIABILITY POLICY

It is agreed the policy is amended as follows:

Name:	Clean Harbors Industrial Services, Inc.
Address:	1980 N. Highway 146, LaPorte, TX 77571
Policy Number:	PEC004203906
Period of Coverage:	November 1, 2019 - November 1, 2020
Name of Insurer:	Indian Harbor Insurance Company
Address of Insurer:	Regulatory Office 505 Eagleview Boulevard, Suite 100 Department: Regulatory Exton, PA 19341-1120 Phone: 800-688-1840
Name of Insured:	Clean Harbors, Inc.
Address of Insured:	42 Longwater Drive, Norwell, MA 02061

ENDORSEMENT

1. This endorsement certifies that the policy to which the endorsement is attached provides liability insurance covering the following underground storage tanks:

   [List the number of tanks at each facility and the name(s) and address(es) of the facility(ies) where the tanks are located. If more than one instrument is used to assure different tanks at any one facility, for each tank covered by this instrument, list the tank identification number provided in the notification submitted pursuant to Title 30, Texas Administrative Code §334.7 of these regulations, or the corresponding state requirement, and the name and address of the facility.]

Number of Tanks	Name	Address	Location of Tanks
2	Clean Harbors Industrial Services, Inc.	1980 N. Highway 146, LaPorte, TX 77571	

For taking corrective action and compensating third parties for bodily injury and property damaged caused by accidental releases; in accordance with and subject to the limits of liability, exclusions, conditions, and other terms of the policy arising from operating the underground storage tank(s) identified above.

The limits of liability are $1,000,000 each occurrence and $1,000,000 annual aggregate limits of the Insurer's liability, exclusive of legal defense costs, which are subject to a separate limit under the policy. This coverage is provided under PEC004203906. The effective date of said policy is November 1, 2019.

2. The insurance afforded with respect to such occurrences is subject to all of the terms and conditions of the policy; provided, however, that any provisions inconsistent with subsections (a) to (e), inclusive, of this Paragraph 2 are hereby amended to conform with subsections (a) to (e), inclusive;

(a) Bankruptcy or insolvency of the insured shall not relieve the Insurer of its obligations under the policy to which this endorsement applies.

(b) The Insurer is liable for the payment of amounts within any deductible applicable to the policy to the provider of corrective action or a damaged third-party, with a right of reimbursement by the insured for any such payment made by the Insurer. This provision does not apply with respect to that amount of any deductible for which coverage is demonstrated under another mechanism or combination of mechanisms as specified in Title 30, TAC, §37.825 of this title (relating to Financial Test of Self-Insurance), §37.830 of this title (relating to Guarantee), §37.835 of this title (relating to Insurance and Risk Retention Group Coverage), §37.840 of this title (relating to Surety Bond), §37.845 of this title (relating to Letter of Credit) and §37.850 of this title (relating to Trust Fund).

(c) Whenever requested by the Executive Director of the TCEQ, the Insurer agrees to furnish to the Executive Director, a signed duplicate original of the policy and all endorsements.

(d) Cancellation or any other termination of the insurance by the Insurer, except for non-payment of premium or misrepresentation by the insured, shall be effective only upon written notice and only after the expiration of sixty (60) days after a copy of such written notice is received by the insured. Cancellation for non-payment of premium or misrepresentation by the insured shall be effective only upon written notice and only after expiration of a minimum of ten (10) days after a copy of such written notice is received by the insured.

(e) The insurance covers claims otherwise covered by the policy that are reported to the Insurer within six months of the effective date of cancellation or non-renewal of the policy except where the new or renewed policy has the same retroactive date or a retroactive date earlier than that of the prior policy, and which arise out of any covered occurrence that commenced after the policy retroactive date, if applicable, and prior to such policy renewal or termination date. Claims reported during such extended reporting period are subject to the terms, conditions, limits, including limits of liability, and exclusions of the policy.

I hereby certify that the wording of this instrument is identical to the wording in 30 TAC §37.835(b)(1) of this title (relating to Insurance and Risk Retention Group Coverage) and that the Insurer is [insert "licensed to transact the business of insurance" or "eligible to provide insurance as an excess or surplus lines insurer"] in Texas.

(Signature of Authorized Representative of Insurer)

Date: 10-28-19

Name of Person Signing	Mary Ann Susavidge
Title of Person Signing	Vice President
Authorized Representative of:	Indian Harbor Insurance Company
Address of Representative	Regulatory Office 505 Eagleview Boulevard, Suite 100 Department: Regulatory Exton, PA 19341-1120 Phone: 800-688-1840

All other terms and conditions remain the same.

ATTACHMENT VIII.B.1
FINANCIAL DISCLOSURE STATEMENTS

Clean Harbors La Porte, LLC
500 Independence Parkway South
La Porte, Texas 77571
281.884.5500
www.cleanharbors.com

May 20, 2020

Mr. Robert Patton, Jr.
Manager, Industrial and Hazardous Waste Permits Section
Texas Commission on Environmental Quality
Building F, MC 130
12100 Park 35 Circle
Austin, Texas 78753

Re: Financial Disclosure Letter for Clean Harbors La Porte, LLC
Permit Renewal
Hazardous Waste Permit No. 50225
Industrial Solid Waste Registration No. 50225
EPA ID No. TXD982290140
RN102949021; CN603661844

Dear Mr. Patton:

This letter is furnished to you in response to financial disclosure requirements as applicable under Texas Health and Safety Code Section 361.085 and Title 30, Texas Administrative Code (30 TAC), Section 305.50 to provide assurance that Clean Harbors La Porte, LLC has sufficient financial resources.

In keeping with the above law and rule requirements I hereby certify that Clean Harbors La Porte, LLC is adequately capitalized and has sufficient financial resources to operate, close, provide post-closure care for and perform corrective action for the above-referenced facility in a safe manner, and in compliance with the permit and all applicable rules.

Clean Harbors La Porte, LLC currently provides an insurance policy financial assurance mechanism as set out in 30 TAC, Chapter 37, Subchapter C to meet Clean Harbors La Porte, LLC's financial assurance obligations.

I am authorized to make these statements on behalf of Clean Harbors La Porte, LLC. I understand that the TCEQ may request additional information as part of their review.

Sincerely,

M L Battles

Michael L. Battles
Chief Financial Officer
Clean Harbors, Inc.

ATTACHMENT VIII.B.2
10K,10Q AUDITED FINANCIAL

40 YEARS OF SUSTAINABILITY IN ACTION

Clean Harbors®

ANNUAL REPORT 2019

40TH ANNIVERSARY

2019 BY THE NUMBERS

RECORD $540M
ADJUSTED EBITDA
Highest in Company History

RECORD $208M
ADJUSTED FREE CASH FLOW
Highest in Company History

RECORD SAFETY
Total Recordable Incident Rate at historic low

RECORD 235M
GALLONS OF WASTE OIL
Most Ever Collected

$3.4B REVENUE
Up 3.4% compared to 2018

3RD Consecutive Year of Profitable Growth and Improved Margins

Clean Harbors further enhances position as the leading provider of environmental, energy and industrial services

Clean Harbors entered 2019 on a high note with a continued focus on extending our top-line momentum, converting revenue into greater profitability, rewarding our team with additional benefits and building on our record safety performance from the prior year.

Operating under the theme "The Next Level," we achieved new heights in 2019 across key safety and financial metrics. Our company-wide safety statistics as measured by Total Recordable Incident Rate (TRIR) reached their lowest level in our history. At the same time, we set all-time highs in Adjusted EBITDA and adjusted free cash flow, ultimately delivering our third consecutive year of profitable growth and improved margins.

In 2020, we celebrate our 40th year in business with our first national TV advertising campaign highlighting our broad array of sustainability-focused services that will become an even more important part of our story in the years ahead.

2019 Key Highlights:

- Highest Adjusted EBITDA in our history
- Highest adjusted free cash flow in our history
- Best safety year in our history – Total Recordable Incident Rate at an all-time low
- 235 million gallons of waste oil collected
- Nearly 25% growth in direct lube sales volumes with our OilPlus® offering
- More than doubled our 401K/RRSP match from previous year
- Enhanced our systems and infrastructure, with greater emphasis on business analytics and robotic process automation

2019 THE NEXT LEVEL Clean Harbors

40TH ANNIVERSARY

About Clean Harbors

Clean Harbors (NYSE: CLH) is North America's leading provider of environmental, energy and industrial services. The Company serves a diverse customer base, including a majority of the Fortune 500, across the chemical, energy, manufacturing and additional markets as well as numerous government agencies. These customers rely on Clean Harbors to deliver a broad range of services, such as end-to-end hazardous waste management, emergency spill response, industrial cleaning and maintenance, and recycling. Through its Safety-Kleen subsidiary, Clean Harbors is also North America's largest re-refiner and recycler of used oil and a leading provider of parts washers and environmental services to commercial, industrial and automotive customers. Founded in 1980 and based in Massachusetts, Clean Harbors operates throughout the United States, Canada, Mexico, Puerto Rico and India. For more information, visit www.cleanharbors.com.

TO OUR SHAREHOLDERS

"2019 was a year of record financial performance for Clean Harbors, as we delivered the highest Adjusted EBITDA and adjusted free cash flow in our history."

Alan S. McKim
Chairman, President and Chief Executive Officer

Dear Shareholders:

2019 was a year of record financial performance for Clean Harbors, as we delivered the highest Adjusted EBITDA and adjusted free cash flow in our history. Our performance was driven by favorable market conditions as well as a combination of strategic initiatives to increase efficiencies, improve pricing and drive higher volumes through our network.

This marked our third consecutive year of profitable growth and improved margins. Adjusted EBITDA grew 10%, or nearly $50 million, fueling a 90-basis-point margin increase. In addition, we enhanced our internal systems and infrastructure, putting a greater emphasis on business analytics and robotic process automation to help prepare us for the next stage of growth.

From my perspective, our most significant accomplishment of 2019 is something not listed in our financial statements. It was the best safety year in our history, with a Total Recordable Incident Rate and other key metrics at all-time lows, following a record 2018. Safety translates into results. And over the past five years, a proactive focus on safety has enabled us to deliver on our commitment to our employees, customers and shareholders. It has strengthened our ability to win new business, protect the communities in which we operate, and attract and retain talented people. Our *Live It 3-6-5* safety philosophy embodies our goal of ensuring that each employee goes home uninjured every day.

Environmental Services Paces a Strong Year

Environmental Services, which includes our recycling and disposal assets, accounted for the majority of our profitable growth in 2019. This reflected a concerted effort to enhance our mix of waste streams, increase utilization, and generate a higher average price per pound. Our unique disposal assets, and the market's confidence in Clean Harbors, have positioned us to capitalize on the ongoing expansion of the U.S. chemical and manufacturing sectors and to consistently capture higher-value waste streams. We also won multiple large-scale remediation and waste projects in 2019. At the same time, our Field Services business grew by more than 10% as we captured a broad range of large and small emergency response projects.

Safety-Kleen Environmental Services grew 7% in 2019 and our core offerings – parts washer services, containerized waste pickups and vacuum services – performed in line with our expectations. Our branches collected a record 235 million gallons of waste oil during the year while maintaining an optimal collection cost per gallon. Our re-refineries ran well in 2019, producing base oil and creating a broad suite of blended products under our Performance Plus brand. For the full year, direct lube sales volumes grew by nearly 25% as our OilPlus™ offering continued to gain traction. With more than 30,000 unique customers, we are steadily expanding our market presence. We believe we will ultimately reach our long-term goals for blended volumes as the market for sustainable products continues to expand.

Outlook for 2020 – COVID-19

The annual letter to shareholders presents a recap of the past year and a roadmap for where we're going based on a snapshot in time. As of the writing of this letter, the world is currently in the grip of a global health crisis due to the Coronavirus pandemic (COVID-19), and our roadmap certainly may change. Regardless of the path the pandemic takes, however, we believe we are as well prepared as we can be, both financially and operationally.

At our core, we are an emergency response company. From 9/11 and the anthrax attacks to Hurricane Katrina, the Deepwater Horizon spill and the avian flu outbreak of 2015, we respond in times of national need. The pandemic is still in its early days across the U.S. and Canada, but Clean Harbors is already in the field decontaminating schools, plants, stadiums, stores and health care facilities, and removing infectious waste. We're on the front lines of the disease, helping to ensure locations are safe for our customers, their communities and the

population as a whole. Though it's impossible to anticipate the full impact or duration of the COVID-19 outbreak, I'm confident that we will play an integral part in helping our customers – and many industries – return to normal operations.

One reason for that confidence is our financial strength. We exited 2019 with an exceptionally strong balance sheet, highlighted by a robust cash balance of more than $400 million. Our net debt-to-EBITDA ratio of 2.1x was the lowest since before our purchase of Safety-Kleen in late 2012. Through a series of refinancings in recent years, we have lowered our weighted average cost of debt to just 4.5%, with a healthy mix of fixed and variable debt. Our first tranche is not due until 2024, and our $400 million revolver is untapped.

Growth Strategy for 2020 and Beyond

While the Coronavirus threatens to disrupt our economy in the short term, we are focused on continuing to deliver profitable growth. Once markets normalize, our disposal and recycling network will remain the cornerstone of our success. We plan to further leverage our facilities and service locations through pricing and mix initiatives, increasing project volumes and cross-selling opportunities.

We're in the early stages of rolling out a new e-commerce platform that will enable customers to request our products and services online. By taking a "next-day" approach to delivering our products and some services, we intend to make Clean Harbors and Safety-Kleen even easier to do business with.

We've always been forward-thinking when it comes to technology, and we expect the addition of an e-commerce platform to greatly benefit our customers. We're also rolling out AI technology to have customers more directly interface with our waste profile systems to expedite the approval and acceptance process for hazardous waste disposal services. Customers will also be able to use our e-commerce platform to schedule their own waste pickups. The customer experience will be much improved and our ability to manage orders or deliver services will be enhanced as well.

We also want to capitalize on the shifting market conditions brought on by IMO 2020. We've already seen the rule drive changes in the values of high-sulfur fuel oil (HSFO) and low-sulfur fuel oil (LSFO). However, crude oil and base oil markets remain in a state of flux with severe pricing disruptions caused by the Coronavirus. In the interim, we are aggressively managing our re-refinery spread by significantly increasing our charge-for-oil (CFO) rates. With the systems we have in place today, we are confident that we can maintain reasonable profitability levels in our Safety-Kleen Oil business, just as we've done effectively in prior low-crude-price environments such as early 2016.

During 2020 we expect to pursue other emerging growth opportunities such as PFAS and take full advantage of the growing market acceptance of our sustainable offerings. As featured on the cover and inside cover of this annual report, we provide a broad array of sustainability-focused services that go beyond just our being the largest collector and recycler of waste oil. Sustainability is core to both the Clean Harbors and Safety-Kleen brands, and has been part of Clean Harbors' DNA for 40 years. Given climate change and rising environmental awareness, we expect that sustainability will become an even more prominent part of our story in the years ahead.

Investments in Our Team

The success of Clean Harbors begins and ends with our people. That's why, over the past three years, we have invested more than $75 million in the form of wage and compensation improvements and increased contributions to retirement and healthcare benefits. Our skilled global team of approximately 15,000 reinforces our reputation in the marketplace every day. Our success in 2019 is a direct result of their hard work and innumerable contributions.

On behalf of our management team and Board of Directors, I want to thank the entire Clean Harbors team for its dedication in helping us achieve our goals. I also would like to thank you, our shareholders, for your ongoing confidence.

2020 marks a milestone for Clean Harbors – our 40th year in business. I'm proud of our success over the past four decades, and look forward to the many activities we have planned to celebrate this milestone as a team in the coming months.

Stay safe and well in the year ahead,

Alan S. McKim
Chairman, President and Chief Executive Officer
Clean Harbors, Inc.
March 31, 2020

For the Years Ended December 31 *(in thousands, except per share amounts)*

Income Statement Data:	2019	2018	2017	2016	2015
Revenues	$ 3,412,190	$ 3,300,303	$ 2,944,978	$ 2,755,226	$ 3,275,137
Cost of revenues (exclusive of items shown separately below)	2,387,819	2,305,551	2,062,673	1,932,857	2,356,806
Selling, general and administrative expenses	484,054	503,747	456,648	422,015	414,164
Accretion of environmental liabilities	10,136	9,806	9,460	10,177	10,402
Depreciation and amortization	300,725	298,625	288,422	287,002	274,194
Goodwill impairment charge	—	—	—	34,013	31,992
Income from operations	229,456	182,574	127,775	69,162	187,579
Other income (expense), net	2,897	(4,510)	(6,119)	6,195	(1,380)
Loss on early extinguishment of debt	(6,131)	(2,488)	(7,891)	—	—
Gain on sale of businesses	687	—	30,732	16,884	—
Interest expense, net	(78,670)	(81,094)	(85,808)	(83,525)	(76,553)
Income before provision (benefit) for income taxes	148,239	94,482	58,689	8,716	109,646
Provision (benefit) for income taxes	50,499	28,846	(42,050)	48,589	65,544
Net income (loss) (1)	$ 97,740	$ 65,636	$ 100,739	$ (39,873)	$ 44,102
Earnings (loss) per share: (1)					
Basic	$ 1.75	$ 1.17	$ 1.77	$ (0.69)	$ 0.76
Diluted	$ 1.74	$ 1.16	$ 1.76	$ (0.69)	$ 0.76
Cash Flow Data:					
Net cash from operating activities	$ 413,192	$ 373,210	$ 285,698	$ 259,624	$ 396,383
Net cash used in investing activities	(217,856)	(349,659)	(203,267)	(361,777)	(350,642)
Net cash (used in) from financing activities	(53,425)	(110,997)	(72,760)	220,235	(90,179)
Other Financial Data:					
Adjusted EBITDA (2)	$ 540,317	$ 491,005	$ 425,657	$ 400,354	$ 504,167
Adjusted Free Cash Flow (3)	$ 208,523	$ 195,311	$ 140,238	$ 61,057	$ 145,382

As of December 31 *(in thousands)*

Balance Sheet Data:	2019	2018	2017	2016	2015
Working capital (4)	$ 680,808	$ 599,880	$ 650,239	$ 588,203	$ 404,076
Total assets (4)	4,108,904	3,738,321	3,706,570	3,681,920	3,431,428
Long-term obligations (including current portion)	1,561,651	1,572,556	1,629,537	1,633,272	1,382,543
Stockholders' equity	1,269,813	1,169,756	1,188,202	1,084,241	1,096,282

1. *The 2019 results include a $6.1 million pre-tax loss on early extinguishment of debt and a $0.7 million gain on the sale of a non-core line of business within our Environmental Services segment. The 2018 results include a $2.5 million pre-tax loss on early extinguishment of debt. The 2017 results include a net benefit of $93.0 million resulting from impacts of the tax law changes enacted in December of 2017, a $7.9 million pre-tax loss on early extinguishment of debt and a $30.7 million pre-tax gain on the sale of a non-core line of business within our Environmental Services segment. The 2016 results include a $34.0 million goodwill impairment charge and a $16.9 million pre-tax gain on the sale of a non-core line of business within our Environmental Services segment. The 2015 results include a $32.0 million goodwill impairment charge in our Environmental Services segment. In 2016, we did not record any income tax benefit as a result of the goodwill impairment charge. In 2015, we recorded an income tax benefit of $2.0 million as a result of the goodwill impairment charge.*
2. *See "Adjusted EBITDA" under Item 6, "Selected Financial Data," on page 27 of the Annual Report on Form 10-K, incorporated herein, for a reconciliation of net income (loss) to Adjusted EBITDA.*
3. *See "Adjusted Free Cash Flow" under Item 7, "Management's Discussion and Analysis," on page 37 of the Annual Report on Form 10-K, incorporated herein, for a reconciliation of net cash from operating activities to adjusted free cash flow.*
4. *The Company adopted Accounting Standards Update 2016-02, Leases, on January 1, 2019 using the modified retrospective method. The 2019 Total Asset balance includes the Operating lease right-of-use asset balance required under that new accounting standard. The 2019 current liability balance used in calculating Working Capital (as defined as current assets less current liabilities) includes the Current portion of operating lease liabilities as required under that new accounting standard.*

EXECUTIVE OFFICERS & DIRECTORS

Executive Officers

Alan S. McKim
Chairman, President and Chief Executive Officer

Michael L. Battles
Executive Vice President and Chief Financial Officer

George L. Curtis
Executive Vice President, Pricing and Proposals*

Eric J. Dugas
Senior Vice President, Finance and Chief Accounting Officer

Sharon M. Gabriel
Executive Vice President and Chief Information Officer*

Eric W. Gerstenberg
Chief Operating Officer*

Robert Johnston
President of Oil and Gas*

Jeffrey H. Knapp
Executive Vice President and Chief Human Resources Officer*

Robert E. Speights
Executive Vice President and Chief Sales Officer*

Michael J. Twohig
Executive Vice President, Safety and Risk Management*

Brian P. Weber
Executive Vice President, Corporate Planning and Development*

**Officer of a wholly owned subsidiary of the parent holding company, Clean Harbors, Inc.*

Directors

Alan S. McKim
Chairman, President and Chief Executive Officer

Dr. Gene Banucci
Lead Director

Edward G. Galante
Director

Rod Marlin
Director

John T. Preston
Director

Andrea Robertson, CPA
Director

Thomas J. Shields
Director

Lauren C. States
Director

John R. Welch
Director

Robert Willett
Director

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

FOR THE FISCAL YEAR ENDED DECEMBER 31, 2019

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

COMMISSION FILE NO. 001-34223

CLEAN HARBORS, INC.

(Exact name of registrant as specified in its charter)

Massachusetts	**04-2997780**
(State or Other Jurisdiction of Incorporation or Organization)	(IRS Employer Identification No.)
42 Longwater Drive Norwell MA	**02061-9149**
(Address of Principal Executive Offices)	(Zip Code)

Registrant's Telephone Number, Including area code: **(781) 792-5000**

Securities registered pursuant to Section 12(b) of the Securities Exchange Act of 1934:

Title of each class	Trading Symbol	Name of each exchange on which registered
Common Stock, $0.01 par value	CLH	New York Stock Exchange

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding twelve months (or for such shorter period that the registrant was required to file such reports) and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer ☒	Accelerated filer ☐
Non-accelerated filer ☐	Smaller reporting company ☐
	Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

On June 28, 2019 (the last business day of the registrant's most recently completed second fiscal quarter), the aggregate market value of the voting and non-voting common stock of the registrant held by non-affiliates of the registrant was approximately $3.7 billion, based on the closing price of such common stock as of that date on the New York Stock Exchange. Reference is made to Part III of this report for the assumptions on which this calculation is based.

On February 19, 2020, there were outstanding 55,829,761 shares of Common Stock, $0.01 par value.

DOCUMENTS INCORPORATED BY REFERENCE

Certain portions of the registrant's definitive proxy statement for its 2020 annual meeting of stockholders (which will be filed with the Commission not later than April 22, 2020) are incorporated by reference into Part III of this report.

CLEAN HARBORS, INC.

ANNUAL REPORT ON FORM 10-K

YEAR ENDED DECEMBER 31, 2019

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Disclosure Regarding Forward-Looking Statements

In addition to historical information, this annual report contains forward-looking statements, which are generally identifiable by use of the words "believes," "expects," "intends," "anticipates," "plans to," "seeks," "should," "estimates," "projects," "may," "likely" or similar expressions. Forward-looking statements are neither historical facts nor assurances of future performance. These forward-looking statements are subject to certain risks and uncertainties that could cause actual results to differ materially from those reflected in these forward-looking statements. Factors that might cause such a difference include, but are not limited to, those discussed in this report under Item 1A, "Risk Factors," and Item 7, "Management's Discussion and Analysis on Financial Condition and Results of Operations." Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect management's opinions only as of the date hereof. We undertake no obligation to revise or publicly release the results of any revision to these forward-looking statements. Readers should also carefully review the risk factors described in other documents which we file from time to time with the Securities and Exchange Commission (the "SEC"), including the quarterly reports on Form 10-Q to be filed by us during 2020.

PART I

ITEM 1. BUSINESS

General

Clean Harbors, Inc. and its subsidiaries (collectively, "we," "Clean Harbors" or the "Company") is a leading provider of environmental, energy and industrial services throughout North America. We are also the largest re-refiner and recycler of used oil in the world and the largest provider of parts cleaning and related environmental services to commercial, industrial and automotive customers in North America. One of our primary goals as a company is supporting our customers in finding environmentally responsible solutions to further their sustainability goals in today's world.

We have two operating segments*;* (i) the Environmental Services segment and (ii) the Safety-Kleen segment.

- **Environmental Services -** Environmental Services segment results are predicated upon the demand by our customers for waste services directly attributable to waste volumes generated by them and project work for which waste handling and/or disposal is required. In managing the business and evaluating performance, management tracks the volumes and mix of waste handled and disposed of through our owned incinerators and landfills, as well as utilization of such incinerators, labor and billable hours and equipment among other key metrics. Levels of activity and ultimate performance associated with this segment can be impacted by several factors including overall U.S. GDP and U.S. industrial production, weather conditions, efficiency of our operations, technology, changing regulations, competition, market pricing of our services and the management of our related operating costs. Environmental Services results are also impacted by the demand for planned and unplanned industrial related cleaning and maintenance services at customer sites and for environmental cleanup services on a scheduled or emergency basis, including response to national events such as major chemical spills, natural disasters or other events where immediate and specialized services are required.

- **Safety-Kleen -** Safety-Kleen segment results are impacted by an array of core service and product offerings that serve to attract small quantity waste producers as customers and integrate them into the Clean Harbors waste network. Core service offerings include parts washer services, containerized waste services, vac services, used motor oil collection and contract blending and packaging services. Key performance indicators tracked by the Company relative to these services include the number of parts washer services performed and pricing and volume of used motor oil and waste collected. Results from these services are primarily driven by the overall number of parts washers placed at customer sites and volumes of waste collected, as well as the demand for and frequency of other offered services. These factors can be impacted by overall economic conditions in the marketplace, especially in the automotive related area. In addition to its core service offerings, Safety-Kleen offers high quality recycled base and blended oil products to end users including fleet customers, distributors and manufacturers of oil products. Other product offerings include automotive related fluids and shop supplies. Relative to its oil related products, management tracks the Company's volumes and relative percentages of base and blended oil sales along with various pricing metrics associated with the commodity driven marketplace. The segment’s results are significantly impacted by overall market pricing and product mix associated with base and blended oil products and, more specifically, the market prices of Group II base oils. Costs incurred in connection with the collection of used oil and other raw materials associated with the segment’s oil related products can also be volatile. Our OilPlus® closed loop initiative, which results in the sale of our renewable oil products directly to our end customers, may also be impacted by changes in customer demand for high-quality, environmentally responsible recycled oil.

Clean Harbors, Inc. was incorporated in Massachusetts in 1980 and our principal executive offices are located in Norwell, Massachusetts. We maintain a website at the following Internet address: http://www.cleanharbors.com. Through a link on this

website, we provide free access to our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934 as soon as reasonably practicable after electronic filing with the SEC. Our guidelines on corporate governance, the charters for our board committees and our code of ethics for members of the board of directors, our chief executive officer and our other senior officers are also available on our website, and we will post on our website any waivers of, or amendments to, such code of ethics. Our website and the information contained therein or connected thereto are not incorporated by reference into this Form 10-K.

Health and Safety

Health and Safety is our #1 core value. Employees at all levels of our Company share this philosophy and are committed to ensuring our safety goals are met. Our commitment to health and safety benefits all of our stakeholders to include our employees, our customers, the community and the environment. In 2019, the continued success of our *Safety Starts with Me: Live It 3-6-5* program, which is a key component in our overall safety approach along with our many other programs, enabled us to achieve low Total Recordable Incident Rate, or "TRIR" and Days Away, Restricted Activity and Transfer Rate, or "DART." For the year ended December 31, 2019, our Company wide TRIR and DART were 1.05 and 0.61, respectively. For the year ended December 31, 2018, our Company wide TRIR and DART were 1.08 and 0.63, respectively. As a result of our unrelenting focus on safety, in 2019 the Company achieved its lowest TRIR and DART rates in history.

In order to protect our employees, continue to lower our incident rates and satisfy our customers' demands to retain the best service providers with the lowest TRIR and DART rates, we are fully committed to continuously improving our health and safety performance through ongoing safety initiatives and training as well as technological solutions aimed at keeping all of our 14,400 employees safe. All employees recognize the importance of protecting themselves, their fellow employees, their customers and all those around them from harm. Our commitment is supported by the *Safety Starts with Me: Live It 3-6-5* program, which includes three Safety philosophies, six Golden Rules of Safety and each employee’s five personal reasons why they choose to be safe at work, on the road and at home.

Compliance

We regard compliance with applicable environmental regulations as a critical component of our overall operations. We strive to maintain the highest professional standards in our compliance activities. A detailed compliance program has been developed for each of our permitted facilities, service centers and other locations under the direction of our compliance staff and based on the operations specific to each location. The compliance staff is responsible for the facilities' permitting and regulatory compliance, compliance training, transportation compliance and related record keeping. To ensure the effectiveness of our regulatory compliance program, our compliance staff monitors daily operational activities. We also have an Environmental Health and Safety Compliance Internal Audit Program designed to identify any weaknesses or opportunities for improvement in our ongoing compliance programs. We also perform periodic audits and inspections of the disposal facilities owned by other companies which we utilize.

Our facilities are frequently inspected and audited by regulatory agencies, as well as by customers. Although our facilities have been cited on occasion for regulatory violations, we believe that each of our facilities is currently in substantial compliance with applicable permit requirements.

Strategy

Our strategy is to develop and maintain ongoing relationships with a diversified group of customers that have recurring needs for our products and services. We seek to expand market awareness of the breadth of our service offerings to current and future customers through targeted marketing opportunities. We strive to be recognized as the premier supplier of a broad range of value-added services based upon quality, responsiveness, customer service, information technologies and cost effectiveness.

The principal elements of our business strategy in no particular order are:

- **Cross-Sell Across Businesses -** We believe the breadth of our service offerings allows us to provide additional services to existing customers. We believe we can provide industrial and field services to customers that traditionally have only used our technical services and technical services to customers that use our industrial services or oil and gas field services. At the same time, we see a variety of cross-selling opportunities between our Environmental Services and Safety-Kleen segments. Reflecting this strategy, we have been successfully cross-selling the products and services of Safety-Kleen, such as parts washers, various recycling services, cleaning products, and our OilPlus® products through our closed loop initiative, to legacy Clean Harbors customers. We believe leveraging our ability to cross-sell across our segments will drive additional revenue for our Company.

- **Capture Large-Scale Projects -** We provide turnkey offsite transportation and landfill or incineration disposal services for soil and other contaminated materials generated from remediation activities. We also assist remediation contractors and project managers with support services including groundwater disposal, waste disposal, roll-off container management and many other related services. We believe this will drive incremental waste volume to our existing facilities, thereby increasing utilization and enhancing overall profitability.

- **Expand Throughput Capacity of Existing Facilities -** We operate and have made substantial investments in an extensive network of hazardous waste management facilities and oil re-refineries, which provide us with significant operating leverage as volumes increase. In addition, there are opportunities to expand waste handling capacity or waste oil processing at these facilities by modifying the terms of the existing permits and by adding equipment and new technology. Through selected permit modifications, we can expand the range of treatment services offered to our customers without the significant capital investment necessary to acquire or build new waste management facilities.

- **Execute Strategic Acquisitions and Divestitures -** We actively pursue selective acquisitions with certain services or market sectors where we believe the acquisitions can enhance and expand our business. We believe that we can expand existing services through strategic acquisitions in order to generate incremental revenues from existing and new customers and to obtain greater market share. In order to maximize synergies, we rapidly integrate our acquisitions into our existing processes. To complement our acquisition strategy, we regularly review and evaluate our existing operations to determine whether our business model should change through the divestiture of certain businesses. Accordingly, from time to time, we divest certain non-core businesses and reallocate our resources to businesses that we believe better align with our long-term strategic direction. For additional information on our acquisitions and divestitures, see "Acquisitions and Divestitures" below.

- **Focus on Cost, Pricing and Productivity Initiatives -** We continually seek to increase efficiency and to reduce costs through enhanced technology, process improvements and strategic expense management. For instance, in 2019, we successfully undertook site consolidations, greater internalization of maintenance costs, and procurement and supply chain improvements. Additionally, we seek areas in our business where strategic investments in automation, process improvements, tools and employees can serve to increase productivity, efficiency and safety compliance.

- **Expand Geographic Coverage of Service Offerings -** We believe our Environmental Services and Safety-Kleen segments have a competitive advantage due to their vast network of locations across North America, particularly in areas where we maintain service locations at or near a treatment, storage and disposal facility ("TSDF"). By opening additional service locations we believe that we can increase our market share within these segments. We believe this will drive additional waste into our existing facilities, thereby increasing utilization and enhancing overall profitability. In addition, our management team continues to assess the competitive landscape in order to identify new business opportunities.

Acquisitions and Divestitures

Acquisitions are an element of our business strategy that involve expansion through the purchase of businesses that complement our existing Company and create opportunities for profitable growth.

In 2019, we acquired two privately-owned businesses for a combined preliminary purchase price of $25.2 million. One acquisition expands the environmental services and hazardous materials management services of the Environmental Services segment while the second complements the Safety-Kleen segment's core service offerings, such as used motor oil collection, parts washers, oil filter recycling and vacuum services.

In 2018, we acquired the U.S. Industrial Cleaning Business of Veolia Environmental Services North America LLC (the "Veolia Business") as well as a privately-owned company for a combined purchase price of $151.2 million. The acquisitions provide significant scale and industrial services capabilities, while increasing the size of our existing U.S. Industrial Services business. The acquisitions were financed with cash on hand. The Veolia Business is included in our Environmental Services segment while the privately-owned company has components included in both the Environmental Services and Safety-Kleen segments.

In 2017, we acquired Lonestar West Inc. ("Lonestar"), a public company headquartered in Alberta, Canada, for CAD $41.8 million ($33.1 million USD at acquisition date), net of cash acquired. The acquisition price included the assumption of approximately CAD $21.3 million ($16.8 million USD at acquisition date) in outstanding debt, which we subsequently repaid. The acquisition supports our growth in the daylighting and hydro excavation services markets. In addition to increasing the size of our hydro vacuum fleet, Lonestar's network of locations provides us with direct access to key geographic markets in both the United States and Canada. The acquired company is included in our Environmental Services segment.

For additional information relating to our acquisition activities during 2019, 2018 and 2017, see Note 4, "Business Combinations," to our consolidated financial statements included in Item 8 of this report.

Other business transactions also include divestitures based on our ongoing review of portfolio assets to determine the extent to which they are contributing to our objectives and growth strategy.

In 2017, we completed the sale of our Transformer Services business, which was a non-core business previously included within the Environmental Services segment, for $45.5 million ($43.4 million net of $2.1 million in transactional related costs). For additional information relating to these divestitures, see Note 5, "Disposition of Businesses," to our consolidated financial statements included in Item 8 of this report.

Protecting the Environment and Corporate Sustainability

Clean Harbors recognizes that sustainability stewardship is a core aspect of our brand and a key component of our long-term success. Our core business is to provide industry, government and the public a wide range of sustainable solutions through environmental, energy and industrial service offerings that protect and restore North America's natural environment. Our sustainability program expands our commitment beyond the services and products to include our operations, employees and community. The program focuses on the following key strategies:

Health and Safety

As we have noted above, Health and Safety is our #1 core value and as such is at the forefront of our sustainability program. Safety is not just the hallmark of our Company but is also at the heart of what we provide to customers. Our programs and procedures focus on delivering services with unparalleled safety to our employees, our customers, local communities and other key stakeholders. Our approach to safety extends to our people, equipment and locations, many of which have qualified for Voluntary Protection Program status under Occupational Safety and Health Administration.

Customer Solutions

Technologies and operational improvements have allowed Clean Harbors to developed initiatives that focus on minimizing the Company’s and our customers’ impact on the environment. As a leading provider of environmental, energy and industrial services throughout North America, we help our customers prevent the release of chemicals and hazardous waste streams into the environment. We also are the leading service provider in the recovery and decontamination of pollutants that have been released. This includes the safe destruction or disposal of hazardous materials in a manner that ensures these materials are no longer a danger to the environment. When providing these services, we are committed to the recycling, reuse and reclamation of these waste streams whenever possible using a variety of methods more fully explained below in the sections describing our general operations. Many of our branded services exemplify our commitment to sustainability and providing environmental solutions to the marketplace. Where possible, liquids such as solvents, chemicals and used oil are continuously recycled to our high-quality standards and made into useful products. Tolling programs provide a closed process in which the customer’s spent solvents are recycled to their precise specifications and returned directly to them.

Our Safety-Kleen OilPlus® Program, unique to the oil industry, is designed to help companies manage their oil needs in a more sustainable way. By having us collect used oil and deliver new re-refined oil products, customers are implementing a closed-loop process for sustainability to the oil industry. We deploy our fleet of trucks, tankers, rail-cars and barges to collect used oil. In 2019 we gathered 235 million gallons of used oil in North America and our state-of-the-art processes enable us to fully realize oils' remarkable capacity to be recycled, re-refined and reused. Our plants have re-refined more than 3.7 billion gallons of used oil since their opening, allowing such oils to have a second life as recycled lubricants and avoiding more than 28.7 million metric tons of greenhouse gases.

Energy Usage

One of the Company’s sustainability goals is to contribute to a cleaner environment by reducing energy usage, specifically our dependency on fossil fuels. Energy usage at our facilities is the focus of our Facility Energy Conservation program, which provides ongoing oversight and recommendations to our facilities to help support their electricity management efforts. We continue to evaluate solar energy as a viable option for our facilities and have built solar arrays at select sites for their ongoing energy needs.

Clean Harbors makes fleet energy management a key focus, beginning with ongoing reviews by our logistics team to reduce total miles driven. We also evaluate options for reducing fuel costs including routine use of rail transportation, implementation of alternative fuel vehicles and using our Performance Plus and EcoPower re-refined engine oils throughout our fleet. Clean Harbors is constantly upgrading our truck fleet with the most fuel-efficient systems and parts and has also

designed custom, multi-compartment trucks that can be used to collect and deliver oil at the same time, decreasing fuel consumption.

Operations

Clean Harbors instills sustainability within its operations through continuous improvements and well-defined strategic initiatives that show the highest positive impact on the environment, the communities and the economy in which we work and live. Our fleet of transportation vehicles represents one of our largest opportunities to apply environmentally sustainable business practices. Our Asset Refurbishment Program is a comprehensive effort to rebuild assets to "like new" quality with the goal of reusing or recycling 100% of all materials. With four asset refurbishment facilities now operational, we are rebuilding an average of more than two vehicles every week.

To provide an efficient and safe alternative for hazardous waste disposal, Clean Harbors developed and built an incinerator at our El Dorado facility which uses world-class air emissions control technology that meets the most stringent emissions standards under the U.S. Clean Air Act.

Engagement

Clean Harbors believes that by staying engaged with our customers, communities and other stakeholders, we can contribute to the long-term health of the environment, society and the economy. When warranted, we utilize formal reporting platforms to inform customers and other stakeholders of our sustainability efforts, including EcoVadis and Ecodesk.

We develop partnerships with key environmental programs to build awareness, while fostering more sustainable business practices. One of our most highly visible public programs for various government and community entities is known as our Home Hazardous Waste service line. Communities trust us to collect paints, solvents, batteries, fluorescent lamps, pesticides, cleaners and other hazardous materials during one-day, multi-day and mobile programs that otherwise might be improperly disposed of or become dangerous to the communities where they are stored.

Our commitment and our business go hand in hand as we work to provide services and products that complement our customers' sustainability plans and hold ourselves and others accountable to environmental, social and corporate governance standards.

Competitive Strengths

- **Leading Provider of Environmental, Energy and Industrial Services -** We are a leading provider of environmental, energy and industrial services. We own nine commercial hazardous waste incinerators, making us the largest operator of such facilities in North America. We are also one of the few industrial services companies with national footprints in both the U.S. and Canada. We provide multi-faceted, high-quality services to a broad mix of customers. We attract and better serve our customers because of our vast capabilities and breadth of services as well as our overall size, scale and geographic location of our large network along with valuable and unique assets used in providing our services.

- **Integrated Network of Assets -** We believe we operate, in the aggregate, the largest number of commercial hazardous waste incinerators, landfills, treatment facilities and TSDFs in North America. Our broad service network enables us to effectively handle a waste stream from its origin through disposal and to efficiently direct and internalize our waste streams to reduce costs. As our processing of waste increases, our size allows us to leverage our network and increase our profit margins as we can internalize a greater volume of waste in our incinerators, landfills and other disposal facilities. Furthermore, these assets are very difficult to duplicate because significant permitting and regulatory approvals would need to take place in order for new commercial waste disposal sites to come on line. High barriers of entry for such assets provide increased value to our network.

- **Comprehensive Service Capabilities -** Our comprehensive service offerings allow us to act as a full-service provider to our customers. Our breadth of service offerings creates incremental revenue growth as customers seek to minimize the number of outside vendors and demand "one-stop-shop" service providers.

- **Largest Collector and Recycler of Used Motor Oil -** As the largest re-refiner and recycler of used oil in North America, during 2019 we returned approximately 191 million gallons of new re-refined oil, lubricants and byproducts back into the marketplace. In 2019, our re-refining process eliminated more than two million metric tons of greenhouse gas ("GHG"), which is the equivalent of growing more than 53 million trees for 10 years in an urban environment or taking over 393,000 passenger cars off the road for one year.

- **Large and Diversified Customer Base -** Our customers range from small companies to Fortune 500 companies and include public and private entities that span multiple industries and business types, including government entities. This diversification limits our credit exposure to any one customer and potential cyclicality to any one industry. As a

percentage of our 2019 revenues, the top ten industries we serviced totaled approximately 78% and included general manufacturing (16%), chemical (14%), automotive (9%), refineries (8%), base and blended oils (7%), government (6%), utilities (5%), transportation (5%), oil and gas (4%) and engineering and consulting (4%).

- **Stable and Recurring Revenue Base -** We have long-standing relationships with our large customers, many of whom have worked with our Company for decades. Our diversified customer base provides stable and recurring revenues, as a significant portion of our revenues are derived from previously served customers with recurring needs for our services. In addition, switching costs for many of our hazardous waste customers are high. This is due to many customers' desire to audit disposal facilities prior to their qualification as approved sites and to limit the number of facilities to which their hazardous waste are shipped in order to reduce potential liability under United States and Canadian environmental laws and regulations. We have been selected as an approved vendor by large and small generators of waste because we possess comprehensive collection, recycling, treatment, transportation, disposal and hazardous waste tracking capabilities and have the expertise necessary to comply with applicable environmental laws and regulations. Those customers that have selected us as an approved vendor typically continue to use our services on a recurring basis.

- **Regulatory Compliance -** We continue to make capital investments in our facilities to ensure that they are in compliance with current federal, state, provincial and local regulations. Companies that rely on in-house disposal may find the current regulatory requirements to be too capital intensive or complicated, and may choose to outsource many of their hazardous waste disposal needs.

- **Effective Cost Management -** Our significant scale allows us to maintain low costs through standardized compliance procedures, significant purchasing power, leveraging our investment in technology and our ability to efficiently utilize logistics and transportation to economically direct waste streams to the most efficient facility. We also have the ability to use internal resources to transport and process the substantial majority of all hazardous waste that we manage for our customers. In addition, our Safety-Kleen results are significantly impacted by the overall market pricing and product mix associated with base and blended oil products and, more specifically, the market prices of Group II base oils. We charge fees related to our used oil collection services which allow us to effectively manage the profit spreads inherent in our business.

- **Proven and Experienced Management Team -** Our executive management team provides depth and continuity. Our 11 executive officers collectively have over 190 years of experience and expertise in the environmental, energy and industrial services industries. Our chief executive officer founded our Company in 1980 and, since the Company's formation, has served as both the Chief Executive Officer and Chairman of the Board.

Operations

General

Seasonality and Cyclical Nature of Business. Our operations may be affected by seasonal fluctuations due to weather and budgetary cycles influencing the timing of customers' spending for products and services. Typically during the first and fourth quarters of each year there is less demand for our products, oil collection, recycling services and environmental services due to the lower levels of activities by our customers as a result of the cold weather, particularly in Canada and the northern and midwestern regions of the United States. As a result, reduced volumes of waste are received at our facilities, higher operating costs are realized due to sub-freezing weather and high levels of snowfall, factory closings for year-end holidays reduce waste volumes and lower volumes of used oil are generated for our collection.

Geographical Information. For the year ended December 31, 2019, we generated $2,863.5 million or 83.9% of our direct revenues in the United States and $548.6 million or 16.1% of our direct revenues in Canada. For the year ended December 31, 2018, we generated $2,721.8 million or 82.5% of our direct revenues in the United States and $578.5 million or 17.5% of our direct revenues in Canada. For additional information about the geographical areas from which our direct revenues are derived and in which our assets are located, see Note 3, "Revenues," and Note 20, "Segment Reporting," respectively, to our consolidated financial statements included in Item 8 of this report.

Environmental Services

We collect, transport, treat and dispose of hazardous and non-hazardous waste, including resource recovery, physical treatment, fuel blending, incineration, landfill disposal, wastewater treatment, lab chemical disposal, explosives management and CleanPack® services. Our CleanPack® services include the collection, identification, categorization, specialized packaging, transportation and disposal of laboratory chemicals and household hazardous waste. We also perform a wide range of industrial maintenance and specialty industrial services and utilize specialty equipment and resources to perform field services at any chosen location on a planned or emergency response basis. All of these services are designed to protect the environment and

address environmental related challenges through the use of innovation and the latest technologies. We provide customers with sustainable solutions that seek to recycle waste materials whenever possible.

Technical Services. We provide technical services through a network of service centers from which a fleet of vehicles are dispatched to pick up customers' waste either on a predetermined schedule or on demand, and to deliver the waste to permitted facilities, which are usually Company-owned. Our service centers can also dispatch chemists to a customer location for collection of chemical and laboratory waste for disposal. InSite Service® offerings is a branded on-site/in-plant service delivery program through which we offer a full range of environmental, industrial and waste management services. This signature program is built on safety, quality, efficiency and integrity, and has been offered by Clean Harbors for more than 25 years. By leveraging Clean Harbors' expertise and capabilities, our on-site staffs are dedicated to developing the safest, most cost-effective and sustainable solutions to service customers' needs.

Collection, Transportation and Logistics Management. As an integral part of our services, we collect industrial waste from customers and transport such waste to and between our facilities for treatment or bulking for shipment to final disposal locations. Customers typically accumulate waste in containers, such as 55-gallon drums, bulk storage tanks or 20-cubic-yard roll-off containers. In providing this service, we utilize a variety of specially designed and constructed tank trucks and semi-trailers as well as third-party transporters, including railroads.

Treatment and Disposal. We recycle, treat and dispose of hazardous and non-hazardous industrial waste. The waste handled includes substances which are classified as "hazardous" because of their corrosive, ignitable, infectious, reactive or toxic properties, and other substances subject to federal, state and provincial environmental regulation. We provide final treatment and disposal services designed to manage waste which cannot be otherwise economically recycled or reused. The waste that we handle comes in solid, sludge, liquid and gas form.

We operate a network of TSDFs that collect, temporarily store and/or consolidate compatible waste streams for more efficient transportation to final recycling, treatment or disposal destinations. These facilities hold special permits, such as Part B permits under the Resource Conservation and Recovery Act ("RCRA") in the United States, which allow them to process, transfer and dispose of waste through various technologies including recycling, incineration, landfill and wastewater treatment depending on each location's permitted and constructed capabilities.

Resource Recovery and Fuel Blending. We operate recycling systems for the reclamation and reuse of certain waste, particularly solvent-based waste generated by industrial cleaning operations, metal finishing and other manufacturing processes. Resource recovery involves the treatment of waste using various methods, which effectively remove contaminants from the original material to restore its fitness for its intended purpose and to reduce the volume of waste requiring disposal.

We also operate a recycling facility that recycles refinery waste and spent catalyst. The recycled oil and catalysts, depending on market conditions, are sold to third parties.

Incineration. Incineration is the preferred method for the treatment of organic hazardous waste because it effectively destroys the contaminants at high temperatures. High temperature incineration effectively eliminates organic waste such as herbicides, halogenated solvents, pesticides and pharmaceutical and refinery waste, regardless of form as gas, liquid, sludge or solid. Federal and state incineration regulations require a destruction and removal efficiency of 99.99% for most organic waste.

As of December 31, 2019, we had nine active incinerators operating in five incinerator facilities that offer a wide range of technological capabilities to customers. In the United States, we operate a fluidized bed thermal oxidation unit for maximum destruction efficiency of hazardous waste with an estimated annual practical capacity of 58,808 tons and three solids and liquids capable incinerator facilities with a combined estimated annual practical capacity of 377,387 tons. We also operate one hazardous waste liquid injection incinerator in Canada with total annual practical capacity of 125,526 tons.

Our incinerator facilities in Kimball, Nebraska; Deer Park, Texas; El Dorado, Arkansas; and Aragonite, Utah, are designed to process liquid organic waste, sludge, solids, soil and debris. Our Deer Park facility has two kilns and a rotary reactor. Our El Dorado facility specializes in the treatment of bulk and containerized hazardous liquids, solids and sludge. In 2017, we opened a new hazardous waste incinerator at our El Dorado, Arkansas facility, which specializes in high-temperature incineration of regulated waste such as industrial and laboratory chemicals, manufacturing byproducts, fertilizers and other solid and liquid materials that would otherwise be hazardous to the environment and public health if not properly managed. Our facilities in Kimball and Deer Park also have on-site landfills for the disposal of ash produced as a result of the incineration process.

Our incinerator facility in Lambton, Ontario, is a liquid injection incinerator designed primarily for the destruction of liquid organic waste. Typical waste streams include wastewater with low levels of organics and other higher concentration organic liquid waste not amenable to conventional physical or chemical waste treatment.

Landfills. Landfills are primarily used for disposal of inorganic waste. In the United States and Canada, we operate nine commercial landfills. Seven of our commercial landfills are designed and permitted for disposal of hazardous waste and two of our landfills are operated for non-hazardous industrial waste disposal and, to a lesser extent, municipal solid waste. In addition to our commercial landfills, we also own and operate, as described above, two non-commercial landfills that only accept waste from our on-site incinerators.

Of our seven commercial landfills used for disposal of hazardous waste, five are located in the United States and two are located in Canada. As of December 31, 2019, the useful economic lives of these landfills included approximately 24.6 million cubic yards of remaining capacity. We estimate the useful economic lives of landfills to include permitted airspace and unpermitted airspace that our management believes to be probable of being permitted based on our analysis of various factors. In addition to the capacity included in the useful economic lives of these landfills, there are approximately 31.9 million cubic yards of additional unpermitted airspace capacity included in the footprints of these landfills that may ultimately be permitted, although there can be no assurance that this additional capacity will be permitted. As of December 31, 2019, the useful economic lives of our two non-hazardous industrial landfills have 3.6 million cubic yards of remaining permitted capacity. These two facilities are located in the United States and have been issued operating permits under Subtitle D of RCRA. Our non-hazardous landfill facilities are permitted to accept commercial industrial waste, including waste from foundries, demolition and construction, machine shops, automobile manufacturing, printing, metal fabrications and recycling.

Wastewater Treatment. We operate nine wastewater treatment facilities that offer or employ a range of wastewater treatment technologies. These wastewater treatment operations involve processing hazardous and non-hazardous waste through use of physical and chemical treatment methods. These facilities treat a broad range of industrial liquid and semi-liquid waste containing heavy metals, organics and suspended solids.

Total Project Management. We also provide total project management services in areas such as chemical packing, on-site waste management, remediation, compliance training and emergency spill response, while leveraging Clean Harbors' network of service centers and environmental capabilities.

Industrial Services. We perform industrial maintenance services and specialty industrial services at refineries, mines, upgraders, chemical plants, pulp and paper mills, manufacturing and power generation facilities. We provide these services throughout North America.

Our crews handle as-needed in-plant services to support ongoing in-plant cleaning and maintenance services, including liquid/dry vacuum, hydro-blasting, dewatering and materials processing, water and chemical hauling and steam cleaning. We provide a variety of specialized industrial services including plant outage and turnaround services, decoking and pigging, chemical cleaning, high and ultra-high pressure water cleaning, pipeline inspection and coating services and large tank and surface impoundment cleaning. We also provide daylighting services which, through the use of specialized hydro vac equipment, deliver safer, cleaner and more precise hydro excavation services to safely uncover highly sensitive underground targets. Our crews also handle oilfield transport and production services supporting drilling, production and completion programs.

Field and Emergency Response Services. Our crews and equipment are dispatched on a planned or emergency basis and perform services such as confined space entry for tank cleaning, site decontamination, large remediation projects, demolition, spill cleanup on land and water, railcar cleaning, product recovery and transfer, scarifying and media blasting and vacuum services. Additional services include filtration and water treatment services.

We are also a leader in providing response services for environmental emergencies of any scale from man-made disasters such as oil spills and natural disasters such as hurricanes.

Oil and Gas Field Services. We provide integrated seismic and right-of-way services for efficient resource discovery and site preparation. These services include: (i) seismic surveying that minimizes costs, environmental impact and time in field; (ii) mulching/line clearing that expedites additional geophysical activities and minimizes environmental impact; and (iii) shot-hole drilling that provides safe and efficient operations in every terrain, including hostile and inaccessible regions. We also provide surface rentals services by supporting oil and gas companies' drilling and well completion programs. Key to our services is our ability to provide solids control to support the drilling process. Our technologies help manage liquids, solids and semi-solid material during the drilling operation, and include centrifuges, tanks and drilling fluid recovery. We also can provide container rentals for safe collection of drill cuttings and other waste, as well as manage disposal of drilling fluids and solids and can supply surface rental equipment to support drill sites by providing wellsite trailers, wastewater treatment systems and holding tanks, light towers, generators and handling tools.

Lodging Services. Our fixed lodges provide turnkey remote accommodations throughout Western Canada and Texas and range in size up to approximately 600 beds. These are open lodges, with amenities that include catering and housekeeping services, fully equipped common areas, fitness rooms and computer rooms, wireless internet and public phones, powered

parking stalls, laundry facilities and daily towel service. We also offer mobile camp operations, which provide services for remote workforce accommodation facilities throughout Western Canada, currently in British Columbia, Saskatchewan and Alberta, with multiple accommodation types. These include client and open camps, operator camps and drill camps. Furthermore, hospitality services are available as a standalone service to clients which have other accommodation arrangements.

Safety-Kleen

Our Safety-Kleen business offers an array of environmental services and complementary products to a diverse range of customers including automobile repair shops, car and truck dealers, metal fabricators, machine manufacturers, fleet maintenance shops and other automotive, industrial and retail customers.

As the largest provider of parts cleaning services in North America, Safety-Kleen offers a complete line of specially designed parts washers to customer locations and then delivers recurring service that includes machine cleaning and maintenance and disposal and replacement of clean solvent or aqueous fluids. We also sell automotive and industrial cleaning products which include antifreeze, windshield washer fluid, degreasers, glass and floor cleaners, hand cleaners, absorbents, mats and spill kits.

Utilizing our collection network, we provide pickup and transportation of hazardous and non-hazardous containerized waste for recycling or disposal, primarily through the Clean Harbors network of recycling, treatment and disposal facilities. We also collect used oil which serves as feedstock for our oil re-refineries discussed below, or process the oil into recycled fuel oil, or "RFO," which is then sold to customers such as asphalt plants, industrial plants, pulp and paper companies. The used oil is also processed into vacuum gas oil which can be further re-refined into lubricant base oils or sold directly into the marine diesel oil fuel market.

Our vacuum services remove solids, residual oily water and sludge and other fluids from customers' oil/water separators, sumps and collection tanks. We also remove and collect waste fluids found at large and small industrial locations, including metal fabricators, auto maintenance providers and general manufacturers.

Utilizing used oil collected by Safety-Kleen branches, we manufacture, formulate, package, distribute and market high-quality lubricants. We offer these products and services direct to business end-users and customers that can in turn market to retailers and end-users. The used oil collected by Safety-Kleen's branch network is processed or re-refined to convert into a variety of products, mostly base lubricating oils, and much smaller quantities of asphalt-like material, glycols and fuels. As the largest re-refiner of used oil in North America, we can process the used oil collected through our six re-refineries located in East Chicago, Indiana; Newark, California; Wichita, Kansas; Tacoma, Washington; Fallon, Nevada; and Breslau, Ontario.

Our primary goal is to produce and sell high-quality blended oils, which are created by combining our re-refined base and other base oils with performance additives in accordance with our proprietary formulations and American Petroleum Institute licenses. Our Performance Plus® brand and "green" proprietary brand EcoPower® are sold to on- and off-road corporate fleets, government entities, automotive service shops and industrial plants, which are serviced through our internal distribution network, as well as an extensive United States and Canada-wide independent distributor network. We also sell unbranded blended oils to distributors that resell them under their private label brands. Our OilPlus® program consists of selling our renewable oil products directly to our end customers. We sell the base oil that we do not blend and sell ourselves to independent blenders/packagers that use it to blend their own branded or private label oils. With more than 200 million gallons of used oil processed annually, we were able to return approximately 191 million gallons of new re-refined oil, lubricants and byproducts back into the marketplace in 2019. We believe our position as the largest collector and re-refiner of used oil in North America, along with our vast service and distributions network, provide a distinct competitive advantage in our ability to provide our customers with collection and oil distribution services through our OilPlus® closed loop program.

Competition

The hazardous waste management industry is highly competitive. The sources of competition vary by locality and by type of service rendered, with competition coming from national and regional waste services companies and hundreds of privately-owned firms. Veolia North America, Waste Management, Inc., US Ecology, Inc. and Stericycle, Inc. are the principal national firms with which we compete. Each of these competitors is able to provide one or more of the environmental services we offer.

Under federal and state environmental laws in the United States, generators of hazardous waste remain liable for improper disposal of such waste. Although generators may hire various companies that have the proper permits and licenses, because of the generators' potential liability, they are very interested in the reputation and financial strength of the companies they use for the management of their hazardous waste. We believe that our technical proficiency, safety record, customer service oriented culture and overall reputation are important considerations to our customers in selecting and continuing to

utilize our services. We also believe that the depth of our recycling, treatment and disposal capabilities, our ability to collect and transport waste products efficiently and our pricing are additional significant factors in the market for treatment and disposal services.

Competition within our Environmental Services segment varies by locality and type of service rendered.

- For our landfill and waste services, competitors include several major national and regional environmental services firms, as well as numerous smaller local firms. We believe the availability of skilled technical professional personnel, quality of performance, diversity of services, safety record, quality of assets and use of current technologies, as well as price, are the key competitive factors in this service industry.
- For our industrial, field and emergency responses services, competitors vary by locality and by type of service rendered, with competition coming from national and regional service providers and hundreds of privately-owned firms that offer energy or industrial services. Envirosystems and Hydrochem PSC in the United States, and CEDA International Corporation and Newalta in Canada, are the principal national firms with which we compete. Each of these competitors is able to provide one or more of the industrial and field services we offer. We believe the availability of specialized equipment and latest technologies, skilled technical professional personnel, quality of performance, diversity of services, safety record and price are the key competitive factors in this industry.
- For our energy related services, competitors vary by locality and type of services provided, with competition coming from national, regional and local service providers. Competition is based on a number of factors, including safety, quality, performance, reliability, service, price, response time and, in some cases, breadth of service offering.

For our Safety-Kleen segment, competitors vary by locality and by type of service rendered, with competition coming from Heritage-Crystal Clean and Veolia North America, along with several regional and local firms. With our Safety-Kleen Oil Plus® closed loop offering, we are competing in certain markets with other North American lubricant distributors.

The principal methods of competition for all of our services and products are quality, price, reliability of service rendered or products sold and technical proficiency. We believe that we offer a more comprehensive range of environmental, energy and industrial services than our competitors in major portions of the United States and Canada.

Employees

As of December 31, 2019, we employed approximately 14,400 active full-time employees, of which 988 in the United States and 676 in Canada were represented by labor unions. We believe that our relationship with our employees is positive. As part of our commitment to employee safety and quality customer service, we have an extensive compliance program and trained environmental, health and safety staff. We adhere to a risk management program designed to reduce potential liabilities to us and to our customers. We also continually strive to invest in our employees through training programs as well as competitive compensation and benefit programs.

Intellectual Property

We have invested significantly in the development of proprietary technology and also to establish and maintain an extensive knowledge of leading technologies. We incorporate these technologies into the services we offer and provide to our customers. As of December 31, 2019, we held a total of 35 U.S. and 12 foreign issued or granted patents (which will expire between 2020 and 2031), one U.S. and one foreign pending patent application, 93 U.S. and 53 foreign trademark registrations and one U.S. and eight foreign pending trademark applications. We also license software and other intellectual property from various third parties. We enter into confidentiality agreements with certain of our employees, consultants and corporate partners, and control access to software documentation and other proprietary information. We believe that we hold adequate rights to all intellectual property used in our business and that we do not infringe upon any intellectual property rights held by other parties.

Management of Risks

We adhere to a program of risk management policies and practices designed to reduce potential liability, as well as to manage customers' ongoing environmental exposures. This program includes installation of risk management systems at our facilities, such as fire suppression, employee training, environmental consciousness, auditing and policy decisions restricting the types of waste handled. We evaluate all revenue opportunities and decline those that we believe involve unacceptable risks.

We dispose of waste at our incinerator, wastewater treatment and landfill facilities, or at facilities owned and operated by other firms that we have audited and approved. We apply established technologies to treatment, storage and recovery of

hazardous waste. We believe our operations are conducted in a safe and prudent manner and in substantial compliance with applicable laws and regulations.

Insurance and Financial Assurance

Our insurance programs cover the potential risks associated with our multifaceted operations from two primary exposures: direct physical damage and third-party liability. We maintain a casualty insurance program providing coverage for vehicles, employer's liability and commercial general liability in the aggregate amount of $105.0 million, $102.0 million and $102.0 million, respectively, per year, subject to retentions of $2.0 million per occurrence for auto and commercial general liability and $1.0 million for employers' liability in the United States and $2.0 million in Canada. We also have workers' compensation insurance whose limits are established by state statutes.

We have pollution liability insurance policies covering potential risks in three areas: as a contractor performing services at customer sites, as a transporter of waste and as a processor of waste at our facilities. The contractor's pollution liability insurance has limits of $20.0 million per occurrence and $25.0 million in the aggregate, covering offsite remedial activities and associated liabilities.

For sudden and accidental in-transit pollution liability, our auto liability policy provides the primary $5.0 million per occurrence of transportation pollution insurance. Our pollution liability policies provide an additional $75.0 million per occurrence and $80.0 million in the aggregate for a total of $80.0 million per occurrence and $85.0 million in the aggregate, respectively. A $2.0 million deductible per occurrence applies to this coverage in the United States and Canada.

Federal and state regulations require liability insurance coverage for all facilities that treat, store or dispose of hazardous waste. RCRA, the Toxic Substances Control Act and comparable state hazardous waste regulations typically require hazardous waste handling facilities to maintain pollution liability insurance in the amount of $1.0 million per occurrence and $2.0 million in the aggregate for sudden occurrences and $3.0 million per occurrence and $6.0 million in the aggregate for non-sudden occurrences. Our liability insurance coverage meets or exceeds all federal and state regulations.

Our international operations are insured under locally placed insurance policies that are compulsory in a specific country. In addition, we have a global foreign liability policy that will provide excess and difference in condition coverage in international countries.

Under our insurance programs, coverage is obtained for catastrophic exposures, cyber security as well as those risks required to be insured by law or contract. It is our policy to retain a significant portion of certain expected losses related primarily to employee benefit, workers' compensation, commercial general and vehicle liability. Provisions for losses expected under these programs are recorded based upon our estimates of the actuarially determined value of the aggregate liability for claims. We believe that policy cancellation terms are similar to those of companies in other industries.

Operators of hazardous waste handling and certain other permitted facilities are required by federal, state, provincial and local regulations to provide financial assurance for closure and post-closure care of those facilities should the facilities cease operation. Closure would include the cost of removing the waste stored at a facility which ceased operating and sending the material to another facility for disposal and the cost of performing certain procedures for decontamination of the facility. As of December 31, 2019, our total estimated closure and post-closure costs requiring financial assurance by regulators were $472.7 million for our U.S. facilities and $56.8 million for our Canadian facilities. We have obtained all of the required financial assurance for our facilities through a combination of surety bonds, funded trusts, letters of credit and insurance from qualified insurance companies.

Environmental Regulation

While our business has benefited substantially from increased government regulation of hazardous waste transportation, storage and disposal, the environmental services industry itself is the subject of extensive and evolving regulation by federal, state, provincial and local authorities. We are required to obtain federal, state, provincial and local permits or approvals for each of our hazardous waste facilities. Such permits are difficult to obtain and, in many instances, extensive studies, tests and public hearings are required before the approvals can be issued. We have acquired all operating permits and approvals now required for the current operation of our business, or have applied for, or are in the process of applying for, all permits and approvals needed in connection with continued operation and planned expansion or modifications of our operations.

We make a continuing effort to anticipate regulatory, political and legal developments that might affect operations, but are not always able to do so. We cannot predict the extent to which any environmental legislation or regulation that may be enacted or enforced in the future may affect our operations.

A new regulation primarily impacting the shipping business but which we are monitoring closely as it could impact our business is known as *"*IMO 2020". On January 1, 2020, the International Maritime Organization (the "IMO") implemented a

new regulation for a 0.50% global sulphur cap for marine fuels. Under the new global cap, ships that traverse the oceans will be required to use marine fuels with a sulphur content of no more than 0.50% sulphur, versus the previous cap of 3.50%, in an effort to reduce the amount of sulphur oxide and decrease pollution and greenhouse gas emissions from the global shipping fleet, which now uses an estimated 3.5 to 4 million barrels per day of fuel oil. The shipping industry is the last major transportation sector to utilize fuel with high levels of sulfur, which is the reason the IMO pushed the industry to more closely align with other transport sectors for pollution reduction.

There are several variables around this regulatory change whereby the impacts of such changes are not yet clear, including anticipated levels of compliance and enforcement. However, it is expected that the implementation of IMO 2020 will result in a significant increase in demand for a broad range of low sulfur distillates including diesel, marine gas oil, marine diesel oil and vacuum gas oil ("VGO") among others. There is uncertainty about the global refinery industry's ability to meet that spike in demand, which could have substantial consequences for the pricing of those products, particularly VGO. The price of VGO typically has a direct impact on the pricing and/or levels of production of base oil. Changes in the marine fuel market as a result of IMO 2020 are also expected to affect the availability of used motor oil, which today is frequently used in the marine market and some of which may be displaced as a result of this new regulation.

United States Hazardous Waste Regulation

Federal Regulations. The most significant federal environmental laws affecting us are the RCRA, the Comprehensive Environmental Response, Compensation and Liability Act, also known as the "Superfund Act," the Clean Air Act, the Clean Water Act and the Toxic Substances Control Act ("TSCA").

RCRA. RCRA is the principal federal statute governing hazardous waste generation, treatment, transportation, storage and disposal. Pursuant to RCRA, the Environmental Protection Agency ("EPA") has established a comprehensive "cradle-to-grave" system for the management of a wide range of materials identified as hazardous waste. States that have adopted hazardous waste management programs with standards at least as stringent as those promulgated by the EPA have been delegated authority by the EPA to administer their facility permitting programs in lieu of the EPA's program.

Every facility that treats, stores or disposes of hazardous waste must obtain a RCRA permit from the EPA or an authorized state agency unless a specific exemption exists, and must comply with certain operating requirements ("Part B" permitting process). RCRA also requires that Part B permits contain provisions for required on-site study and cleanup activities, known as "corrective action," including detailed compliance schedules and provisions for assurance of financial responsibility. See Note 10, "Closure and Post-Closure Liabilities," and Note 11, "Remedial Liabilities," to our consolidated financial statements included in Item 8 of this report for a discussion of our environmental liabilities. See "Insurance and Financial Assurance" above for a discussion of our financial assurance requirements.

The Superfund Act. The Superfund Act is the primary federal statute regulating the cleanup of inactive hazardous substance sites and imposing liability for cleanup on the responsible parties. It provides for immediate EPA coordinated response and removal actions for hazardous substances released into the environment. It also authorizes the government to respond to the release or threatened release of hazardous substances or to order responsible persons to perform any necessary cleanup. The statute provides for strict and, in certain cases, joint and several liability to the parties involved in the generation, transportation and disposal of hazardous substances for the cost of these responses and related costs, and for the cost of damages to natural resources. Under the statute, we may be deemed liable as a generator or transporter of a hazardous substance which is released into the environment, or as the owner or operator of a facility from which there is a release of a hazardous substance into the environment. See Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report for a description of the principal such proceedings in which we are now involved.

The Clean Air Act. The Clean Air Act was passed by Congress to control the emissions of pollutants into the air and requires permits to be obtained for certain sources of hazardous air pollutants, such as vinyl chloride or air criteria pollutants, such as carbon monoxide. In 1990, Congress amended the Clean Air Act to require further reductions of air pollutants with specific targets for non-attainment areas in order to meet certain ambient air quality standards. These amendments also require the EPA to promulgate regulations which (i) control emissions of 187 hazardous air pollutants; (ii) create uniform operating permits for major industrial facilities similar to RCRA operating permits; (iii) mandate the phase-out of ozone depleting chemicals; and (iv) provide for enhanced enforcement.

The Clean Water Act. This legislation prohibits discharge of pollutants into the waters of the United States without government authorization and regulates the discharge of pollutants into surface waters and sewers from a variety of sources, including disposal sites and treatment facilities. The EPA has promulgated "pretreatment" regulations under the Clean Water Act, which establish pretreatment standards for introduction of pollutants into publicly owned treatment works. In the course of the treatment process, our wastewater treatment facilities generate wastewater, which we discharge to publicly owned treatment

works pursuant to permits issued by the appropriate government authorities. We are required to obtain discharge permits and conduct sampling and monitoring programs.

TSCA. We operate a network of collection, treatment and field services (remediation) facilities throughout North America whose activities are regulated under provisions of TSCA. TSCA established a national program for the management of substances classified as polychlorinated biphenyls ("PCBs") which include waste PCBs as well as RCRA waste contaminated with PCBs. The rules set minimum design and operating requirements for storage, treatment and disposal of PCB waste. Since their initial publication, the rules have been modified to enhance the management standards for TSCA-regulated operations including the decommissioning of PCB transformers and articles, detoxification of transformer oils, incineration of PCB liquids and solids landfill disposal of PCB solids, and remediation of PCB contamination at customer sites.

Other Federal Regulations. In addition to regulations specifically directed at our transportation, storage and disposal facilities, there are a number of regulations that may "pass-through" to the facilities based on the acceptance of regulated waste from affected customer facilities. Each facility that accepts affected waste must comply with the regulations for that waste, facility or industry. Examples of this type of regulation are National Emission Standards for Benzene Waste Operations and National Emissions Standards for Pharmaceuticals Production. Each of our facilities addresses these regulations on a case-by-case basis determined by its requirement to comply with the pass-through regulations.

In our transportation operations, we are regulated by the U.S. Department of Transportation, the Federal Railroad Administration, the Federal Aviation Administration and the U.S. Coast Guard, as well as by the regulatory agencies of each state in which we operate or through which our vehicles pass.

Health and safety standards under the Occupational Safety and Health Act ("OSHA") are also applicable to all of our operations.

State and Local Regulations. Pursuant to the EPA's authorization of RCRA equivalent state run programs, a number of U.S. states have regulatory programs governing the operations and permitting of hazardous waste facilities. Accordingly, the hazardous waste treatment, storage and disposal activities of a number of our facilities are regulated by the relevant state agencies in addition to federal EPA regulation.

Some states classify as hazardous some waste that are not regulated under RCRA. For example, Massachusetts considers waste oil as "hazardous waste" while RCRA does not. Accordingly, we must comply with state requirements for handling state regulated waste, and, when necessary, obtain state licenses for treating, storing and disposing of such waste at our facilities.

Our facilities are also regulated pursuant to state statutes, including those addressing clean water and clean air. Local sewer discharge and flammable storage requirements are applicable to certain of our facilities. Our facilities are also subject to local siting, zoning and land use restrictions. We believe that each of our facilities is in substantial compliance with the applicable requirements of federal and state licenses which we have obtained. Once issued, such licenses have maximum fixed terms of a given number of years, which differ from state to state, ranging from three to ten years. The issuing state agency may review or modify a license at any time during its term. We anticipate that once a license is issued with respect to a facility, the license will be renewed at the end of its term if the facility's operations are in compliance with applicable requirements. However, there can be no assurance that regulations governing future licensing will remain static, or that we will be able to comply with such requirements.

Canadian Hazardous Waste Regulation

In Canada, the provinces retain control over environmental issues within their boundaries and thus have the primary responsibility for regulating management of hazardous waste. The federal government regulates issues of national scope or where activities cross provincial boundaries.

Provincial Regulations. Most of Canada's industrial development and the major part of its population are located in four provinces: Ontario, Quebec, Alberta and British Columbia, each of which have detailed environmental regulations. We operate major waste management facilities in each of these provinces, as well as waste transfer facilities in Nova Scotia and Manitoba.

The main provincial acts dealing with hazardous waste management are:

- Ontario—Environmental Protection Act;
- Quebec—Environmental Quality Act;
- Alberta—Environmental Protection and Enhancement Act; and
- British Columbia—Waste Management Act.

These pieces of legislation were developed by the provinces independently and, among other things, generally control the generation, characterization, transport, treatment and disposal of hazardous waste. Regulations developed by the provinces under the relevant legislation are also developed independently, but are often quite similar in effect and sometimes in application. For example, there is some uniformity in manifest document design and utilization.

Provincial legislation also provides for the establishment of waste management facilities. In this case, the facilities are also controlled by provincial statutes and regulations governing emissions to air, groundwater and surface water and prescribing design criteria and operational guidelines.

Waste transporters require a permit to operate under provincial waste management regulations and are subject to the requirements of the Federal Transportation of Dangerous Goods Act, as discussed below. They are required to report the quantities and disposition of materials shipped.

Canadian Federal Regulations. The Canadian federal government has authority for those matters which are national in scope and in impact and for Canada's relations with other nations. The main federal laws governing hazardous waste management are:

- Canadian Environmental Protection Act (1999) ("CEPA 99"), and
- Transportation of Dangerous Goods Act.

Environment Canada is the federal agency with responsibility for environmental matters and the main legislative instrument is the CEPA 99. This act charges Environment Canada and Health Canada, the Federal agency responsible for the health of individuals, with protection of human health and the environment and seeks to control the production, importation and use of substances in Canada and to control their impact on the environment.

The Export and Import of Hazardous waste Regulations under CEPA 99 control the export and import of hazardous waste and hazardous recyclable materials. By reference, these regulations incorporate the Transportation of Dangerous Goods Act and Regulations, which address identification, packaging, marking and documentation of hazardous materials during transport. CEPA 99 requires that anyone proposing to export or import hazardous waste or hazardous recyclable materials or to transport them through Canada, must notify the Minister of the Environment and obtain a permit to do so. Section 9 of CEPA 99 allows the federal government to enter into administrative agreements with the provinces and territories for the development and improvement of environmental standards. These agreements represent cooperation towards a common goal rather than a delegation of authority under CEPA 99. To facilitate the development of provincial and territorial agreements, the federal, provincial and territorial governments participate in the Canadian Council of Ministers of the Environment ("CCME"). The CCME comprises the 14 environment ministers from the federal, provincial and territorial governments, who normally meet at least once a year to discuss national environmental priorities and to determine work to be carried out under the auspices of the CCME.

Canadian Local and Municipal Regulations. Local and municipal regulations seldom reference direct control of hazardous waste management activities. Municipal regulations and by-laws, however, control such issues as land use designation, access to municipal services and use of emergency services, all of which can have a significant impact on facility operation.

Compliance with Environmental Regulations

The environmental regulations discussed above require that we remediate contaminated sites, operate our facilities in accordance with enacted regulations, obtain required financial assurance for closure and post-closure care of our facilities should such facilities cease operations and make capital investments in order to keep our facilities in compliance with environmental regulations.

As further discussed in Note 10, "Closure and Post-Closure Liabilities," and Note 11, "Remedial Liabilities," to our consolidated financial statements included in Item 8 of this report, we have accrued environmental liabilities as of December 31, 2019, of $189.8 million. For the years ended December 31, 2019 and 2018, we spent $18.7 million and $10.1 million, respectively, to address environmental liabilities.

As discussed more fully above under the heading "Insurance and Financial Assurance," we are required to provide financial assurance with respect to certain statutorily required closure, post-closure and corrective action obligations at our facilities. We have placed the required financial assurance primarily through qualified insurance companies.

As described in Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report, we are involved in legal proceedings arising under environmental laws and regulations. Alleged failure to comply with laws and regulations may lead to the imposition of fines or the denial, revocation or delay of the renewal of permits and

licenses by government entities. In addition, such government entities, as well as surrounding landowners, may claim that we are liable for environmental damages. Citizens groups have become increasingly active in challenging the grant or renewal of permits and licenses for hazardous waste facilities, and responding to such challenges has further increased the costs associated with establishing new facilities or expanding current facilities. A significant judgment against us, the loss of a significant permit or license or the imposition of a significant fine could have a material effect on our business and future prospects.

ITEM 1A. RISK FACTORS

An investment in our securities involves certain risks, including those described below. You should consider carefully these risk factors together with all of the information included in or incorporated by reference in this report before investing in our securities.

Risks Affecting All of Our Businesses

Our businesses are subject to operational and safety risks.

Provision of environmental, energy and industrial services to our customers by both of our business segments involves risks such as equipment defects, malfunctions and failures and natural disasters, which could potentially result in releases of hazardous materials, damage to or total loss of our property or assets, injury or death of our employees or a need to shut down or reduce operation of our facilities while remedial actions are undertaken. Our employees often work under potentially hazardous conditions. These risks expose us to potential liability for pollution and other environmental damages, personal injury, loss of life, business interruption and property damage or destruction. We must also maintain a solid safety record in order to remain a preferred supplier to our major customers. While we seek to minimize our exposure to such risks primarily through (i) comprehensive training programs, (ii) our Environmental Health and Safety Compliance Internal Audit Program, (iii) vehicle and equipment maintenance programs and (iv) insurance, such programs and insurance may not be adequate to cover all of our potential liabilities.

Our businesses are subject to numerous statutory and regulatory requirements, which may increase in the future.

Our businesses are subject to numerous statutory and regulatory requirements. Our ability to continue to hold licenses and permits required for our businesses is subject to maintaining satisfactory compliance with such requirements. We may incur significant costs to maintain compliance. Also, these requirements may increase in the future as a result of statutory and regulatory changes. Regulators, in addition to investors, customers and the public in general, have been increasingly focused on Environmental, Social and Governance (ESG) and cyber-security practices of companies. We may be subject to additional regulations and disclosure requirements in the future arising from the increased focus on ESG and cyber-security responsibility. In addition, customers may require us to implement or report on certain ESG responsible procedures or standards to continue doing business with us. The occurrence of any of the foregoing could have a material impact on our financial condition or results of operations. Further, although we are very committed to compliance and safety, we may not, either now or in the future, be in full compliance at all times with such statutory and regulatory requirements. Consequently, we may be required to pay fines/penalties for noncompliance and may incur significant costs to maintain or improve our compliance with such requirements.

Our operations are increasingly dependent upon technology. Failure of these technologies, failure to upgrade or innovate these technologies or failure to identify and develop new technologies could have an adverse impact on our results.

Our information technology systems are critical to our operations, customer experience and financial reporting. Malfunctions of these technologies, including disruptions due to natural or man-made disasters (e.g. terrorism, cyber intrusion), could interrupt operations or negatively impact our service to our customers and hurt our business reputation. System failures could also impede our ability to collect and report financial results timely or comply with regulations associated with our operations.

Identification of new and emerging technologies may be a risk and an opportunity to our business. Research and development of new technologies may require significant spending which may negatively impact our operating results. Failure to innovate and focus on new technologies that provide superior alternatives to traditional environmental services, waste disposal or oil collection and re-refining service offerings may negatively impact our financial results.

A cyber security incident could negatively impact our business and our relationships with customers.

We use computers in substantially all aspects of our business operations and also mobile devices and other online activities to connect with our employees and customers. Such uses give rise to cyber security risks, including security breach, espionage, system disruption, theft, disruption of our business operations, remediation costs for repairs of system damage and inadvertent release of information. Our business involves the storage and transmission of numerous classes of sensitive and/or confidential information and intellectual property including, but not limited to, private information about employees and

financial and strategic information about our Company and our business partners. Furthermore, as we pursue our strategy to grow through acquisitions and new initiatives that improve our operations and cost structure, we are also expanding and improving our information technologies, resulting in a larger technological presence and corresponding exposure to cyber security risk. If we fail to assess and identify cyber security risks associated with acquisitions and new initiatives, we may become increasingly vulnerable to such risks. Additionally, while we have implemented measures to prevent security breaches and cyber incidents, our preventative measures and incident response efforts may not be entirely effective. The theft, destruction, loss, misappropriation or release of sensitive and/or confidential information or intellectual property, or interference with our information technology systems or the technology systems of third parties on which we rely, could result in business disruption, negative publicity, brand damage, violation of privacy laws, loss of customers, potential liability and competitive disadvantage, which could have a material advers affect on our financial position or results of operations.

If we become unable to obtain, at reasonable cost, the insurance, surety bonds, letters of credit and other forms of financial assurance required for our facilities and operations, our business and results of operations would be adversely affected.

We are required to provide substantial amounts of financial assurance to government agencies for closure and post-closure care of our licensed hazardous waste treatment facilities and certain other permitted facilities should those facilities cease operation, and we are also occasionally required to post surety, bid and performance bonds in connection with certain customer projects. As of December 31, 2019, our total estimated closure and post-closure costs requiring financial assurance by regulators were $472.7 million for our U.S. facilities and $56.8 million for our Canadian facilities. We have obtained all of the required financial assurance for our facilities through a combination of surety bonds, letters of credit and insurance from qualified insurance companies. The financial assurance related to closure and post-closure obligations of our U.S. facilities will renew in 2020. Our Canadian facilities utilize surety bonds, which renew at various dates throughout 2020, as well as letters of credit.

Our ability to continue operating our facilities and conducting our other operations would be adversely affected if we became unable to obtain sufficient insurance, surety bonds, letters of credit and other forms of financial assurance at reasonable cost to meet our regulatory and other business requirements. The availability of insurance, surety bonds, letters of credit and other forms of financial assurance is affected by our insurers', sureties' and lenders' assessment of our risk and by other factors outside of our control such as general conditions in the insurance and credit markets.

Our insurance coverage and self-insurance reserves may be inadequate to cover all significant risk exposures, and increasing costs to maintain adequate coverage may significantly impact our financial condition and results of operations.

We carry a range of insurance policies intended to protect our assets and operations, including general liability insurance, property damage, business interruption and environmental risk insurance. While we endeavor to purchase insurance coverage appropriate to our risk assessment, we are unable to predict with certainty the frequency, nature or magnitude of claims for direct or consequential damages, and as a result our insurance program may not fully cover us for losses we may incur. In addition, as a result of a number of catastrophic weather and other events, insurance companies have incurred substantial losses and in many cases they have substantially reduced the nature and amount of insurance coverage available to the market, have broadened exclusions and/or have substantially increased the cost of such coverage. If this trend continues, we may not be able to maintain insurance of the types and coverage we desire at reasonable rates. A partially or completely uninsured claim against us (including liabilities associated with cleanup or remediation at our facilities), if successful and of sufficient magnitude, could have a material adverse effect on our business, financial condition and results of operations. Any future difficulty in obtaining insurance could also impair our ability to secure future contracts, which may be conditioned upon the availability of adequate insurance coverage. In addition, claims associated with risks for which we are self-insured (workers' compensation, employee medical, comprehensive general liability and vehicle liability) may exceed our recorded reserves, which could negatively impact future earnings.

Tax interpretations and changes in tax regulations and legislation could adversely affect our results of operations.

We are subject to income taxes in the United States, Canada and various state and local jurisdictions. Tax interpretations, regulations and legislation in the various jurisdictions in which we operate are subject to change and uncertainty and can impact net income, income tax expense and deferred income tax assets or liabilities. Our interpretation of tax rules and regulations, including those relating to foreign jurisdictions, requires judgment that may be challenged by taxation authorities upon audit. Although we believe our assumptions, judgments and estimates are reasonable, changes in tax laws or our interpretation of tax laws and the resolution of any tax audits could significantly impact the amounts provided for income taxes in our consolidated financial statements.

Fluctuations in foreign currency exchange could affect our financial results.

We earn revenues, pay expenses, own assets and incur liabilities in countries using currencies other than the U.S. Dollar. In fiscal 2019, we recorded approximately 16.1% of our direct revenues in Canada. Because our consolidated financial statements are presented in U.S. Dollars, we must translate revenues, income and expenses as well as assets and liabilities into U.S. Dollars at exchange rates in effect during or at the end of each reporting period. Therefore, increases or decreases in the value of the U.S. Dollar against other currencies in countries where we operate affect our results of operations and the value of balance sheet items denominated in foreign currencies.

Failure to correctly identify and manage acquisitions and divestitures could adversely impact our future results.

We continuously evaluate potential acquisition candidates and from time to time acquire companies that we believe will strategically fit into our business and growth objectives. If we are unable to successfully integrate and develop acquired businesses, we could fail to achieve anticipated synergies and cost savings, including any expected increases in revenues and operating results, which could have a material adverse effect on our financial results. We also continually review our portfolio of assets to determine the extent to which assets or group of assets are contributing to our objectives and growth strategy. When we decide to sell a business or specific asset group, we may be unable to do so on satisfactory terms and within our anticipated time frame.

We have acquired, and expect generally to acquire, all the outstanding shares of our more significant acquired companies. Due to this acquisition method our investment in those companies are or will be subject to all of their liabilities other than their respective debts which we paid or will pay at the time of the acquisitions. Unknown liabilities or other obligations may adversely affect our financial condition and results of operations.

Certain adverse conditions have required, and future conditions might require, us to make substantial write-downs in our assets, which have adversely affected or would adversely affect our balance sheet and results of operations.

We review our long-lived tangible and intangible assets for impairment whenever events or changes in circumstances indicate that the carrying value of an asset may not be recoverable. We also test our goodwill and indefinite-lived intangible assets for impairment at least annually on December 31, or when events or changes in the business environment indicate that the carrying value of a reporting unit or indefinite lived intangible may exceed its fair value. During each of 2019, 2018 and 2017, we determined that no asset write-downs were required. However, if conditions in any of the businesses in which we operate were to deteriorate, we could determine that certain of our assets are impaired and we would then be required to write-off all or a portion of the value of such assets. Any significant write-offs would adversely affect our balance sheet and results of operations.

Our growth and success are dependent upon key personnel. If we lose key personnel and are unable to hire additional qualified personnel in a timely manner, our business may be harmed.

Our ability to continue to grow, operate our facilities and provide our services is dependent upon the expertise of certain key managerial and technical personnel. The market for skilled and experienced personnel is highly competitive. Our ability to retain key personnel and/or attract new qualified personnel may have an impact on our business and financial results.

Natural disasters or other catastrophic events could negatively affect our business, financial condition and results of operations.

Natural disasters such as hurricanes, tornados or earthquakes could negatively affect our operations and financial performance. Such events could result in physical damage to one or more of our facilities or equipment, the temporary lack of an adequate workforce in a market and the temporary disruption in rail or truck transportation services upon which we rely. These events could prevent or delay shipments and reduce both volumes and revenue. Weather conditions and other event driven special projects also cause interim variations in our results. We may be required to suspend operations in some or all of our locations, which could have a material adverse effect on our business, financial condition and results of operations.

Additional Risks Affecting Our Environmental Services Business

The hazardous waste management business which our Environmental Services segment operates is subject to significant environmental liabilities.

We have accrued environmental liabilities valued as of December 31, 2019 at $189.8 million, substantially all of which we assumed in connection with certain acquisitions. We calculate our environmental liabilities on a present value basis in accordance with generally accepted accounting principles, which take into consideration both the amount of such liabilities and the timing when we project that we will be required to pay such liabilities. We anticipate our environmental liabilities will be payable over many years and that cash flows generated from our operations will generally be sufficient to fund the payment of

such liabilities when required. However, events not now anticipated (including future changes in environmental laws and regulations or their enforcement) could require that such payments be made earlier or in greater amounts than we now estimate, which could adversely affect our financial condition and results of operations.

We may also assume additional environmental liabilities as part of future acquisitions. Although we will endeavor to accurately estimate and limit environmental liabilities presented by the businesses or facilities to be acquired, some liabilities, including ones that may exist only because of the past operations of an acquired business or facility, may prove to be more difficult or costly to address than we then estimate. It is also possible that government officials responsible for enforcing environmental laws may believe an environmental liability is more significant than we then estimate, or that we will fail to identify or fully appreciate an existing liability before we become legally responsible to address it.

The hazardous waste management industry in which we participate is subject to significant economic and business risks.

The future operating results of our Environmental Services segment may be affected by such factors as our ability to utilize our facilities and workforce profitably in the face of intense price competition, maintain or increase market share in an industry which has in the past experienced significant downsizing and consolidation, realize benefits from cost reduction programs, generate incremental volumes of waste to be handled through our facilities from existing and acquired sales offices and service centers, obtain sufficient volumes of waste at prices which produce revenue sufficient to offset the operating costs of our facilities, minimize downtime and disruptions of operations and develop our field services business. In particular, economic downturns or recessionary conditions in North America, and increased outsourcing by North American manufacturers to plants located in countries with lower wage costs and less stringent environmental regulations, have adversely affected and may in the future adversely affect the demand for our services. Our Environmental Services business is also cyclical to the extent that it is dependent upon a stream of waste from cyclical industries such as chemical and petrochemical. If those cyclical industries slow significantly, the business that we receive from them would likely decrease.

The extensive environmental regulations to which we are subject may increase our costs and potential liabilities and limit our ability to expand our facilities.

Our operations and those of others in the environmental services industry are subject to extensive federal, state, provincial and local environmental requirements in both the United States and Canada, including those relating to emissions to air, discharged wastewater, storage, treatment, transport and disposal of regulated materials and cleanup of soil and groundwater contamination. In particular, if we fail to comply with government regulations governing the transport of hazardous materials, such failure could negatively impact our ability to collect, process and ultimately dispose of hazardous waste generated by our customers. Efforts to conduct our operations in compliance with all applicable laws and regulations, including environmental rules and regulations, require programs to promote compliance, such as training employees and customers, purchasing health and safety equipment and in some cases hiring outside consultants and lawyers. Even with these programs, we and other companies in the environmental services industry are routinely faced with government enforcement proceedings, which can result in fines or other sanctions and require expenditures for remedial work on waste management facilities and contaminated sites. Certain of these laws impose strict and, under certain circumstances, joint and several liability on current and former owners and operators of facilities that release regulated materials or that generate those materials and arrange for their disposal or treatment at contaminated sites. Such liabilities can relate to required cleanup of releases of regulated materials and related natural resource damages. The landscape of environmental regulation to which we are subject can change. Changes to environmental regulation often present new business opportunities for us; however, such changes may also result in increased operating and compliance costs or, in more significant cases, changes to how our facilities are able to operate. We constantly monitor the landscape of environmental regulation; however, our ability to navigate through any changes to such regulations may result in a material effect on our operations, cash flows or financial condition.

From time to time, we have paid fines or penalties in government environmental enforcement proceedings, usually involving our waste treatment, storage and disposal facilities. Although none of these fines or penalties that we have paid in the past has had a material adverse effect upon us, we might in the future be required to make substantial expenditures as a result of government proceedings which would have a negative impact on our financial condition and results of operations. Furthermore, regulators have the power to suspend or revoke permits or licenses needed for operation of our plants, equipment, and vehicles based on, among other factors, our compliance record, and customers may decide not to use a particular disposal facility or do business with us because of concerns about our compliance record. Suspension or revocation of permits or licenses would impact our operations and could have a material impact on our financial results. Although we have never had any of our facilities' operating permits revoked, suspended or non-renewed involuntarily, it is possible that such an event could occur in the future.

Some environmental laws and regulations impose liability and responsibility on present and former owners, operators or users of facilities and sites for contamination at such facilities and sites without regard to causation or knowledge of

contamination. Past practices have resulted in releases of regulated materials at and from certain of our facilities, or the disposal of regulated materials at third-party sites, which may require investigation and remediation, and potentially result in claims of personal injury, property damage and damages to natural resources. In addition, we occasionally evaluate various alternatives with respect to our facilities, including possible dispositions or closures. Investigations undertaken in connection with these activities may lead to discoveries of contamination that must be remediated, and closures of facilities might trigger compliance requirements that are not applicable to operating facilities. We are currently conducting remedial activities at certain of our facilities and paying a portion of the remediation costs at certain sites owned by third parties. While, based on available information, we believe these remedial activities will not result in a material effect upon our operations or financial condition, these activities or the discovery of previously unknown conditions could result in material costs.

In addition to the costs of complying with environmental laws and regulations, we incur costs defending against environmental litigation brought by government agencies and private parties. We are now, and may in the future be, a defendant in lawsuits brought by parties alleging environmental damage, personal injury and/or property damage, which may result in our payment of significant amounts.

Environmental and land use laws also impact our ability to expand our facilities. In addition, we are required to obtain government permits to operate our facilities, including all of our landfills. Even if we comply with all applicable environmental laws, we might not be able to obtain requisite permits from applicable government authorities to extend or modify such permits to fit our business needs.

If our assumptions relating to expansion of our landfills should prove inaccurate, our results of operations and cash flow could be adversely affected.

When we include permitted or probable expansion airspace in our calculation of available airspace, we adjust our landfill liabilities to the present value of projected costs for cell closure and landfill closure and post-closure. It is possible that our estimates or assumptions could ultimately turn out to be significantly different from actual results. In some cases we may be unsuccessful in obtaining an expansion permit or we may determine that an expansion permit is no longer probable. To the extent that such estimates, or the assumptions used to make those estimates, prove to be significantly different than actual results, or our beliefs that we will receive expansion permits change adversely in a significant manner, our landfill assets, including the assets incurred in the pursuit of the expansion, may be subject to impairment. Furthermore, lower prospective profitability may result due to increased interest accretion and depreciation or asset impairment charges related to the removal of previously included expansion airspace. In addition, if our assumptions concerning expansion airspace should prove inaccurate, certain of our cash expenditures for closure of landfills could be accelerated and adversely affect our results of operations and cash flow.

A significant portion of our Environmental Services business depends upon the demand for cleanup of major spills and other remedial projects and regulatory developments over which we have no control.

Our operations can be affected by the commencement and completion of cleanup of major spills and other events, customers' decisions to undertake remedial projects, seasonal fluctuations due to weather and budgetary cycles influencing the timing of customers' spending for remedial activities, the timing of regulatory decisions relating to hazardous waste management projects, changes in regulations governing the management of hazardous waste, secular changes in the waste processing industry towards waste minimization and the propensity for delays in the demand for remedial services and changes in the myriad of government regulations governing our diverse operations. We do not control such factors and, as a result, our revenue and income can vary from quarter to quarter, and past financial results for certain quarters may not be a reliable indicator of future results for comparable quarters in subsequent years.

Additional Risks Affecting Our Safety-Kleen Business

Fluctuations in oil prices may negatively affect our Safety-Kleen business.

A significant portion of our Safety-Kleen business involves collecting used oil from certain of our customers, re-refining a portion of such used oil into base and blended lubricating oils and then selling both such re-refined oil and the recycled oil ("RFO"), to other customers. Changes in the reported spot market prices of oil affect the prices at which we can sell our re-refined oil and RFO. If applicable rates increase or decrease, we typically will charge a higher or lower corresponding price for these oil products. The prices at which we sell these oil products can also be affected by changes in certain indices measuring changes in the price of heavy fuel oil, with increases and decreases in the indices typically translating into a higher or lower price for these oil products. The cost to collect used oil, including the amounts we pay to obtain a portion of our used oil and therefore ability to collect necessary volumes and the fuel costs of our oil collection fleet, typically also increases or decreases when the relevant indices increase or decrease. However, even though the prices we can charge for these oil products and the costs to collect and re-refine used oil and process RFO typically increase and decrease together, there is no assurance that when our costs to collect and re-refine used oil and process RFO increase we will be able to increase the prices we charge for these

oil products to cover such increased costs, or that our costs to collect and re-refine used oil and process RFO will decline when the prices we can charge for such oil products decline. These risks are exacerbated when there are rapid fluctuations in these oil indices.

Environmental laws and regulations have adversely affected and may adversely affect Safety-Kleen's parts cleaning and other solvent related services.

In connection with its parts cleaning and other solvent related services, Safety-Kleen has been subject to fines and certain orders requiring it to take environmental remedial action. Safety-Kleen may also be subject to monetary fines, civil or criminal penalties, remediation, cleanup or stop orders, injunctions, orders to cease or suspend certain practices or denial of permits required for the operation of its facilities. The outcome of any proceeding and associated costs and expenses could have a material adverse impact on Safety-Kleen's financial condition and results of operations.

Recent and potential changes in environmental laws and regulations may also adversely affect future Safety-Kleen parts cleaning and other solvent related services. Interpretation or enforcement of existing laws and regulations, or the adoption of new laws and regulations, may require Safety-Kleen to modify or curtail its parts cleaning operations or replace or upgrade its facilities or equipment at substantial cost, which we may not be able to pass on to our customers, and we may choose to indemnify our customers from any fines or penalties they may incur as a result of these new laws and regulations. On the other hand, in some cases if new laws and regulations are less stringent, Safety-Kleen's customers or competitors may be able to manage waste more effectively themselves, which could decrease the need for Safety-Kleen's parts cleaning and other solvent related services or increase competition, which could adversely affect Safety-Kleen's results of operations.

Safety-Kleen is subject to existing and potential product liability lawsuits.

Safety-Kleen has been named from time to time as a defendant in product liability lawsuits in various courts and jurisdictions throughout the United States. As of December 31, 2019, Safety-Kleen was involved in approximately 55 such proceedings (including cases which have been settled but not formally dismissed) wherein persons claim personal injury resulting from the use of its parts cleaning equipment or cleaning products. These proceedings typically involve allegations that the solvents used in Safety-Kleen's parts cleaning equipment contain contaminants or that Safety-Kleen's recycling process does not effectively remove the contaminants that become entrained in the solvents during their use. In addition, certain claimants assert that Safety-Kleen failed to adequately warn the product user of potential risks, including a historic failure to warn that such solvents contain trace amounts of toxic or hazardous substances such as benzene.

Safety-Kleen maintains insurance that we believe will provide coverage for these claims (over amounts accrued for self-insured retentions and deductibles in certain limited cases). This insurance may not provide coverage for potential awards of punitive damages against Safety-Kleen. Although Safety-Kleen has vigorously defended and will continue to vigorously defend itself and the safety of its products against all of these claims, these lawsuits are subject to many uncertainties and outcomes cannot be predicted with assurance. Safety-Kleen may also be named in additional product liability lawsuits in the future, including claims for which insurance coverage may not be available. If any one or more of these lawsuits were decided unfavorably against Safety-Kleen and the plaintiffs were awarded punitive damages, or if insurance coverage were not available for any such claim, our financial condition and results of operations could be materially and adversely affected. Additionally, if any one or more of these lawsuits were decided unfavorably against Safety-Kleen, such outcome may encourage more lawsuits against us.

Risks Relating to Our Levels of Debt and Letters of Credit

Our substantial levels of outstanding debt and letters of credit could adversely affect our financial condition and ability to fulfill our obligations.

As of December 31, 2019, we had outstanding $845.0 million of senior unsecured notes, $734.7 million of senior secured term loans, and $146.9 million of letters of credit. Our substantial levels of outstanding debt and letters of credit may:

- adversely impact our ability to obtain additional financing in the future for working capital, capital expenditures, acquisitions or other general corporate purposes or to repurchase our senior unsecured notes from holders upon any change of control;
- require us to dedicate a substantial portion of our cash flow to payment of interest on our debt and fees on our letters of credit, which reduces the availability of our cash flow to fund working capital, capital expenditures, acquisitions and other general corporate purposes;
- subject us to the risk of increased sensitivity to interest rate increases based upon variable interest rates, including interest on $384.7 million of our $734.7 million senior secured term loans for which we do not currently have interest rate hedges and borrowings (if any) under our revolving credit facility;

- increase the possibility of an event of default under the financial and operating covenants contained in our debt instruments; and
- limit our ability to adjust to rapidly changing market conditions, reduce our ability to withstand competitive pressures and make us more vulnerable to a downturn in general economic conditions of our business than our competitors with less debt.

Our ability to make scheduled payments of principal or interest with respect to our debt, including our outstanding senior unsecured notes, our secured term loans, any revolving loans and our finance leases, and to pay fee obligations with respect to our letters of credit, will depend on our ability to generate cash and our future financial results. If we are unable to generate sufficient cash flow from operations in the future to service our debt and letter of credit fee obligations, we might be required to refinance all or a portion of our existing debt and letter of credit facilities or to obtain new or additional such facilities. However, we might not be able to obtain any such new or additional facilities on favorable terms or at all.

Despite our substantial levels of outstanding debt and letters of credit, we could incur substantially more debt and letter of credit obligations in the future.

Although our revolving credit agreement and the indentures and loan agreements governing our other outstanding debt contain restrictions on the incurrence of additional debt (including, for this purpose, reimbursement obligations under outstanding letters of credit), these restrictions are subject to a number of qualifications and exceptions and the additional debt which we might incur in the future in compliance with these restrictions could be substantial. In particular, as of December 31, 2019, we had up to approximately $229.2 million available for additional borrowings and letters of credit under our revolving credit facility. Our revolving credit agreement and the indentures and loan agreement governing our other outstanding debt also allow us to borrow significant amounts of money from other sources. These restrictions also do not prevent us from incurring obligations (such as operating leases) that do not constitute “debt” or “indebtedness” as defined in the relevant agreements. To the extent we incur in the future additional debt and letter of credit or other obligations, the related risks would increase.

The covenants in our debt agreements restrict our ability to operate our business and might lead to a default under our debt agreements.

Our revolving credit agreement and the indentures and loan agreement governing our other outstanding debt limit, among other things, the extent to which the Company or our restricted subsidiaries can:

- incur or guarantee additional indebtedness (including, for this purpose, reimbursement obligations under letters of credit) or issue preferred stock;
- pay dividends or make other distributions to our stockholders;
- purchase or redeem capital stock or subordinated indebtedness;
- make investments;
- create liens;
- incur restrictions on the ability of our restricted subsidiaries to pay dividends or make other payments to us;
- sell assets, including capital stock of our subsidiaries;
- consolidate or merge with or into other companies or transfer all or substantially all of our assets; and
- engage in transactions with affiliates.

As a result of these covenants, we may not be able to respond to changes in business and economic conditions and to obtain additional financing, if needed, and we may be prevented from engaging in transactions that might otherwise be beneficial to us. Our revolving credit facility requires, and our future credit facilities may require, us to maintain under certain circumstances certain financial ratios and satisfy certain other financial condition tests. Our ability to meet these financial ratios and tests can be affected by events beyond our control, and we may not be able to meet those tests. The breach of any of these covenants could result in a default under our outstanding or future debt. Upon the occurrence of an event of default, the lenders could elect to declare all amounts outstanding under such debts, including accrued interest or other obligations, to be immediately due and payable. If amounts outstanding under such debt were accelerated, our assets might not be sufficient to repay in full that debt and our other debt.

Our revolving credit agreement and the indenture and loan agreement governing our other outstanding debt also contain cross-default and cross-acceleration provisions. Under these provisions, a default or acceleration under one instrument

governing our debt may constitute a default under our other debt instruments that contain cross-default and cross-acceleration provisions, which could result in the related debt and the debt under such other instruments becoming immediately due and payable. In such event, we would need to raise funds from alternative sources, which funds might not be available to us on favorable terms, on a timely basis or at all. Alternatively, such a default could require us to sell assets and otherwise curtail operations to pay our creditors. The proceeds of such a sale of assets or curtailment of operations might not enable us to pay all of our liabilities.

Other Risks Relating to Our Common Stock

The Massachusetts Business Corporation Act and our By-Laws contain certain anti-takeover provisions.

Sections 8.06 and 7.02 of the Massachusetts Business Corporation Act provide that Massachusetts corporations which are publicly-held must have a staggered board of directors and that written demand by holders of at least 40% of the outstanding shares of each relevant voting group of stockholders is required for stockholders to call a special meeting unless such corporations take certain actions to affirmatively "opt-out" of such requirements. In accordance with these provisions, our By-Laws provide for a staggered board of directors which consists of three classes of directors of which one class is elected each year for a three-year term, and require that written application by holders of at least 25% (which is less than the 40% which would otherwise be applicable without such a specific provision in our By-Laws) of our outstanding shares of common stock is required for stockholders to call a special meeting. In addition, our By-Laws prohibit the removal by the stockholders of a director except for cause. These provisions could inhibit a takeover of our Company by restricting stockholders' action to replace the existing directors or approve other actions which a party seeking to acquire us might propose. A takeover transaction would frequently afford stockholders an opportunity to sell their shares at a premium over then market prices.

ITEM 1B. UNRESOLVED STAFF COMMENTS

Not applicable.

ITEM 2. PROPERTIES

Our principal executive offices are in Norwell, Massachusetts. In the first quarter of 2020, we purchased our primary executive office building in Norwell which occupies 104,008 square feet. We also currently lease 52,418 square feet of additional office space in Norwell under arrangements which may not expire until 2042. We also have regional administrative offices in Texas and South Carolina, as well as Alberta, Canada and Hyderabad, India. Our properties are sufficient and suitable for our current needs.

We have a network of more than 480 service locations across 49 states, eight Canadian provinces, Puerto Rico and Mexico. Those service locations include service centers, satellite locations, branches, active hazardous waste management properties, lodging facilities and oil processing facilities. The service centers and branches are the principal sales and service centers from which we provide our environmental, energy and industrial services. The active hazardous waste management properties include incinerator facilities, commercial and non-commercial landfills, wastewater treatment facilities, TSDFs, solvent recovery management and recycling facilities, oil accumulation centers, oil terminals and oil re-refineries. Some of our properties offer multiple capabilities. The following sets forth certain information as of December 31, 2019 regarding our properties.

Service Centers, Satellite Locations and Branches

We have approximately 360 service centers, satellite locations and branches throughout the United States and Canada which serve as principal sales and service centers from which we provide parts cleaning services, containerized waste services, oil collection services and other environmental services.

Active Hazardous Waste Management Properties

Incinerator Facilities. We own five operating incinerator facilities that have a total of nine incinerators with 561,721 tons of total practical capacity and an overall average utilization rate for 2019 of 84.6%. Our practical capacity is not based on a theoretical 24-hour, seven-day operation, but rather is determined as the production level at which our incinerators can operate with an acceptable degree of efficiency, taking into consideration factors such as longer term customer demand, permanent staffing levels, operating shifts, holidays, scheduled maintenance and mix of product. Capacity utilization is calculated by dividing actual production tons by practical capacity at each incinerator.

	# of Incinerators	Practical Capacity (Tons)	Utilization Rate Year Ended December 31, 2019
Arkansas	3	145,072	88.8%
Nebraska	1	58,808	87.9%
Utah	1	66,815	88.4%
Texas	3	165,500	78.9%
Ontario, Canada	1	125,526	83.5%
	9	561,721	84.6%

Our incinerators offer a wide range of technological capabilities to customers through this network. We provide incineration in the United States through one fluidized bed thermal oxidation unit and three solids and liquids-capable incinerator facilities and we operate in Canada one active hazardous waste liquid injection incinerator.

Commercial and Non-Commercial Landfills. In the United States and Canada, we operate nine commercial landfills with approximately 28.2 million cubic yards of remaining highly probable airspace. Seven of our commercial landfills are designed and permitted for the disposal of hazardous waste and two landfills are operated for nonhazardous industrial waste disposal and, to a lesser extent, municipal solid waste. In addition to our commercial landfills, we also own and operate two non-commercial landfills that only accept waste from our on-site incinerators. See "Landfill Accounting" within Note 2, "Significant Accounting Policies," to our consolidated financial statements included in Item 8 of this report for additional information on our commercial and non-commercial landfills.

Wastewater Treatment Facilities. We operate a total of nine facilities, of which eight are owned and one is leased, that offer a range of wastewater treatment technologies and services. Wastewater treatment consists primarily of three types of services: hazardous wastewater treatment, sludge de-watering or drying and non-hazardous wastewater treatment.

Treatment, Storage and Disposal Facilities. We operate 18 TSDFs, of which 16 are owned and two are leased, in the United States and Canada. Our TSDFs facilitate the movement of materials among our network of service centers and treatment and disposal facilities. Transportation may be accomplished by truck, rail, barge or a combination of modes, with our own assets or in conjunction with third-party transporters. Specially designed containment systems, vehicles and other equipment permitted for hazardous and industrial waste transport, together with drivers trained in transportation and waste handling procedures, provide for the movement of customer waste streams.

Solvent Recovery Management and Recycling Operations. We own two facilities specializing in solvent recovery management.

Oil Processing, Blending and Packaging Facilities

Oil Accumulation Centers. We operate a total of nine accumulation centers, of which eight are owned and one is leased, used for accumulating waste oil from our branches.

Oil Terminals. We operate a total of 53 oil terminals, of which 33 are owned and 20 are leased, which collect or process used oil prior to delivery to re-refineries or distribution as RFO.

Oil Recycling and Re-refining Facilities. We own six oil re-refineries, five in the United States and one in Canada. With more than 200 million gallons of used oil processed annually, we were able to return 191 million gallons of new re-refined oil, lubricants and byproducts back into the marketplace in 2019.

Oil Packaging and Blending Facilities. We operate a total of five oil packaging and blending facilities, of which three are owned and two are leased, which are used for blending and packaging oil from our branches.

Lodging Facilities

Lodge Operations. We own and operate six fixed lodges, five of which are in Western Canada and a single lodge in Texas. These lodges are all located on sites which are leased by the Company under long-term land lease agreements.

Camps. We operate various camp facilities that can grow and shrink in size and location. Generally, we have ongoing operations at one to two larger facilities that we expect to operate on a multi-year basis. Additionally, we have five office complexes, two mini-camps and approximately 20 single and double occupancy drill camps in our fleet that can operate at any time. All of our camp facilities are owned and located on various sites throughout Western Canada. Sites for the larger facilities are generally leased, whereas sites for our smaller facilities are generally provided by our customers.

ITEM 3. LEGAL PROCEEDINGS

See Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report for a description of legal proceedings.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Common Stock

Our common stock trades on the New York Stock Exchange ("NYSE") under the symbol CLH. On February 19, 2020, there were 261 stockholders of record of our common stock, excluding stockholders whose shares were held in nominee, or "street name" accounts through brokers or banks. On our last record date, 21,644 additional stockholders beneficially held shares in street name accounts.

We have never declared nor paid any cash dividends on our common stock, and we do not intend to pay any dividends on our common stock in the foreseeable future. We intend to retain our future earnings, if any, for use in the operation and expansion of our business, payment of our outstanding debt and for our stock repurchase program. In addition, our current credit agreement and indentures limit the amount we could pay as cash dividends on or for repurchase of our common stock. For additional information surrounding our stock repurchase program, see Note 15, "Stockholders' Equity," to our consolidated financial statements included in Item 8 of this report.

Securities Authorized For Issuance Under Equity Compensation Plans

See Item 12, "Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters," for a description of the securities which are authorized for issuance under our equity compensation plans.

Issuer Purchases of Equity Securities

Period	Total Number of Shares Purchased [1]	Average Price Paid Per Share [2]	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Approximate Dollar Value of Shares that May Yet Be Purchased Under the Plans or Programs [3] (in thousands)
October 1, 2019 through October 31, 2019	617	$ 74.78	—	$ 289,684
November 1, 2019 through November 30, 2019	21,966	83.36	19,000	288,095
December 1, 2019 through December 31, 2019	59,899	84.27	40,329	284,684
Total	82,482	$ 83.95	59,329	

(1) Includes 23,153 shares withheld by us from employees to satisfy employee tax obligations upon vesting of restricted shares granted under our long-term equity incentive programs.

(2) The average price paid per share of common stock repurchased under our stock repurchase program includes commissions paid to the brokers.

(3) Our board of directors has authorized the repurchase of up to $600.0 million of our common stock. We have funded and intend to fund the repurchases through available cash resources. The stock repurchase program authorizes us to purchase our common stock on the open market or in privately negotiated transactions periodically in a manner that complies with applicable U.S. securities laws. The number of shares purchased and the timing of the purchases has depended and will depend on a number of factors, including share price, cash required for business plans, trading volume and other conditions. During April 2018, we implemented a repurchase plan in accordance with Rule 10b5-1 promulgated under the Securities Exchange Act of 1934, as amended. Future repurchases will be made under the Rule 10b5-1 plan as well as open market or privately negotiated transactions as described above. We have no obligation to repurchase stock under this program and may suspend or terminate the repurchase program at any time.

COMPARISON OF 5-YEAR CUMULATIVE TOTAL RETURN

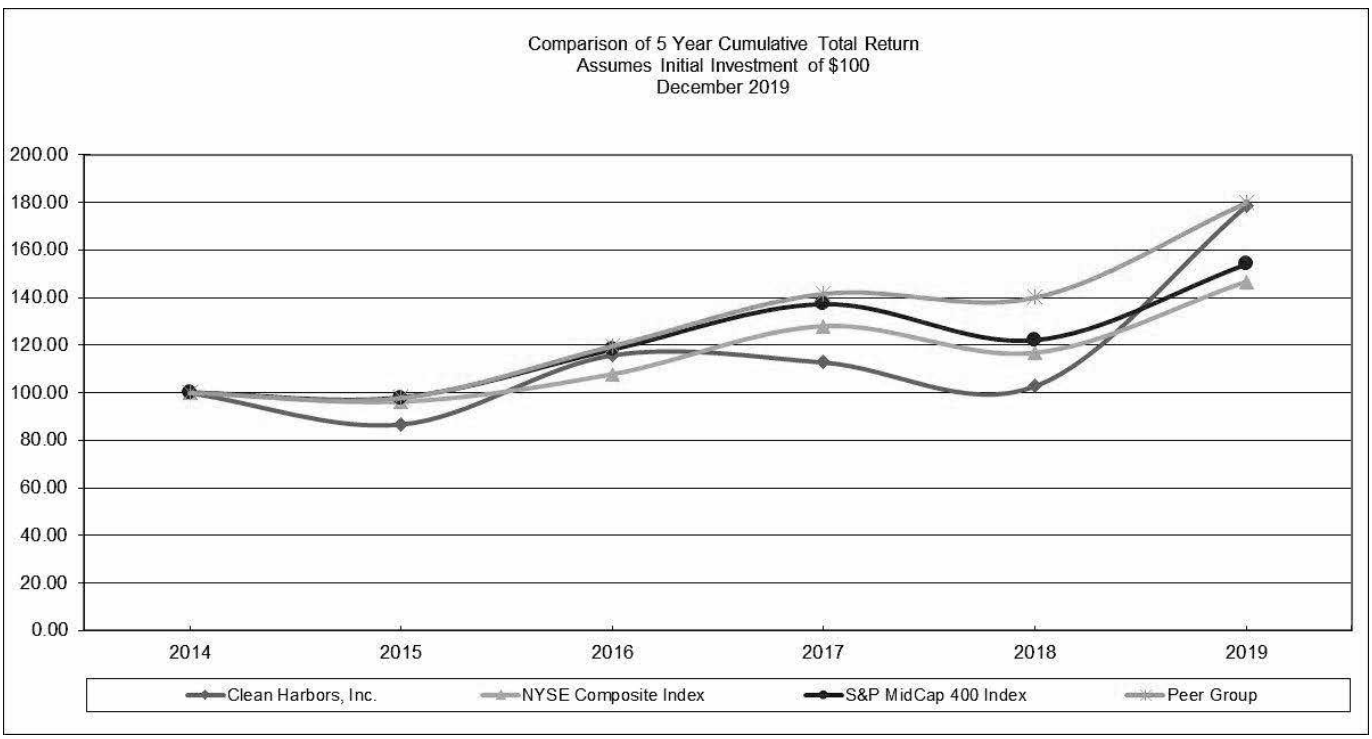
AMONG CLEAN HARBORS, INC.,

NYSE COMPOSITE INDEX, S&P MIDCAP 400 INDEX, REFUSE SYSTEMS AND CUSTOM PEER GROUP

Performance Graph

The following graph compares the five-year return from investing $100 in each of our common stock, the NYSE Composite Index, the S&P Midcap 400 Index, and a custom peer group. In 2018, we selected a custom peer group that more closely aligns with the breadth and size of our business. This peer group is comprised of American Water Works Company, Inc., Casella Waste Systems, Inc., Civeo Corporation, Covanta Holding Corporation, Heritage-Crystal Clean, Inc., Iron Mountain Incorporated, Newpark Resources, Inc., Oil States International, Inc., Republic Services, Inc., Stericycle, Inc., Superior Energy Services, Inc., US Ecology, Inc., and Waste Management, Inc. In 2019, we removed the Refuse Systems comparative, which had previously been included in the Comparison of 5-Year Cumulative Total Return chart below, because we believe our custom peer group is more relevant.

The values illustrated assume reinvestment of dividends on the ex-dividend date and compares relative performance since a particular starting date. In this instance, the starting date was December 31, 2014, when our common stock closed at $48.05 per share. The graph is presented pursuant to SEC rules and is not meant to be an indication of our future performance.



ITEM 6. SELECTED FINANCIAL DATA

The following summary of consolidated financial information has been derived from the audited consolidated financial statements included in Item 8, "Financial Statements and Supplementary Data," of this report and in the Form 10-Ks we previously filed with the SEC. This information should be reviewed in conjunction with Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations," and the financial statements and notes thereto included in Item 8, "Financial Statements and Supplementary Data," of this report.

	For the years ended December 31,				
(in thousands, except per share amounts)	2019	2018	2017	2016	2015
Statement of Operations Data:					
Total revenues	$3,412,190	$3,300,303	$2,944,978	$2,755,226	$3,275,137
Net income (loss) [(1)]	97,740	65,636	100,739	(39,873)	44,102
Earnings (loss) per share: [(1)]					
Basic	1.75	1.17	1.77	(0.69)	0.76
Diluted	1.74	1.16	1.76	(0.69)	0.76
Other Financial Data:					
Adjusted EBITDA [(2)]	540,317	491,005	425,657	400,354	504,167

	As of December 31,				
(in thousands)	2019	2018	2017	2016	2015
Balance Sheet Data:					
Total assets	$ 4,108,904	$ 3,738,321	$ 3,706,570	$ 3,681,920	$ 3,431,428
Long-term obligations (including current portion)	1,561,651	1,572,556	1,629,537	1,633,272	1,382,543
Stockholders' equity	1,269,813	1,169,756	1,188,202	1,084,241	1,096,282

(1) The 2019 results include a $6.1 million pre-tax loss on early extinguishment of debt and a $0.7 million gain on the sale of a non-core line of business within our Environmental Services segment. The 2018 results include a $2.5 million pre-tax loss on early extinguishment of debt. The 2017 results include a net benefit of $93.0 million resulting from impacts of the tax law changes enacted in December of 2017, a $7.9 million pre-tax loss on early extinguishment of debt and a $30.7 million pre-tax gain on the sale of a non-core line of business within our Environmental Services segment. The 2016 results include a $34.0 million goodwill impairment charge and a $16.9 million pre-tax gain on the sale of a non-core line of business within our Environmental Services segment. The 2015 results include a $32.0 million goodwill impairment charge in our Environmental Services segment. In 2016, we did not record any income tax benefit as a result of the goodwill impairment charge. In 2015, we recorded an income tax benefit of $2.0 million as a result of the goodwill impairment charge.

(2) The following is a reconciliation of net income (loss) to Adjusted EBITDA for the following periods (in thousands). See additional information regarding this non-GAAP measure under the heading *"Adjusted EBITDA"* in Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations," of this report.

	For the years ended December 31,				
(in thousands, except for percentages)	2019	2018	2017	2016	2015
Net income (loss)	$ 97,740	$ 65,636	$ 100,739	$ (39,873)	$ 44,102
Accretion of environmental liabilities	10,136	9,806	9,460	10,177	10,402
Depreciation and amortization	300,725	298,625	288,422	287,002	274,194
Goodwill impairment charges	—	—	—	34,013	31,992
Other (income) expense, net	(2,897)	4,510	6,119	(6,195)	1,380
Loss on early extinguishment of debt	6,131	2,488	7,891	—	—
Gain on sale of businesses	(687)	—	(30,732)	(16,884)	—
Interest expense, net	78,670	81,094	85,808	83,525	76,553
Provision (benefit) for income taxes	50,499	28,846	(42,050)	48,589	65,544
Adjusted EBITDA	$ 540,317	$ 491,005	$ 425,657	$ 400,354	$ 504,167
As a percentage of total revenues	15.8%	14.9%	14.5%	14.5%	15.4%

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Overview

We are North America's leading provider of environmental, energy and industrial services supporting our customers in finding environmentally responsible solutions to further their sustainability goals in today's world. We believe we operate, in the aggregate, the largest number of hazardous waste incinerators, landfills and treatment, storage and disposal facilities ("TSDFs") in North America. We serve a diverse customer base, including Fortune 500 companies, across the chemical, energy, manufacturing and additional markets, as well as numerous government agencies. These customers rely on us to deliver a broad range of services including but not limited to end-to-end hazardous waste management, emergency response, industrial cleaning and maintenance and recycling services. We are also the largest re-refiner and recycler of used oil in North America and the largest provider of parts cleaning and related environmental services to commercial, industrial and automotive customers in North America.

We have two operating segments*;* (i) the Environmental Services segment and (ii) the Safety-Kleen segment. Performance of our segments is evaluated on several factors of which the primary financial measure is Adjusted EBITDA as described more fully below. The following is a discussion of how management evaluates its segments including key performance indicators that management uses to assess the segments' results, as well as certain macroeconomic trends and influences that impact each reportable segment:

- **Environmental Services -** Environmental Services segment results are predicated upon the demand by our customers for waste services directly attributable to waste volumes generated by them and project work for which waste handling and/or disposal is required. In managing the business and evaluating performance, management tracks the volumes and mix of waste handled and disposed of through our owned incinerators and landfills, as well as utilization of such incinerators, labor and billable hours and equipment among other key metrics. Levels of activity and ultimate performance associated with this segment can be impacted by several factors including overall U.S. GDP and U.S. industrial production, weather conditions, efficiency of our operations, technology, changing regulations, competition, market pricing of our services and the management of our related operating costs. Environmental Services results are also impacted by the demand for planned and unplanned industrial related cleaning and maintenance services at customer sites and for environmental cleanup services on a scheduled or emergency basis, including response to national events such as major chemical spills, natural disasters or other events where immediate and specialized services are required.

- **Safety-Kleen -** Safety-Kleen segment results are impacted by an array of core service and product offerings that serve to attract small quantity waste producers as customers and integrate them into the Clean Harbors waste network. Core service offerings include parts washer services, containerized waste services, vac services, used motor oil collection and contract blending and packaging services. Key performance indicators tracked by the Company relative to these services include the number of parts washer services performed and pricing and volume of used motor oil and waste collected. Results from these services are primarily driven by the overall number of parts washers placed at customer sites and volumes of waste collected, as well as the demand for and frequency of other offered services. These factors can be impacted by overall economic conditions in the marketplace, especially in the automotive related area. In addition to its core service offerings, Safety-Kleen offers high quality recycled base and blended oil products to end users including fleet customers, distributors and manufacturers of oil products. Other product offerings include automotive related fluids and shop supplies. Relative to its oil related products, management tracks the Company's volumes and relative percentages of base and blended oil sales along with various pricing metrics associated with the commodity driven marketplace. The segment's results are significantly impacted by overall market pricing and product mix associated with base and blended oil products and, more specifically, the market prices of Group II base oils. Costs incurred in connection with the collection of used oil and other raw materials associated with the segment's oil related products can also be volatile. Our OilPlus® closed loop initiative, which results in the sale of our renewable oil products directly to our end customers, may also be impacted by changes in customer demand for high-quality, environmentally responsible recycled oil.

Highlights

Total revenues for 2019 increased 3.4% to $3.4 billion, compared with $3.3 billion in 2018. Our Environmental Services segment increased direct revenues $95.9 million in 2019 compared with 2018 due to greater activity at our sales and service branches and improvements in average pricing which was driven by a more profitable mix of waste streams across our incinerator network. Direct revenues recorded by Safety-Kleen increased $16.8 million in 2019 compared to 2018 as a result of continued growth across Safety-Kleen's core service offerings and higher volumes of blended oil sales. Foreign currency

translation of our Canadian operations negatively impacted our consolidated direct revenues by $12.9 million in 2019 as compared to 2018.

Income from operations in 2019 was $229.5 million, compared with $182.6 million in 2018. We reported net income in 2019 and 2018 of $97.7 million and $65.6 million, respectively. Adjusted EBITDA, which is the primary financial measure by which our segments are evaluated, increased 10.0% to $540.3 million in 2019 from $491.0 million in 2018. The increased level of Adjusted EBITDA in 2019 was primarily attributable to higher revenue amounts as described above and improved operating margins. Additional information regarding Adjusted EBITDA, which is a non-GAAP measure, including a reconciliation of Adjusted EBITDA to net income, appears below under *"Adjusted EBITDA."*

Net cash from operating activities for 2019 was $413.2 million, an increase of $40.0 million from 2018. Adjusted free cash flow, which management uses to measure our financial strength and ability to generate cash, was $208.5 million in 2019, which represented a $13.2 million increase over 2018 primarily due to greater levels of operating income and lower levels of working capital, which was due in part to a change in timing of interest payments associated with the debt refinancing completed in the third quarter of 2019. These increases were partially offset by increased capital and environmental spending. Additional information regarding adjusted free cash flow, which is a non-GAAP measure, including a reconciliation of adjusted free cash flow to net cash from operating activities, appears below under "*Adjusted Free Cash Flow*."

Segment Performance

The primary financial measure by which we evaluate the performance of our segments is Adjusted EBITDA. The following table sets forth certain financial information associated with our results of operations for the years ended December 31, 2019, 2018 and 2017 (in thousands, except percentages).

	Summary of Operations						
	For the years ended December 31,			2019 over 2018		2018 over 2017	
	2019	2018	2017	$ Change	% Change	$ Change	% Change
Direct Revenues[1]:							
Environmental Services	$ 2,237,068	$ 2,141,194	$ 1,857,474	$ 95,874	4.5%	$ 283,720	15.3%
Safety-Kleen	1,178,129	1,161,282	1,087,886	16,847	1.5	73,396	6.7
Corporate Items	(3,007)	(2,173)	(382)	(834)	N/M	(1,791)	N/M
Total	3,412,190	3,300,303	2,944,978	111,887	3.4	355,325	12.1
Cost of Revenues[2]:							
Environmental Services	1,620,038	1,576,705	1,373,789	43,333	2.7	202,916	14.8
Safety-Kleen	749,407	725,734	690,344	23,673	3.3	35,390	5.1
Corporate Items	18,374	3,112	(1,460)	15,262	N/M	4,572	N/M
Total	2,387,819	2,305,551	2,062,673	82,268	3.6	242,878	11.8
Selling, General and Administrative Expenses:							
Environmental Services	170,746	183,633	162,375	(12,887)	(7.0)	21,258	13.1
Safety-Kleen	146,344	153,519	147,731	(7,175)	(4.7)	5,788	3.9
Corporate Items	166,964	166,595	146,542	369	0.2	20,053	13.7
Total	484,054	503,747	456,648	(19,693)	(3.9)	47,099	10.3
Adjusted EBITDA							
Environmental Services	446,284	380,856	321,310	65,428	17.2	59,546	18.5
Safety-Kleen	282,378	282,029	249,811	349	0.1	32,218	12.9
Corporate Items	(188,345)	(171,880)	(145,464)	(16,465)	(9.6)	(26,416)	(18.2)
Total	$ 540,317	$ 491,005	$ 425,657	$ 49,312	10.0%	$ 65,348	15.4%

N/M = not meaningful

(1) Direct revenue is revenue allocated to the segment performing the provided service.

(2) Cost of revenue is shown exclusive of items presented separately on the consolidated statements of operations, which consist of (i) accretion of environmental liabilities and (ii) depreciation and amortization.

Direct Revenues

There are many factors which have impacted and continue to impact our revenues. These factors include, but are not limited to: overall industrial activity and growth in North America, existence or non-existence of large scale environmental waste and remediation projects, competitive industry pricing, impacts of acquisitions and divestitures, the level of emergency response projects, base and blended oil pricing, market changes relative to the collection of used oil, the number of parts washers placed at customer sites and foreign currency translation. In addition, customer efforts to minimalize hazardous waste and changes in regulation can also impact our revenues.

Environmental Services

	For the years ended December 31,			2019 over 2018		2018 over 2017	
(in thousands, except percentages)	2019	2018	2017	$ Change	% Change	$ Change	% Change
Direct revenues	$ 2,237,068	$ 2,141,194	$ 1,857,474	$ 95,874	4.5%	$ 283,720	15.3%

Environmental Services direct revenues for the year ended December 31, 2019 increased $95.9 million from the comparable period in 2018. Greater levels of activity at our sales and service branches and improved average pricing for

disposal of waste streams at our incinerators drove this increase in 2019. Service related revenues increased, in part, due to $15.1 million of emergency response work associated with Field and Emergency Response revenue streams during 2019, compared to $9.8 million during 2018. Despite a higher number of down days at our Deer Park facility in Q1 2019 as a result of a fire at a neighboring facility, utilization at our incinerator facilities in 2019 remained relatively consistent with the prior year at approximately 85%. A mix of higher priced waste streams resulted in an increase in direct revenues from our incinerator facilities year over year. Average price per ton increased approximately 11% from the prior year for a $35.1 million increase in direct revenues in 2019. These increases were partially offset by a decrease in Industrial Services revenue as we continue to focus on selecting higher margin turnaround projects. Also impacting the year over year change in direct revenues within this segment was the negative impact of foreign currency translation on our Canadian operations of $9.3 million.

Environmental Services direct revenues for the year ended December 31, 2018 increased $283.7 million from the comparable period in 2017. Included in the current year revenues was $154.0 million of direct revenues from the Veolia Business, which we acquired on February 23, 2018. Excluding the impacts from the Veolia Business, Environmental Services direct revenues increased $129.5 million primarily due to greater levels of activity at our sales and service branches and increased levels of disposal related revenues from improved pricing conditions and mix associated with waste streams at our incinerators in 2018. For the year ended December 31, 2018, landfill volumes increased slightly as compared to 2017. The utilization rate at our incinerators was 86.7% on a practical capacity of 561,721 tons for the year ended December 31, 2018, compared with 87.6% on a practical capacity of 561,721 tons in 2017. The decrease in utilization rates in 2018 was impacted by a slightly higher number of down days at our facilities during 2018; however, impacts on the profitability of the business from an increase in down days was more than offset by improved pricing conditions and an increase in volumes of higher margin waste streams received in 2018. The impact of foreign currency translation on our Canadian operations within the Environmental Services segment was minimal in the year ended December 31, 2018 as compared to 2017.

Safety-Kleen

	For the years ended December 31,			2019 over 2018		2018 over 2017	
(in thousands, except percentages)	2019	2018	2017	$ Change	% Change	$ Change	% Change
Direct revenues	$1,178,129	$1,161,282	$1,087,886	$ 16,847	1.5%	$ 73,396	6.7%

Safety-Kleen direct revenues for the year ended December 31, 2019 increased $16.8 million from the comparable period in 2018 primarily due to growth in the business' core service offerings and increased blended oil volumes. Revenues generated through our core service offerings, such as handling of containerized waste and vacuum services, accounted for $22.3 million of incremental revenues driven both by volume and pricing increases. Higher volumes of blended oil sales and increased pricing of our used motor oil collections contributed $15.6 million and $5.2 million, respectively, to the growth in direct revenues from the comparable period in 2018. Revenue from contract blending and packaging also increased $9.3 million due to increased volume. These increases were partially offset by a $17.5 million decrease in base oil sales due to reductions in pricing experienced in 2019 in response to lower demand across the base oil market and lower base oil volumes, most significantly seen in the first quarter of 2019. Sales of recycled fuel oil and refinery bi-products decreased by $12.3 million from prior year due to a reduction in volume. In 2019, parts washer services were relatively consistent with the prior year. Also included in the change within this segment was the negative impact of foreign currency translation on our Canadian operations of $3.4 million.

Safety-Kleen direct revenues for the year ended December 31, 2018 increased $73.4 million from the comparable period in 2017 primarily due to more favorable pricing on oil products and growth in the business' core service offerings. Revenues generated through our core service offerings such as handling of containerized waste and vac services, parts washer services as well as sales of automotive and industrial cleaning products accounted for $21.3 million of incremental revenues. Increased base and blended volumes and oil pricing accounted for $34.7 million of incremental direct revenues from the comparable period in 2017. Sales of contract packaging and blending services, refinery bi-products and recycled fuel oil also increased by $38.9 million from the comparable period in 2017. These increases were partially offset by a decrease in used motor oil collection revenues of $19.5 million as market pricing for these services was negatively impacted as crude oil prices generally rose throughout the earlier parts of 2018. The impact of foreign currency translation on our Canadian operations within the Safety-Kleen segment was minimal in the year ended December 31, 2018 as compared to 2017.

Cost of Revenues

We believe that our ability to manage operating costs is important to our ability to remain price competitive. We continue to upgrade the quality and efficiency of our services through the development of new technology and continued modifications at our facilities, invest in new business opportunities and aggressively implement strategic sourcing and logistics solutions as well as other cost reduction initiatives while also continuing to optimize our management and operating structure in an effort to

maintain and increase operating margins. These strategic cost saving actions help to reduce the impacts of naturally rising costs such as labor and other core operating costs across our businesses.

Environmental Services

(in thousands, except percentages)	For the years ended December 31, 2019	2018	2017	2019 over 2018 $ Change	2019 over 2018 % Change	2018 over 2017 $ Change	2018 over 2017 % Change
Cost of revenues	$1,620,038	$1,576,705	$1,373,789	$ 43,333	2.7 %	$ 202,916	14.8 %
As a % of Direct revenues	72.4%	73.6%	74.0%		(1.2)%		(0.4)%

Environmental Services cost of revenues increased $43.3 million for the year ended December 31, 2019, however these costs decreased as a percentage of direct revenue due to a mix of higher priced waste streams in our incineration network, which increased profitability, and the results of ongoing cost reduction projects, including site consolidations. The overall cost increase was due to compensation and benefits related costs, equipment and supply costs and transportation, outside disposal and fuel costs which increased $20.4 million, $11.4 million and $3.9 million, respectively. The incremental operating costs were commensurate with greater activity levels in 2019.

Environmental Services cost of revenues for the year ended December 31, 2018 increased $202.9 million from the comparable period in 2017. The acquired Veolia Business had cost of revenues of $131.2 million in the year ended December 31, 2018. Excluding these costs, Environmental Services cost of revenues for the year ended December 31, 2018 increased $71.7 million, however these costs as a percentage of direct revenues decreased slightly over the comparable period of 2017, due to a more favorable mix of waste streams in our incineration network which increased profitability. The overall cost increase was due to labor and benefit related costs, transportation, disposal and fuel costs, and equipment, supply and various other expenses of $45.4 million, $16.2 million and $10.0 million, respectively. The incremental operating costs were commensurate with greater activity levels in 2018 and overall inflationary pressure across several cost categories including certain commodity supplies such as fuel and other supplies.

Safety-Kleen

(in thousands, except percentages)	For the years ended December 31, 2019	2018	2017	2019 over 2018 $ Change	2019 over 2018 % Change	2018 over 2017 $ Change	2018 over 2017 % Change
Cost of revenues	$ 749,407	$725,734	$690,344	$ 23,673	3.3%	$ 35,390	5.1 %
As a % of Direct revenues	63.6%	62.5%	63.5%		1.1%		(1.0)%

Safety-Kleen cost of revenues for the year ended December 31, 2019 increased $23.7 million from the comparable period in 2018. As a percentage of direct revenues, these costs increased as well mainly due to lower average pricing on the oil products sold leading to reduced leverage of our fixed cost base. Increased logistics costs, largely due to weather at the beginning of the year, also negatively impacted costs as a percentage of direct revenues. The overall cost increase was due to higher compensation and benefits related costs of $8.5 million, raw material costs associated with blended oil products of $5.5 million and transportation, disposal and fuel costs of $2.7 million. These increases were in line with the overall growth of our core service offerings and blended oil sales.

Safety-Kleen cost of revenues for the year ended December 31, 2018 increased $35.4 million from the comparable period in 2017, however these costs decreased as a percentage of revenue due to our effective management of the spread between used oil input costs and base oil pricing, as well as the implementation of new pricing strategies, which generated greater levels of direct revenue. The overall cost increase was primarily due to increased costs of raw materials associated with oil products of $15.8 million, increased transportation, disposal and fuel costs of $12.3 million and labor related costs of $6.3 million. These increases were in line with the overall growth of the business and increased costs of commodities.

Selling, General and Administrative Expenses

We strive to manage our selling, general and administrative ("SG&A") expenses commensurate with the overall performance of our segments and corresponding revenue levels. We believe that our ability to properly align these costs with business performance is reflective of our strong management of the businesses and further promotes our ability to remain competitive in the marketplace.

Environmental Services

(in thousands, except percentages)	For the years ended December 31, 2019	2018	2017	2019 over 2018 $ Change	2019 over 2018 % Change	2018 over 2017 $ Change	2018 over 2017 % Change
SG&A expenses	$ 170,746	$ 183,633	$ 162,375	$ (12,887)	(7.0)%	$ 21,258	13.1 %
As a % of Direct revenues	7.6%	8.6%	8.7%		(1.0)%		(0.1)%

Environmental Services SG&A expenses for the year ended December 31, 2019 decreased $12.9 million from the comparable period in 2018 and SG&A as a percentage of direct revenue decreased as well. The primary driver of these decreases relates to certain trade receivables which were reserved for in 2018 and subsequently recovered in 2019, generating a favorable difference of nearly $13.0 million. The favorable resolution of a litigation matter further reduced SG&A expenses by $5.5 million in 2019. These decreases were partially offset by a $5.2 million increase in compensation and benefits related costs which was consistent with the growth of the business in 2019. Excluding the recovery of trade receivables and litigation impacts, 2019 SG&A expenses as a percentage of direct revenues still improved over the prior year.

Environmental Services SG&A expenses for the year ended December 31, 2018 increased $21.3 million from the comparable period in 2017, however as a percentage of direct revenues, these costs remained consistent between the two periods. The increase in SG&A expenses was primarily due to increases in salary, benefits and variable compensation related costs of $14.7 million and bad debt expense of $7.0 million, partially offset by cost reductions across various expense categories. The increases in salary, benefits and variable compensation are in line with the growth of the business in 2018 as compared to 2017.

Safety-Kleen

(in thousands, except percentages)	For the years ended December 31, 2019	2018	2017	2019 over 2018 $ Change	2019 over 2018 % Change	2018 over 2017 $ Change	2018 over 2017 % Change
SG&A expenses	$ 146,344	$ 153,519	$ 147,731	$ (7,175)	(4.7)%	$ 5,788	3.9 %
As a % of Direct revenues	12.4%	13.2%	13.6%		(0.8)%		(0.4)%

Safety-Kleen SG&A expenses for the year ended December 31, 2019 decreased $7.2 million from the comparable period in 2018 and SG&A as a percentage of direct revenues decreased as well. The primary driver of these decreases is a $4.4 million decrease in compensation and benefits related costs resulting from lower headcount and cost saving initiatives implemented by the business throughout 2019. A reduction in legal related costs of $1.6 million also contributed to the overall decrease in SG&A expenses.

Safety-Kleen SG&A expenses for the year ended December 31, 2018 increased $5.8 million from the comparable period in 2017, however these costs decreased as a percentage of direct revenues, as the additional direct revenues outpaced incremental SG&A expenses. The overall increase in SG&A expenses was primarily due to increased salaries, benefits and variable compensation of $5.7 million as we continue to grow the business.

Corporate Items

(in thousands, except percentages)	For the years ended December 31, 2019	2018	2017	2019 over 2018 $ Change	2019 over 2018 % Change	2018 over 2017 $ Change	2018 over 2017 % Change
SG&A expenses	$ 166,964	$ 166,595	$ 146,542	$ 369	0.2%	$ 20,053	13.7%

Corporate Items SG&A expenses for the year ended December 31, 2019 were consistent with the comparable period in 2018. Continued investment in our employees increased our compensation and benefits related costs by $6.6 million and stock-based compensation increased by $1.0 million due to the achievement of certain performance metrics associated with performance based awards. These costs were offset by a $6.9 million reduction in legal and consulting fees due to cost saving initiatives.

Corporate Items SG&A expenses for the year ended December 31, 2018 increased $20.1 million from the comparable period in 2017 primarily due to increased salaries and benefits resulting from continued commitments to investing in our employees and variable compensation totaling $14.8 million, as well as increased stock-based compensation of $4.3 million primarily attributable to the achievement of performance metrics associated with performance based awards in 2018. Incremental costs associated with the acquired Veolia Business also contributed to the increased costs.

Adjusted EBITDA

Management considers Adjusted EBITDA to be a measurement of performance which provides useful information to both management and investors. Adjusted EBITDA should not be considered an alternative to net income or other measurements under generally accepted accounting principles ("GAAP"). Adjusted EBITDA is not calculated identically by all companies and, therefore our measurements of Adjusted EBITDA, while defined consistently and in accordance with our existing credit agreement, may not be comparable to similarly titled measures reported by other companies.

We use Adjusted EBITDA to enhance our understanding of our operating performance, which represents our views concerning our performance in the ordinary, ongoing and customary course of our operations. We historically have found it helpful, and believe that investors have found it helpful, to consider an operating measure that excludes certain expenses relating to transactions not reflective of our core operations.

The information about our operating performance provided by this financial measure is used by our management for a variety of purposes. We regularly communicate Adjusted EBITDA results to our lenders since our loan covenants are based upon levels of Adjusted EBITDA achieved and to our board of directors and we discuss with the board our interpretation of such results. We also compare our Adjusted EBITDA performance against internal targets as a key factor in determining cash and equity bonus compensation for executives and other employees, largely because we believe that this measure is indicative of how the fundamental business is performing and is being managed.

We also provide information relating to our Adjusted EBITDA so that analysts, investors and other interested persons have the same data that we use to assess our core operating performance. We believe that Adjusted EBITDA should be viewed only as a supplement to the GAAP financial information. We also believe, however, that providing this information in addition to, and together with, GAAP financial information provides a better understanding of our core operating performance and how management evaluates and measures our performance.

The following is a reconciliation of net income to Adjusted EBITDA for the following periods (in thousands, except percentages):

	For the years ended December 31,		
	2019	2018	2017
Net income	$ 97,740	$ 65,636	$ 100,739
Accretion of environmental liabilities	10,136	9,806	9,460
Depreciation and amortization	300,725	298,625	288,422
Other (income) expense, net	(2,897)	4,510	6,119
Loss on early extinguishment of debt	6,131	2,488	7,891
Gain on sale of businesses	(687)	—	(30,732)
Interest expense, net	78,670	81,094	85,808
Provision (benefit) for income taxes	50,499	28,846	(42,050)
Adjusted EBITDA	$ 540,317	$ 491,005	$ 425,657
As a % of Direct revenues	15.8%	14.9%	14.5%

Depreciation and Amortization

	For the years ended December 31,			2019 over 2018		2018 over 2017	
(in thousands, except percentages)	2019	2018	2017	$ Change	% Change	$ Change	% Change
Depreciation of fixed assets and amortization of landfills and finance leases	$ 265,531	$ 264,254	$ 251,403	$ 1,277	0.5%	$ 12,851	5.1 %
Permits and other intangibles amortization	35,194	34,371	37,019	823	2.4%	(2,648)	(7.2)%
Total depreciation and amortization	$ 300,725	$ 298,625	$ 288,422	$ 2,100	0.7%	$ 10,203	3.5 %

Depreciation and amortization for the year ended December 31, 2019 remained relatively consistent with the same period in the prior year. Depreciation and amortization for the year ended December 31, 2018 increased $10.2 million from the comparable period in 2017, primarily due to incremental depreciation from acquisitions and a slight increase in volumes at our landfills that drove higher landfill amortization.

Other Income (Expense), net

	For the years ended December 31,			2019 over 2018		2018 over 2017	
(in thousands, except percentages)	2019	2018	2017	$ Change	% Change	$ Change	% Change
Other income (expense), net	$ 2,897	$ (4,510)	$ (6,119)	$ 7,407	(164.2)%	$ 1,609	(26.3)%

For the year ended December 31, 2019, other income (expense), net increased $7.4 million from the comparable period in 2018 primarily due to insurance proceeds received in 2019 and smaller comparative losses recognized on sales or disposals of fixed assets. Other income (expense), net increased $1.6 million from 2017 to 2018 primarily due to smaller losses recognized on sales or disposals of fixed assets in 2018.

Loss on Early Extinguishment of Debt

	For the years ended December 31,			2019 over 2018		2018 over 2017	
(in thousands, except percentages)	2019	2018	2017	$ Change	% Change	$ Change	% Change
Loss on early extinguishment of debt	$ (6,131)	$ (2,488)	$ (7,891)	$ (3,643)	146%	$ 5,403	(68.5)%

During the year ended December 31, 2019, we recorded a $6.1 million loss on early extinguishment of debt in connection with the extinguishment of $845.0 million of unsecured senior notes due 2021 which were repaid during the current year. During the year ended December 31, 2018, we recorded a $2.5 million loss on early extinguishment of debt in connection with the extinguishment of the remaining $400.0 million previously outstanding senior unsecured notes. During the year ended December 31, 2017, we recorded a $7.9 million loss on early extinguishment of debt in connection with the extinguishment of $400.0 million of the previously outstanding senior unsecured notes. The losses recognized in each of these years consisted of amounts paid in excess of par in order to extinguish the debt prior to maturity and non-cash expenses related to the write-off of unamortized financing costs. For additional information regarding our financing arrangements, see Note 12, "Financing Arrangements," under Item 8, "Financial Statements and Supplementary Data," of this report.

Gain on Sale of Businesses

	For the years ended December 31,			2019 over 2018		2018 over 2017	
(in thousands, except percentages)	2019	2018	2017	$ Change	% Change	$ Change	% Change
Gain on sale of businesses	$ 687	$ —	$ 30,732	$ 687	N/M	$ (30,732)	N/M

During the year ended December 31, 2019, we recorded a $0.7 million gain on the sale of a non-core business within our Environmental Services segment. During the year ended December 31, 2017, we recorded a $30.7 million gain on the sale of our Transformer Services business which had been part of our Environmental Services segment. For additional information regarding these gains on sale of businesses, see Note 5, "Disposition of Businesses," under Item 8, "Financial Statements and Supplementary Data," of this report.

Provision (Benefit) for Income Taxes

	For the years ended December 31,			2019 over 2018		2018 over 2017	
(in thousands, except percentages)	2019	2018	2017	$ Change	% Change	$ Change	% Change
Provision (benefit) for income taxes	$ 50,499	$ 28,846	$ (42,050)	$ 21,653	75.1%	$ 70,896	(168.6)%

For the year ended December 31, 2019, provision for income taxes increased $21.7 million from the comparable period in 2018 due to higher earnings in the United States and the impact from a nonrecurring $9.8 million benefit recognized in 2018 related to the filing of then current and amended prior year tax returns in that year. The effective tax rate for 2019 was 34.1% as compared to 30.5% in the prior year.

The income tax benefit in 2017 was primarily driven by impacts from the enactment of the Tax Cuts and Jobs Act (the "Tax Act") signed into law in December 2017. Impacts of the Tax Act resulted in a net benefit of $93.0 million being recorded in 2017. Excluding the impacts of the Tax Act, a provision of $51.0 million would have been recognized.

Liquidity and Capital Resources

(in thousands)	For the years ended December 31, 2019	2018	2017
Net cash from operating activities	$ 413,192	$ 373,210	$ 285,698
Net cash used in investing activities	(217,856)	(349,659)	(203,267)
Net cash used in financing activities	(53,425)	(110,997)	(72,760)

Net cash from operating activities

Net cash from operating activities for the year ended December 31, 2019 was $413.2 million, an increase of $40.0 million compared to the year ended December 31, 2018. The increase was most directly attributable to greater levels of operating income and lower working capital, partially offset by an increase in environmental spending. The reduction in working capital was primarily attributable to the timing of interest payments associated with the debt refinancing completed in the third quarter of 2019. Refinancing this debt changed the timing of our related interest payments from June and December to January and July.

Net cash from operating activities for the year ended December 31, 2018 was $373.2 million, an increase of $87.5 million compared to the year ended December 31, 2017. The increase was most directly attributable to greater levels of operating income, lower interest payments and a reduction in environmental expenditures, which was offset by higher working capital levels due to overall growth in our business.

Net cash used in investing activities

Net cash used in investing activities for the year ended December 31, 2019 was $217.9 million, a decrease of $131.8 million compared to the year ended December 31, 2018. This decrease was due to less cash used to fund acquisitions in 2019 and an increase in net proceeds from sales of marketable securities, partially offset by $26.8 million of increased capital expenditure levels, net of proceeds, primarily due to 2019 investments in facility upgrades and landfill spending.

Net cash used in investing activities for the year ended December 31, 2018 was $349.7 million, an increase of $146.4 million compared to the year ended December 31, 2017. The change was primarily driven by the 2018 use of cash to fund acquisitions, increased capital expenditure levels net of proceeds primarily related to sales of manufacturing assets in Western Canada, a reduction in net purchases of marketable securities and the lack in 2018 of proceeds from sale of a business, which occurred in 2017 with the Transformer Services divestiture.

Net cash used in financing activities

Net cash used in financing activities for the year ended December 31, 2019 was $53.4 million, a decrease of $57.6 million compared to the year ended December 31, 2018. The decrease was primarily driven by a $50.0 million reduction in net principal payments on debt obligations in 2019 and a $23.7 million decrease in repurchases of common stock, partially offset by increased outflows for deferred financing costs associated with debt refinancing activities in 2019 of $6.1 million, tax payments related to withholdings on vested restricted stock of $4.2 million and changes in uncashed checks of $3.8 million.

Net cash used in financing activities for the year ended December 31, 2018 was $111.0 million, an increase of $38.2 million compared to the year ended December 31, 2017. The primary reason for the increase in 2018 was the increase in funds used for the net pay down of debt obligations totaling $55.8 million which occurred during the year. Offsetting this increase was decreased outflows related to stock repurchases of $3.9 million, premiums paid on the extinguishment of debt of $4.8 million, and changes in uncashed checks of $5.8 million.

Adjusted Free Cash Flow

Management considers adjusted free cash flow to be a measure of liquidity which provides useful information to both management, creditors and investors about our financial strength and our ability to generate cash. Additionally, adjusted free cash flow is a metric on which a portion of management incentive compensation is based. We define adjusted free cash flow as net cash from operating activities excluding cash impacts of items derived from non-operating activities, such as taxes paid in connection with divestitures, less additions to property, plant and equipment plus proceeds from sales or disposals of fixed assets. Adjusted free cash flow should not be considered an alternative to net cash from operating activities or other measurements under GAAP. Adjusted free cash flow is not calculated identically by all companies, and therefore our measurements of adjusted free cash flow may not be comparable to similarly titled measures reported by other companies.

The following is a reconciliation from net cash from operating activities to adjusted free cash flow for the following periods (in thousands):

	For the years ended December 31,		
	2019	2018	2017
Net cash from operating activities	$ 413,192	$ 373,210	$ 285,698
Additions to property, plant and equipment	(216,324)	(193,344)	(167,007)
Proceeds from sale and disposal of fixed assets	11,655	15,445	7,124
Tax liability on sale of business	—	—	14,423
Adjusted free cash flow	$ 208,523	$ 195,311	$ 140,238

Summary of Capital Resources

At December 31, 2019, cash and cash equivalents and marketable securities totaled $414.4 million, compared to $279.4 million at December 31, 2018. At December 31, 2019, cash and cash equivalents held by foreign subsidiaries totaled $74.5 million and were readily convertible into other currencies including U.S. Dollars. At December 31, 2019, the cash and cash equivalents and marketable securities balance for our U.S. operations was $339.9 million, and our U.S. operations had net operating cash flows of $392.7 million for the year ended December 31, 2019. Additionally, we have a $400.0 million revolving credit facility, of which approximately $229.2 million was available to borrow at December 31, 2019. Based on the above and our current plans, we believe that our operations have adequate financial resources to satisfy their current liquidity needs.

We assess our liquidity in terms of our ability to generate cash to fund our operating, investing, and financing activities. Our primary ongoing cash requirements will be to fund operations, capital expenditures, interest payments and investments in line with our business strategy. We believe our future operating cash flows will be sufficient to meet our future operating and internal investing cash needs as well as any cash needs relating to our stock repurchase program. Furthermore, our existing cash balance and the availability of additional borrowings under our revolving credit facility provide additional potential sources of liquidity should they be required.

Financing Arrangements

The financing arrangements and principal terms of our $545.0 million principal amount of 4.875% senior unsecured notes due 2027 and $300.0 million principal amount of 5.125% senior unsecured notes due 2029, and $734.7 million senior secured notes due 2024 which were outstanding at December 31, 2019, and our $400.0 million revolving credit facility, are discussed further in Note 12, “Financing Arrangements,” to our consolidated financial statements included in Item 8 of this report.

As of December 31, 2019, we were in compliance with the covenants of all of our debt agreements, and we believe we will continue to meet such covenants.

Environmental Liabilities

	As of December 31,		2019 over 2018	
(in thousands)	2019	2018	$ Change	% Change
Closure and post-closure liabilities	$ 75,651	$ 69,931	$ 5,720	8.2 %
Remedial liabilities	114,173	121,017	(6,844)	(5.7)%
Total environmental liabilities	$ 189,824	$ 190,948	$ (1,124)	(0.6)%

Total environmental liabilities as of December 31, 2019 were $189.8 million, a decrease of $1.1 million compared to December 31, 2018. This decrease was primarily due to expenditures of $18.7 million, partially offset by accretion of $10.1 million, changes in environmental liability estimates recorded to the consolidated balance sheet of $3.9 million and new asset retirement obligations and liabilities assumed in acquisitions of $2.9 million.

We anticipate our environmental liabilities, substantially all of which we assumed in connection with our acquisitions, will be payable over many years and that cash flow from operations will generally be sufficient to fund the payment of such liabilities when required. However, events not anticipated (such as future changes in environmental laws and regulations) could require that such payments be made earlier or in greater amounts than currently anticipated, which could adversely affect our results of operations, cash flow and financial condition. Conversely, the development of new treatment technologies or other circumstances may arise in the future which may reduce amounts ultimately paid.

During 2019, 2018 and 2017, we recognized a net benefit of $0.3 million, net charge of $2.1 million and net benefit of $0.2 million, respectively, for changes in estimates of recorded environmental liabilities. Generally, we recognize benefits primarily due to the successful introduction of new technology for remedial activities, favorable results from environmental studies of the on-going remediation, including favorable regulatory approvals and lower project costs realized by utilizing internal labor and equipment. In 2018, the net increase in our environmental liabilities from changes in estimates recorded to the consolidated statement of operations was $2.1 million and primarily related to an increase in projected cleanup costs at third party Superfund sites where we are a potentially responsible party.

Contractual Obligations

The following table has been included to assist in understanding our debt and similar obligations as of December 31, 2019 and our ability to meet such contractual obligations (in thousands):

		Payments due in			
	Total	Less than 1 year	1-3 years	4-5 years	After 5 years
Closure, post-closure and remedial liabilities[(1)]	$ 458,409	$ 24,300	$ 51,804	$ 28,304	$ 354,001
Current and long-term obligations, at par	1,579,697	7,535	15,071	712,091	845,000
Interest on current and long-term obligations [(2)]	477,233	71,769	142,615	127,127	135,722
Finance leases	65,222	2,733	5,618	5,720	51,151
Operating leases	187,525	50,814	69,757	38,510	28,444
Total contractual obligations	$ 2,768,086	$ 157,151	$ 284,865	$ 911,752	$ 1,414,318

(1) The undiscounted value of closure, post-closure and remedial liabilities of $458.4 million is equivalent to the present value of $189.8 million based on discounting of $178.5 million and the undiscounted remainder of $90.1 million to be accrued for closure and post-closure liabilities over the remaining site lives.

(2) Interest on our variable-rate $734.7 million senior secured term loans was calculated based on the effective interest rate of that debt as of December 31, 2019. Our interest rate swap agreements effectively fix the interest rate on $350.0 million of that variable rate debt at an annual rate of approximately 4.67%, while the remaining balance pays interest based upon LIBOR and an applicable margin. The assumed rate reflected in the table above for this variable rate debt after considering the swap agreements is 4.06%.

Off-Balance Sheet Arrangements

We obtain standby letters of credit as security for financial assurances we have been required to provide to regulatory bodies for our hazardous waste facilities and which would be called only in the event that we fail to satisfy closure, post-closure and other obligations under the permits issued by those regulatory bodies for such licensed facilities. As of December 31, 2019, there were $146.9 million outstanding letters of credit. See Note 12, "Financing Arrangements," to our consolidated financial statements included in Item 8 of this report for further discussion of our standby letters of credit and other financing arrangements.

Except for our obligations under letters of credit described above and performance obligations incurred in the ordinary course of business, we are not party to any off-balance sheet arrangements involving guarantee, contingency or similar obligations to entities whose financial statements are not consolidated with our results, and that have or are reasonably likely to have a current or future effect on our financial condition, changes in financial condition, revenues or expenses, results of operations, liquidity, capital expenditures or capital resources that would be material to investors in our securities.

Capital Expenditures

In 2019, our capital expenditures, net of disposals, were $204.7 million. We anticipate that 2020 capital spending, net of disposals, will be in the range of $215.0 million to $240.0 million, inclusive of $20.0 million to $25.0 million for the purchase of our corporate headquarters in January 2020 and some expected capital improvements to that facility during 2020. However, unanticipated changes in environmental regulations could require us to make significant capital expenditures for our facilities and adversely affect our results of operations and cash flow.

Critical Accounting Policies and Estimates

The preparation of our financial statements requires us to make estimates and judgments that affect the reported amounts of our assets, liabilities, revenues and expenses and related disclosures of contingent liabilities. Our significant accounting policies are discussed in Note 2, "Significant Accounting Policies," to our consolidated financial statements included in Item 8 of this report. We believe that, of our significant accounting policies, the following contain estimates that involve a higher degree of complexity in their application: accounting for landfills, non-landfill closure and post-closure liabilities, remedial liabilities, goodwill, permits and other intangible assets and legal matters. Our management reviews critical accounting estimates with the Audit Committee of our Board of Directors on an ongoing basis and as needed prior to the release of our annual financial statements.

Landfill Accounting. We amortize landfill improvements and certain landfill-related permits over their estimated useful lives. The units-of-consumption method is used to amortize land, landfill cell construction, asset retirement costs and remaining landfill cells and sites. We also utilize the units-of-consumption method to record closure and post-closure obligations for landfill cells and sites. Under the units-of-consumption method, we include future estimated construction and asset retirement costs, as well as costs incurred to date, in the amortization base of the landfill assets. Additionally, where appropriate, as discussed below, we include probable expansion airspace yet to be permitted in the calculation of the total remaining useful life of the landfill. If we determine that expansion capacity should no longer be considered in calculating the recoverability of a landfill asset, we may be required to recognize an asset impairment or incur significantly higher amortization expense. If at any time we decide to abandon the expansion effort, the capitalized costs related to the expansion effort are expensed immediately.

Landfill Assets. Landfill assets include the costs of landfill site acquisition, permits and cell construction incurred to date. These amounts are amortized under the units-of-consumption method such that the asset is completely amortized when the landfill ceases accepting waste.

Landfill Capacity. Landfill capacity, which is the basis for the amortization of landfill assets and for the accrual of final closure and post-closure obligations, represents total permitted airspace plus unpermitted airspace that management believes is probable of ultimately being permitted based on established criteria. Our management applies the following criteria for evaluating the probability of obtaining a permit for future expansion airspace at existing sites, which provides management a basis to evaluate the likelihood of success of unpermitted expansions:

- Personnel are actively working to obtain the permit or permit modifications (land use, state and federal) necessary for expansion of an existing landfill, and progress is being made on the project.
- Management expects to submit the application within the next year and to receive all necessary approvals to accept waste within the next five years.
- At the time the expansion is included in management's estimate of the landfill's useful economic life, it is probable that the required approvals will be received within the normal application and processing time periods for approvals in the jurisdiction in which the landfill is located.
- We have a legal right to use or obtain the right to use the land associated with the expansion plan through title or lease.
- There are no significant known political, technical, legal or business restrictions or other issues that could impair the success of such expansion.
- Management is committed to pursuing the expansion which is supported by a complete financial feasibility analysis which demonstrates that the expansion will have a positive financial and operational impact.
- Additional airspace and related additional costs, including permitting, final closure and post-closure costs have been estimated based on the conceptual design of the proposed expansion.

As of December 31, 2019, there were no unpermitted expansions included in management's landfill calculation. If actual expansion airspace is significantly different from management's estimate of expansion airspace, the amortization rates used for the units-of-consumption method would change, therefore impacting our profitability. If we determine that there is less actual expansion airspace at a landfill, this would increase amortization expense recorded and decrease profitability, while if we determine a landfill has more actual expansion airspace, amortization expense would decrease and profitability would increase.

Landfill Final Closure and Post-Closure Liabilities. The balance of landfill final closure and post-closure liabilities at December 31, 2019 and 2018 was $39.4 million and $37.8 million, respectively. We have material financial commitments for the costs associated with requirements of the EPA and the comparable regulatory agency in Canada for landfill final closure and post-closure activities. In the United States, the landfill final closure and post-closure requirements are established under the standards of the EPA, and are implemented and applied on a state-by-state basis. We develop estimates for the cost of these

activities based on our evaluation of site-specific facts and circumstances, such as the existence of structures and other landfill improvements that would need to be dismantled, the amount of groundwater monitoring and leachate management expected to be performed and the length of the post-closure period as determined by the applicable regulatory agency. Included in our cost estimates are our interpretation of current regulatory requirements and proposed regulatory changes. Such estimates may change in the future due to various circumstances including, but not limited to, permit modifications, changes in legislation or regulations, technological changes and results of environmental studies. We perform zero-based reviews of these estimated liabilities based upon a planned schedule, typically every five years or sooner if the occurrence of a significant event is likely to change the timing or amount of the currently estimated expenditures. We consider a significant event to be a new regulation or an amendment to an existing regulation, a new permit or modification to an existing permit or a change in the market price of a significant cost item. Our cost estimates are calculated using internal sources as well as input from third-party experts. These costs are measured at estimated fair value using present value techniques, and therefore changes in the estimated timing of closure and post-closure activities would affect the liability, the value of the related asset and our results of operations.

Final closure costs are the costs incurred after the site ceases to accept waste, but before the landfill is certified as closed by the applicable state or provincial regulatory agency. These costs generally include the costs required to cap the final cell of the landfill (if not included in cell closure), dismantle certain structures for landfills and other landfill improvements and regulation-mandated groundwater monitoring and leachate management. Post-closure costs involve the maintenance and monitoring of a landfill site that has been certified closed by the applicable regulatory agency. These costs generally include groundwater monitoring and leachate management. Regulatory post-closure periods are generally 30 years after landfill closure. Final closure and post-closure obligations are accrued on a units-of-consumption basis, such that the present value of the final closure and post-closure obligations are fully accrued at the date the landfill discontinues accepting waste.

Non-Landfill Closure and Post-Closure Liabilities. The balance of our non-landfill closure and post-closure liabilities at December 31, 2019 and 2018 was $36.3 million and $32.1 million, respectively. We base estimates for non-landfill closure and post-closure liabilities on our interpretations of existing permit and regulatory requirements for closure and post-closure maintenance and monitoring. Our cost estimates are calculated using internal sources as well as input from third-party experts. We estimate when future operations will cease and inflate the current cost of closing the non-landfill facility using the appropriate inflation rate and then discounting the future value to arrive at an estimated present value of closure and post-closure costs. The estimates for non-landfill closure and post-closure liabilities are inherently uncertain due to the possibility that permit and regulatory requirements will change in the future, impacting the estimation of total costs and the timing of the expenditures. We review non-landfill closure and post-closure liabilities for changes to key assumptions that would impact the amount of the recorded liabilities. Changes that would prompt us to revise a liability estimate include changes in legal requirements that impact our expected closure plan or scope of work, in the market price of a significant cost item, in estimates as to when future operations may cease or in the expected timing of the cost expenditures. Changes in estimates for non-landfill closure and post-closure events immediately impact the required liability and the value of the corresponding asset. If a change is made to a fully-amortized asset, the adjustment is charged immediately to expense. When a change in estimate relates to an asset that has not been fully amortized, the adjustment to the asset is recognized in income prospectively as a component of amortization. Historically, material changes to non-landfill closure and post-closure estimates have been infrequent. See Note 10, "Closure and Post-Closure Liabilities," to our consolidated financial statements included in Item 8 of this report for the changes to these Landfill and Non-Landfill Closure and Post-Closure liabilities during the years ended December 31, 2018 and 2017.

Remedial Liabilities. The balance of our remedial liabilities at December 31, 2019 and 2018 was $114.2 million and $121.0 million, respectively. See Note 11, "Remedial Liabilities," to our consolidated financial statements included in Item 8 of this report for the changes to the remedial liabilities during the years ended December 31, 2019 and 2018. Remedial liabilities are obligations to investigate, alleviate and/or eliminate the effects of a release (or threat of a release) of hazardous substances into the environment and may also include corrective action under RCRA. Our remediation obligations can be further characterized as legal, superfund, long-term maintenance and one-time projects. Legal liabilities are typically comprised of litigation matters that involve potential liability for certain aspects of environmental cleanup and can include third-party claims for property damage or bodily injury allegedly arising from or caused by exposure to hazardous substances originating from our activities or operations or, in certain cases, from the actions or inactions of other persons or companies. Superfund liabilities are typically claims alleging that we are a potentially responsible party ("PRP") and/or are potentially liable for environmental response, removal, remediation and cleanup costs at/or from either a facility we own or a site owned by a third-party. As described in Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report, Superfund liabilities also include certain liabilities payable to government entities for which we are potentially liable to reimburse the sellers in connection with our 2002 acquisition of substantially all of the assets of the Chemical Services Division (the "CSD assets") of Safety-Kleen Corp. Long-term maintenance liabilities include the costs of groundwater monitoring, treatment system operations, permit fees and facility maintenance for inactive operations. One-time projects liabilities include the costs necessary to comply with regulatory requirements for the removal or treatment of contaminated materials.

Amounts recorded related to the costs required to remediate a location are determined by internal engineers and operational personnel and incorporate input from external third parties. The estimates consider such factors as the nature and extent of environmental contamination (if any); the terms of applicable permits and agreements with regulatory authorities as to cleanup procedures and whether modifications to such permits and agreements will likely need to be negotiated; the cost of performing anticipated cleanup activities based upon current technology; and in the case of Superfund and other sites where other parties will also be responsible for a portion of the cleanup costs, the likely allocation of such costs and the ability of such other parties to pay their share. Each quarter, our management discusses if any events have occurred or milestones have been met that would warrant the creation of a new remedial liability or the revision of an existing remedial liability. Such events or milestones include identification and verification as a PRP, receipt of a unilateral administrative order under Superfund or requirement for RCRA interim corrective measures, completion of the feasibility study under Superfund or the corrective measures study under RCRA, new or modifications to existing permits, changes in property use or a change in the market price of a significant cost item. Remedial liabilities are inherently difficult to estimate and there is a risk that the actual quantities of contaminants could differ from the results of the site investigation, which could materially impact the amount of our liability. It is also possible that chosen methods of remedial solutions will not be successful and funds will be required for alternative solutions.

Remedial liabilities are discounted when the timing of the payments is estimable and the amounts are determinable, with the exception of remedial liabilities assumed as part of an acquisition that are measured at fair value at the acquisition date.

We establish reserves for estimated environmental liabilities based on acceptable technologies when we determine the liability is appropriate. Introductions of new technologies are subject to successful demonstration of the effectiveness of the alternative technology and regulatory approval. We routinely review and evaluate the sites for which we have established estimated environmental liabilities reserves to determine if there should be changes in the established reserves. The changes in estimates are reflected as adjustments in the ordinary course of business in the period when we determine that an adjustment is appropriate as new information becomes available. Upon demonstration of the effectiveness of the alternative technology and applicable regulatory approval, we update our estimated cost of remediating the affected sites.

Goodwill and Other Long-Lived Assets. Goodwill is reviewed for impairment annually as of December 31 or when events or changes in the business environment indicate the carrying value of a reporting unit may exceed its fair value. This review is performed by comparing the fair value of each reporting unit to its carrying value, including goodwill. If the fair value is less than the carrying amount, a loss is recorded for the excess of the carrying value over the fair value up to the carrying amount of goodwill.

We determine our reporting units by identifying the components of each operating segment, and then in some circumstances aggregate components having similar economic characteristics based on quantitative and/or qualitative factors. As of December 31, 2019, we have four reporting units, consisting of Environmental Sales and Service, Environmental Facilities, Safety-Kleen Oil and Safety-Kleen Environmental Services.

We conducted our annual impairment test of goodwill for all of our reporting units to which goodwill was allocated as of December 31, 2019 and determined that no adjustment to the carrying value of goodwill for any reporting unit was then necessary. In all cases the estimated fair value of each reporting unit significantly exceeded its carrying value. We measure fair value for all of our reporting units using an income approach (a discounted cash flow analysis) which incorporates several estimates and assumptions with varying degrees of uncertainty. The discounted cash flow analyses include estimated cash flows for a discrete period and for a terminal period thereafter. We corroborate our estimates of fair values by also considering other factors such as the fair value of comparable companies to businesses contained in our reporting units, as well as performing a reconciliation of the total estimated fair value of all reporting units to our market capitalization.

Indefinite-lived intangible assets are not amortized but are reviewed for impairment annually as of December 31, or when events or changes in the business environment indicate that the carrying value may be impaired. If the fair value of the asset is less than the carrying amount, we perform a quantitative test to determine the fair value. The impairment loss, if any, is measured as the excess of the carrying value of the asset over its fair value. The estimated fair values of the indefinite-lived intangibles exceeded their carrying values at December 31, 2019. However, we will continue to monitor the performance of our indefinite-lived intangible assets, and future events might result in an impairment of indefinite-lived intangible assets.

Our long-lived assets are carried on our financial statements based on their cost less accumulated depreciation or amortization. Long-lived assets with finite lives are reviewed for impairment whenever events or changes in circumstances indicate that their carrying value may not be entirely recoverable. When such factors and circumstances exist, our management compares the projected undiscounted future cash flows associated with the related asset or group of assets to the respective carrying amounts. The impairment loss, if any, would be measured as the excess of the carrying amount over the fair value of the asset and is recorded in the period in which the determination is made. Any resulting impairment losses recorded by us would have an adverse impact on our results of operations.

In consideration of historical goodwill impairments for our Oil and Gas Field Services and Lodging Services operations and continued lower than historical results in the oil and gas related industries, specifically in Western Canada, we continue to monitor the carrying value of those businesses' long-lived assets and assess the risk of asset impairment. We concluded that no events or circumstances have arisen during 2019 which would indicate that the carrying values of those asset groups are not recoverable.

We will continue to evaluate all of our goodwill and other long-lived assets impacted by economic downturns most predominantly in the oil and gas related markets in which we operate. If further economic difficulties resulting from depressed oil and gas related pricing and lower overall activity levels, particularly in our Canadian operations, continue for a significant foreseeable period of time and thus future operating results are significantly less than current expectations, additional impairment charges may be recognized. The market conditions which could lead to such future impairments are currently most prevalent in our Oil and Gas Field Services and Lodging Services operations within the Environmental Sales & Services reporting unit.

Legal Matters. As described in Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report, we are subject to legal proceedings which relate to our past acquisitions or which have arisen in the ordinary course of business. Accruals are established for legal matters when, in our opinion, it is probable that a liability exists and the liability can be reasonably estimated. As of December 31, 2019, we had reserves of $26.0 million consisting of (i) $18.4 million related to pending legal or administrative proceedings, including Superfund liabilities, which were included in remedial liabilities on the consolidated balance sheets and (ii) $7.6 million primarily related to legal claims as well as federal, state and provincial enforcement actions, which were included in accrued expenses on the consolidated balance sheets. In management's opinion, it is not reasonably possible that the potential liability in excess of what is recorded, if any, that may result from these actions, either individually or collectively, will have a material effect on our financial position, results of operations or cash flows.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

In the normal course of business, we are exposed to market risks, including changes in interest rates and certain foreign currency rates, primarily relating to the Canadian dollar. Our philosophy in managing interest rate risk is to maintain a debt portfolio inclusive of both variable and fixed-rate debt so as to limit our interest expense and exposure to interest rate volatility. In 2018, we entered into interest rate swap agreements with the intention of hedging interest rate exposure on a portion of our outstanding LIBOR-based variable rate senior secured term loans. Under the terms of the swaps, we receive interest based on the 1-month LIBOR index and pay interest at a weighted average rate of approximately 2.92% on an initial notional amount of $350.0 million. When combined with the 1.75% interest rate margin for Eurocurrency borrowings, the effective annual interest rate on such $350.0 million aggregate principal amount of term loans is therefore approximately 4.67%.

We designated our interest rate swap agreements as effective cash flow hedges at inception, and therefore the change in fair value is recorded in stockholders' equity as a component of accumulated other comprehensive loss and included in interest expense at the same time as interest expense is affected by the hedged transactions. Differences paid or received over the life of the agreements are recorded as additions to or reductions of interest expense on the underlying debt.

The following table provides information regarding our fixed and variable rate borrowings at December 31, 2019 (in thousands):

Scheduled Maturity Dates	2020	2021	2022	2023	2024	Thereafter	Total
Senior secured term loans due 2024	$ 7,535	$ 7,535	$ 7,535	$ 7,535	$ 704,557	$ —	$ 734,697
Unsecured senior notes due 2027	—	—	—	—	—	545,000	545,000
Unsecured senior notes due 2029	—	—	—	—	—	300,000	300,000
Long term obligations, at par	$ 7,535	$ 7,535	$ 7,535	$ 7,535	$ 704,557	$ 845,000	$ 1,579,697

The interest rate on the $545.0 million senior unsecured notes due July 15, 2027 is fixed at 4.875%. Interest payments on this debt are due semiannually on January 15 and July 15 in the amount of $13.2 million upon each date commencing January 15, 2020. The interest rate on the $300.0 million senior unsecured notes due July 15, 2029 is fixed at 5.125%. Interest payments on these $300.0 million notes are also due semiannually on January 15 and July 15 in the amount of $7.6 million upon each date commencing on January 15, 2020.

We continue to have interest rate risk relative to the portion of our term loans which exceeds the $350.0 million of principal which is subject to our interest rate swap agreement. As of December 31, 2019, $384.7 million of those term loans was subject to variable interest rate risk. The effective interest rate on the variable portion of the term loans as of December 31, 2019 was 3.55%. Should the average interest rate on the variable rate portion of our long-term obligations change by 100 basis points, we estimate that our annual interest expense would change by up to approximately $3.8 million.

In addition to the fixed and variable rate borrowings described in the above table, we have a revolving credit agreement with maximum borrowings of up to $400.0 million (with a $325.0 million sub-limit for letters of credit), under which no borrowings were outstanding at December 31, 2019.

We view our investment in our foreign subsidiaries as long-term; thus, we have not entered into any hedging transactions between any two foreign currencies or between any of the foreign currencies and the U.S. Dollar. Given our significant investment in Canada and the fluctuations that have and can occur between the U.S. Dollar and Canadian Dollar exchange rates, significant movements in cumulative translation adjustment amounts recorded as a component of other comprehensive income (loss) can occur in any given period.

During 2019, our Canadian subsidiaries transacted a portion of their business in U.S. Dollars and at any period end had cash on deposit in U.S. Dollars and outstanding U.S. Dollar accounts receivable related to those transactions. Those cash and receivable amounts are vulnerable to foreign currency transaction gains or losses. Exchange rate movements also affect the translation of Canadian generated profits and losses into U.S. Dollars. Had the Canadian Dollar been 10.0% stronger or weaker against the U.S. Dollar, we would have reported increased or decreased net income of $5.3 million and $4.8 million for the years ended December 31, 2019 and 2018, respectively.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the stockholders and the Board of Directors of Clean Harbors, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Clean Harbors, Inc. and subsidiaries (the "Company") as of December 31, 2019 and 2018, the related consolidated statements of operations, comprehensive income, cash flows and stockholders' equity, for each of the three years in the period ended December 31, 2019, and the related notes and the schedule listed in the Index at Item 15 (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2019 and 2018, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2019, in conformity with accounting principles generally accepted in the United States of America.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated February 26, 2020, expressed an unqualified opinion on the Company's internal control over financial reporting.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matter

The critical audit matter communicated below is a matter arising from the current-period audit of the financial statements that was communicated or required to be communicated to the audit committee and that (1) relates to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Remedial Liabilities - Refer to Note 2, Significant Accounting Policies, and Note 11, Remedial Liabilities, to the financial statements

Critical Audit Matter Description

Remedial liabilities include the costs of removal or containment of contaminated material, the treatment of potentially contaminated groundwater and maintenance and monitoring costs necessary to comply with regulatory requirements. Most of the Company's remedial liabilities relate to the active and inactive hazardous waste treatment and disposal facilities which the Company acquired and Superfund sites owned by third parties for which the Company, or the prior owners of certain of the Company's facilities, may have certain indemnification obligations. The Company's estimate of remedial liabilities involved an analysis of such factors as: (i) the nature and extent of environmental contamination (if any); (ii) the terms of applicable permits and agreements with regulatory authorities as to cleanup procedures and whether modifications to such permits and agreements will likely need to be negotiated; (iii) the cost of performing anticipated cleanup activities based upon current technology; and (iv) in the case of Superfund and other sites where other parties will also be responsible for a portion of the cleanup costs, the likely allocation of such costs and the ability of such other parties to satisfy the costs which have been apportioned to these other parties.

Remedial liabilities are inherently difficult to estimate and involve a significant amount of judgment. Estimating remedial liabilities requires that the existing environmental contamination be understood. There are risks that the actual quantities of contaminants differ from the results of the site investigation, and that contaminants exist that have not been identified by the site investigation. In addition, the amount of remedial liabilities recorded is dependent on the remedial method selected. There is a risk that funds will be expended on a remedial solution that is not successful, which could result in the Company incurring incremental costs of an alternative solution.

The Company routinely reviews and evaluates the sites for which remedial liabilities have been recognized to determine if there should be changes in the cost estimates. As a result, the valuation of liabilities is subject to material changes as additional information becomes available, particularly as it relates to changes in technologies and changes in laws and regulations that govern the remediation efforts.

Total remedial liabilities recorded as of December 31, 2019 were $114.2 million.

Given the subjectivity and judgment involved in measuring remedial liabilities due to the (i) uncertainty as to the types and quantities of contaminants to be remediated, (ii) the stage of remediation and extended period over which the remediation efforts are expected to occur, (iii) complexities and uncertainties of the selection of the method of remediation and inherent variability in the efficacy of the selected remediation efforts, and (iv) understanding the effects on the estimates due to changes in technology and changes in laws and regulations, auditing remedial liabilities involved especially subjective judgment and an increased extent of effort, including the need to involve our specialists who have expertise in environmental remediation.

How the Critical Audit Matter Was Addressed in the Audit

Our audit procedures related to the remedial liabilities included the following, among others:

- We tested the effectiveness of controls related to the recognition and measurement of remedial liabilities, including those controls over changes in estimates.
- We evaluated management’s ability to accurately forecast future cash flows by comparing actual results to management’s historical forecasts through retrospective reviews.
- We evaluated the methods and assumptions used by management to estimate the remedial liabilities by confirming specific facts and circumstances related to a selection of sites with project managers and other Company personnel responsible for monitoring these sites, including internal and external counsel.
- With the assistance of auditor specialists who have expertise in environmental matters and specialized skills and training, we evaluated the reasonableness of the Company’s estimates by:
    - Searching for information in the public domain for completeness of sites identified for remediation.
    - Assessing the completeness of the Company’s costs estimate for a selection of sites, specifically, comparing the costs estimates to relevant regulatory guidelines and specifications.
    - Testing the accuracy of the amounts recorded for a selection of sites, specifically, verifying the mathematical accuracy of the calculation, agreeing cost components to supporting documents, and/or developing an independent range of cost estimates.

/s/ Deloitte & Touche LLP

Boston, Massachusetts
February 26, 2020

We have served as the Company's auditor since 2005.

CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED BALANCE SHEETS
(dollars in thousands)

	As of December 31,	
	2019	2018
ASSETS		
Current assets:		
Cash and cash equivalents	$ 371,991	$ 226,507
Short-term marketable securities	42,421	52,856
Accounts receivable, net of allowances aggregating $38,711 and $44,315, respectively	644,738	606,952
Unbilled accounts receivable	56,326	54,794
Deferred costs	21,746	18,770
Inventories and supplies	214,744	199,479
Prepaid expenses and other current assets	48,942	42,800
Total current assets	1,400,908	1,202,158
Property, plant and equipment, net	1,588,151	1,561,978
Other assets:		
Operating lease right-of-use assets	162,206	—
Goodwill	525,013	514,189
Permits and other intangibles, net	419,066	441,875
Other	13,560	18,121
Total other assets	1,119,845	974,185
Total assets	$ 4,108,904	$ 3,738,321
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Current portion of long-term obligations	$ 7,535	$ 7,535
Accounts payable	298,375	276,461
Deferred revenue	73,370	61,843
Accrued expenses	276,540	233,405
Current portion of closure, post-closure and remedial liabilities	23,301	23,034
Current portion of operating lease liabilities	40,979	—
Total current liabilities	720,100	602,278
Other liabilities:		
Closure and post-closure liabilities, less current portion of $7,283 and $9,592, respectively	68,368	60,339
Remedial liabilities, less current portion of $16,018 and $13,442, respectively	98,155	107,575
Long-term obligations, less current portion	1,554,116	1,565,021
Operating lease liabilities, less current portion	121,020	—
Deferred taxes, unrecognized tax benefits and other long-term liabilities	277,332	233,352
Total other liabilities	2,118,991	1,966,287
Commitments and contingent liabilities (See Note 18)		
Stockholders' equity:		
Common stock, $0.01 par value:		
Authorized 80,000,000 shares; issued and outstanding 55,797,734 and 55,847,261 shares, respectively	558	558
Additional paid-in capital	644,412	655,415
Accumulated other comprehensive loss	(210,051)	(223,371)
Accumulated earnings	834,894	737,154
Total stockholders' equity	1,269,813	1,169,756
Total liabilities and stockholders' equity	$ 4,108,904	$ 3,738,321

The accompanying notes are an integral part of these consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF OPERATIONS
(in thousands except per share amounts)

	For the years ended December 31,		
	2019	**2018**	**2017**
Revenues:			
Service revenues	$ 2,842,881	$ 2,709,239	$ 2,398,650
Product revenues	569,309	591,064	546,328
Total revenues	3,412,190	3,300,303	2,944,978
Cost of revenues: (exclusive of items shown separately below)			
Service revenues	1,945,021	1,861,975	1,641,798
Product revenues	442,798	443,576	420,875
Total cost of revenues	2,387,819	2,305,551	2,062,673
Selling, general and administrative expenses	484,054	503,747	456,648
Accretion of environmental liabilities	10,136	9,806	9,460
Depreciation and amortization	300,725	298,625	288,422
Income from operations	229,456	182,574	127,775
Other income (expense), net	2,897	(4,510)	(6,119)
Loss on early extinguishment of debt	(6,131)	(2,488)	(7,891)
Gain on sale of businesses	687	—	30,732
Interest expense, net of interest income of $4,227, $2,958 and $1,897, respectively	(78,670)	(81,094)	(85,808)
Income before provision (benefit) for income taxes	148,239	94,482	58,689
Provision (benefit) for income taxes	50,499	28,846	(42,050)
Net income	$ 97,740	$ 65,636	$ 100,739
Earnings per share:			
Basic	$ 1.75	$ 1.17	$ 1.77
Diluted	$ 1.74	$ 1.16	$ 1.76
Shares used to compute earnings per share — Basic	55,845	56,148	57,072
Shares used to compute earnings per share — Diluted	56,129	56,340	57,200

The accompanying notes are an integral part of these consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(in thousands)

	For the years ended December 31,		
	2019	2018	2017
Net income	$ 97,740	$ 65,636	$ 100,739
Other comprehensive income (loss), net of tax:			
Unrealized (losses) gains on available-for-sale securities	(120)	77	32
Reclassification adjustment for losses on available-for-sale securities included in net income	332	—	143
Unrealized loss on interest rate hedge	(14,401)	(9,579)	—
Reclassification adjustment for losses on interest rate hedge included in net income	2,335	806	—
Foreign currency translation adjustments	25,130	(42,350)	41,636
Unfunded pension liability	44	82	108
Other comprehensive income (loss), net of tax	13,320	(50,964)	41,919
Comprehensive income	$ 111,060	$ 14,672	$ 142,658

The accompanying notes are an integral part of these consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	For the years ended December 31,		
	2019	**2018**	**2017**
Cash flows from operating activities:			
Net income	$ 97,740	$ 65,636	$ 100,739
Adjustments to reconcile net income to net cash from operating activities:			
Depreciation and amortization	300,725	298,625	288,422
Allowance for doubtful accounts	2,408	15,817	7,901
Amortization of deferred financing costs and debt discount	3,809	3,846	3,482
Accretion of environmental liabilities	10,136	9,806	9,460
Changes in environmental liability estimates	(332)	2,147	(195)
Deferred income taxes	8,005	19,089	(83,335)
Other (income) expense, net	(2,897)	4,510	6,119
Stock-based compensation	17,816	16,792	13,146
Gain on sale of businesses	(687)	—	(30,732)
Loss on early extinguishment of debt	6,131	2,488	7,891
Environmental expenditures	(18,701)	(10,115)	(12,965)
Changes in assets and liabilities, net of acquisitions:			
Accounts receivable and unbilled accounts receivable	(33,271)	(79,563)	(33,764)
Inventories and supplies	(15,869)	(26,958)	(5,002)
Other current assets	(14,421)	(7,946)	16,720
Accounts payable	7,153	46,915	(10,684)
Other current and long-term liabilities	45,447	12,121	8,495
Net cash from operating activities	413,192	373,210	285,698
Cash flows used in investing activities:			
Additions to property, plant and equipment	(216,324)	(193,344)	(167,007)
Proceeds from sale and disposal of fixed assets	11,655	15,445	7,124
Acquisitions, net of cash acquired	(29,363)	(151,023)	(49,227)
Additions to intangible assets including costs to obtain or renew permits	(3,904)	(4,688)	(1,617)
Purchases of available-for-sale securities	(35,836)	(44,772)	(38,342)
Proceeds from sale of available-for-sale securities	51,202	28,723	376
Proceeds from sale of businesses, net of transactional costs	4,714	—	45,426
Net cash used in investing activities	(217,856)	(349,659)	(203,267)
Cash flows used in financing activities:			
Change in uncashed checks	(3,705)	132	(5,940)
Proceeds from exercise of stock options	—	—	46
Tax payments related to withholdings on vested restricted stock	(7,429)	(3,266)	(3,149)
Repurchases of common stock	(21,390)	(45,080)	(48,971)
Deferred financing costs paid	(10,079)	(4,027)	(5,718)
Payments on finance leases	(586)	—	—
Premiums paid on early extinguishment of debt	(2,701)	(1,238)	(6,028)
Principal payments on debt	(852,535)	(405,768)	(402,000)
Proceeds from issuance of debt, net of discount	845,000	348,250	399,000
Borrowing from revolving credit facility	—	50,000	—
Payment on revolving credit facility	—	(50,000)	—
Net cash used in financing activities	(53,425)	(110,997)	(72,760)
Effect of exchange rate change on cash	3,573	(5,446)	2,731
Increase (decrease) in cash and cash equivalents	145,484	(92,892)	12,402
Cash and cash equivalents, beginning of year	226,507	319,399	306,997
Cash and cash equivalents, end of year	$ 371,991	$ 226,507	$ 319,399
Supplemental information:			
Cash payments for interest and income taxes:			
Interest paid	$ 60,852	$ 89,171	$ 93,174
Income taxes paid	27,035	20,036	18,682
Non-cash investing activities:			
Property, plant and equipment accrued	30,964	15,657	16,109
Transfer of inventory to property, plant and equipment	—	—	12,641
Payable for estimated purchase price adjustment	—	4,032	—

The accompanying notes are an integral part of these consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands)

	Common Stock		Shares Held Under Employee Participation Plan	Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Earnings	Total Stockholders' Equity
	Number of Shares	$0.01 Par Value					
Balance at January 1, 2017	57,298	$ 573	$ (469)	$ 725,670	$ (214,326)	$ 572,793	$ 1,084,241
Net income	—	—	—	—	—	100,739	100,739
Cumulative effect of change in accounting for stock based compensation	—	—	—	681	—	(450)	231
Other comprehensive income	—	—	—	—	41,919	—	41,919
Stock-based compensation	—	—	—	13,146	—	—	13,146
Issuance of common stock for restricted share vesting, net of employee tax withholding	133	1	—	(3,150)	—	—	(3,149)
Exercise of stock options	2	—	—	46	—	—	46
Repurchases of common stock	(907)	(9)	—	(48,962)	—	—	(48,971)
Shares held under employee participation plan	(25)	—	469	(469)	—	—	—
Balance at December 31, 2017	56,501	565	—	686,962	(172,407)	673,082	1,188,202
Net income	—	—	—	—	—	65,636	65,636
Cumulative effect of change in accounting principle	—	—	—	—	—	(1,564)	(1,564)
Other comprehensive loss	—	—	—	—	(50,964)	—	(50,964)
Stock-based compensation	—	—	—	16,792	—	—	16,792
Issuance of common stock for restricted share vesting, net of employee tax withholding	160	1	—	(3,267)	—	—	(3,266)
Repurchases of common stock	(814)	(8)	—	(45,072)	—	—	(45,080)
Balance at December 31, 2018	55,847	558	—	655,415	(223,371)	737,154	1,169,756
Net income	—	—	—	—	—	97,740	97,740
Other comprehensive income	—	—	—	—	13,320	—	13,320
Stock-based compensation	—	—	—	17,816	—	—	17,816
Issuance of common stock for restricted share vesting, net of employee tax withholding	249	3	—	(7,432)	—	—	(7,429)
Repurchases of common stock	(298)	(3)	—	(21,387)	—	—	(21,390)
Balance at December 31, 2019	55,798	$ 558	$ —	$ 644,412	$ (210,051)	$ 834,894	$ 1,269,813

The accompanying notes are an integral part of these consolidated financial statements.

(1) OPERATIONS

Clean Harbors, Inc., through its subsidiaries (collectively, the "Company"), is a leading provider of environmental, energy and industrial services throughout North America. The Company is also the largest re-refiner and recycler of used oil and the largest provider of parts cleaning and related environmental services to commercial, industrial and automotive customers in North America.

(2) SIGNIFICANT ACCOUNTING POLICIES

The accompanying consolidated financial statements of the Company reflect the application of certain significant accounting policies as described below:

Principles of Consolidation

The accompanying consolidated statements include the accounts of Clean Harbors, Inc. and its majority-owned subsidiaries. All intercompany accounts and transactions have been eliminated in consolidation.

Use of Estimates

The preparation of consolidated financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions, which are evaluated on an ongoing basis, that affect the amounts reported in the Company's consolidated financial statements and accompanying notes. Management bases its estimates on historical experience and on various other assumptions it believes to be reasonable at the time under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities and disclosure, if any, of contingent assets and liabilities and reported amounts of revenues and expenses. Actual results could differ from those estimates and judgments.

Cash, Cash Equivalents and Uncashed Checks

Cash consists primarily of cash on deposit and money market accounts. Marketable securities with maturities of three months or less from the date of purchase are classified as cash equivalents. The Company's cash management program with its revolving credit lender allows for the maintenance of a zero balance in the U.S. bank disbursement accounts that are used to issue vendor and payroll checks. The program can result in checks outstanding in excess of bank balances in the disbursement accounts. When checks are presented to the bank for payment, cash deposits in amounts sufficient to fund the checks are made, at the Company's discretion, either from funds provided by other accounts or under the terms of the Company's revolving credit facility. Therefore, until checks are presented for payment, there is no right of offset by the bank and the Company continues to have control over cash relating to both released as well as unreleased checks. Checks that have been written to vendors or employees but have not yet been presented for payment at the Company's bank are classified as uncashed checks as part of accounts payable and changes in the balance are reported as a financing activity in the consolidated statements of cash flows.

Marketable Securities

The Company, through its wholly-owned captive insurance subsidiary, invests in marketable securities consisting of U.S. Treasury securities, corporate notes and bonds and commercial paper. As of December 31, 2019 and 2018, the Company had total marketable securities and cash equivalents as follows (in thousands):

	December 31, 2019	December 31, 2018
Commercial paper	$ 2,395	$ 8,126
Total cash equivalents	2,395	8,126
U.S. Treasury securities	12,406	10,133
Corporate notes and bonds	26,678	38,036
Commercial paper	3,337	4,687
Total short-term marketable securities	42,421	52,856
Total financial assets	$ 44,816	$ 60,982

Realized gains and losses on sales of available-for-sale marketable securities in the years ended December 31, 2019, 2018 and 2017 were immaterial. The majority of the marketable securities have a remaining maturity of less than one year and fair value approximates cost.

Allowances for Doubtful Accounts

On a regular basis, the Company evaluates its accounts receivable and establishes the allowance for doubtful accounts based on an evaluation of certain criteria and evidence of collection certainty including historical collection trends, current economic trends and changes in customer payment patterns. Past-due receivable balances are written off when the Company's internal collection efforts have been deemed unsuccessful in collecting the outstanding balance due.

Credit Concentration

Concentration of credit risks in accounts receivable is limited due to the large number of customers comprising the Company's customer base throughout North America. The Company maintains policies over credit extension that include credit evaluations, credit limits and collection monitoring procedures on a customer-by-customer basis. However, the Company generally does not require collateral before services are performed. No individual customer accounted for more than 10% of accounts receivable or more than 10% of total direct revenues in the periods presented.

Inventories and Supplies

Inventories are stated at the lower of cost or market. The cost of oil and oil products is principally determined on a first-in, first-out ("FIFO") basis. The cost of supplies and drums, solvent and solution and other inventories is determined on a FIFO or a weighted average cost basis. The Company continually reviews its inventories for obsolete or unsalable items and adjusts its carrying value to reflect estimated realizable values.

Property, Plant and Equipment, net (excluding landfill assets)

Property, plant and equipment, net is stated at cost less accumulated depreciation. Expenditures for major renewals and improvements which extend the life or usefulness of the asset are capitalized. Items of an ordinary repair or maintenance nature are charged directly to operating expense as incurred. Gains and losses on the sale of property, plant and equipment are included in other income (expense), net. During the construction and development period of an asset, the costs incurred are classified as construction-in-progress.

The Company depreciates and amortizes the capitalized cost of these assets, using the straight-line method as follows:

Asset Classification	Estimated Useful Life
Buildings and building improvements	
Buildings	20-42 years
Leasehold and building improvements	2-45 years
Camp and lodging equipment	8-15 years
Vehicles	2-15 years
Equipment	
Capitalized software and computer equipment	3-5 years
Containers and railcars	8-16 years
All other equipment	4-30 years
Furniture and fixtures	5-8 years

The Company recognizes an impairment in the carrying value of long-lived assets when the expected future undiscounted cash flows derived from the assets, or group of assets, are less than their carrying value. The Company did not record any impairment charges related to long-lived assets in any of the periods presented.

Goodwill

Goodwill is comprised of the purchase price of business acquisitions in excess of the fair value of the net assets acquired. Goodwill is reviewed for impairment annually as of December 31, or when events or circumstances indicate that the carrying value of the reporting unit may exceed its fair value. If the carrying value of a reporting unit exceeds the fair value, an

impairment loss will be recognized in an amount equal to that excess, limited to the total amount of goodwill allocated to that reporting unit. The Company did not recognize any impairment losses in any of the periods presented. See Note 8, "Goodwill and Other Intangible Assets," for additional information related to the Company's goodwill impairment tests.

Permits and Other Intangibles

Costs related to acquiring licenses, permits and intangible assets, such as legal fees, site surveys, engineering costs and other expenditures are capitalized. Other intangible assets consist primarily of customer and supplier relationships, trademarks and trade names and non-compete agreements.

Permits relating to landfills are amortized on a units-of-consumption basis. All other permits are amortized over periods ranging from 5 to 30 years on a straight-line basis. Finite-lived intangible assets are amortized on a straight-line basis over their respective useful lives, which range from 5 to 20 years.

All finite-lived intangible assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying value may not be recoverable. When such factors and circumstances exist, management compares the projected undiscounted future cash flows associated with the related asset or group of assets to the carrying amount. The impairment loss, if any, is measured as the excess of the carrying amount over the fair value of the asset or group of assets.

Indefinite-lived intangible assets are not amortized but are reviewed for impairment annually as of December 31, or when events or changes in the business environment indicate that the carrying value may be impaired. If the fair value of the asset is less than the carrying amount, the impairment loss is measured as the excess of the carrying value of the asset over its fair value.

Landfill Accounting

The Company amortizes landfill improvements and certain landfill-related permits over the estimated useful lives. The units-of-consumption method is used to amortize land, landfill cell construction, asset retirement costs and remaining landfill cells and sites. The Company also utilizes the units-of-consumption method to record closure and post-closure obligations for landfill cells and sites. Under the units-of-consumption method, the Company includes future estimated construction and asset retirement costs, as well as costs incurred to date, in the amortization base of the landfill assets. Additionally, where appropriate, as described below, the Company includes probable expansion airspace that has yet to be permitted in the calculation of the total remaining useful life of the landfill. If it is determined that expansion capacity should no longer be considered in calculating the recoverability of a landfill asset, the Company may be required to recognize an asset impairment or incur significantly higher amortization expense. If at any time the Company makes the decision to abandon the expansion effort, the capitalized costs related to the expansion effort are expensed immediately.

Landfill assets—Landfill assets include the costs of landfill site acquisition, permits and cell construction incurred to date. These amounts are recorded at cost, which includes capitalized interest as applicable. Landfill assets, net of amortization, are combined with management's estimate of the costs required to complete construction of the landfill to determine the amount to be amortized over the remaining estimated useful economic life of a site. Amortization of landfill assets is recorded on a units-of-consumption basis, such that the landfill assets should be completely amortized at the date the landfill ceases accepting waste. Amortization totaled $12.3 million, $10.3 million and $9.5 million for the years ended December 31, 2019, 2018 and 2017, respectively. Changes in estimated costs to complete construction are applied prospectively to the amortization rate.

Landfill capacity—Landfill capacity, which is the basis for the amortization of landfill assets and for the accrual of final closure and post-closure obligations, represents total permitted airspace plus unpermitted airspace that management believes is probable of ultimately being permitted based on established criteria. The Company applies the following criteria for evaluating the probability of obtaining a permit for future expansion airspace at existing sites, which provides management a basis to evaluate the likelihood of success of unpermitted expansions:

- Personnel are actively working to obtain the permit or permit modifications (land use, state and federal) necessary for expansion of an existing landfill, and progress is being made on the project.
- Management expects to submit the application within the next year and to receive all necessary approvals to accept waste within the next five years.
- At the time the expansion is included in management's estimate of the landfill's useful economic life, it is probable that the required approvals will be received within the normal application and processing time periods for approvals in the jurisdiction in which the landfill is located.

- We have a legal right to use or obtain the right to use the land associated with the expansion plan through title or lease.
- There are no significant known political, technical, legal or business restrictions or other issues that could impair the success of such expansion.
- Management is committed to pursuing the expansion which is supported by a complete financial feasibility analysis which demonstrates that the expansion will have a positive financial and operational impact.
- Additional airspace and related additional costs, including permitting, final closure and post-closure costs have been estimated based on the conceptual design of the proposed expansion.

As of December 31, 2019, there were no unpermitted expansions included in the Company's landfill accounting model. If actual expansion airspace is significantly different from management's estimate of expansion airspace, the amortization rates used for the units-of-consumption method would change, therefore impacting our profitability. If we determine that there is less actual expansion airspace at a landfill, this would increase amortization expense recorded and decrease profitability, while if we determine a landfill has more actual expansion airspace, amortization expense would decrease and profitability would increase.

As of December 31, 2019, the Company had 11 active landfill sites (including the Company's two non-commercial landfills), which have estimated remaining lives (based on anticipated waste volumes and remaining highly probable airspace) as follows:

Facility Name	Location	Remaining Lives (Years)	Remaining Highly Probable Airspace (cubic yards) (in thousands)		
			Permitted	Unpermitted	Total
Altair	Texas	2	179	—	179
Buttonwillow	California	23	5,982	—	5,982
Deer Park	Texas	3	103	—	103
Deer Trail	Colorado	28	1,697	—	1,697
Grassy Mountain	Utah	43	4,909	—	4,909
Kimball	Nebraska	7	165	—	165
Lambton	Ontario, Canada	60	4,710	—	4,710
Lone Mountain	Oklahoma	23	3,905	—	3,905
Ryley	Alberta	5	653	—	653
Sawyer	North Dakota	69	3,459	—	3,459
Westmorland	California	64	2,732	—	2,732
			28,494	—	28,494

At December 31, 2019 and 2018, the Company had no cubic yards of permitted, but not highly probable, airspace.

The following table presents the remaining highly probable airspace from January 1, 2017 through December 31, 2019 (in thousands of cubic yards):

	2019	2018	2017
Remaining capacity at January 1,	29,760	31,113	32,228
Changes in highly probable airspace, net	—	(223)	—
Consumed	(1,266)	(1,130)	(1,115)
Remaining capacity at December 31,	28,494	29,760	31,113

Amortization of cell construction costs and accrual of cell closure obligations—Landfills are typically comprised of a number of cells, which are constructed within a defined acreage (or footprint). The cells are typically discrete units, which require both separate construction and separate capping and closure procedures. Cell construction costs are the costs required to excavate and construct the landfill cell. These costs are typically amortized on a units-of-consumption basis, such that they are completely amortized when the specific cell ceases accepting waste. In some instances, the Company has landfills that are engineered and constructed as "progressive trenches." In progressive trench landfills, a number of contiguous cells form a progressive trench. In those instances, the Company amortizes cell construction costs over the airspace within the entire trench, such that the cell construction costs will be fully amortized at the end of the trench useful life.

The design and construction of a landfill does not create a landfill asset retirement obligation. Rather, the asset retirement obligation for cell closure (the cost associated with capping each cell) is incurred in relatively small increments as waste is placed in the landfill. Therefore, the cost required to construct the cell cap is capitalized as an asset retirement cost and a liability of an equal amount is established, based on the discounted cash flow associated with each capping event, as airspace is consumed. Spending for cell capping is reflected as environmental expenditures within operating activities in the consolidated statements of cash flows.

Landfill final closure and post-closure liabilities—The balance of landfill final closure and post-closure liabilities at December 31, 2019 and 2018 was $39.4 million and $37.8 million, respectively. The Company has material financial commitments for the costs associated with requirements of the Environmental Protection Agency ("EPA") and the comparable regulatory agency in Canada for landfill final closure and post-closure activities. In the United States, the landfill final closure and post-closure requirements are established under the standards of the EPA, and are implemented and applied on a state-by-state basis. The Company develops estimates for the cost of these activities based on an evaluation of site-specific facts and circumstances, including the Company's interpretation of current regulatory requirements and proposed regulatory changes. Such estimates may change in the future due to various circumstances including, but not limited to, permit modifications, changes in legislation or regulations, technological changes and results of environmental studies.

Final closure costs are the costs incurred after the site ceases to accept waste, but before the landfill is certified as closed by the applicable state regulatory agency. These costs generally include the costs required to cap the final cell of the landfill (if not included in cell closure), the costs required to dismantle certain structures for landfills and other landfill improvements, and regulation-mandated groundwater monitoring and leachate management. Post-closure costs involve the maintenance and monitoring of a landfill site that has been certified closed by the applicable regulatory agency. These costs generally include groundwater monitoring and leachate management. Regulatory post-closure periods are generally 30 years after landfill closure. Final closure and post-closure obligations are accrued on a units-of-consumption basis, such that the present value of the final closure and post-closure obligations are fully accrued at the date the landfill discontinues accepting waste.

Cell closure, final closure and post-closure costs (also referred to as "asset retirement obligations") are calculated by estimating the total obligation in current dollars, adjusted for inflation (1.02% during both 2019 and 2018) and discounted at the Company's credit-adjusted risk-free interest rate (6.02% and 5.66% during 2019 and 2018, respectively).

Non-Landfill Closure and Post-Closure Liabilities

The balance of non-landfill closure and post-closure liabilities at December 31, 2019 and 2018 was $36.3 million and $32.1 million, respectively. Non-landfill closure and post-closure obligations arise when the Company commences non-landfill facility operations and include costs required to dismantle and decontaminate certain structures and other costs incurred during the closure process. Post-closure costs, if required, include associated maintenance and monitoring costs as required by the closure permit. Post-closure periods are performance-based and are not generally specified in terms of years in the closure permit, but generally range from 10 to 30 years or more.

The Company records its non-landfill closure and post-closure liability by: (i) estimating the current cost of closing a non-landfill facility and the post-closure care of that facility, if required, based upon the closure plan that the Company is required to follow under its operating permit, or in the event the facility operates with a permit that does not contain a closure plan, based upon legally enforceable closure commitments made by the Company to various government agencies; (ii) estimates as to when future operations may cease; (iii) inflating the current cost estimates of closing the non-landfill facility using the inflation rate to the time of closing; and (iv) discounting the future value back to the present using the credit-adjusted risk-free interest rate.

The estimates for non-landfill closure and post-closure liabilities are inherently uncertain due to the possibility that permit and regulatory requirements will change in the future, impacting the estimation of total costs and the timing of the expenditures. Management reviews non-landfill closure and post-closure liabilities for changes to key assumptions that would impact the amount of the recorded liabilities. Changes that would prompt management to revise a liability estimate include changes in legal requirements that impact the Company's expected closure plan or scope of work, in the market price of a significant cost item, in the estimate as to when future operations at a location might cease or in the expected timing of the costs. Changes in estimates for non-landfill closure and post-closure events immediately impact the liability and the value of the corresponding asset. If a change is made to a fully-amortized asset, the adjustment is charged immediately to expense. When a change in estimate relates to an asset that has not been fully amortized, the adjustment to the asset recognized in income prospectively as a component of amortization. Historically, changes to non-landfill closure and post-closure estimates have not been material.

Remedial Liabilities

The balance of remedial liabilities at December 31, 2019 and 2018 was $114.2 million and $121.0 million, respectively. Remedial liabilities, including Superfund liabilities, include the costs of removal or containment of contaminated material, treatment of potentially contaminated groundwater and maintenance and monitoring costs necessary to comply with regulatory requirements. Most of the Company's remedial liabilities relate to the active and inactive hazardous waste treatment and disposal facilities which the Company acquired in the last 17 years and Superfund sites owned by third parties for which the Company, or the prior owners of certain of the Company's facilities for which the Company may have certain indemnification obligations, have been identified as potentially responsible parties ("PRPs") or potential PRPs. The Company's estimate of remedial liabilities involves an analysis of such factors as: (i) the nature and extent of environmental contamination (if any); (ii) the terms of applicable permits and agreements with regulatory authorities as to cleanup procedures and whether modifications to such permits and agreements will likely need to be negotiated; (iii) the cost of performing anticipated cleanup activities based upon current technology; and (iv) in the case of Superfund and other sites where other parties will also be responsible for a portion of the cleanup costs, the likely allocation of such costs and the ability of such other parties to pay their share. The measurement of remedial liabilities is reviewed at least quarterly and changes in estimates are recognized in the consolidated statements of operations when identified.

The Company periodically evaluates potential remedial liabilities at sites that it owns or operates or to which the Company or the sellers of the Chemical Services Division of Safety-Kleen ("CSD") assets (or the respective predecessors of the Company or such sellers) transported or disposed of waste, including 130 Superfund sites as of December 31, 2019. The Company periodically reviews and evaluates sites requiring remediation, including Superfund sites, giving consideration to the nature (i.e., owner, operator, arranger, transporter or generator) and the extent (i.e., amount and nature of waste hauled to the location, number of years of site operations or other relevant factors) of the Company's (or such sellers') alleged connection with the site, the extent (if any) to which the Company believes it may have an obligation to indemnify cleanup costs in connection with the site, the regulatory context surrounding the site, the accuracy and strength of evidence connecting the Company (or such sellers) to the location, the number, connection and financial ability of other named and unnamed PRPs and the nature and estimated cost of the likely remedy. Where the Company concludes that it is probable that a liability has been incurred and an amount can be estimated, a provision is made, based upon management's judgment and prior experience of such estimated liability.

Remedial liabilities are inherently difficult to estimate. Estimating remedial liabilities requires that the existing environmental contamination be understood. There are risks that the actual quantities of contaminants differ from the results of the site investigation, and that contaminants exist that have not been identified by the site investigation. In addition, the amount of remedial liabilities recorded is dependent on the remedial method selected. There is a risk that funds will be expended on a remedial solution that is not successful, which could result in the Company incurring the additional incremental costs of an alternative solution. Such estimates, which are subject to change, are subsequently revised if and when additional or new information becomes available.

Remedial liabilities are discounted when the timing of the payments is determinable and the amounts are estimable. In the case of remedial liabilities assumed in connection with acquisitions, acquired liabilities are recorded at fair value as of the dates of the acquisitions calculated by inflating costs in current dollars using an estimate of future inflation rates as of the respective acquisition dates until the expected time of payment, and then discounting the amount of the payments to their present value using a risk-free discount rate as of the acquisition dates. Discount rates used in the present value determination of the Company's remedial liabilities range from 1.37% to 4.90%.

Self-Insurance Liabilities

The Company self-insures a significant portion of expected losses under its workers' compensation, employee medical, comprehensive general liability and vehicle liability. Liabilities associated with these losses are recorded based on the Company's estimates of the ultimate cost to settle incurred claims, both reported and not yet reported. These recorded liabilities are estimated based on independent actuarial estimates and judgments which consider the frequency and settlement amount of historical claims data.

Revenue Recognition

The Company generates service and product revenues through the following operating segments: Environmental Services and Safety-Kleen. The Company recognizes revenue when control of the promised goods or services is transferred to the Company's customers, in an amount that reflects the consideration the Company expects to be entitled to in exchange for those goods or services.

The majority of the Company's revenues are for services, which are recognized based on time and materials incurred at contractually agreed-upon rates. Product revenues are recognized when the products are delivered and control transfers to the customer. The Company's payment terms vary by the type and location of its customers and the products or services offered. The periods between invoicing and when payments are due are not significant. For all periods presented, any amounts billed to customers related to shipping and handling are classified as revenue and the Company's shipping and handling costs are included in costs of revenues. In the course of operations, the Company collects sales tax and other excise taxes from its customers and recognizes a current liability which is then relieved when the taxes are remitted to the appropriate government authorities. The Company excludes sales and other excise taxes that it collects from customers from its revenues.

The Company's Environmental Services operating segment generally has the following four sources of revenue:

Technical Services—Technical Services revenues are generated from fees charged for waste material management and disposal services including onsite environmental management services, collection and transportation, packaging, recycling, treatment and disposal of waste. Revenue is primarily generated by short-term projects, most of which are governed by master service agreements that are long-term in nature. These master service agreements are typically entered into with the Company's larger customers and outline the pricing and legal frameworks for such arrangements. Services are provided based on purchase orders or agreements with the customer and include prices based upon units of volume of waste, and transportation and other fees. Collection and transportation revenues are recognized over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. Revenues for treatment and disposal of waste are recognized upon completion of treatment, final disposition in a landfill or incineration, or when the waste is shipped to a third party for processing and disposal. The Company periodically enters into bundled arrangements for the collection and transportation and disposal of waste. For such arrangements, transportation and disposal are considered distinct performance obligations and the Company allocates revenue to each based on the relative standalone selling price (i.e. the estimated price that a customer would pay for the services on a standalone basis). Revenues from waste that is not yet completely processed and disposed and the related costs are deferred. The deferred revenues and costs are recognized when the related services are completed. The period between collection and transportation and the final processing and disposal ranges depending on location of the customer, but generally is measured in days.

Field and Emergency Response Services—Field Services revenues are generated from cleanup services at customer sites, including municipalities and utilities, or other locations on a scheduled or emergency response basis. Services include confined space entry for tank cleaning, site decontamination, large remediation projects, demolition, spill cleanup on land and water, railcar cleaning, product recovery and transfer and vacuum services. Additional services include filtration and water treatment services. Response services for environmental emergencies include any scale from man-made disasters such as oil spills, to natural disasters such as hurricanes. These services are provided based on purchase orders or agreements with customers and include prices generally based upon daily, hourly or job rates for equipment, materials and personnel. The Company recognizes revenue for these services over time, as the customer receives and consumes the benefits of the service as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. The duration of such services can be over a number of hours, several days or even months for larger scale projects.

Industrial Services—Industrial Services revenues are generated from industrial and specialty services provided to refineries, mines, upgraders, chemical plants, pulp and paper mills, manufacturing facilities, power generation facilities and other industrial customers throughout North America. Services include in-plant cleaning and maintenance services, plant outage and turnaround services, decoking and pigging, chemical cleaning, high and ultra-high pressure water cleaning, pipeline inspection and coating services, large tank and surface impoundment cleaning, oilfield transport, daylighting, production services and directional boring services supporting drilling, completion and production programs. Services are provided based on purchase orders or agreements with the customer and include prices based upon daily, hourly or job rates for equipment, materials and personnel. The Company recognizes revenue for these services over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred.

Oil, Gas and Lodging Services and Other—Oil, Gas and Lodging Services and Other is primarily comprised of revenues generated from providing Oil and Gas Field Services that support upstream activities such as exploration and drilling for oil and gas companies and Lodging Services to customers in Western Canada and Texas. The Company recognizes Oil and Gas Field Services revenue over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize

revenue over time, based on time and materials incurred. Revenue for lodging accommodation services is recognized over time based on passage of time.

The Company's Safety-Kleen operating segment generally has the following two sources of revenue:

Safety-Kleen Environmental Services—Safety-Kleen Environmental Services revenues are generated from providing parts washer services, containerized waste handling and disposal services, oil collection services, vacuum services, direct sales of blended oil products, and other complementary services and product sales. Containerized waste services consist of profiling, collecting, transporting and recycling or disposing of a wide variety of waste. Other products and services include sale of complementary supply products including automotive fluids and shop supplies and other environmental services. Parts washer services include customer use of our parts washer equipment, cleaning and maintenance of the parts washer equipment and removal and replacement of used cleaning fluids. Parts washer services are considered a single performance obligation due to the highly integrated and interdependent nature of the arrangement. Revenue from parts washer services is recognized over the service interval as the customer receives the benefit of the services. Collection and transportation revenues are recognized over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. Product revenue is recognized upon the transfer of control whereby control transfers when the products are delivered to the customer.

Safety-Kleen Oil—Revenues from Safety-Kleen Oil, previously referred to as Kleen Performance Products, are generated from sales of high-quality base and blended lubricating oils to third-party distributors, government agencies, fleets, railroads and industrial customers. The business also sells recycled fuel oil to asphalt plants, industrial plants and pulp and paper companies. The used oil is also processed into vacuum gas oil which can be further re-refined into lubricant base oils or sold directly into the marine diesel oil fuel market. Revenue for oil products is recognized at a point in time, upon the transfer of control. Control transfers when the products are delivered to the customer.

The Company adopted Accounting Standards Codification 606, *Revenue from contracts with customers,* on January 1, 2018 without adjusting prior period amounts. The only significant impact from the adoption of this standard related to incremental disclosures now required. Upon adoption, a cumulative effect adjustment was not recorded.

Foreign Currency

The Company has international operations, substantially all of which are located in Canada. The functional currencies of those operations are the local currency and therefore assets and liabilities of those foreign operations are translated to U.S. Dollars at the exchange rate in effect at the balance sheet date and revenue and expenses at the average exchange rate for the period. Gains and losses from the translation of the consolidated financial statements of foreign subsidiaries into U.S. Dollars are included in stockholders' equity as a component of accumulated other comprehensive loss. Gains and losses from transactions not denominated in the functional currency of an entity are recognized in the consolidated statements of operations. Recorded balances that are denominated in a currency other than the functional currency are remeasured to the functional currency using the exchange rate at the balance sheet date and gains or losses are recorded in the consolidated statements of operations.

Advertising Expense

Advertising costs are expensed as incurred. Advertising expense was $9.8 million in 2019, $10.5 million in 2018 and $11.8 million in 2017.

Stock-Based Compensation

Stock-based compensation cost is measured at the grant date based on the fair value of the award and is recognized as expense over the requisite service period, which generally represents the vesting period. In addition, the Company issues awards with performance targets established at the grant date. The expense for these awards is recognized over the requisite service period when management believes it is probable those performance targets will be achieved. The fair value of the Company's grants are based on the closing price of the Company's common stock on the respective dates of grant. Forfeitures are recognized as they occur.

Income Taxes

Current income tax expense approximates cash to be paid or refunded for taxes for the applicable period. Deferred tax expense or benefit is the result of changes between deferred tax assets and liabilities. Deferred tax assets and liabilities are

determined based upon the temporary differences between the financial statement basis and tax basis of assets and liabilities as well as from net operating loss and tax credit carryforwards as measured by the enacted tax rates which will be in effect when these differences reverse. The effect of a change in tax rates on deferred tax assets and liabilities is generally recognized in income in the period that includes the enactment date. The Company evaluates the recoverability of future tax deductions and credits and a valuation allowance is established by tax jurisdiction when, based on an evaluation of both positive and negative objective verifiable evidence, it is more likely than not that some portion or all of deferred tax assets will not be realized.

The Company recognizes and measures a tax benefit from uncertain tax positions when it is more likely than not that the tax position will be sustained upon examination by the taxing authorities, based on the technical merits of the position. The Company recognizes a liability for unrecognized tax benefits resulting from uncertain tax positions taken or expected to be taken in a tax return. The Company adjusts these liabilities when its judgment changes as a result of the evaluation of new information not previously available. Due to the complexity of some of these uncertainties, the ultimate resolution may result in a payment that is materially different from the current estimate or future recognition of an unrecognized benefit. These differences will be reflected as increases or decreases to income tax expense in the period in which they are determined.

The Company recognizes interest and penalties related to unrecognized tax benefits within the provision (benefit) for income taxes line in the consolidated statements of operations. Accrued interest and penalties are included within the deferred taxes, unrecognized tax benefits and other long-term liabilities line in the consolidated balance sheet.

Earnings per Share ("EPS")

Basic EPS is calculated by dividing net income by the weighted average number of common shares outstanding during the period. Diluted EPS gives effect to all potentially dilutive common shares that were outstanding during the period.

Leases

The Company’s leases predominately relate to real estate and equipment such as vehicles and industrial equipment utilized in operations as well as rail cars utilized in connection with the Company’s transportation needs. Contracts are reviewed at inception to determine if the arrangement is a lease and, if so, whether it is an operating or finance lease. For all of its leases, the Company has elected not to separate lease and nonlease components, such as common area maintenance.

The Company generally enters into real estate leases with five to ten-year terms and non-real estate leases with two to seven-year terms. In the normal course of business, the Company also enters into short-term leases having terms of less than one-year. These leases are generally equipment leases entered into for short periods of time (e.g. daily, weekly or monthly) to satisfy immediate and/or short-term operational needs of the business which can arise based upon the nature of particular services performed or seasonality factors. The Company has elected not to recognize right of use ("ROU") assets and lease liabilities for these short-term leases. Expense for all such short-term leases is disclosed as short-term lease cost as shown in Note 19, "Leases."

Operating and finance leases with terms exceeding one year are recognized as ROU assets and lease liabilities and measured based on the present value of the future lease payments over the lease term at commencement date. When applicable, the ROU asset includes any lease payments made at or before the commencement date and initial direct costs incurred and is reduced by lease incentives received under the lease agreement.

Certain of the Company's real estate leases contain escalating future lease payments. Escalating lease payments that are based upon explicit amounts contained in the lease or an index (e.g., consumer price index) are included in its determination of future lease payments to determine the ROU asset and lease liability recognized at the commencement date. Any differences in the future lease payments from initial recognition are not anticipated to be material and will be recorded as variable lease cost in the period incurred. The variable lease cost will also include the Company’s portion of property tax, utilities and common area maintenance. A significant portion of the Company’s real estate lease agreements include renewal periods at the Company’s option. The Company includes these renewal periods in the lease term only when renewal is reasonably certain based upon facts and circumstances specific to the lease and known by the Company. The Company uses its incremental borrowing rate on collateralized debt based on the information available at the lease commencement date in determining the present value of future lease payments as the implicit rate is typically not readily determinable.

Recent Accounting Pronouncements

Standards implemented

In February 2016, the Financial Accounting Standards Board issued Accounting Standards Update 2016-02, *Leases (Topic 842)*. The amendment increases transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheet and disclosing key information about leasing arrangements. The Company adopted Topic 842 on January 1, 2019 using the modified retrospective method of adoption. Prior period amounts have not been adjusted and continue to be reported in accordance with the Company's historical accounting methodology pursuant to ASC 840, *Leases*. As permitted under the transition guidance, the Company elected to apply the package of three practical expedients for all existing leases which, among other things, allowed the Company to maintain the lease classification for all existing leases at the adoption date. The adoption of Topic 842 resulted in the recognition of ROU assets of $185.5 million and total current and noncurrent lease liabilities of $188.5 million at adoption. Additionally, Topic 842 required new and expanded disclosures to enable users of financial statements to assess the amount, timing and uncertainty of cash flows arising from leases. The standard did not have a material impact on the consolidated statements of operations or cash flows.

(3) REVENUES

Disaggregation of Revenue

We disaggregate the Company’s third party revenues by geographic location and source of revenue as we believe these categories depict how revenue and cash flows are affected by economic factors (in thousands):

	For the year ended December 31, 2019			
	Environmental Services	Safety-Kleen	Corporate	Total
Primary Geographical Markets				
United States	$ 1,721,322	$ 1,220,096	$ (586)	$ 2,940,832
Canada	371,041	98,595	1,722	471,358
Total third party revenues	$ 2,092,363	$ 1,318,691	$ 1,136	$ 3,412,190
Sources of Revenue [1]				
Technical Services	$ 1,120,043	$ —	$ —	$ 1,120,043
Field and Emergency Response Services	340,906	—	—	340,906
Industrial Services	514,390	—	—	514,390
Oil, Gas and Lodging Services and Other	117,024	—	1,136	118,160
Safety-Kleen Environmental Services	—	851,520	—	851,520
Safety-Kleen Oil [2]	—	467,171	—	467,171
Total third party revenues	$ 2,092,363	$ 1,318,691	$ 1,136	$ 3,412,190

	For the year ended December 31, 2018			
	Environmental Services	Safety-Kleen	Corporate	Total
Primary Geographical Markets				
United States	$ 1,598,402	$ 1,196,661	$ 1,082	$ 2,796,145
Canada	405,441	98,694	23	504,158
Total third party revenues	$ 2,003,843	$ 1,295,355	$ 1,105	$ 3,300,303
Sources of Revenue [1]				
Technical Services	$ 1,037,388	$ —	$ —	$ 1,037,388
Field and Emergency Response Services	304,727	—	—	304,727
Industrial Services	541,895	—	—	541,895
Oil, Gas and Lodging Services and Other	119,833	—	1,105	120,938
Safety-Kleen Environmental Services	—	795,077	—	795,077
Safety-Kleen Oil [2]	—	500,278	—	500,278
Total third party revenues	$ 2,003,843	$ 1,295,355	$ 1,105	$ 3,300,303

(1) All revenue except oil and oil product sales within Safety-Kleen Oil and product sales within Safety-Kleen Environmental Services, which include various automotive related fluids, shop supplies and direct blended oil sales, are recognized over time. Safety-Kleen Oil and Safety-Kleen Environmental Services product sales are recognized at a point in time.

(2) Safety-Kleen Oil was formerly known as Kleen Performance Products.

Contract Balances

(in thousands)	December 31, 2019	December 31, 2018
Receivables	$ 644,738	$ 606,952
Contract assets (unbilled receivables)	56,326	54,794
Contract liabilities (deferred revenue)	73,370	61,843

The timing of revenue recognition, billings and cash collections results in billed accounts receivable, unbilled receivables (contract assets) and customer advances and deposits or deferred revenue (contract liabilities) on the consolidated balance sheet. Generally, billing occurs subsequent to revenue recognition, as a right to payment is not just subject to passage of time, resulting in contract assets. Contract assets are generally classified as current. The Company sometimes receives advances or deposits from its customers before revenue is recognized, resulting in contract liabilities. These assets and liabilities are reported on the consolidated balance sheet on a contract-by-contract basis at the end of each reporting period. The contract liability balances at the beginning of each period presented were generally fully recognized in the subsequent three-month period.

Variable Consideration

The nature of the Company's contracts give rise to certain types of variable consideration, including in limited cases volume discounts. Accordingly, management establishes a revenue allowance to cover the estimated amounts of revenue that may need to be credited to customers' accounts in future periods. The Company estimates the amount of variable consideration to include in the estimated transaction price based on historical experience, anticipated performance and its best judgment at the time and to the extent it is probable that a significant reversal of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is resolved.

Contract Costs

Contract costs include direct and incremental costs to obtain or fulfill a contract. The Company’s contract costs that are subject to capitalization are comprised of costs associated with parts washer services and costs associated with the treatment and disposal of waste. Parts washer costs include costs of solvent, commissions paid relating to revenue generated from parts washer services, and transportation costs associated with transferring the product picked up from the services as it is returned to the Company’s facilities or a third party site. Costs related to the treatment of waste include costs for waste receiving, drum movement and storage, waste consolidation and transportation between facilities. Deferred costs associated with parts washer

services are amortized ratably over the average service interval, which ranges between four and 16 weeks. Deferred costs related to treatment and disposal of waste are recognized when the corresponding waste is disposed of and are included in deferred costs within total current assets in the Company's consolidated balance sheets. The deferred contract cost balances at the beginning of each period presented were fully recognized in cost of revenue in the subsequent three-month period.

(4) BUSINESS COMBINATIONS

2019 Acquisitions

On May 31, 2019, the Company acquired a privately-owned business for $14.8 million in cash consideration. The acquired company expands the environmental services and hazardous materials management services of the Company and is included in the Environmental Services segment. In connection with this acquisition, a preliminary goodwill amount of $7.4 million was recognized.

On March 1, 2019, the Company acquired certain assets of a privately-owned business for $10.4 million. The acquired business complements the Safety-Kleen segment's core service offerings, such as used motor oil collection, parts washers, oil filter recycling and vacuum services. In connection with this acquisition, a preliminary goodwill amount of $5.2 million was recognized.

The results of operations of these acquired businesses were not material in 2019. Pro forma revenue and earnings amounts on a combined basis as if these acquisitions had been completed on January 1, 2018 are immaterial to the consolidated financial statements of the Company since that date.

2018 Acquisitions

On August 31, 2018, the Company acquired a privately-owned company which expands the environmental services and waste oil capabilities of the Company for a $26.7 million purchase price, net of cash. The acquired company is included in the Safety-Kleen and Environmental Services segments. In connection with this acquisition, a goodwill amount of $12.3 million was recognized. The results of operations of this acquired business were not material in 2018.

On February 23, 2018, the Company completed the acquisition of the U.S. Industrial Cleaning Business of Veolia Environmental Services North America LLC (the "Veolia Business"). The acquisition provides significant scale and industrial services capabilities while increasing the size of the Company's existing U.S. Industrial Services business. The Company acquired the Veolia Business for a purchase price of $124.5 million. The Veolia Business has been integrated into the Environmental Services segment. The amount of revenue from the Veolia Business included in the Company's results of operations for the year ended December 31, 2018 was $154.0 million. The amount of pre-tax loss from the Veolia Business included in the Company's results of operations for the year ended December 31, 2018 was $0.9 million, which included $14.6 million in depreciation expense as well as $0.6 million of amortization expense related to intangible assets. During the year ended December 31, 2018, the Company incurred acquisition-related costs of approximately $1.4 million in connection with the transaction which are included in selling, general and administrative expenses in the consolidated statements of operations.

The Company finalized purchase accounting for the Veolia Business in the first quarter of 2019. The components and allocation of the purchase price for the Veolia Business consist of the following amounts (in thousands):

	Final Allocation
Accounts receivable, including unbilled receivable	$ 39,558
Inventories and supplies	1,126
Prepaid expenses and other current assets	828
Property, plant and equipment	72,243
Permits and other intangibles	5,140
Current liabilities	(18,372)
Closure and post-closure liabilities	(354)
Total identifiable net assets	100,169
Goodwill	24,331
Total purchase price	$ 124,500

The weighted average amortization period for the intangibles acquired is 8.2 years. The excess of the total purchase price, which includes the aggregate cash consideration paid in excess of the fair value of the tangible net assets and intangible assets acquired, was recorded as goodwill. The goodwill recognized is attributable to the expected operating synergies and growth potential that the Company expects to realize from this acquisition. Goodwill generated from the acquisition is deductible for tax purposes.

Pro forma revenue and earnings amounts on a combined basis as if this acquisition had been completed on January 1, 2017 are immaterial to the consolidated financial statements of the Company since that date.

2017 Acquisitions

On July 14, 2017, the Company acquired Lonestar West Inc. ("Lonestar"), a public company headquartered in Alberta, Canada, for CAD $41.8 million, ($33.1 million USD at acquisition date), net of cash acquired, which included an equity payout of CAD $0.72 per share to Lonestar shareholders and the assumption of approximately CAD $21.3 million ($16.8 million USD at acquisition date) in outstanding debt, which Clean Harbors subsequently repaid. The acquisition supports the Company's growth in the daylighting and hydro excavation services markets. In addition to increasing the size of the Company's hydro vacuum fleet, Lonestar's network of locations provides the Company with direct access to key geographic markets in both the United States and Canada. The acquired company is included in the Environmental Services segment. In connection with this acquisition a goodwill amount of $2.8 million was recognized.

On January 31, 2017, the Company acquired a privately held company for a purchase price of approximately $11.9 million in cash, net of cash acquired. The acquired business produces and distributes oil products and therefore complements the Company's closed loop model as it relates to the sale of its oil products. The acquired company is included in the Safety-Kleen segment. In connection with this acquisition a goodwill amount of $5.0 million was recognized.

The combined amount of direct revenues from the acquisitions included in the Company's results of operations for the year ended December 31, 2017 was approximately $14.5 million.

(5) DISPOSITION OF BUSINESS

On June 30, 2017, the Company completed the sale of its Transformer Services business, a non-core business within the Environmental Services operating segment. The Transformer Services business was sold for $45.5 million ($43.4 million net of $2.1 million in transactional related costs). As a result of the sale, the Company recognized a pre-tax gain of $30.7 million in gain on sale of businesses in the Company’s consolidated statement of operations for the year ended December 31, 2017.

(6) INVENTORIES AND SUPPLIES

Inventories and supplies consisted of the following (in thousands):

	December 31, 2019	December 31, 2018
Oil and oil related products	$ 75,408	$ 70,823
Supplies and drums	115,128	104,609
Solvent and solutions	9,973	10,657
Other	14,235	13,390
Total inventories and supplies	$ 214,744	$ 199,479

Supplies and drums consist primarily of drums and containers used in providing the Company's products and services as well as critical spare parts to support the Company's incinerator and re-refinery operations. Other inventories consisted primarily of parts washer components, cleaning fluids, absorbents and automotive fluids, such as windshield washer fluid and antifreeze.

(7) PROPERTY, PLANT AND EQUIPMENT

Property, plant and equipment consisted of the following (in thousands):

	December 31, 2019	December 31, 2018
Land	$ 131,023	$ 123,734
Asset retirement costs (non-landfill)	15,924	15,148
Landfill assets	182,276	154,918
Buildings and improvements [(1)]	499,159	440,188
Camp and lodging equipment	158,277	152,998
Vehicles [(1)]	785,056	721,735
Equipment	1,779,366	1,697,490
Furniture and fixtures	6,054	5,453
Construction in progress	36,679	20,931
	3,593,814	3,332,595
Less - accumulated depreciation and amortization	2,005,663	1,770,617
Total property, plant and equipment, net	$ 1,588,151	$ 1,561,978

(1) December 31, 2019 balances inclusive of ROU assets classified as finance leases.

Depreciation expense, inclusive of landfill and finance lease amortization was $265.5 million, $264.3 million and $251.4 million for the years ended December 31, 2019, 2018 and 2017, respectively.

(8) GOODWILL AND OTHER INTANGIBLE ASSETS

The changes in goodwill for the years ended December 31, 2019 and 2018 were as follows (in thousands):

	Environmental Services	Safety-Kleen	Totals
Balance at January 1, 2018	$ 172,386	$ 306,137	$ 478,523
Increase from current period acquisitions	37,007	3,697	40,704
Measurement period adjustments from prior period acquisitions	(78)	—	(78)
Decrease from disposition of business	—	—	—
Foreign currency translation	(2,296)	(2,664)	(4,960)
Balance at December 31, 2018	$ 207,019	$ 307,170	$ 514,189
Increase from current period acquisitions	7,378	5,225	12,603
Measurement period adjustments from prior period acquisitions	(2,675)	(1,355)	(4,030)
Foreign currency translation	809	1,442	2,251
Balance at December 31, 2019	$ 212,531	$ 312,482	$ 525,013

The Company conducted its annual impairment test of goodwill as of December 31, 2019 and determined that no adjustment to the carrying value of goodwill for any reporting unit was then necessary because the fair values of the reporting units exceeded their respective carrying values. The fair value of all reporting units was determined using an income approach based upon estimates of future discounted cash flows. The resulting estimates of fair value were validated through the consideration of other factors such as the fair value of comparable companies to the reporting units and a reconciliation of the sum of all estimated fair values of the reporting units to the Company's overall market capitalization. In all cases, the estimated fair values of the reporting units significantly exceeded the respective carrying values.

Significant judgments and unobservable inputs categorized as Level 3 in the fair value hierarchy are inherent in the impairment tests performed and include assumptions about the amount and timing of expected future cash flows, growth rates, and the determination of appropriate discount rates. Level 3 inputs are unobservable inputs for the asset or liability in which there is little, if any, market activity for the asset or liability at the measurement date. The Company believes that the

assumptions used in its impairment tests are reasonable, but variations in any of the assumptions may result in different measurements of fair values.

The impacts of any adverse business and market conditions which impact the overall performance of the Company's reporting units will continue to be monitored. If the Company's reporting units do not achieve the financial performance that the Company expects, it is possible that goodwill impairment charges may result. There can therefore be no assurance that future events will not result in an impairment of goodwill.

As of December 31, 2019 and 2018, the Company's finite-lived and indefinite-lived intangible assets consisted of the following (in thousands):

	December 31, 2019			December 31, 2018		
	Cost	Accumulated Amortization	Net	Cost	Accumulated Amortization	Net
Permits	$ 184,235	$ 87,228	$ 97,007	$ 177,583	$ 79,358	$ 98,225
Customer and supplier relationships	401,696	207,884	193,812	393,487	179,824	213,663
Other intangible assets	38,331	33,018	5,313	37,262	29,743	7,519
Total amortizable permits and other intangible assets	624,262	328,130	296,132	608,332	288,925	319,407
Trademarks and trade names	122,934	—	122,934	122,468	—	122,468
Total permits and other intangible assets	$ 747,196	$ 328,130	$ 419,066	$ 730,800	$ 288,925	$ 441,875

The Company regularly monitors and assesses whether events or changes in circumstances relative to the Company's business might indicate that future cash flows attributable to the Company's asset groups may not be sufficient to recover the current value of those assets. During the year ended and as of December 31, 2019, there were no events or changes in circumstances which would indicate that the carrying values of the Company's asset groups would not be recoverable and thus no impairment charge was recorded related to the Company's long-lived assets. If expectations of future cash flows were to decrease in the future as a result of worse than expected or prolonged periods of depressed activity, future impairments may become evident.

Amortization expense of permits and other intangible assets for the years ended December 31, 2019, 2018 and 2017 were $35.2 million, $34.4 million and $37.0 million, respectively.

The expected amortization of the net carrying amount of finite-lived intangible assets at December 31, 2019 is as follows (in thousands):

Years ending December 31,	Expected Amortization
2020	$ 33,083
2021	29,788
2022	29,534
2023	25,306
2024	23,921
Thereafter	154,500
	$ 296,132

(9) ACCRUED EXPENSES

Accrued expenses consisted of the following (in thousands):

	December 31, 2019	December 31, 2018
Accrued insurance	$ 74,376	$ 70,217
Accrued interest	21,222	3,930
Accrued compensation and benefits	72,473	77,881
Accrued income, real estate, sales and other taxes	35,749	25,670
Accrued other	72,720	55,707
	$ 276,540	$ 233,405

As of December 31, 2019 and 2018, accrued insurance included employee medical insurance costs of $14.3 million and $14.7 million, respectively, and accruals for losses under our workers' compensation, comprehensive general liability and vehicle liability self-insurance programs of $59.4 million and $53.9 million, respectively.

The increase in accrued interest from the comparable period in 2018 is due to the timing of required interest payments which changed due to the redemption of the 2021 unsecured senior notes and the issuance of the 2027 and 2029 unsecured senior notes. For additional information relating to accrued interest, see Note 12, "Financing Arrangements."

The increase in accrued income, real estate, sales and other taxes from the comparable period in 2018 is due to an increase in accrued federal tax of $10.5 million driven by higher taxable income and the timing of tax payments.

As of December 31, 2019 and 2018, accrued other includes a derivative liability of $20.8 million and $8.8 million, respectively, related to the Company's cash flow hedges. The increase in the fair value of the derivative liability is mainly due to changes in variable interest rates. For additional information relating to the derivative liability, see Note 12, "Financing Arrangements."

(10) CLOSURE AND POST-CLOSURE LIABILITIES

The changes to closure and post-closure liabilities (also referred to as "asset retirement obligations") from January 1, 2018 through December 31, 2019 were as follows (in thousands):

	Landfill Retirement Liability	Non-Landfill Retirement Liability	Total
Balance at January 1, 2018	$ 32,382	$ 28,655	$ 61,037
Liabilities assumed in acquisitions	—	685	685
New asset retirement obligations	2,518	—	2,518
Accretion	2,537	2,567	5,104
Changes in estimates recorded to consolidated statement of operations	(37)	1,497	1,460
Changes in estimates recorded to consolidated balance sheet	1,867	64	1,931
Expenditures	(1,224)	(1,057)	(2,281)
Currency translation and other	(234)	(289)	(523)
Balance at December 31, 2018	37,809	32,122	69,931
Liabilities assumed in acquisitions	—	220	220
New asset retirement obligations	2,705	—	2,705
Accretion	2,772	2,829	5,601
Changes in estimates recorded to consolidated statement of operations	248	2,437	2,685
Changes in estimates recorded to consolidated balance sheet	3,303	562	3,865
Expenditures	(7,718)	(2,121)	(9,839)
Currency translation and other	282	201	483
Balance at December 31, 2019	$ 39,401	$ 36,250	$ 75,651

All of the landfill facilities reflected in the above table were active as of December 31, 2019 and 2018. The 2019 and 2018 environmental changes in estimates recorded to the consolidated statements of operations include $2.3 million and $1.2 million, respectively, related to increased facility closure costs at one of our locations.

Anticipated payments (based on current estimated costs and anticipated timing of necessary regulatory approvals to commence work on closure and post-closure activities) for each of the next five years and thereafter are as follows (in thousands):

Year ending December 31,	
2020	$ 7,571
2021	10,307
2022	14,407
2023	11,329
2024	3,344
Thereafter	277,001
Undiscounted closure and post-closure liabilities	323,959
Less: Discount at credit-adjusted risk-free rate	(158,186)
Less: Undiscounted estimated closure and post-closure liabilities relating to airspace not yet consumed	(90,122)
Present value of closure and post-closure liabilities	$ 75,651

(11) REMEDIAL LIABILITIES

The changes to remedial liabilities from January 1, 2018 through December 31, 2019 were as follows (in thousands):

	Remedial Liabilities for Landfill Sites	Remedial Liabilities for Inactive Sites	Remedial Liabilities (Including Superfund) for Non-Landfill Operations	Total
Balance at January 1, 2018	$ 1,800	$ 65,342	$ 57,326	$ 124,468
Accretion	86	2,745	1,871	4,702
Changes in estimates recorded to consolidated statement of operations	(1)	130	558	687
Expenditures	(47)	(3,759)	(4,028)	(7,834)
Currency translation and other	—	857	(1,863)	(1,006)
Balance at December 31, 2018	1,838	65,315	53,864	121,017
Accretion	88	2,639	1,808	4,535
Changes in estimates recorded to consolidated statement of operations	(17)	(913)	(2,087)	(3,017)
Expenditures	(59)	(5,079)	(3,724)	(8,862)
Currency translation and other	1	29	470	500
Balance at December 31, 2019	$ 1,851	$ 61,991	$ 50,331	$ 114,173

In 2019, the net reduction in the company's remedial liabilities from changes in estimates recorded to the consolidated statement of operations was $3.0 million and primarily related to reductions in estimates for remedial activities at five locations. There were no significant (benefits) charges in 2018 resulting from changes in estimates for remedial liabilities.

Anticipated payments at December 31, 2019 (based on current estimated costs and anticipated timing of necessary regulatory approvals to commence work on remedial activities) for each of the next five years and thereafter were as follows (in thousands):

Year ending December 31,		
2020	$	16,729
2021		17,883
2022		9,207
2023		7,930
2024		5,701
Thereafter		77,000
Undiscounted remedial liabilities		134,450
Less: Discount		(20,277)
Total remedial liabilities	$	114,173

The following tables show, respectively, (i) the amounts of such estimated liabilities associated with the types of facilities and sites involved and (ii) the amounts of such estimated liabilities associated with each facility or site which represents at least 5% of the total and with all other facilities and sites as a group and as of December 31, 2019.

Estimates based on type of facility or site (in thousands, except percentages):

Type of Facility or Site	Remedial Liability	% of Total	Reasonably Possible Additional Liabilities [1]
Facilities now used in active conduct of the Company's business (39 facilities)	$ 44,381	38.9%	$ 10,691
Inactive facilities not now used in active conduct of the Company's business but most of which were acquired because the assumption of remedial liabilities for such facilities was part of the purchase price for the CSD assets (37 facilities)	61,991	54.3	10,658
Superfund sites owned by third parties (17 sites)	7,801	6.8	780
Total	$ 114,173	100.0%	$ 22,129

(1) Amounts represent the high end of the range of management's best estimate of the reasonably possible additional liabilities.

Estimates based on amount of potential liability (in thousands, except percentages):

Location	Type of Facility or Site	Remedial Liability[1]	% of Total	Reasonably Possible Additional Liabilities[2]
Baton Rouge, LA	Closed incinerator and landfill	$ 22,690	19.9%	$ 3,975
Bridgeport, NJ	Closed incinerator	18,191	15.9	2,578
Mercier, Quebec	Idled incinerator and legal proceedings	10,761	9.4	1,098
Linden, NJ	Operating solvent recycling center	7,312	6.4	762
Various	All other incinerators, landfills, wastewater treatment facilities and service centers (72 facilities)	47,418	41.6	12,936
Various	Superfund sites (each representing less than 5% of total liabilities) owned by third parties (17 sites)	7,801	6.8	780
Total		$ 114,173	100.0%	$ 22,129

(1) $18.4 million of the $114.2 million remedial liabilities include estimates related to the legal and administrative proceedings discussed in Note 18, "Commitments and Contingencies," as well as other such estimated remedial liabilities.

(2) Amounts represent the high end of the range of management's best estimate of the reasonably possible additional liabilities.

Revisions to remediation reserve requirements may result in upward or downward adjustments to income from operations in any given period. The Company believes that its extensive experience in the environmental services business, as well as its involvement with a large number of sites, provides a reasonable basis for estimating its aggregate liability. It is possible, however, that future changes in available technology, regulatory or enforcement developments, the results of environmental studies or other factors could necessitate the recording of additional liabilities or the revision of currently recorded liabilities that could be material. Since the Company's satisfaction of the liabilities will occur over many years, the Company cannot reasonably predict the nature or extent of possible future events or the impact that those events, if any, might have on the current estimates of remedial liabilities.

(12) FINANCING ARRANGEMENTS

The following table is a summary of the Company's financing arrangements (in thousands):

Current Obligations:	December 31, 2019	December 31, 2018
Senior secured Term Loan Agreement ("Term Loan Agreement")	$ 7,535	$ 7,535
Long-Term Obligations:		
Senior secured Term Loan Agreement due June 30, 2024	$ 727,162	$ 734,697
Unsecured senior notes, at 4.875%, due July 15, 2027 ("2027 Notes")	545,000	—
Unsecured senior notes, at 5.125%, due July 15, 2029 ("2029 Notes")	300,000	—
Unsecured senior notes, at 5.125%, due June 1, 2021 ("2021 Notes")	—	845,000
Long-term obligations, at par	1,572,162	1,579,697
Unamortized debt issuance costs and premium, net	(18,046)	(14,676)
Long-term obligations, at carrying value	$ 1,554,116	$ 1,565,021

Financing Activities

Unsecured Senior Notes. On July 2, 2019, the Company completed a private placement of $545.0 million aggregate principal amount of 2027 Notes and $300.0 million aggregate principal amount of 2029 Notes (collectively, the "New Notes"). The 2027 Notes will mature on July 15, 2027, and the 2029 Notes will mature on July 15, 2029. Interest payments on each series of the New Notes will be paid semiannually on January 15 and July 15, commencing on January 15, 2020.

The Company may redeem all or any portion of the 2027 Notes prior to July 15, 2022 or the 2029 Notes prior to July 15, 2024 at a redemption price equal to 100% of the principal amount redeemed plus a make whole premium as of the date of redemption including accrued and unpaid interest, if any, up to the date of redemption. Additionally, prior to July 15, 2022 for the 2027 Notes and July 15, 2024 for the 2029 Notes, the Company may use cash proceeds of one or more equity offerings to redeem up to 35% in aggregate principal of the 2027 Notes or the 2029 Notes at a redemption price equal to 104.875% or 105.125%, respectively, plus accrued and unpaid interest thereon, if any, up to the date of redemption.

After the dates in the preceding paragraph, the Company may redeem all or any portion of the New Notes which remain outstanding at any time upon proper notice at the following redemption prices if redeemed during the twelve-month period commencing on July 15 of the years set forth below plus accrued and unpaid interest, if any, up to the date of redemption:

2027 Notes

Year	Percentage
2022	102.438%
2023	101.219%
2024 and thereafter	100.000%

2029 Notes

Year	Percentage
2024	102.563%
2025	101.281%
2026 and thereafter	100.000%

Concurrently with the closing of the New Notes on July 2, 2019, the Company repurchased, using a portion of the net proceeds from the sale of the New Notes, an aggregate principal amount of $701.0 million of the 2021 Notes. The total amount paid in repurchasing the 2021 Notes was $706.2 million including $3.1 million of accrued interest. On July 17, 2019, the Company redeemed the remaining $144.0 million outstanding 2021 Notes, including $0.9 million of accrued interest, using the remaining net proceeds from the sale of the New Notes and available cash. In connection with this early repurchase and redemption of the 2021 Notes, the Company recorded a loss on early extinguishment of debt of $6.1 million during the year ended December 31, 2019. With the repurchase and redemption of the 2021 Notes, none of the Company’s outstanding debt is registered under the Securities Act of 1933, as amended.

The New Notes and the related indenture contain various customary non-financial covenants and are guaranteed by substantially all of the Company’s current and future domestic subsidiaries. The New Notes are effectively subordinated to the Company's Term Loan Agreement, revolving credit facility and finance lease obligations to the extent of the value of the assets securing such secured indebtedness. The New Notes are effectively subordinated to all indebtedness and other liabilities of the Company's subsidiaries that are not guarantors of the New Notes.

Senior Secured Term Loans. On April 17, 2018, the Company, and substantially all of the Company's domestic subsidiaries as guarantors, entered into the first amendment (the “First Amendment”) of the Term Loan Agreement. The First Amendment reduced the applicable interest rate margin for the Company’s term loans (the "Term Loans") outstanding under the Term Loan Agreement by 25 basis points for both Eurocurrency borrowings and base rate borrowings. After giving effect to the repricing, the applicable interest rate margins for the Term Loans are 1.75% for Eurocurrency borrowings and 0.75% for base rate borrowings.

On July 19, 2018, the Company, and substantially all of the Company’s domestic subsidiaries as guarantors, entered into an Incremental Facility Amendment (the “Incremental Facility Amendment”) to the Company’s Term Loan Agreement. The Incremental Facility Amendment increased the principal amount of the Term Loans outstanding under the Term Loan Agreement by $350.0 million. The Term Loans under the Term Loan Agreement will mature on June 30, 2024 and may be prepaid at any time without premium or penalty other than customary breakage costs with respect to Eurodollar based loans. The Company’s obligations under the Term Loan Agreement are guaranteed by all of the Company’s domestic restricted subsidiaries and secured by liens on substantially all of the assets of the Company and the guarantors. The effective annual interest rate of the Term Loans on December 31, 2019 was 3.55%.

Concurrently with the closing on July 19, 2018 of the Incremental Facility Amendment, the Company repurchased $322.0 million aggregate principal of previously outstanding unsecured senior notes. The total amount paid to repurchases these notes

was $330.9 million inclusive of $7.9 million of accrued interest and $1.0 million of debt redemption fees. On August 1, 2018, the Company redeemed the remaining $78.0 million of principal of the previously outstanding notes. In connection with this redemption, the Company recorded a loss on early extinguishment of debt of $2.5 million during the year ended December 31, 2018.

As of December 31, 2019 and December 31, 2018, the estimated fair value of the Company's outstanding long-term obligations, including the current portion, was $1.6 billion. The Company's estimates of the fair value of its long-term obligations, including the current portion, are based on quoted market prices or other available market data which are considered Level 2 measures according to the fair value hierarchy. Level 2 utilizes quoted market prices in markets that are not active, broker or dealer quotation, or alternative pricing sources with reasonable levels of price transparency for similar assets and liabilities.

Revolving Credit Facility. On November 1, 2016, the Company and one of the Company's subsidiaries (the "Canadian Borrower") entered into an amended and restated credit agreement for the Company's revolving credit facility with Bank of America, N.A. ("BofA"), as agent for the lenders under the facility (the "Agent"). Under the amended and restated facility, the Company has the right to obtain revolving loans and letters of credit for a combined maximum of up to $300.0 million (with a sub-limit of $250.0 million for letters of credit) and the Canadian Borrower has the right to obtain revolving loans and letters of credit for a combined maximum of up to $100.0 million (with a $75.0 million sub-limit for letters of credit). Availability under the U.S. line is subject to a borrowing base basically comprised of 85% of the eligible accounts receivable of the Company and its U.S. subsidiaries plus 100% of cash deposited in a controlled account with the Agent, and availability under the Canadian line is subject to a borrowing base basically comprised of 85% of the eligible accounts receivable of the Company's Canadian subsidiaries plus 100% of cash deposited in a controlled account with the Agent's Canadian affiliate. Subject to certain conditions, the facility will expire on November 1, 2021.

Borrowings under the revolving credit facility bear interest at a rate of, at the Company's option, either (i) LIBOR plus an applicable margin ranging from 1.25% to 1.50% per annum based primarily on the level of the Company's average liquidity for the most recent 30 day period or (ii) BofA's base rate plus an applicable margin ranging from 0.25% to 0.50% per annum based primarily on such average liquidity. There is also an unused line fee, calculated on the then unused portion of the lenders' $400.0 million maximum commitments, ranging from 0.25% to 0.30% per annum of the unused commitment. For outstanding letters of credit, the Company will pay to the lenders a fee equal to the then applicable LIBOR margin described above, and to the issuing banks a standard fronting fee and customary fees and charges in connection with all amendments, extensions, draws and other actions with respect to letters of credit.

The Company's obligations under the revolving credit facility (including revolving loans and reimbursement obligations for outstanding letters of credit) are guaranteed by substantially all of the Company's U.S. subsidiaries and secured by a first lien on the Company's and its U.S. subsidiaries' accounts receivable. The Canadian Borrower's obligations under the facility are guaranteed by substantially all of the Company's Canadian subsidiaries and secured by a first lien on the accounts receivable of the Canadian subsidiaries.

The Company utilizes letters of credit primarily as security for financial assurance which it has been required to provide to regulatory bodies for its hazardous waste facilities and which would be called only in the event that the Company fails to satisfy closure, post-closure and other obligations under the permits issued by those regulatory bodies for such licensed facilities. On August 1, 2018, the Company borrowed $50.0 million under the revolving credit facility in connection with the redemption of $78.0 million of previously outstanding unsecured senior notes. The Company repaid the $50.0 million borrowing during the fourth quarter of 2018. At December 31, 2019 and 2018, the revolving credit facility had no outstanding loan balances, availability of $229.2 million and $235.4 million, respectively, and outstanding letters of credit of $146.9 million and $130.1 million, respectively.

Cash Flow Hedges

The Company's strategy to hedge against fluctuations in variable interest rates involves entering into interest rate derivative agreements.

Although the interest rate on the Term Loans is variable, the Company has effectively fixed the interest rate on $350.0 million principal outstanding by entering into interest rate swap agreements in 2018 with a notional amount of $350.0 million. Under the terms of the interest rate swap agreements, the Company receives interest based on the 1-month LIBOR index and pays interest at a weighted average rate of approximately 2.92%, resulting in an effective annual interest rate of approximately 4.67%.

The Company recognizes derivative instruments as either assets or liabilities on the consolidated balance sheet at fair value. No ineffectiveness has been identified on these swaps and, therefore, the change in fair value is recorded in stockholders' equity as a component of accumulated other comprehensive loss. Amounts are reclassified from accumulated other comprehensive loss into interest expense on the consolidated statement of operations in the same period or periods during which the hedged transaction affects earnings.

As of December 31, 2019 and December 31, 2018, the Company recorded a derivative liability with a fair value of $20.8 million and $8.8 million, respectively, within accrued expenses in connection with these cash flow hedges.

The fair value of the interest rate swaps is calculated using discounted cash flow valuation methodologies based upon the one-month LIBOR yield curves that are observable at commonly quoted intervals for the full term of the interest rate swaps and as such is considered a Level 2 measure according to the fair value hierarchy.

(13) INCOME TAXES

The domestic and foreign components of income before provision (benefit) for income taxes were as follows (in thousands):

	For the years ended December 31,		
	2019	2018	2017
Domestic	$ 156,571	$ 115,070	$ 101,714
Foreign	(8,332)	(20,588)	(43,025)
Total	$ 148,239	$ 94,482	$ 58,689

The provision (benefit) for income taxes consisted of the following (in thousands):

	For the years ended December 31,		
	2019	2018	2017
Current:			
Federal	$ 20,482	$ (7,677)	$ 25,613
State	14,564	12,653	11,083
Foreign	7,448	4,781	4,589
	42,494	9,757	41,285
Deferred			
Federal	7,933	19,899	(85,488)
State	550	(1,205)	1,085
Foreign	(478)	395	1,068
	8,005	19,089	(83,335)
Provision (benefit) for income taxes	$ 50,499	$ 28,846	$ (42,050)

The Company's effective tax rate for fiscal years 2019, 2018 and 2017 was 34.1%, 30.5% and (71.6)%, respectively. The effective income tax rate varied from the amount computed using the statutory federal income tax rate as follows (in thousands):

	For the years ended December 31,		
	2019	2018	2017
Tax expense at US statutory rate	$ 31,130	$ 19,841	$ 20,541
State income taxes, net of federal benefit	10,597	8,711	4,547
Foreign rate differential	276	(1,124)	3,733
Valuation allowance	4,459	10,466	16,552
Uncertain tax position interest and penalties	474	(1,806)	3,730
Tax credits	(50)	(9,799)	—
Non-deductible compensation	1,922	1,813	256
Other	1,691	1,032	1,600
Adjustment for Tax Cuts and Jobs Act	—	(288)	(93,009)
Provision (benefit) for income taxes	$ 50,499	$ 28,846	$ (42,050)

Due to the Tax Cuts and Jobs Act (the “Tax Act”) signed into law on December 22, 2017, the statutory rate in effect was 21% in 2019 and 2018, compared to 35% in 2017.

For the year ended December 31, 2017, the Company calculated its best estimate of the impact of the Tax Act in its year-end income tax provision in accordance with its understanding of the Tax Act and guidance available as of the date of the 2017 Form 10-K filing and as a result recorded a net benefit of $93.0 million as a component of the 2017 income tax expense. This provisional net income tax benefit was comprised of a $100.5 million tax benefit for the remeasurement of deferred tax assets and liabilities to the 21% rate at which they are expected to reverse, offset by a one-time tax expense on deemed repatriation of $7.5 million. This one-time charge was after the utilization of $7.5 million of foreign tax credits which had full valuation allowances applied to them previously.

During 2018, the Company completed its analysis of impacts of the Tax Act and specific to the one-time deemed repatriation, adjusted the previous amount recorded of $7.5 million to $6.6 million resulting in a $0.9 million benefit to tax expense recorded in 2018. The Company also recorded the final remeasurement of its deferred tax assets and liabilities and adjusted the deferred tax benefit from $100.5 million to $99.9 million or approximately $0.6 million of deferred expense recorded in 2018. The total net impact of changes in tax law resulted in a net benefit of approximately $0.3 million in 2018.

During 2018, the Company also completed an analysis of certain federal manufacturing and research and development credit benefits for tax years 2014 through 2017. Upon the filing of its 2017 tax return in October 2018, the Company recognized $3.3 million of tax benefits and recognized an additional $7.1 million upon the amendments of its 2014 through 2016 tax returns for a net benefit recorded as a component of the 2018 tax provision of $9.8 million (shown as Tax credits in the table above).

During the year ended December 31, 2018, the Company recorded $5.0 million of tax benefits related to tax deductible foreign currency losses to accumulated other comprehensive loss and as such these benefits are not included within the provision (benefit) for income taxes.

The components of the total net deferred tax assets and liabilities as of December 31, 2019 and 2018 were as follows (in thousands):

	2019	2018
Deferred tax assets:		
Provision for doubtful accounts	$ 8,949	$ 10,715
Closure, post-closure and remedial liabilities	26,960	28,380
Operating lease liabilities	40,879	—
Accrued expenses	17,602	15,686
Accrued compensation	7,155	7,774
Net operating loss carryforwards[(1)]	50,824	43,284
Tax credit carryforwards[(2)]	16,909	16,909
Uncertain tax positions accrued interest and federal benefit	4,176	519
Stock-based compensation	2,435	3,440
Other	10,418	7,067
Total deferred tax assets	186,307	133,774
Deferred tax liabilities:		
Property, plant and equipment	(184,594)	(164,246)
Operating lease right-of-use assets	(40,985)	—
Permits and other intangible assets	(98,654)	(103,539)
Prepaid expenses	(9,694)	(9,187)
Total deferred tax liabilities	(333,927)	(276,972)
Total net deferred tax liability before valuation allowance	(147,620)	(143,198)
Less valuation allowance	(83,643)	(79,295)
Net deferred tax liabilities	$ (231,263)	$ (222,493)

(1) As of December 31, 2019, the net operating loss carryforwards included (i) state net operating loss carryovers of $201.8 million which will begin to expire in 2020, (ii) federal net operating loss carryforwards of $25.5 million which will begin to expire in 2025 and (iii) foreign net operating loss carryforwards of $145.0 million which will begin to expire in 2020.

(2) As of December 31, 2019, the foreign tax credit carryforwards of $16.6 million will expire between 2020 and 2024.

The Company has not accrued for any remaining undistributed foreign earnings. These amounts continue to be indefinitely reinvested in foreign operations.

A valuation allowance is required to be established when, based on an evaluation of available evidence, it is more likely than not that some portion or all of the deferred tax assets will not be realized. Accordingly, as of December 31, 2019 and 2018, the Company had a valuation allowance of $83.6 million and $79.3 million, respectively. The total allowance as of December 31, 2019 consisted of $16.5 million of foreign tax credits, $0.8 million of acquired federal net operating losses, $10.7 million of state net operating loss carryforwards, $34.1 million of foreign net operating loss carryforwards, $14.9 million of deferred tax assets of a Canadian subsidiary and $6.6 million of realized and unrealized capital losses. The allowance as of December 31, 2018 consisted of $16.5 million of foreign tax credits, $0.8 million of acquired federal net operating losses, $9.6 million of state net operating loss carryforwards and $22.7 million of foreign net operating loss carryforwards, $26.6 million of deferred tax assets of a Canadian subsidiary and $3.1 million of unrealized capital losses.

The changes to unrecognized tax benefits (excluding related penalties and interest) from January 1, 2017 through December 31, 2019, were as follows (in thousands):

	2019	2018	2017
Unrecognized tax benefits as of January 1	$ 3,159	$ 5,121	$ 1,738
Additions to current year tax positions	—	—	1,457
(Reductions) additions to prior year tax positions	3,354	(625)	2,031
Expirations	(209)	(1,115)	(231)
Foreign currency translation	110	(222)	126
Unrecognized tax benefits as of December 31	$ 6,414	$ 3,159	$ 5,121

At December 31, 2019, 2018 and 2017, the Company had recorded $6.4 million, $3.2 million and $5.1 million, respectively, of unrecognized tax benefits that if recognized would affect the annual effective tax rate. The Company recorded $3.1 million of unrecognized tax benefits for Canadian Revenue Agency transfer pricing adjustments for which relief from double taxation has been requested. Therefore, an offsetting benefit of $3.1 million was also recorded resulting in no effect on the annual effective tax rate.

At December 31, 2019, 2018 and 2017 the Company has accrued interest of $1.7 million, $0.8 million and $0.9 million, respectively, relative to unrecognized tax benefits. Interest expense that is recorded as a tax expense against the liability for unrecognized tax benefits for the years ended December 31, 2019, 2018 and 2017 included interest and penalties of $0.9 million, $(0.1) million and $0.5 million, respectively.

The Company files U.S. federal income tax returns as well as income tax returns in various states and foreign jurisdictions. The Company's tax years 2014-2016 are currently under review by the Internal Revenue Service (the "IRS"). The Company does not believe the examination will result in material adjustments to previously filed returns. Additionally, any net operating losses that were generated in prior years and utilized in these years may also be subject to examination by the IRS. The Company may also be subject to examinations by state and local revenue authorities for calendar years 2014 through 2018. The Company has ongoing U.S. state and local jurisdictional audits, as well as Canadian federal and provincial audits, all of which the Company believes will not result in material liabilities.

Due to expiring statute of limitation periods and the resolution of tax audits, the Company believes that total unrecognized tax benefits will decrease by approximately $0.2 million within the next 12 months.

(14) EARNINGS PER SHARE

The following are computations of basic and diluted earnings per share (in thousands, except for per share amounts):

	For the years ended December 31,		
	2019	2018	2017
Numerator for basic and diluted earnings per share:			
Net income	$ 97,740	$ 65,636	$ 100,739
Denominator:			
Weighted basic shares outstanding	55,845	56,148	57,072
Dilutive effect of equity-based compensation awards	284	192	128
Weighted dilutive shares outstanding	56,129	56,340	57,200
Basic earnings per share	$ 1.75	$ 1.17	$ 1.77
Diluted earnings per share	$ 1.74	$ 1.16	$ 1.76

For the years ended December 31, 2019, 2018 and 2017, all then outstanding performance awards and restricted stock awards were included in the calculation of diluted earnings per share except for 122,785, 79,390 and 152,831 respectively, of performance stock awards for which the performance criteria were not attained at the time and 16,304, 121,803 and 49,373 respectively, of restricted stock awards and performance stock awards which were excluded as their inclusion would have an antidilutive effect.

(15) STOCKHOLDERS' EQUITY

The Company's board of directors has authorized the repurchase of up to $600.0 million of the Company's common stock. The Company has funded and intends to continue to fund the repurchases through available cash resources. The repurchase program authorizes the Company to purchase the Company's common stock on the open market or in privately negotiated transactions periodically in a manner that complies with applicable U.S. securities laws. The number of shares purchased and the timing of the purchases have depended and will depend on a number of factors including share price, cash required for future business plans, trading volume and other conditions. The Company has no obligation to repurchase stock under this program and may suspend or terminate the repurchase program at any time. During the years ended December 31, 2019, 2018 and 2017, the Company repurchased and retired a total of approximately 0.3 million, 0.8 million and 0.9 million shares, respectively, of the Company's common stock for total costs of approximately $21.4 million, $45.1 million and $49.0 million, respectively. Through December 31, 2019, the Company has repurchased and retired a total of approximately 5.9 million shares of its common stock for approximately $315.3 million under this program. As of December 31, 2019, an additional $284.7 million remained available for repurchase of shares under this program.

(16) ACCUMULATED OTHER COMPREHENSIVE LOSS

The changes in accumulated other comprehensive loss by component and related tax (loss) benefit for the years ended December 31, 2019, 2018 and 2017 were as follows (in thousands):

	Foreign Currency Translation Adjustments	Unrealized (Losses) Gains on Available-for-Sale Securities	Unrealized Loss on Interest Rate Hedge	Unfunded Pension Liability	Total
Balance at January 1, 2017	$ (212,211)	$ (321)	$ —	$ (1,794)	$ (214,326)
Other comprehensive income before reclassifications	41,636	184	—	146	41,966
Amounts reclassified out of accumulated other comprehensive loss	—	222	—	—	222
Tax loss	—	(231)	—	(38)	(269)
Other comprehensive income	41,636	175	—	108	41,919
Balance at December 31, 2017	(170,575)	(146)	—	(1,686)	(172,407)
Other comprehensive (loss) income before reclassifications	(47,374)	182	(9,579)	124	(56,647)
Amounts reclassified out of accumulated other comprehensive loss	—	—	806	—	806
Tax benefit (loss)	5,024	(105)	—	(42)	4,877
Other comprehensive (loss) income	(42,350)	77	(8,773)	82	(50,964)
Balance at December 31, 2018	(212,925)	(69)	(8,773)	(1,604)	(223,371)
Other comprehensive income (loss) before reclassifications	25,130	(70)	(14,401)	60	10,719
Amounts reclassified out of accumulated other comprehensive loss	—	332	2,335	—	2,667
Tax loss	—	(50)	—	(16)	(66)
Other comprehensive income (loss)	25,130	212	(12,066)	44	13,320
Balance at December 31, 2019	$ (187,795)	$ 143	$ (20,839)	$ (1,560)	$ (210,051)

During the year ended December 31, 2018, the Company converted an intercompany loan with a foreign subsidiary to equity, which resulted in losses for tax purposes. The loan had been historically treated as a component of the Company's investment in that subsidiary, and as a result, foreign currency gains and losses on the loan had been accumulated as a component of other comprehensive (loss) income. The subsidiary continues to operate as part of the Company. The tax benefit of $5.0 million, which was triggered by the conversion, was therefore allocated to other comprehensive (loss) income rather than net income.

The amounts reclassified out of accumulated other comprehensive loss into the consolidated statement of operations, with presentation location, during the years ended December 31, 2019, 2018, and 2017 were as follows (in thousands):

Other Comprehensive Income Components	For the years ended December 31, 2019	2018	2017	Location
Unrealized (losses) gains on available-for-sale securities	$ (332)	$ —	$ (222)	Other income (expense), net
Unrealized loss on interest rate hedge	(2,335)	(806)	—	Interest expense, net of interest income

(17) STOCK-BASED COMPENSATION

Stock-Based Compensation

In 2010, the Company adopted an equity incentive plan (the "2010 Plan"), which provides for awards of up to 6,000,000 shares of common stock (subject to certain anti-dilution adjustments) in the form of (i) stock options, (ii) stock appreciation rights, (iii) restricted stock, (iv) restricted stock units, and (v) certain other stock-based awards. The Company ceased issuing stock options in 2008, and all awards issued to date under the 2010 Plan have been in the form of restricted stock awards and performance stock awards as described below.

As of December 31, 2019 and 2018, the Company had restricted stock awards and performance stock awards outstanding under the 2010 Plan. The restricted stock awards generally vest over three to five years subject to continued employment. The performance stock awards vest depending on the satisfaction of certain performance criteria and continued service conditions as described below.

Total stock-based compensation cost charged to selling, general and administrative expenses for the years ended December 31, 2019, 2018 and 2017 was $17.8 million, $16.8 million and $13.1 million, respectively. The total income tax benefit recognized in the consolidated statements of operations from stock-based compensation was $3.1 million, $3.2 million and $3.7 million for the years ended December 31, 2019, 2018 and 2017, respectively.

Restricted Stock Awards

The following table summarizes information about restricted stock awards for the year ended December 31, 2019:

Restricted Stock	Number of Shares	Weighted Average Grant-Date Fair Value
Unvested at January 1, 2019	657,240	$ 54.65
Granted	174,114	68.82
Vested	(249,319)	53.99
Forfeited	(59,438)	55.65
Unvested at December 31, 2019	522,597	$ 59.57

As of December 31, 2019, there was $20.6 million of total unrecognized compensation cost arising from restricted stock awards. This cost is expected to be recognized over a weighted average period of 2.6 years. The total fair value of restricted stock vested during 2019, 2018 and 2017 was $16.8 million, $10.8 million and $7.3 million, respectively.

Performance Stock Awards

The following table summarizes information about performance stock awards for the year ended December 31, 2019:

Performance Stock	Number of Shares	Weighted Average Grant-Date Fair Value
Unvested at January 1, 2019	213,490	$ 55.71
Granted	125,034	70.77
Vested	(105,583)	55.68
Forfeited	(28,388)	56.82
Unvested at December 31, 2019	204,553	$ 64.78

As of December 31, 2019, there was $2.8 million of total unrecognized compensation cost arising from performance stock awards whereby the performance conditions had been met or were deemed probable of vesting. The total fair value of performance awards vested during 2019, 2018 and 2017 was $8.1 million, $1.2 million and $3.0 million, respectively.

(18) COMMITMENTS AND CONTINGENCIES

Legal and Administrative Proceedings

The Company and its subsidiaries are subject to legal proceedings and claims arising in the ordinary course of business. Actions filed against the Company arise from commercial and employment-related claims including alleged class actions related to sales practices and wage and hour claims. The plaintiffs in these actions may be seeking damages or injunctive relief or both. These actions are in various jurisdictions and stages of proceedings, and some are covered in part by insurance. In addition, the Company's waste management services operations are regulated by federal, state, provincial and local laws enacted to regulate discharge of materials into the environment, remediation of contaminated soil and groundwater or otherwise protect the environment. This ongoing regulation results in the Company frequently becoming a party to legal or administrative proceedings involving all levels of government authorities and other interested parties. The issues involved in such proceedings generally relate to alleged violations of existing permits and licenses or alleged responsibility under federal or state Superfund laws to remediate contamination at properties owned either by the Company or by other parties ("third-party sites") to which either the Company or the prior owners of certain of the Company's facilities shipped waste.

At December 31, 2019 and 2018, the Company had recorded reserves of $26.0 million and $25.4 million, respectively, for actual or probable liabilities related to the legal and administrative proceedings in which the Company was then involved, the principal of which are described below. In management's opinion, it is not reasonably possible that the potential liability beyond what has been recorded, if any, that may result from these actions, either individually or collectively, will have a material effect on our financial position, results of operations or cash flows. The Company periodically adjusts the aggregate amount of these reserves when actual or probable liabilities are paid or otherwise discharged, new claims arise, or additional relevant information about existing or probable claims becomes available. As of December 31, 2019 and 2018, the $26.0 million and $25.4 million, respectively, of reserves consisted of (i) $18.4 million and $17.9 million, respectively, related to pending legal or administrative proceedings, including Superfund liabilities, which were included in remedial liabilities on the consolidated balance sheets, and (ii) $7.6 million and $7.5 million, respectively, primarily related to federal, state and provincial enforcement actions, which were included in accrued expenses on the consolidated balance sheets.

As of December 31, 2019, the principal legal and administrative proceedings in which the Company was involved, or which had been terminated during 2019, were as follows:

Ville Mercier. In September 2002, the Company acquired the stock of a subsidiary (the "Mercier Subsidiary") which owns a hazardous waste incinerator in Ville Mercier, Quebec (the "Mercier Facility"). The property adjacent to the Mercier Facility, which is also owned by the Mercier Subsidiary, is now contaminated as a result of actions dating back to 1968, when the Government of Quebec issued to a company unrelated to the Mercier Subsidiary two permits to dump organic liquids into lagoons on the property. In 1999, Ville Mercier and three neighboring municipalities filed separate legal proceedings against the Mercier Subsidiary and the Government of Quebec. In 2012, the municipalities amended their existing statement of claim to seek $2.9 million (CAD $) in general damages and $10.0 million (CAD $) in punitive damages, plus interest and costs, as well as injunctive relief. Both the Government of Quebec and the Company have filed summary judgment motions against the municipalities. The parties are attempting to negotiate a resolution and hearings on the motions have been delayed. In September 2007, the Quebec Minister of Sustainable Development, Environment and Parks issued a notice pursuant to Section 115.1 of the Environment Quality Act, superseding notices issued in 1992, which are the subject of the pending litigation. The more recent notice notifies the Mercier Subsidiary that, if the Mercier Subsidiary does not take certain remedial measures at the site, the Minister intends to undertake those measures at the site and claim direct and indirect costs related to such measures. The Company has accrued for costs expected to be incurred relative to the resolution of this matter and believes this matter will not have future material effect on its financial position or results of operations.

Safety-Kleen Legal Proceedings. On December 28, 2012, the Company acquired Safety-Kleen, Inc. ("Safety-Kleen") and thereby became subject to the legal proceedings in which Safety-Kleen was a party on that date. In addition to certain Superfund proceedings in which Safety-Kleen has been named as a potentially responsible party as described below under "Superfund Proceedings," the principal such legal proceedings involving Safety-Kleen which were outstanding as of December 31, 2019 were as follows:

Product Liability Cases. Safety-Kleen has been named as a defendant in various lawsuits that are currently pending in various courts and jurisdictions throughout the United States, including approximately 55 proceedings (excluding cases which

have been settled but not formally dismissed) as of December 31, 2019, wherein persons claim personal injury resulting from the use of Safety-Kleen's parts cleaning equipment or cleaning products. These proceedings typically involve allegations that the solvent used in Safety-Kleen's parts cleaning equipment contains contaminants and/or that Safety-Kleen's recycling process does not effectively remove the contaminants that become entrained in the solvent during their use. In addition, certain claimants assert that Safety-Kleen failed to warn adequately the product user of potential risks, including a historic failure to warn that solvent contains trace amounts of toxic or hazardous substances such as benzene.

The Company maintains insurance that it believes will provide coverage for these product liability claims (over amounts accrued for self-insured retentions and deductibles in certain limited cases), except for punitive damages to the extent not insurable under state law or excluded from insurance coverage. The Company also believes that these claims lack merit and has historically vigorously defended, and intends to continue to vigorously defend, itself and the safety of its products against all of these claims. Such matters are subject to many uncertainties and outcomes are not predictable with assurance. Consequently, The Company is unable to ascertain the ultimate aggregate amount of monetary liability or financial impact with respect to these matters as of December 31, 2019. From January 1, 2019 to December 31, 2019, 27 product liability claims were settled or dismissed. Due to the nature of these claims and the related insurance, the Company did not incur any expense as insurance provided coverage in full for all such claims. Safety-Kleen may be named in similar, additional lawsuits in the future, including claims for which insurance coverage may not be available.

Superfund Proceedings

The Company has been notified that either the Company (which, since December 28, 2012, includes Safety-Kleen) or the prior owners of certain of the Company's facilities for which the Company may have certain indemnification obligations have been identified as PRPs or potential PRPs in connection with 130 sites which are subject to or are proposed to become subject to proceedings under federal or state Superfund laws. Of the 130 sites, five (including the BR Facility described below) involve facilities that are now owned or leased by the Company and 125 involve third-party sites to which either the Company or the prior owners of certain of the Company’s facilities shipped waste. Of the 125 third-party sites, 31 are now settled, 16 are currently requiring expenditures on remediation and 78 are not currently requiring expenditures on remediation.

In connection with each site, the Company has estimated the extent, if any, to which it may be subject, either directly or as a result of any indemnification obligations, for cleanup and remediation costs, related legal and consulting costs associated with PRP investigations, settlements, and related legal and administrative proceedings. The amount of such actual and potential liability is inherently difficult to estimate because of, among other relevant factors, uncertainties as to the legal liability (if any) of the Company or the prior owners of certain of the Company's facilities to contribute a portion of the cleanup costs, the assumptions that must be made in calculating the estimated cost and timing of remediation, the identification of other PRPs and their respective capability and obligation to contribute to remediation efforts, and the existence and legal standing of indemnification agreements (if any) with prior owners, which may either benefit the Company or subject the Company to potential indemnification obligations. The Company believes its potential liability could exceed $100,000 at 10 of the 125 third-party sites.

BR Facility. The Company acquired in 2002 a former hazardous waste incinerator and landfill in Baton Rouge (the "BR Facility"), for which operations had been previously discontinued by the prior owner. In September 2007, the EPA issued a special notice letter to the Company related to the Devil's Swamp Lake Site ("Devil's Swamp") in East Baton Rouge Parish, Louisiana. Devil's Swamp includes a lake located downstream of an outfall ditch where wastewater and storm water have been discharged, and Devil's Swamp is proposed to be included on the National Priorities List due to the presence of Contaminants of Concern ("COC") cited by the EPA. These COCs include substances of the kind found in wastewater and storm water discharged from the BR Facility in past operations. The EPA originally requested COC generators to submit a good faith offer to conduct a remedial investigation feasibility study directed towards the eventual remediation of the site. In 2018 the Company completed performing corrective actions at the BR Facility under an order issued by the Louisiana Department of Environmental Quality, and has also completed conducting the remedial investigation and feasibility study for Devil's Swamp under an order issued by the EPA. The Company cannot presently estimate the potential additional liability for the Devil's Swamp cleanup until a final remedy is selected by the EPA with issuance of a Record of Decision.

Third-Party Sites. Of the 125 third-party sites at which the Company has been notified it is a PRP or potential PRP or may have indemnification obligations, Clean Harbors has an indemnification agreement at 11 of these sites with ChemWaste, a former subsidiary of Waste Management, Inc., and at six additional of these third-party sites, Safety-Kleen has a similar indemnification agreement with McKesson Corporation. These agreements indemnify the Company (which now includes Safety-Kleen) with respect to any liability at the 17 sites for waste disposed prior to the Company's (or Safety-Kleen's) acquisition of the former subsidiaries of Waste Management and McKesson which had shipped waste to those sites.

Accordingly, Waste Management or McKesson are paying all costs of defending those subsidiaries in those 17 cases, including legal fees and settlement costs. However, there can be no guarantee that the Company's ultimate liabilities for those sites will not exceed the amount recorded or that indemnities applicable to any of these sites will be available to pay all or a portion of related costs. Except for the indemnification agreements which the Company holds from ChemWaste, McKesson and two other entities, the Company does not have an indemnity agreement with respect to any of the 125 third-party sites discussed above.

Federal, State and Provincial Enforcement Actions

From time to time, the Company pays fines or penalties in regulatory proceedings relating primarily to waste treatment, storage or disposal facilities. As of December 31, 2019 and 2018, there were 12 and 10 proceedings, respectively, for which the Company reasonably believes that the sanctions could equal or exceed $100,000. The Company believes that the fines or other penalties in these or any of the other regulatory proceedings will, individually or in the aggregate, not have a material effect on its financial condition, results of operations or cash flows.

Self-Insurance Liabilities

Under the Company's insurance programs, coverage is obtained for catastrophic exposures, as well as those risks required to be insured by law or contract. The Company's policy is to retain a significant portion of certain expected losses related to workers' compensation, employee medical, comprehensive general liability and vehicle liability. A portion of these self-insured liabilities are managed through its wholly-owned captive insurance subsidiary.

Provisions for losses expected under these programs are recorded based upon the Company's estimates of the aggregate liability for claims. The current deductible per participant per year for the employee medical insurance policy is $0.8 million. The current deductible per occurrence for workers' compensation is $1.0 million, general liability is $2.0 million and vehicle liability is $2.0 million. The retention per claim for the environmental impairment policy is $1.0 million. At December 31, 2019 and 2018, the Company had accrued $59.4 million and $53.9 million, respectively, for its self-insurance liabilities (exclusive of employee medical insurance) using a risk-free discount rate of 1.52% and 2.96%, respectively.

Anticipated payments for contingencies related to workers' compensation, comprehensive general liability and vehicle liability related claims at December 31, 2019 for each of the next five years and thereafter were as follows (in thousands):

Years ending December 31,		
2020	$	20,838
2021		12,675
2022		8,951
2023		6,097
2024		4,743
Thereafter		7,659
Undiscounted self-insurance liabilities		60,963
Less: Discount		1,570
Total self-insurance liabilities (included in accrued expenses)	$	59,393

(19) LEASES

As of December 31, 2019, the Company’s lease portfolio was predominately operating leases for real estate, vehicles and rail cars. The Company presents operating lease balances separately on the consolidated balance sheet. The Company's finance leases relate to certain buildings and equipment. The following table presents our finance lease balances and their classification on the consolidated balance sheet as of December 31, 2019 (in thousands):

Finance Lease Balances (Classification)	December 31, 2019	
ROU assets (Property, plant and equipment, net)	$	32,307
Current portion of lease liabilities (Accrued expenses)		801
Long-term portion of lease liabilities (Deferred taxes, unrecognized tax benefits and other long-term liabilities)		34,517

The Company's lease expense was as follows (in thousands):

	For the year ended December 31, 2019
Operating lease cost	$ 55,402
Finance lease cost:	
Amortization of ROU assets	1,142
Interest on lease liabilities	1,415
Total finance lease cost	2,557
Short-term lease cost	84,749
Variable lease cost	6,702
Total lease cost	$ 149,410

Other information related to leases was as follows:

Weighted Average Remaining Lease Term (years)	**December 31, 2019**
Operating leases	5.1
Finance leases	21.3
Weighted Average Discount Rate	
Operating leases	5.29%
Finance leases	4.97%

Supplemental Cash Flow Related Disclosures (in thousands)	**For the year ended December 31, 2019**
Cash paid for amounts included in the measurement of lease liabilities	
Operating cash flows from operating leases	$ 56,240
Operating cash flows from finance leases	1,415
Financing cash flows from finance leases	586
ROU assets obtained in exchange for operating lease liabilities	17,699
ROU assets obtained in exchange for finance lease liabilities	33,449

At December 31, 2019, the Company's future lease payments under non-cancelable leases that have lease terms in excess of one year were as follows (in thousands):

Years ending December 31,	**Operating Leases**	**Finance Leases**
2020	$ 50,814	$ 2,733
2021	38,705	2,782
2022	31,052	2,836
2023	22,723	2,895
2024	15,787	2,825
Thereafter	28,444	51,151
Total future lease payments	187,525	65,222
Amount representing interest	(25,526)	(29,904)
Total lease liabilities	$ 161,999	$ 35,318

At December 31, 2019, none of the Company's executed leases that had not yet commenced will create significant rights or obligations in the future and its sublease transactions are not material. Additionally, the Company does not have any related party leases, and there were no restrictions or covenants imposed by its leases.

Disclosures related to relevant periods prior to adoption of Topic 842

The following is a summary of future minimum payments under operating leases that have initial or remaining non-cancelable lease terms in excess of one year at December 31, 2018 (in thousands):

Year	Total Operating Leases
2019	$ 56,480
2020	45,467
2021	33,564
2022	24,509
2023	15,253
Thereafter	35,778
Total minimum lease payments	$ 211,051

During the years ended December 31, 2018 and 2017, rent expense, including short-term rentals, was approximately $141.1 million and $125.4 million, respectively.

(20) SEGMENT REPORTING

Segment reporting is prepared on the same basis that the Company's chief executive officer, who is the Company's chief operating decision maker, manages the business, makes operating decisions and assesses performance. The Company is managed and reports as two operating segments; (i) the Environmental Services segment which consists of the Company's historical Technical Services, Industrial Services, Field Services and Oil, Gas and Lodging businesses, and (ii) the Safety-Kleen segment.

Third-party revenue is revenue billed to outside customers by a particular segment. Direct revenues is revenue allocated to the segment providing the product or service. Intersegment revenues represent the sharing of third-party revenues among the segments based on products and services provided by each segment as if the products and services were sold directly to the third-party. The intersegment revenues are shown net. The operations not managed through the Company's operating segments described above are recorded as "Corporate Items."

The following tables reconcile third-party revenues to direct revenues for the years ended December 31, 2019, 2018 and 2017 (in thousands):

	For the year ended December 31, 2019			
	Environmental Services	Safety-Kleen	Corporate Items	Totals
Third-party revenues	$ 2,092,363	$ 1,318,691	$ 1,136	$ 3,412,190
Intersegment revenues, net	140,577	(140,577)	—	—
Corporate Items, net	4,128	15	(4,143)	—
Direct revenues	$ 2,237,068	$ 1,178,129	$ (3,007)	$ 3,412,190

	For the year ended December 31, 2018			
	Environmental Services	Safety-Kleen	Corporate Items	Totals
Third-party revenues	$ 2,003,843	$ 1,295,355	$ 1,105	$ 3,300,303
Intersegment revenues, net	134,104	(134,104)	—	—
Corporate Items, net	3,247	31	(3,278)	—
Direct revenues	$ 2,141,194	$ 1,161,282	$ (2,173)	$ 3,300,303

	For the year ended December 31, 2017			
	Environmental Services	Safety-Kleen	Corporate Items	Totals
Third-party revenues	$ 1,728,700	$ 1,213,703	$ 2,575	$ 2,944,978
Intersegment revenues, net	125,822	(125,822)	—	—
Corporate Items, net	2,952	5	(2,957)	—
Direct revenues	$ 1,857,474	$ 1,087,886	$ (382)	$ 2,944,978

The primary financial measure by which the Company evaluates the performance of its segments is Adjusted EBITDA, which consists of net income plus accretion of environmental liabilities, depreciation and amortization, net interest expense, loss on early extinguishment of debt and provision (benefit) for income taxes and excludes other gains, losses and non-cash charges not deemed representative of fundamental segment results and other (income) expense, net. Transactions between the segments are accounted for at the Company's best estimate based on similar transactions with outside customers.

The following table presents Adjusted EBITDA information used by management by reported segment (in thousands):

	For the years ended December 31,		
	2019	2018	2017
Adjusted EBITDA:			
Environmental Services	$ 446,284	$ 380,856	$ 321,310
Safety-Kleen	282,378	282,029	249,811
Corporate Items	(188,345)	(171,880)	(145,464)
Total	540,317	491,005	425,657
Reconciliation to Consolidated Statements of Operations:			
Accretion of environmental liabilities	10,136	9,806	9,460
Depreciation and amortization	300,725	298,625	288,422
Income from operations	229,456	182,574	127,775
Other (income) expense, net	(2,897)	4,510	6,119
Loss on early extinguishment of debt	6,131	2,488	7,891
Gain on sale of businesses	(687)	—	(30,732)
Interest expense, net of interest income	78,670	81,094	85,808
Income from operations before provision (benefit) for income taxes	$ 148,239	$ 94,482	$ 58,689

The following table presents assets by reported segment and in the aggregate (in thousands):

	December 31, 2019	December 31, 2018
Property, plant and equipment, net		
Environmental Services	$ 939,352	$ 951,867
Safety-Kleen	555,310	553,220
Corporate Items	93,489	56,891
Total property, plant and equipment, net	$ 1,588,151	$ 1,561,978
Goodwill and Permits and other intangibles, net		
Environmental Services		
Goodwill	$ 212,531	$ 207,019
Permits and other intangibles, net	89,722	93,313
Total Environmental Services	302,253	300,332
Safety-Kleen		
Goodwill	$ 312,482	$ 307,170
Permits and other intangibles, net	329,344	348,562
Total Safety-Kleen	641,826	655,732
Total	$ 944,079	$ 956,064

Geographic Information

As of December 31, 2019 and 2018, the Company had property, plant and equipment, net of depreciation and amortization and permits and other intangible assets, net of amortization in the following geographic locations (in thousands):

	December 31, 2019		December 31, 2018	
	Total	% of Total	Total	% of Total
Property, plant and equipment, net				
United States	$ 1,273,205	80.2%	$ 1,233,949	79.0%
Canada and other foreign	314,946	19.8	328,029	21.0
Total property, plant and equipment, net	$ 1,588,151	100.0%	$ 1,561,978	100.0%
Permits and other intangibles, net				
United States	$ 372,609	88.9%	$ 393,045	88.9%
Canada and other foreign	46,457	11.1	48,830	11.1
Total permits and other intangibles, net	$ 419,066	100.0%	$ 441,875	100.0%

The following table presents the total assets by geographical area (in thousands):

	December 31, 2019	December 31, 2018
United States	$ 3,413,254	$ 3,090,311
Canada and other foreign	695,650	648,010
Total	$ 4,108,904	$ 3,738,321

(21) QUARTERLY DATA (UNAUDITED)

(in thousands, except per share amounts)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2019				
Total revenues	$ 780,839	$ 868,678	$ 891,668	$ 871,005
Cost of revenues [1]	564,364	594,933	612,754	615,768
Income from operations	23,734	73,048	80,367	52,307
Other income (expense), net	2,983	(564)	(427)	905
Net income [2]	976	36,244	36,369	24,151
Basic earnings per share [3]	0.02	0.65	0.65	0.43
Diluted earnings per share [3]	0.02	0.65	0.65	0.43

(in thousands, except per share amounts)	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2018				
Total revenues	$ 749,778	$ 849,140	$ 843,181	$ 858,204
Cost of revenues [1]	546,425	583,584	580,685	594,857
Income from operations	10,991	64,353	65,745	41,485
Other (expense) income, net	(299)	846	(996)	(4,061)
Net (loss) income [2]	(12,631)	30,747	31,089	16,431
Basic (loss) earnings per share [3]	(0.22)	0.55	0.55	0.29
Diluted (loss) earnings per share [3]	(0.22)	0.54	0.55	0.29

(1) Accretion of environmental liabilities and depreciation and amortization are shown separately on the consolidated statements of operations.

(2) Net income in the third quarters of 2019 and 2018 included a $6.1 million and $2.5 million loss on early extinguishment of debt, respectively.

(3) Earnings (loss) per share are computed independently for each of the quarters presented. Accordingly, the quarterly basic and diluted earnings (loss) per share may not equal the total computed for the year.

CLEAN HARBORS, INC. AND SUBSIDIARIES

SCHEDULE II

VALUATION AND QUALIFYING ACCOUNTS

For the Three Years Ended December 31, 2019

(in thousands)

Allowance for Doubtful Accounts	Balance Beginning of Period	Additions Charged to Operating Expense	Deductions from Reserves [1]	Balance End of Period
2017	$ 15,046	$ 7,901	$ 6,774	$ 16,173
2018	16,173	15,817	5,622	26,368
2019	26,368	2,408	6,283	22,493

(1) Amounts deemed uncollectible, net of recoveries.

Revenue Allowance[2]	Balance Beginning of Period	Additions Charged to Revenue	Deductions from Reserves	Balance End of Period
2017	$ 14,203	$ 24,862	$ 27,439	$ 11,626
2018	11,626	41,338	35,017	17,947
2019	17,947	35,549	37,278	16,218

(2) Due to the nature of the Company's businesses and the invoices that result from the services provided, customers may withhold payments and attempt to renegotiate amounts invoiced. In addition, for some of the services provided, the Company's invoices are based on quotes that can either generate credits or debits when the actual revenue amount is known. Based on industry knowledge and historical trends, the Company records a revenue allowance accordingly. This practice causes the volume of activity flowing through the revenue allowance during the year to be higher than the balance at the end of the year. Increases in overall sales volumes and the expansion of the customer base in recent years have also increased the volume of additions and deductions to the allowance during the year. The revenue allowance is intended to cover the net amount of revenue adjustments that may need to be credited to customers' accounts in future periods. Management determines the appropriate total revenue allowance by evaluating the following factors on a customer-by-customer basis as well as on a consolidated level: trends in adjustments to previously billed amounts, existing economic conditions and other information as deemed applicable. Revenue allowance estimates can differ materially from the actual adjustments, but historically the revenue allowance has been sufficient to cover the net amount of the reserve adjustments issued in subsequent reporting periods.

Valuation Allowance on Deferred Tax Assets	Balance Beginning of Period	Additions Charged to Income Tax Expense	Other Changes to Reserves	Balance End of Period
2017	$ 55,189	$ 9,052	$ 4,114	$ 68,355
2018	68,355	10,466	474	79,295
2019	79,295	4,459	(111)	83,643

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Based on an evaluation under the supervision and with the participation of our Chief Executive Officer and Chief Financial Officer, as of the end of the period covered by this Annual Report on Form 10-K, our Chief Executive Officer and Chief Financial Officer have concluded that our disclosure controls and procedures (as defined under Rule 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the "Exchange Act")) were effective as of December 31, 2019 to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in Securities and Exchange Commission rules and forms and is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

Management's Annual Report on Internal Control Over Financial Reporting

The Company's management is responsible for establishing and maintaining adequate internal control over financial reporting, as that term is defined in Exchange Act Rule 13a-15(f). Under the supervision and with the participation of the Company's management, including the Chief Executive Officer and Chief Financial Officer, the Company conducted an evaluation of its internal control over financial reporting based on the framework in *Internal Control—Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

The Company's management evaluated the effectiveness of Clean Harbors internal control over financial reporting as of December 31, 2019. Based on their evaluation under the framework in *Internal Control—Integrated Framework (2013)*, the Company's management concluded that the Company maintained effective internal control over financial reporting as of December 31, 2019 based on the criteria in the *Internal Control—Integrated Framework (2013)*.

Deloitte & Touche LLP, the independent registered public accounting firm that audited the Company's consolidated financial statements, has issued an attestation report on the effectiveness of the Company's internal control over financial reporting as of December 31, 2019, which is included below in this Item 9A of this Annual Report on Form 10-K.

Changes in Internal Control over Financial Reporting

There were no changes in the Company's internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Exchange Act Rules 13a-15 or 15d-15 that was conducted during the quarter ended December 31, 2019 that have materially affected, or are reasonably likely to materially affect, the Company's internal control over financial reporting.

Limitations on the Effectiveness of Controls

The Company's management, including the Chief Executive Officer and Chief Financial Officer, does not expect that the Company's disclosure controls and procedures or the Company's internal control over financial reporting will prevent all errors and all fraud.

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Further, the design of disclosure controls and procedures and internal control over financial reporting must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations of controls and procedures and internal control over financial reporting, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within the Company have been detected.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the stockholders and the Board of Directors of Clean Harbors, Inc.

Opinion on Internal Control over Financial Reporting

We have audited the internal control over financial reporting of Clean Harbors, Inc. and subsidiaries (the "Company") as of December 31, 2019, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2019, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by COSO.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated financial statements as of and for the year ended December 31, 2019, of the Company and our report dated February 26, 2020 expressed an unqualified opinion on those financial statements.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying *Management's Annual Report on Internal Control over Financial Reporting*. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Deloitte & Touche LLP

Boston, Massachusetts
February 26, 2020

ITEM 9B. OTHER INFORMATION

Not applicable.

PART III

Except for the information set forth below under Item 12 with respect to securities authorized for issuance under the registrant's equity compensation plans, the information called for by Item 10 (Directors, Executive Officers and Corporate Governance), Item 11 (Executive Compensation), Item 12 (Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters), Item 13 (Certain Relationships and Related Transactions and Director Independence) and Item 14 (Principal Accountant Fees and Services) is incorporated herein by reference to the registrant's definitive proxy statement for its 2020 annual meeting of shareholders, which definitive proxy statement will be filed with the Securities and Exchange Commission by April 22, 2020.

For the purpose of calculating the aggregate market value of the voting stock of the registrant held by non-affiliates as shown on the cover page of this report, it has been assumed that the directors and executive officers of the registrant, as will be set forth in the Company's definitive proxy statement for its 2020 annual meeting of shareholders, are the only affiliates of the registrant. However, this should not be deemed to constitute an admission that all of such persons are, in fact, affiliates or that there are not other persons who may be deemed affiliates of the registrant.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

In addition to the information about the security ownership of certain beneficial owners and management and related stockholder matters which is incorporated herein by reference to the Company's definitive proxy statement for the Company's 2020 annual meeting of shareholders, the following table includes information as of December 31, 2019 regarding shares of common stock authorized for issuance under the Company's equity compensation plan. The Company's shareholders previously approved the plan.

Plan Category	Number of securities to be issued upon exercise of outstanding options and rights(a)	Weighted average exercise price of outstanding options and rights(b)	Number of securities remaining available for future issuance under equity compensation plan (excluding securities reflected in column (a))(c)
Equity compensation plan approved by security holders[1]	—	$ —	3,853,811

(1) Includes the Company's 2010 Stock Incentive Plan (the "2010 Plan") under which there were on December 31, 2019 no outstanding options but 3,853,811 shares were available for grant of stock options, stock appreciation rights, restricted stock, restricted stock units and certain other stock-based awards. See Note 17, "Stock-Based Compensation," to the Company's consolidated financial statements included in Item 8, "Financial Statements and Supplementary Data," in this report.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) Documents Filed as a Part of this Report

All other schedules are omitted because they are not applicable, not required, or because the required information is included in the financial statements or notes thereto.

3. Exhibits:

The list of exhibits filed as part of this annual report on Form 10-K is set forth on the Exhibit Index immediately following the signature page to this report, and such Exhibit Index is incorporated herein by reference.

Exhibits to this annual report on Form 10-K have been included only with the copies of the Form 10-K filed with the Securities and Exchange Commission. Upon request to the Company and payment of a reasonable fee, copies of the individual exhibits will be furnished. The Company undertakes to furnish to the Commission upon request copies of instruments (in addition to the exhibits listed below) relating to the Company's acquisitions and long-term debt.

ITEM 16. FORM 10-K SUMMARY

None

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized on February 26, 2020.

CLEAN HARBORS, INC.

By: /s/ ALAN S. MCKIM
Alan S. McKim
Chief Executive Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, this Form 10-K has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/s/ ALAN S. MCKIM Alan S. McKim	Chairman, President and Chief Executive Officer	February 26, 2020
/s/ MICHAEL L. BATTLES Michael L. Battles	Executive Vice President and Chief Financial Officer	February 26, 2020
/s/ ERIC J. DUGAS Eric J. Dugas	Senior Vice President, Finance and Chief Accounting Officer	February 26, 2020
* Gene Banucci	Director	February 26, 2020
* Edward G. Galante	Director	February 26, 2020
* Rod Marlin	Director	February 26, 2020
* John T. Preston	Director	February 26, 2020
* Andrea Robertson	Director	February 26, 2020
* Thomas J. Shields	Director	February 26, 2020
* Lauren C. States	Director	February 26, 2020
* John R. Welch	Director	February 26, 2020
* Robert Willett	Director	February 26, 2020

*By: /s/ ALAN S. MCKIM
Alan S. McKim
Attorney-in-Fact

EXHIBIT INDEX

Item No.	Description	Location
2.1	Acquisition Agreement by and between Safety-Kleen Services, Inc., as Seller, and Clean Harbors, Inc., as Purchaser, dated as of February 22, 2002	(1)
2.2	First Amendment to Acquisition Agreement by and between Safety-Kleen Services, Inc., as Seller, and Clean Harbors, Inc., as Purchaser, dated as of March 8, 2002	(2)
2.3	Second Amendment to Acquisition Agreement by and between Safety-Kleen Services, Inc. as Seller, and Clean Harbors, Inc. as Purchaser, dated as of April 30, 2002	(3)
2.4	Third Amendment to Acquisition Agreement by and between Safety-Kleen Services, Inc., as Seller, and Clean Harbors, Inc., as Purchaser, dated as of September 6, 2002	(4)
2.5	Fourth Amendment to Acquisition Agreement by and between Safety-Kleen Services, Inc., as Seller and Clean Harbors, Inc., as Purchaser, dated as of July 14, 2003	(5)
2.6	Agreement and Plan of Merger dated as of October 26, 2012 among Safety-Kleen, Inc., Clean Harbors, Inc., and CH Merger Sub, Inc.	(6)
3.1A	Restated Articles of Organization of Clean Harbors, Inc.	(7)
3.1B	Articles of Amendment [as filed on May 9, 2011] to Restated Articles of Organization of Clean Harbors	(8)
3.4D	Amended and Restated By-Laws of Clean Harbors, Inc.	(9)
3.4E	Description of rights of holders of Clean Harbors, Inc. common stock	(10)
4.34	Fifth Amended and Restated Credit Agreement dated as of November 1, 2016 among Clean Harbors, Inc., as the U.S. Borrower, Clean Harbors Industrial Services Canada, Inc., as the Canadian Borrower, Bank of America, N.A., as Administrative Agent, and the Lenders party thereto	(11)
4.34B	Amended and Restated Security Agreement (Canadian Domiciled Loan Parties) dated as of November 1, 2016 among Clean Harbors Industrial Services Canada, Inc., as the Canadian Borrower and a Grantor, the subsidiaries of Clean Harbors, Inc. listed on Annex A thereto or that thereafter become a party thereto as Grantors, and Bank of America, N.A., as Agent	(11)
4.34C	Amended and Restated Guarantee (U.S. Domiciled Loan Parties-U.S. Facility Obligations) dated as of November 1, 2016 executed by the U.S. Domiciled Subsidiaries of Clean Harbors, Inc. named therein in favor of Bank of America, N.A., as Agent for itself and the other U.S. Facility Secured Parties	(11)
4.34D	Amended and Restated Guarantee (Canadian Domiciled Loan Parties-Canadian Facility Obligations) dated as of November 1, 2016 executed by the Canadian Domiciled Subsidiaries of Clean Harbors, Inc. named therein in favor of Bank of America, N.A., as Agent for itself and the other Canadian Facility Secured Parties	(11)
4.34E	Amended and Restated Guarantee (U.S. Domiciled Loan Parties-Canadian Facility Obligations) dated as of November 1, 2016 executed by Clean Harbors, Inc. and the U.S. Domiciled Subsidiaries of Clean Harbors, Inc. named therein in favor of Bank of America, N.A., as Agent for itself and the other Canadian Facility Secured Parties	(11)
4.34F	First Amendment to Credit Agreement, dated as of June 30, 2017, by and among Clean Harbors, Inc., Clean Harbors Industrial Services Canada, Inc., the other Loan Parties party thereto, certain of the Lenders party thereto, which constitute the “Required Lenders”, and Bank of America, N.A., as Administrative Agent	(12)
4.34G	Second Amended and Restated Security Agreement (U.S. Domiciled Loan Parties) dated as of June 30, 2017, among Clean Harbors, Inc., as the U.S. Borrower and a Grantor, the subsidiaries of Clean Harbors, Inc. listed on Annex A thereto or that thereafter become a party thereto as Grantors, and Bank of America, N.A., as Agent	(12)
4.34H	Second Amendment to Credit Agreement, dated as of July 19, 2018, by and among Clean Harbors, Inc., Clean Harbors Industrial Services Canada, the Other Loan Parties party thereto, certain of the Lenders party thereto which constitute the “Required Lenders,” and Bank of America, N.A., as Agent.	(13)
4.34I	Third Amendment to Credit Agreement, dated as of July 2, 2019, by and among Clean Harbors, Inc., Clean Harbors Industrial Services Canada, Inc., the Other Loan Parties party thereto, certain of the Lenders party thereto which constitute the “Required Lenders,” and Bank of America, N.A., as Agent	(14)
4.34J	Fourth Amendment to Credit Agreement, dated as of February 20, 2020, by and among Clean Harbors, Inc., Clean Harbors Industrial Services Canada, Inc., the Other Loan Parties party thereto, certain of the Lenders party thereto which constitute the "Required Lenders," and Bank of America, N.A., as Agent	Filed herewith

Item No.	Description	Location
4.43	Credit Agreement dated as of June 30, 2017, among the Financial Institutions party thereto, as Lenders, Goldman Sachs Lending Partners LLC, as Administrative Agent and Collateral Agent, Clean Harbors, Inc., as Borrower, and the Loan Guarantors from time to time party thereto	(12)
4.43A	Security Agreement dated as of June 30, 2017, among Clean Harbors, Inc. and its subsidiaries listed on Annex A thereto or that become a party thereto as the Grantors, and Goldman Sachs Lending Partners LLC, as the Agent	(12)
4.43B	First Amendment to Credit Agreement dated as of June 30, 2017, among the Financial Institutions party thereto, as Lenders, Goldman Sachs Lending Partners LLC, as Administrative Agent and Collateral Agent, Clean Harbors, Inc., as Borrower, and the Loan Guarantors from time to time party thereto.	(15)
4.43C	Incremental Facility Amendment dated July 19, 2018, to Credit Agreement dated as of June 30, 2017, among the Financial Institutions party thereto, as Lenders, Goldman Sachs Lending Partners LLC, as Administrative Agent and Collateral Agent, Clean Harbors, Inc., as Borrower, and the Loan Guarantors from time to time party thereto	(13)
4.44	Intercreditor Agreement dated as of June 30, 2017, among Clean Harbors, Inc., and the subsidiaries of Clean Harbors, Inc. listed on the signature pages thereto (together with any subsidiary that becomes a party thereto after the date thereof), Bank of America, N.A., as the Initial ABL Agent, and Goldman Sachs Lending Partners LLC, as agent under the Term Loan Agreement	(12)
4.45	Indenture dated as of July 2, 2019, among Clean Harbors, Inc., as Issuer, the subsidiaries of Clean Harbors, Inc. named therein as Guarantors, and U.S. Bank National Association, as Trustee	(14)
10.43*	Key Employee Retention Plan	(16)
10.43A*	Form of Severance Agreement under Key Employee Retention Plan with Confidentiality and Non-Competition Agreement	(17)
10.52C*	Clean Harbors, Inc. Management Incentive Plan [as amended and restated effective January 1, 2017]	(18)
10.54*	Clean Harbors, Inc. 2010 Stock Incentive Plan [as amended on May 10, 2010]	(19)
10.54A*	Revised form of Restricted Stock Award Agreement [Non-Employee Director] [for use under 2010 Stock Incentive Plan]	(17)
10.54B*	Revised form of Restricted Stock Award Agreement [Employee] [for use under Clean Harbors, Inc. 2010 Stock Incentive Plan]	(17)
10.54C*	Revised form of Performance-Based Restricted Stock Award Agreement [for use under Clean Harbors, Inc. 2010 Stock Incentive Plan]	(17)
10.54D*	Amendment to Section 8 and 10(i) of the Company's 2010 Stock Incentive Plan	(20)
10.56*	Mike Battles accepted offer letter effective as of January 6, 2016	(21)
10.57*	Clean Harbors, Inc. 2019 CEO Annual Incentive Bonus Plan	(22)
21	Subsidiaries	Filed herewith
23	Consent of Independent Registered Public Accounting Firm	Filed herewith
24	Power of Attorney	Filed herewith
31.1	Rule 13a-14a/15d-14(a) Certification of the CEO Alan S. McKim	Filed herewith
31.2	Rule 13a-14a/15d-14(a) Certification of the CFO Michael L. Battles	Filed herewith
32	Section 1350 Certifications	Filed herewith
101	The following materials from the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2019, formatted in iXBRL (Inline eXtensible Business Reporting Language): (i) Consolidated Balance Sheets, (ii) Consolidated Statements of Operations, (iii) Consolidated Statements of Comprehensive Income, (iv) Consolidated Statements of Cash Flows, (v) Consolidated Statements of Stockholders' Equity and (vi) Notes to Consolidated Financial Statements, tagged as blocks of text	(23)
104	Cover page from the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2019, formatted in iXBRL and contained in Exhibit 101.	

* A "management contract or compensatory plan or arrangement" filed as an exhibit to this report pursuant to Item 15(a)(3) of Form 10-K.

(1) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on February 28, 2002.

(2) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-K Annual Report for the Year ended December 31, 2001.

(3) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-Q Quarterly Report for the Quarterly Period ended March 31, 2002.

(4) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on September 25, 2002.

(5) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-Q Quarterly Report for the Quarterly Period ended June 30, 2003.

(6) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on October 31, 2012.

(7) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on May 19, 2005.

(8) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on May 12, 2011.

(9) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on December 22, 2014.

(10) Incorporated by reference to prospectus supplement dated November 28, 2012 filed on November 28, 2012 under the Company's Registration Statement on Form S-3 (File No. 333-185141).

(11) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on November 2, 2016.

(12) Incorporated by reference to the similarly numbered exhibit to the Company's 8-K Report filed on June 30, 2017.

(13) Incorporated by reference to the similarly numbered exhibit to the Company's Report on Form 8-K filed on July 20, 2018.

(14) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on July 3, 2019.

(15) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on April 17, 2018.

(16) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-Q Quarterly Report for the quarterly period ended March 31, 1999.

(17) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-K Annual Report for the Year ended December 31, 2010.

(18) Incorporated by reference to Appendix B to the Company's definitive proxy statement for its 2017 annual meeting of shareholders filed on April 26, 2017.

(19) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on May 14, 2010.

(20) Incorporated by reference to Appendix B to the Company's definitive proxy statement for its annual meeting of shareholders filed on March 22, 2013.

(21) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on January 11, 2016.

(22) Incorporated by reference to Appendix A to the Company's definitive proxy statement for its 2019 annual meeting of shareholders filed on April 24, 2019.

(23) These interactive data files are furnished herewith and deemed not filed or part of a registration statement or prospectus for purposes of Sections 11 or 12 of the Securities Act of 1933, as amended, are deemed not filed for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, and otherwise are not subject to liability under those sections.

Form 10-K
Copies of the Company's Annual Report on Form 10-K for the year ended December 31, 2019, filed with the Securities and Exchange Commission on February 26, 2020, may be obtained without charge online at www.cleanharbors.com, or by writing to our corporate headquarters:

42 Longwater Drive
P.O. Box 9149
Norwell, MA 02061-9149
Attention: Investor Relations
781.792.5100

Annual Shareholders Meeting
Wednesday, June 3, 2020
10:00 a.m. EDT
Clean Harbors Corporate Headquarters
42 Longwater Drive
Norwell, MA 02061

Auditors
Deloitte & Touche LLP
200 Berkeley Street
Boston, MA 02116

Secretary of the Corporation
C. Michael Malm, Esq.
Davis, Malm & D'Agostine, P.C.

Corporate Counsel
Davis, Malm & D'Agostine, P.C.
One Boston Place
Boston, MA 02108

Transfer Agent
American Stock Transfer &
Trust Company
6201 15th Avenue
New York, NY 11219
800.937.5449

Corporate Headquarters
42 Longwater Drive
P.O. Box 9149
Norwell, MA 02061-9149
781.792.5000
www.cleanharbors.com

Common Stock

Our common stock trades on the New York Stock Exchange (NYSE) under the symbol CLH. On February 19, 2020, there were 261 stockholders of record of our common stock, excluding stockholders whose shares were held in nominee, or "street name" accounts through brokers or banks. On our last record date, 21,644 additional stockholders beneficially held shares in street name accounts.

We have never declared nor paid any cash dividends on our common stock, and we do not intend to pay any dividends on our common stock in the foreseeable future. We intend to retain our future earnings, if any, for use in the operation and expansion of our business, payment of our outstanding debt and the continuation of our stock repurchase program. In addition, our current credit agreement and indentures limit the amount we could pay as cash dividends on, or for the repurchase of, our common stock.

Safe Harbor Statement

Any statements contained herein that are not historical facts are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. These forward-looking statements are generally identifiable by use of the words "believes," "expects," "intends," "anticipates," "plans to," "seeks," "should," "estimates," "projects," "may," "likely," or similar expressions. Such statements may include, but are not limited to, statements about future financial and operating results, the Company's plans, objectives, expectations and intentions and other statements that are not historical facts. Forward-looking statements are neither historical facts nor assurances of future performance. Such statements are based upon the beliefs and expectations of Clean Harbors' management as of this date only and are subject to certain risks and uncertainties that could cause actual results to differ materially, including, without limitation, the risks and uncertainties surrounding COVID-19 and the related impact on our business, and those items identified as "Risk Factors" in Clean Harbors' most recently filed Form 10-K and Form 10-Q. Therefore, readers are cautioned not to place undue reliance on these forward-looking statements. Our actual results and financial condition may differ materially from those indicated in the forward-looking statements. Clean Harbors undertakes no obligation to revise or publicly release the results of any revision to these forward-looking statements other than through its filings with the Securities and Exchange Commission, which may be viewed in the "Investors" section of the Clean Harbors website.

Clean Harbors is an Affirmative Action/Equal Opportunity Employer.

CLEAN HARBORS, INC.
42 Longwater Drive,
P.O. BOX 9149
Norwell, MA 02061-9149
781.792.5000
www.cleanharbors.com

ANNUAL REPORT 2018

PEOPLE AND TECHNOLOGY CREATING A SAFER, CLEANER ENVIRONMENT

CleanHarbors

2018 BY THE NUMBERS

$3.3B
REVENUE
Up $355M compared to last year

$491M
ADJUSTED EBITDA
15% higher than the prior year

$195M+
ADJUSTED FREE CASH FLOW
$55M more than in 2017

150M
Gallons of base oil produced

487K
TONS
of hazardous materials incinerated

SAFETY
Lowest incident rate in company history

Strengthening our position as the leading provider of environmental, energy and industrial services

Clean Harbors delivered a strong financial performance in 2018. Our continued focus on business fundamentals, strategic initiatives and investments enabled us to take better advantage of improved market conditions. The result has been profitable growth and further expansion of our industry leadership.

We expanded our talented workforce in 2018 through acquisitions synergistically aligned with our business. Our 15,000 highly-trained employees are our most valuable asset and they continue to exceed expectations. With safety as our number one priority and our continuous investments in technology, we set a record for safety in 2018, achieving the lowest incident rate in our history.

During 2018, we drove sizeable volumes of higher value waste streams, taking advantage of increased manufacturing, industrial and chemical production in the U.S. Our Safety-Kleen business collected 234 million gallons of waste oil while also producing a record 150 million gallons of base oil.

In 2019, we will continue to reinvest in our people as we expect to continue to grow given the favorable industry trends supporting our business.

In 2018, Clean Harbors acquired Veolia's U.S. Industrial Services Business.

Veolia acquisition added:

- +1,300 employees
- +60 locations
- +600 fleet/units

About Clean Harbors

Clean Harbors (NYSE: CLH) is North America's leading provider of environmental, energy and industrial services. The Company serves a diverse customer base, including a majority of the Fortune 500, across the chemical, energy, manufacturing and additional markets as well as numerous government agencies. These customers rely on Clean Harbors to deliver a broad range of services, such as end-to-end hazardous waste management, emergency spill response, industrial cleaning and maintenance, and recycling. Through its Safety-Kleen subsidiary, Clean Harbors is also North America's largest re-refiner and recycler of used oil and a leading provider of parts washers and environmental services to commercial, industrial and automotive customers. Founded in 1980 and based in Massachusetts, Clean Harbors operates throughout the United States, Canada, Mexico and Puerto Rico. For more information, visit www.cleanharbors.com.

TO OUR SHAREHOLDERS

Dear Shareholders:

In 2018, Clean Harbors achieved strong profitable growth and record free cash flows as we benefited from strategic initiatives and investments, including the acquisition of Veolia's U.S. Industrial Services business. Our 2018 results were also driven by favorable economic conditions and improving market fundamentals such as the upswing in U.S. industrial production. At the same time, a rise in base oil and lubricant pricing contributed to the steady performance of our Safety-Kleen segment.

With both our segments generating improved results, we delivered a $355 million increase in revenue, to $3.3 billion. We achieved Adjusted EBITDA of $491 million, 15 percent higher than in the prior year. Growing our Adjusted EBITDA more rapidly than revenues also led to a 40 basis point improvement in our EBITDA margins, demonstrating our ability to leverage our network of assets. In 2018, we generated adjusted free cash flow of $195.3 million, or $55 million more than 2017.

Record Safety Performance

At Clean Harbors, safety is our number one priority and one of our five Core Values. Every single employee is required to embrace our "Safety Starts with Me: Live It 3-6-5" philosophy, with the ultimate goal of no one getting hurt. In 2018, we took an important step toward that goal by delivering the lowest incident rate in our history. Despite our record success last year, we know we can and must do better in order to reach our ultimate goal of zero incidents. We actively manage our safety programs to ensure that each one of our employees goes home uninjured every night. We intend to redouble our efforts around safety this year and set a new record in 2019.

Improving the Mix in our Disposal Network

One of our primary success factors in 2018 was our ability to attract and drive higher value waste streams into our disposal assets. This strategy was supported by favorable market conditions, specifically increases in manufacturing and industrial production and continued expansion of the U.S. chemical industry. These trends should continue in the years ahead given the availability of low natural gas prices and the current tax and tariff policies that support domestic growth.

Our new El Dorado, Arkansas incinerator was designed to meet the highest regulatory emission standards and it features the most advanced pollution-control technology of any hazardous waste plant in North America. In 2018, the El Dorado location ran at 95% utilization – up from 85% a year ago – demonstrating this location's capabilities and how well it ran in its second year of operation.

When we look at the verticals that drove our business in 2018, the chemical and manufacturing sectors accounted for nearly one-third of all our revenue. We expect that number to continue to increase given the multi-year expansion plans for both industries in the United States and the types of high hazardous waste that they typically generate.

Strategic Acquisitions and Divestitures in 2018

Clean Harbors has a proven track record for acquiring and integrating businesses while maximizing synergies realized in these transactions. In early 2018 we acquired Veolia's U.S. industrial services business for approximately $125 million. This business added 1,300 employees, 60 locations, a blue-chip customer base and a sizeable fleet of vehicles and specialized equipment. It provided us with increased scale and capabilities to serve our customers while also directing incremental waste volumes into our disposal network. We believe this transaction will enhance long-term shareholder value and continue to support our profitable growth momentum.

Later in the year, we acquired Cyn Environmental, a small Massachusetts-based company that supports our environmental services and waste oil collection businesses. Their locations include a Part B oil terminal outside Boston and a PCB storage facility in New Hampshire that have been welcome additions to our network.

While we continue to look for attractive bolt-on acquisitions like Cyn, we also seek to prune our business portfolio when appropriate, by divesting smaller non-core assets or businesses where we believe we may not be the natural long-term owners of such operations. In line with this strategy, in late 2018 we sold the assets belonging to our lodging manufacturing operation in Western Canada.

Growing SK, Managing the Spread and Driving Blended Gallons

Another key element behind our 2018 success was the continued growth and the operational efficiencies of our Safety-Kleen segment, driven by the steady contributions of its branch operations

"With both our segments generating improved results, we delivered a $355 million increase in revenue, to $3.3 billion. We achieved Adjusted EBITDA of $491 million, 15 percent higher than in the prior year."

Alan S. McKim
Chairman, President and Chief Executive Officer

and an improved performance in the SK Oil business. The Safety-Kleen team leveraged many of the acquisitions we completed in 2016 and 2017 in order to effectively cross-sell our core SK services. Those acquired assets also helped us manage the spread between the waste oil we collect and the price we receive for base oil. The team did a remarkable job at not only maintaining that spread in 2018 but expanding it, despite some variability in base oil pricing over the course of the year. Safety-Kleen branches collected 234 million gallons of waste oil in 2018, while maintaining a net charge for oil position on those collections as we optimized our cost per gallon. During the year, our re-refineries ran well while setting a record level of production, generating 150 million gallons of base oil.

In addition to growing the core lines of business within its branches, our long-term strategy for Safety-Kleen is to shift the re-refinery portion of the business away from commodity base oil, which tends to be volatile, and sell more blended lubricants. To realize that vision, in 2017 we launched Safety-Kleen's OilPlus™ closed loop offering – selling and delivering our Performance Plus brand of lubricants directly to customers, offering them a high-quality recycled oil product. In 2018, we grew the volumes sold associated with that initiative by 70% to more than nine million gallons and distributed these products to more than 27,000 customers. While we had even more ambitious internal targets, our OilPlus™ offering continues to gain traction and we are steadily expanding our market presence. Interest levels for our collection services and oil products remain high and given the strength of our value proposition for our customers, we expect the closed loop to continue to grow and create value for our shareholders in the years ahead.

As we look to 2019 within our blended business, we are prioritizing the strengthening of our relationships with wholesale distribution partners. We have a comprehensive effort underway to reinvigorate the amount of blended gallons we sell through this channel. For 2019, we intend to increase our total blended gallons by more than 25%, to 50 million blended gallons sold, with about half of the increase coming from the closed loop and the remainder from our distributor partnerships.

Enhancing our Debt Structure

In 2018, we refinanced a portion of our long-term debt. We took advantage of favorable conditions in the debt markets and strong demand for our debt offering to replace $400 million of fixed senior notes due in 2020 with $350 million of variable Term Loan B debt, as well as $50 million in borrowings from our revolver. During the fourth quarter, in consideration of our cash on hand and the loan environment, we thought it prudent to slightly de-lever, and elected to repay the $50 million portion we borrowed on our revolver. At current rates, our 2018 refinancing activity provides for approximately $4 million in interest expense savings on an annualized basis while also providing us with greater financial flexibility. We ended 2018 with a net debt to EBITDA ratio of 2.6x. We will continue to actively manage our debt portfolio going forward to maintain an optimal structure.

Additional Investments in Our Team

We recognize that our highly skilled team of 15,000 employees is our most valuable asset and remains the backbone of our organization. We would not have had the success we had in 2018 without their collective efforts and valuable contributions. During the year, we embarked on a strategy to reinvest in our workforce through greater benefits, including a 401K match program, increases in healthcare benefits and driver retention programs. Those initiatives resulted in an additional $30 million invested in our team compared to the prior year. Those investments in our employees will continue in 2019 as we more than double our 401K contributions, absorb all healthcare cost increases and support other benefits.

Additionally, Clean Harbors is dedicated to developing and investing in the latest technologies relative to our equipment needs, in order to deliver the safest and most technologically advanced equipment to our workforce. Not only will this allow us to deliver superior services to our customers but it will also help us to retain and attract the best workforce in our industry. These investments remain critical if we are to succeed over the long term, particularly given the current tight labor market and the availability of drivers.

Business Outlook

We entered 2019 on an upward trajectory that will support our planned profitable growth. The external economic environment remains positive for us as the underlying dynamics of our primary markets are encouraging. Ongoing growth of the U.S. chemical and manufacturing sectors is among the favorable trends that should support a continued rise in high-value waste streams entering our disposal facilities. We see a robust pipeline of remediation and waste project opportunities as customers are more willing to fund these larger-scale projects. Within industrial services, we will benefit from our second year owning Veolia's U.S. Industrial Services business. We expect Safety-Kleen to continue to grow in 2019 through its core branch offerings, re-refinery network, direct lube sales program and renewed efforts with distributors. We expect another year of strong cash flow generation in 2019 and will continue to be judicious with our capital and allocate it to areas where we believe we will generate the best returns for our shareholders.

On behalf of our management team and Board of Directors, I want to offer my sincere thanks to our talented team of individuals, for producing the strong results we achieved in 2018. And to our shareholders and customers, we extend our appreciation for the confidence you have placed in Clean Harbors. We are excited about our prospects given the multiple favorable industry trends supporting our business. We look forward to a year of strong profitable growth and free cash flow generation in 2019.

Sincerely,

Alan S. McKim
Chairman, President and Chief Executive Officer
Clean Harbors, Inc.
March 31, 2019

SELECTED FINANCIAL DATA

For the Year Ended December 31 *(in thousands, except per share amounts)*

Income Statement Data:	2018	2017	2016	2015	2014
Revenues	$ 3,300,303	$ 2,944,978	$ 2,755,226	$ 3,275,137	$ 3,401,636
Cost of revenues (exclusive of items shown separately below)	2,305,551	2,062,673	1,932,857	2,356,806	2,441,796
Selling, general and administrative expenses	503,747	456,648	422,015	414,164	437,921
Accretion of environmental liabilities	9,806	9,460	10,177	10,402	10,612
Depreciation and amortization	298,625	288,422	287,002	274,194	276,083
Goodwill impairment charge	—	—	34,013	31,992	123,414
Income from operations	182,574	127,775	69,162	187,579	111,810
Other (expense) income, net	(4,510)	(6,119)	6,195	(1,380)	4,380
Loss on early extinguishment of debt	(2,488)	(7,891)	—	—	—
Gain on sale of businesses	—	30,732	16,884	—	—
Interest expense, net	(81,094)	(85,808)	(83,525)	(76,553)	(77,668)
Income before provision (benefit) for income taxes	94,482	58,689	8,716	109,646	38,522
Provision (benefit) for income taxes	28,846	(42,050)	48,589	65,544	66,850
Net income (loss) (1)	$ 65,636	$ 100,739	$ (39,873)	$ 44,102	$ (28,328)
Earnings (loss) per share (1) :					
Basic	$ 1.17	$ 1.77	$ (0.69)	$ 0.76	$ (0.47)
Diluted	$ 1.16	$ 1.76	$ (0.69)	$ 0.76	$ (0.47)
Cash Flow Data:					
Net cash from operating activities	$ 373,210	$ 285,698	$ 259,624	$ 396,383	$ 297,366
Net cash used in investing activities	(349,659)	(203,267)	(361,777)	(350,642)	(258,294)
Net cash (used in) from financing activities	(110,997)	(72,760)	220,235	(90,179)	(93,945)
Other Financial Data:					
Adjusted EBITDA (2)	$ 491,005	$ 425,657	$ 400,354	$ 504,167	$ 521,919
Adjusted Free Cash Flow (3)	$ 195,311	$ 140,238	$ 61,057	$ 145,382	$ 47,917

At December 31 *(in thousands)*

Balance Sheet Data:	2018	2017	2016	2015	2014
Working capital	$ 599,880	$ 650,239	$ 588,203	$ 404,076	$ 553,962
Total assets	3,738,321	3,706,570	3,681,920	3,431,428	3,689,423
Long-term obligations (including current portion)	1,572,556	1,629,537	1,633,272	1,382,543	1,380,681
Stockholders' equity	1,169,756	1,188,202	1,084,241	1,096,282	1,262,871

1. *The 2018 results include a $2.5 million pre-tax loss on early extinguishment of debt. The 2017 results include a net benefit of $93.0 million resulting from impacts of the tax law changes enacted in December of 2017, a $7.9 million pre-tax loss on early extinguishment of debt and a $30.7 million pre-tax gain on the sale of a non-core line of business within our Environmental Services segment. The 2016 results include a $34.0 million goodwill impairment charge and a $16.9 million pre-tax gain on the sale of a non-core line of business within our Environmental Services segment. The 2015 results include a $32.0 million goodwill impairment charge in our Environmental Services segment, and the 2014 results include a $123.4 million goodwill impairment charge in our Safety-Kleen segment. In 2016, we did not record any income tax benefit as a result of the goodwill impairment charge. In 2015 and 2014, we recorded income tax benefits of $2.0 million and $2.7 million, respectively, as a result of the goodwill impairment charges.*
2. *See "Adjusted EBITDA" under Item 6, "Selected Financial Data," on page 26 of the Annual Report on Form 10-K, incorporated herein, for a reconciliation of net income (loss) to Adjusted EBITDA.*
3. *See "Adjusted Free Cash Flow" under Item 7, "Management's Discussion and Analysis," on page 36 of the Annual Report on Form 10-K, incorporated herein, for a reconciliation of net cash from operating activities to adjusted free cash flow.*

EXECUTIVE OFFICERS & DIRECTORS

Executive Officers

Alan S. McKim
Chairman, President and Chief Executive Officer

Michael L. Battles
Executive Vice President and Chief Financial Officer

George L. Curtis
Executive Vice President, Pricing and Proposals*

Eric J. Dugas
Senior Vice President, Finance and Chief Accounting Officer

Sharon M. Gabriel
Executive Vice President and Chief Information Officer*

Eric W. Gerstenberg
Chief Operating Officer*

Robert Johnston
President of Oil and Gas*

Jeffrey H. Knapp
Executive Vice President and Chief Human Resources Officer*

Robert E. Speights
Executive Vice President and Chief Sales Officer*

Michael J. Twohig
Executive Vice President, Safety and Risk Management*

David J. Vergo
President, Safety-Kleen*

Brian P. Weber
Executive Vice President, Corporate Planning and Development*

**Officer of a wholly owned subsidiary of the parent holding company, Clean Harbors, Inc.*

Directors

Alan S. McKim
Chairman, President and Chief Executive Officer

Dr. Gene Banucci
Lead Director

Edward G. Galante
Director

Rod Marlin
Director

John T. Preston
Director

Andrea Robertson, CPA
Director

Thomas J. Shields
Director

Lauren C. States
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Director

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the fiscal year ended December 31, 2018
OR
☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the transition period from to .

COMMISSION FILE NO. 001-34223

CLEAN HARBORS, INC.

(Exact name of registrant as specified in its charter)

Massachusetts (State or other jurisdiction of incorporation or organization)	**04-2997780** (IRS Employer Identification No.)
42 Longwater Drive, Norwell, MA (Address of principal executive offices)	**02061-9149** (Zip Code)

Registrant's telephone number: (781) 792-5000

Securities registered pursuant to Section 12(b) of the Securities Exchange Act of 1934:

Title of each class:	Name of each exchange on which registered:
Common Stock, $.01 par value	New York Stock Exchange

Securities registered pursuant to Section 12(g) of the Securities Exchange Act of 1934: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange Act. Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding twelve months (or for such shorter period that the registrant was required to file such reports) and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ☒ No ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of the registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of “large accelerated filer,” “accelerated filer,” “smaller reporting company,” and "emerging growth company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer ☒	Accelerated filer ☐
Non-accelerated filer ☐	Smaller reporting company ☐
	Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

On June 29, 2018 (the last business day of the registrant's most recently completed second fiscal quarter), the aggregate market value of the voting and non-voting common stock of the registrant held by non-affiliates of the registrant was approximately $2.9 billion, based on the closing price of such common stock as of that date on the New York Stock Exchange. Reference is made to Part III of this report for the assumptions on which this calculation is based.

On February 15, 2019, there were outstanding 55,855,142 shares of Common Stock, $.01 par value.

DOCUMENTS INCORPORATED BY REFERENCE

Certain portions of the registrant's definitive proxy statement for its 2019 annual meeting of stockholders (which will be filed with the Commission not later than April 30, 2019) are incorporated by reference into Part III of this report.

CLEAN HARBORS, INC.

ANNUAL REPORT ON FORM 10-K

YEAR ENDED DECEMBER 31, 2018

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Disclosure Regarding Forward-Looking Statements

In addition to historical information, this annual report contains forward-looking statements, which are generally identifiable by use of the words "believes," "expects," "intends," "anticipates," "plans to," "estimates," "projects," or similar expressions. These forward-looking statements are subject to certain risks and uncertainties that could cause actual results to differ materially from those reflected in these forward-looking statements. Factors that might cause such a difference include, but are not limited to, those discussed in this report under Item 1A, "Risk Factors," and Item 7, "Management's Discussion and Analysis on Financial Condition and Results of Operations." Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect management's opinions only as of the date hereof. We undertake no obligation to revise or publicly release the results of any revision to these forward-looking statements. Readers should also carefully review the risk factors described in other documents which we file from time to time with the Securities and Exchange Commission (the "SEC"), including the quarterly reports on Form 10-Q to be filed by us during 2019.

PART I

ITEM 1. BUSINESS

General

Clean Harbors, Inc. and its subsidiaries (collectively, "we," "Clean Harbors" or the "Company") is a leading provider of environmental, energy and industrial services throughout North America. We are also the largest re-refiner and recycler of used oil in the world and the largest provider of parts cleaning and related environmental services to commercial, industrial and automotive customers in North America.

During the first quarter of fiscal year 2018, certain of our businesses undertook a reorganization which included changes to the underlying business and management structures. The reorganization resulted in combining the Environmental Services businesses from an operational and management perspective, deepening customer relationships and allowing for efficiencies across our operations through the sharing of resources, namely labor and equipment, which will reduce third party spending and promote cross selling of our business offerings. In connection with this reorganization, our chief operating decision maker requested changes in the information that he regularly reviews for purposes of allocating resources and assessing performance. These changes required a reconsideration of our operating segments in the first quarter of 2018 and resulted in a change in our assessment of our operating segments. We concluded that we now have two operating segments for disclosure purposes*;* (i) the Environmental Services segment which consists of our historical Technical Services, Industrial Services, Field Services and Oil, Gas and Lodging businesses, and (ii) the Safety-Kleen segment.

- **Environmental Services -** Environmental Services segment results are predicated upon the demand by our customers for waste services directly attributable to waste volumes generated by them and project work for which waste handling and/or disposal is required. In managing the business and evaluating performance, management tracks the volumes and mix of waste handled and disposed of through our owned incinerators and landfills, as well as utilization of such incinerators, labor and billable hours and equipment among other key metrics. Levels of activity and ultimate performance associated with this segment can be impacted by several factors including overall U.S. GDP and U.S. industrial production, weather conditions, efficiency of our operations, competition and market pricing of our services and the management of our related operating costs. Environmental Services results are also impacted by the demand for planned and unplanned industrial related cleaning and maintenance services at customer sites and for environmental cleanup services on a scheduled or emergency basis, including response to national events such as major oil spills, natural disasters or other events where immediate and specialized services are required.

- **Safety-Kleen -** Safety-Kleen segment results are impacted by an array of core service offerings that serve to attract small quantity waste producers as customers and integrate them into the Clean Harbors waste network. Core service offerings include parts washer services, containerized waste services, vac services, used motor oil collection and sale of base and blended oil products as well as complementary products including automotive related fluids and shop supplies. Key performance indicators tracked by the Company relative to these services include the number of parts washer services performed and used motor oil and waste volumes collected. Results from these services are primarily driven by the overall number of parts washers placed at customer sites and volumes of waste collected. These factors can be impacted by overall economic conditions in the marketplace especially in the automotive related area. Safety-Kleen offers high quality base and blended oil products to end users including fleet customers, distributors, and manufacturers of oil products. Relative to these oil related products, management tracks the Company's volumes and relative percentages of base and blended oil sales along with various pricing metrics associated with the commodity driven marketplace. The segment’s results are

significantly impacted by overall market pricing and product mix associated with base and blended oil products and, more specifically, the market prices of Group II base oils, which historically have correlated with overall crude oil prices. Costs incurred in connection with the collection of used oils and other raw materials associated with the segment's oil related products can also be volatile. The implementation of our OilPlus® closed loop initiative resulting in the sale of our renewable oil products directly to our end customers will also impact future operating results.

Clean Harbors, Inc. was incorporated in Massachusetts in 1980 and our principal office is located in Norwell, Massachusetts. We maintain a website at the following Internet address: http://www.cleanharbors.com. Through a link on this website, we provide free access to our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Securities Exchange Act of 1934 as soon as reasonably practicable after electronic filing with the SEC. Our guidelines on corporate governance, the charters for our board committees, and our code of ethics for members of the board of directors, our chief executive officer and our other senior officers are also available on our website, and we will post on our website any waivers of, or amendments to, such code of ethics. Our website and the information contained therein or connected thereto are not incorporated by reference into this annual report.

Health and Safety

Health and Safety is our #1 priority. Employees at all levels of our Company share this philosophy and are committed to ensuring our safety goals are met. Our commitment to health and safety benefits everyone—our employees, our customers, the community, and the environment. In 2018, our successful *Safety Starts With Me: Live It 3-6-5* program, which is a key component in our overall safety approach along with our many other programs, enabled us to achieve a low Total Recordable Incident Rate, or "TRIR;" Days Away, Restricted Activity and Transfer Rate, or "DART;" and Experience Modification Rate, or "EMR." For the year ended December 31, 2018, our Company wide TRIR, DART and EMR were 1.08, 0.63 and 0.58, respectively. For the year ended December 31, 2017, our Company wide TRIR, DART and EMR were 1.34, 0.80 and 0.58, respectively.

In order to protect our employees, continue to lower our incident rates, and satisfy our customers' demands to retain the best service providers with the lowest TRIR, DART and EMR rates, we are fully committed to continuously improving our health and safety performance. All employees recognize the importance of protecting themselves, their fellow employees, their customers, and all those around them from harm. This commitment is supported by the philosophies and Golden Rules of Safety that is the cornerstone of the *Safety Starts with Me: Live It 3-6-5* program. *Live It 3-6-5* is our dedication to the safety of our workers through each and every employee's commitment to our three Safety philosophies, our six Golden Rules of Safety and each employee's five personal reasons why they choose to be safe at work, on the road and at home.

Compliance

We regard compliance with applicable environmental regulations as a critical component of our overall operations. We strive to maintain the highest professional standards in our compliance activities. Our compliance program has been developed for each of our waste management facilities and service centers under the direction of our compliance staff. The compliance staff is responsible for facilities permitting and regulatory compliance, compliance training, transportation compliance, and related record keeping. To ensure the effectiveness of our regulatory compliance program, our compliance staff monitors daily operational activities. We also have an Environmental Health and Safety Compliance Internal Audit Program designed to identify any weaknesses or opportunities for improvement in our ongoing compliance programs. We also perform periodic audits and inspections of the disposal facilities owned by other companies which we utilize.

Our facilities are frequently inspected and audited by regulatory agencies, as well as by customers. Although our facilities have been cited on occasion for regulatory violations, we believe that each of our facilities is currently in substantial compliance with applicable permit requirements.

Strategy

Our strategy is to develop and maintain ongoing relationships with a diversified group of customers that have recurring needs for environmental, energy or industrial services. We strive to be recognized as the premier supplier of a broad range of value-added services based upon quality, responsiveness, customer service, information technologies, breadth of service offerings and cost effectiveness.

The principal elements of our business strategy in no particular order are:

- **Cross-Sell Across Businesses**—We believe the breadth of our service offerings allows us to provide additional services to existing customers and as such, the reorganization that took place during the first quarter of 2018 resulted

in deepening of our customer relationships and promoting the cross selling of such service offerings. We believe we can provide industrial and field services to customers that traditionally have only used our technical services and technical services to customers that use our industrial services or oil and gas field services. At the same time, we see a variety of cross-selling opportunities between our Environmental Services and Safety-Kleen segments. Reflecting this strategy, we have been successfully cross-selling the services of Safety-Kleen, such as parts washers, various cleaning products, recycling services and our OilPlus® closed loop initiative, to legacy Clean Harbors customers. We believe leveraging our ability to cross-sell across our segments will drive additional revenue for our Company.

- **Capture Large-Scale Projects**—We provide turnkey offsite transportation and landfill or incineration disposal services for soil and other contaminated media generated from remediation activities. We also assist remediation contractors and project managers with support services including groundwater disposal, waste disposal, roll-off container management, and many other related services. We believe this will drive incremental waste volume to our existing facilities, thereby increasing utilization and enhancing overall profitability.
- **Expand Throughput Capacity of Existing Facilities**—We operate an extensive network of hazardous waste management facilities and oil re-refineries and have made substantial investments in these facilities, which provide us with significant operating leverage as volumes increase. In addition, there are opportunities to expand waste handling capacity or waste oil processing at these facilities by modifying the terms of the existing permits and by adding equipment and new technology. Through selected permit modifications, we can expand the range of treatment services offered to our customers without the large capital investment necessary to acquire or build new waste management facilities.
- **Pursue Strategic Acquisitions**—We actively pursue selective acquisitions in certain services or market sectors where we believe the acquisitions can enhance and expand our business. We believe that we can expand existing services through strategic acquisitions in order to generate incremental revenues from existing and new customers and to obtain greater market share. In order to maximize synergies, we rapidly integrate our acquisitions into our existing processes. For additional information on our acquisitions, see "Acquisitions and Divestitures" below.
- **Execute Strategic Divestitures**—To complement our acquisition strategy and focus on internal growth, we regularly review and evaluate our existing operations to determine whether our business model should change through the divestiture of certain businesses. Accordingly, from time to time, we divest certain non-core businesses and reallocate our resources to businesses that we believe better align with our long-term strategic direction.
- **Focus on Cost, Pricing and Productivity Initiatives**—We continually seek to increase efficiency and to reduce costs through enhanced technology, process efficiencies and stringent expense management. For instance, in 2018, we successfully undertook, in response to current and expected business conditions, branch consolidations, greater internalization of maintenance costs, procurement and supply chain improvements. Additionally, we seek areas in our business where strategic investment in processes, tools and employees can serve to increase productivity, efficiency and safety compliance.
- **Expand Service Offerings and Geographic Coverage**—We believe our Environmental Services and Safety-Kleen segments have a competitive advantage due to their vast network of locations across North America, particularly in areas where we maintain service locations at or near a treatment, storage and disposal facility, or "TSDF." By opening additional service locations we believe that we can increase our market share within these segments. We believe this will drive additional waste into our existing facilities, thereby increasing utilization and enhancing overall profitability. In addition, our management team continues to assess the competitive landscape in order to identify new business opportunities.

Acquisitions and Divestitures

Acquisitions are an element of our business strategy that involves expansion through the purchase of businesses that complement our existing company and create multiple opportunities for profitable growth.

In 2018, we acquired the U.S. Industrial Cleaning Business of Veolia Environmental Services North America LLC (the "Veolia Business") as well as a privately-owned company for a combined preliminary purchase price of $151.3 million. The acquisitions provide significant scale and industrial services capabilities, while increasing the size of our existing U.S. Industrial Services business. The acquisitions were financed with cash on hand. The Veolia Business is included in our Environmental Services segment while the privately-owned company has components included in both the Environmental Services and Safety-Kleen segments.

In 2017, we acquired Lonestar West Inc. ("Lonestar"), a public company headquartered in Alberta, Canada, for approximately CAD $41.8 million ($33.1 million USD), net of cash acquired. The acquisition price included the assumption of approximately CAD $21.3 million ($16.8 million USD) in outstanding debt, which we subsequently repaid. The acquisition

supports our growth in the daylighting and hydro excavation services markets. In addition to increasing the size of our hydro vac fleet, Lonestar's network of locations provides us with direct access to key geographic markets in both the United States and Canada. The acquired company is included in our Environmental Services segment.

In 2016, we acquired seven businesses for a combined purchase price of $204.8 million, paid in cash and subject to customary post-closing adjustments, which complement our strategy to create a closed loop model as it relates to the sale and distribution of our oil products. These acquisitions also provided us three additional oil re-refineries while also expanding our used motor oil collection network and providing greater blending and packaging capabilities. These acquisitions also provided us with greater access to customers in the West Coast region of the United States and additional locations with Part B permits. Operations of these acquisitions are primarily being integrated across our Safety-Kleen segment, with certain operations also being integrated into our Environmental Services segment.

For additional information relating to our acquisition activities during 2018, 2017 and 2016, see Note 4, "Business Combinations," to our consolidated financial statements included in Item 8 of this report.

Other business transactions also include divestitures based on our ongoing review of portfolio assets to determine the extent to which they are contributing to our objectives and growth strategy.

In 2017 we completed the sale of our Transformer Services business, which was a non-core business previously included within the legacy Technical Services segment, for $45.5 million ($43.4 million net of $2.1 million in transactional related costs) subject to customary post-closing adjustments. In 2016 we completed the sale of our Catalyst Services business, which was a non-core business previously included within the legacy Industrial Services operating segment, for approximately $50.6 million ($49.2 million net of cash retained by the catalyst services business) subject to customary post-closing adjustments. For additional information relating to these divestitures, see Note 5, "Disposition of Businesses," to our consolidated financial statements included in Item 8 of this report.

Protecting the Environment and Corporate Sustainability

Our core business is to provide industry, government and the public a wide range of environmental, energy and industrial services that protect and restore North America's natural environment.

As a leading provider of environmental, energy and industrial services throughout North America, our first goal is to help our customers prevent the release of chemicals and hazardous waste streams into the environment. We also are the leading service provider in the recovery and decontamination of pollutants that have been released. This includes the safe destruction or disposal of hazardous materials in a manner that ensures these materials are no longer a danger to the environment. When providing these services, we are committed to the recycling, reuse and reclamation of these wastes whenever possible using a variety of methods more fully explained below in the sections describing our general operations. Many of our branded services exemplify our commitment to sustainability and providing environmental solutions to the marketplace. Where possible, liquids such as solvents, chemicals and used oil are continuously recycled to our high-quality standards and made into useful products. Tolling programs provide a closed process in which the customer’s spent solvents are recycled to their precise specifications and returned directly to them.

In 2018 we gathered nearly 225 million gallons of used oil in North America through our Safety-Kleen business. Since their opening, our plants have re-refined more than 3.3 billion gallons of used oil, avoiding more than 27 million metric tons of greenhouse gases.

We have also become the leading North American provider of services to protect the ozone layer from the destructive effects of chlorofluorocarbons, or "CFCs," which are ozone layer depleting substances and global warming compounds that have global warming potentials up to 10,000 times more powerful than carbon dioxide. Global-warming potential is a relative measure of how much heat a greenhouse gas traps in the atmosphere.

Since 2013, more than 7.9 million metric tons of carbon dioxide emissions were avoided by destroying CFCs at our Arkansas incinerator. That is equivalent to removing approximately 1.6 million passenger vehicles from the road for one year.

Our fleet of transportation vehicles represents one of our largest opportunities to apply sustainable business practices. Our Asset Refurbishment Program is a comprehensive effort to rebuild assets to "like new" quality. With four facilities now operational, we are able to rebuild approximately two vehicles every week. Our goal is 100% reuse or recycling of all materials.

One of our most highly visible public programs for various governmental and community entities involves the removal of thousands of tons of hazardous wastes, from households throughout the United States and Canada, that might otherwise be improperly disposed of or become dangerous to the communities where they are stored.

As we provide these wide-ranging services throughout North America, we are committed to ensuring that our own operations are environmentally responsible. Our sustainability efforts are guided by a formal policy, strategy and plan and we continue to build on our past efforts, such as implementing numerous energy efficiency improvements and various transportation initiatives within our fleet, including using our own recycled oil. We developed initiatives that focus on improving the Company's and our customers' impact on the environment. Our technologies and increased operational efficiencies have allowed us to deliver innovative customer solutions, like our Safety-Kleen Oil Plus® Program, that show our commitment to sustainable methodologies and transform the way we do business.

Competitive Strengths

- **Leading Provider of Environmental, Energy and Industrial Services**—We are a leading provider of environmental, energy and industrial services. We own nine of the 13 commercial hazardous waste incinerators, making us the largest operator of such facilities in North America. We are also one of the few industrial services companies with national footprints in both the U.S. and Canada. We provide multi-faceted, high-quality services to a broad mix of customers. We attract and better serve our customers because of our vast capabilities and breadth of services as well as our overall size, scale and geographic location of our large network along with valuable and unique assets used in providing our services.

- **Integrated Network of Assets**—We believe we operate, in the aggregate, the largest number of commercial hazardous waste incinerators, landfills, treatment facilities and TSDFs in North America. Our broad service network enables us to effectively handle a waste stream from its origin through disposal and to efficiently direct and internalize our waste streams to reduce costs. As our processing of wastes increases, our size allows us to leverage our network and increase our profit margins as we can internalize a greater volume of waste in our incinerators, landfills and other disposal facilities. Furthermore, these assets are very difficult to duplicate because significant permitting and regulatory approvals would need to take place in order for new waste disposal sites to come on line. High barriers of entry for such assets provide increased value to our network.

- **Comprehensive Service Capabilities**—Our comprehensive service offerings allow us to act as a full-service provider to our customers. Our breadth of service offerings creates incremental revenue growth as customers seek to minimize the number of outside vendors and demand "one-stop-shop" service providers.

- **Largest Collector and Recycler of Used Motor Oil**— As the largest re-refiner and recycler of used oil in the world, we returned during 2018 approximately 192 million gallons of new re-refined oil, lubricants and byproducts back into the marketplace. In 2018, our re-refining process eliminated more than two million metric tons of greenhouse gas ("GHG"), which is the equivalent of growing more than 54 million trees for 10 years in an urban environment or taking over 395,000 passenger cars off the road for one year.

- **Large and Diversified Customer Base**—Our customers range from Fortune 500 companies to midsize and small public and private entities that span multiple industries and business types, including governmental entities. This diversification limits our credit exposure to any one customer and potential cyclicality to any one industry. As a percentage of our 2018 revenues, the top ten industries we service totaled approximately 76% and included general manufacturing (17%), chemical (14%), refineries (8%), base and blended oils (8%), automotive (7%), government (6%), utilities (5%), transportation (4%), oil and gas (4%) and construction (3%).

- **Stable and Recurring Revenue Base**—We have long-standing relationships with our large customers, many of whom have worked with our Company for decades. Our diversified customer base provides stable and recurring revenues, as a significant portion of our revenues are derived from previously served customers with recurring needs for our services. In addition, switching costs for many of our hazardous waste customers are high. This is due to many customers' desire to audit disposal facilities prior to their qualification as approved sites and to limit the number of facilities to which their hazardous wastes are shipped in order to reduce their potential liability under United States and Canadian environmental laws and regulations. We have been selected as an approved vendor by large and small generators of waste because we possess comprehensive collection, recycling, treatment, transportation, disposal, and hazardous waste tracking capabilities and have the expertise necessary to comply with applicable environmental laws and regulations. Those customers that have selected us as an approved vendor typically continue to use our services on a recurring basis.

- **Regulatory Compliance**—We continue to make capital investments in our facilities to ensure that they are in compliance with current federal, state, provincial and local regulations. Companies that rely on in-house disposal may find the current regulatory requirements to be too capital intensive or complicated, and may choose to outsource many of their hazardous waste disposal needs.

- **Effective Cost Management**—Our significant scale allows us to maintain low costs through standardized compliance procedures, significant purchasing power, leveraging our investment in technology and our ability to efficiently utilize logistics and transportation to economically direct waste streams to the most efficient facility. We also have the ability to transport and process with internal resources the substantial majority of all hazardous waste that we manage for our customers. In addition, our Safety-Kleen results are significantly impacted by the overall market pricing and product mix associated with base and blended oil products and, more specifically, the market prices of Group II base oils. We charge fees related to our used oil collection services which allow us to effectively manage the profit spreads inherent in our business.
- **Proven and Experienced Management Team**—Our executive management team provides depth and continuity. Our 12 executive officers collectively have over 200 years of experience and expertise in the environmental, energy and industrial services industries. Our chief executive officer founded our Company in 1980, and since its formation has served as both the Chief Executive Officer and Chairman of the Board.

Operations

General

Seasonality and Cyclical Nature of Business. Our operations may be affected by seasonal fluctuations due to weather and budgetary cycles influencing the timing of customers' spending for products and services. Typically during the first quarter of each year there is less demand for our products, oil collection, recycling and environmental services due to the lower levels of activities by our customers as a result of the cold weather, particularly in the Northern and Midwestern regions of the United States and Canada. As a result, reduced volumes of waste are received at our facilities, higher operating costs are realized due to sub-freezing weather and high levels of snowfall, factory closings for year-end holidays reduce waste volume, and lower volumes of used oil are generated for our collection.

Geographical Information. For the year ended December 31, 2018, we generated $2,721.8 million or 82.5% of our direct revenues in the United States and $578.5 million or 17.5% of revenues in Canada. For the year ended December 31, 2017, we generated $2,392.0 million or 81.2% of our direct revenues in the United States and $553.0 million or 18.8% of revenues in Canada. For additional information about the geographical areas from which our revenues are derived and in which our assets are located, see Note 19, "Segment Reporting," to our consolidated financial statements included in Item 8 of this report.

Environmental Services

We collect, transport, treat and dispose of hazardous and non-hazardous waste, including resource recovery, physical treatment, fuel blending, incineration, landfill disposal, wastewater treatment, lab chemical disposal, explosives management and CleanPack® services. Our CleanPack® services include the collection, identification and categorization, specialized packaging, transportation and disposal of laboratory chemicals and household hazardous waste. We also perform a wide range of industrial maintenance and specialty industrial services and utilize specialty equipment and resources to perform field services at any chosen location on a planned or emergency response basis. All of these services are designed to protect the environment and address environmental related challenges through the use of innovation and the latest technologies. We provide customers with sustainable solutions that seek to recycle waste materials whenever possible.

Technical Services. We provide technical services through a network of service centers from which a fleet of vehicles are dispatched to pick up customers' waste either on a predetermined schedule or on demand, and to deliver the waste to permitted facilities, which are usually Company-owned. Our service centers also can dispatch chemists to a customer location for collection of chemical and laboratory waste for disposal. InSite Service offerings is a branded on-site/in-plant service delivery program through which we offer a full range of environmental, industrial and waste management services. This signature program is built on safety, quality, efficiency and integrity, and has been offered by Clean Harbors for more than 25 years. By leveraging Clean Harbors' expertise and capabilities, our on-site staffs are dedicated to developing the safest, most cost-effective solutions to service customers' needs.

Collection, Transportation and Logistics Management. As an integral part of our services, we collect industrial waste from customers and transport such waste to and between our facilities for treatment or bulking for shipment to final disposal locations. Customers typically accumulate waste in containers, such as 55-gallon drums, bulk storage tanks or 20-cubic-yard roll-off containers. In providing this service, we utilize a variety of specially designed and constructed tank trucks and semi-trailers as well as third-party transporters, including railroads.

Treatment and Disposal. We recycle, treat and dispose of hazardous and non-hazardous industrial waste. The waste handled includes substances which are classified as "hazardous" because of their corrosive, ignitable, infectious, reactive or toxic properties, and other substances subject to federal, state and provincial environmental regulation. We provide final

treatment and disposal services designed to manage waste which cannot be otherwise economically recycled or reused. The waste that we handle comes in solid, sludge, liquid and gas form.

We operate a network of TSDFs that collect, temporarily store and/or consolidate compatible waste streams for more efficient transportation to final recycling, treatment or disposal destinations. These facilities hold special permits, such as Part B permits under the Resource Conservation and Recovery Act, or "RCRA," in the United States, which allow them to process, transfer and dispose of waste through various technologies including recycling, incineration, and landfill and wastewater treatment depending on each location's permitted and constructed capabilities.

Resource Recovery and Fuel Blending. We operate recycling systems for the reclamation and reuse of certain waste, particularly solvent-based waste generated by industrial cleaning operations, metal finishing and other manufacturing processes. Resource recovery involves the treatment of wastes using various methods, which effectively remove contaminants from the original material to restore its fitness for its intended purpose and to reduce the volume of waste requiring disposal.

We also operate a recycling facility that recycles refinery waste and spent catalyst. The recycled oil and catalysts, depending on market conditions, are sold to third parties.

Incineration. Incineration is the preferred method for the treatment of organic hazardous waste because it effectively destroys the contaminants at high temperatures. High temperature incineration effectively eliminates organic waste such as herbicides, halogenated solvents, pesticides, pharmaceutical and refinery waste, regardless of whether gases, liquids, sludge or solids. Federal and state incineration regulations require a destruction and removal efficiency of 99.99% for most organic waste.

As of December 31, 2018, we had nine active incinerators operating in five incinerator facilities that offer a wide range of technological capabilities to customers. In the United States, we operate a fluidized bed thermal oxidation unit for maximum destruction efficiency of hazardous waste with an estimated annual practical capacity of 58,808 tons and three solids and liquids capable incinerator facilities with a combined estimated annual practical capacity of 377,387 tons. We also operate one hazardous waste liquid injection incinerator in Canada with total annual practical capacity of 125,526 tons.

Our incinerator facilities in Kimball, Nebraska; Deer Park, Texas; El Dorado, Arkansas; and Aragonite, Utah, are designed to process liquid organic waste, sludge, solids, soil and debris. Our Deer Park facility has two kilns and a rotary reactor. Our El Dorado facility specializes in the treatment of bulk and containerized hazardous liquids, solids and sludge. In 2017, we opened a new hazardous waste incinerator at our El Dorado, Arkansas facility, which specializes in high-temperature incineration of regulated waste such as industrial and laboratory chemicals, manufacturing byproducts, fertilizers and other solid and liquid materials that would otherwise be hazardous to the environment and public health if not properly managed. Our facilities in Kimball and Deer Park also have on-site landfills for the disposal of ash produced as a result of the incineration process.

Our incinerator facility in Lambton, Ontario, is a liquid injection incinerator, designed primarily for the destruction of liquid organic waste. Typical waste streams include wastewater with low levels of organics and other higher concentration organic liquid waste not amenable to conventional physical or chemical waste treatment.

Landfills. Landfills are primarily used for disposal of inorganic waste. In the United States and Canada, we operate nine commercial landfills. Seven of our commercial landfills are designed and permitted for disposal of hazardous waste and two of our landfills are operated for non-hazardous industrial waste disposal and, to a lesser extent, municipal solid waste. In addition to our commercial landfills, we also own and operate, as described above, two non-commercial landfills that only accept waste from our on-site incinerators.

Of our seven commercial landfills used for disposal of hazardous waste, five are located in the United States and two are located in Canada. As of December 31, 2018, the useful economic lives of these landfills included approximately 25.6 million cubic yards of remaining capacity. This estimate of the useful economic lives of these landfills includes permitted airspace and unpermitted airspace that our management believes to be probable of being permitted based on our analysis of various factors. In addition to the capacity included in the useful economic lives of these landfills, there are approximately 31.9 million cubic yards of additional unpermitted airspace capacity included in the footprints of these landfills that may ultimately be permitted, although there can be no assurance that this additional capacity will be permitted. In addition to the hazardous waste landfills, we operate two non-hazardous industrial landfills with 3.8 million cubic yards of remaining permitted capacity. These two facilities are located in the United States and have been issued operating permits under Subtitle D of RCRA. Our non-hazardous landfill facilities are permitted to accept commercial industrial waste, including waste from foundries, demolition and construction, machine shops, automobile manufacturing, printing, metal fabrications and recycling.

Wastewater Treatment. We operate nine wastewater treatment facilities that offer a range of wastewater treatment technologies. These wastewater treatment operations involve processing hazardous and non-hazardous waste through use of

physical and chemical treatment methods. These facilities treat a broad range of industrial liquid and semi-liquid waste containing heavy metals, organics and suspended solids.

Total Project Management. We also provide total project management services in areas such as chemical packing, on-site waste management, remediation, compliance training and emergency spill response, while leveraging the Clean Harbors network of service centers and environmental capabilities.

Industrial Services. We perform industrial maintenance services and specialty industrial services at refineries, mines, upgraders, chemical plants, pulp and paper mills, manufacturing, and power generation facilities. We provide these services throughout North America.

Our crews handle as-needed in-plant services to support ongoing in-plant cleaning and maintenance services, including liquid/dry vacuum, hydro-blasting, dewatering and materials processing, water and chemical hauling and steam cleaning. We provide a variety of specialized industrial services including plant outage and turnaround services, decoking and pigging, chemical cleaning, high and ultra-high pressure water cleaning, pipeline inspection and coating services, and large tank and surface impoundment cleaning. We also provide daylighting services which, through the use of specialized hydro vac equipment, deliver safer, cleaner and more precise hydro excavation services to safely uncover highly sensitive underground targets. Our crews also handle oilfield transport and production services supporting drilling, completions and production programs.

Field and Emergency Response Services. Our crews and equipment are dispatched on a planned or emergency basis and perform services such as confined space entry for tank cleaning, site decontamination, large remediation projects, demolition, spill cleanup on land and water, railcar cleaning, product recovery and transfer, scarifying and media blasting and vacuum services. Additional services include filtration and water treatment services.

We are also a leader in providing response services for environmental emergencies of any scale from man-made disasters such as oil spills and natural disasters such as hurricanes.

Oil and Gas Field Services. We provide integrated seismic and right-of-way services for efficient resource discovery and site preparation. These services include: (i) seismic surveying that minimizes costs, environmental impact, and time in field; (ii) mulching/line clearing that expedites additional geophysical activities and minimizes environmental impact; and (iii) shot-hole drilling that provides safe and efficient operations in every terrain, including hostile and inaccessible regions. We also provide surface rentals services by supporting oil and gas companies' drilling and well completion programs. Key to our services is our ability to provide solids control to support the drilling process. Our technologies help manage liquids, solids and semi-solid material during the drilling operation, and include centrifuges, tanks, and drilling fluid recovery. We also can provide container rentals for safe collection of drill cuttings and other wastes, as well as manage disposal of drilling fluids and solids and can supply surface rental equipment to support drill sites by providing wellsite trailers, wastewater treatment systems and holding tanks, light towers, generators and handling tools.

Lodging Services. Our fixed lodges provide turnkey remote accommodations throughout Western Canada, primarily in the Fort McMurray area, and range in size up to approximately 600 beds. These are open lodges, with amenities that include catering and housekeeping services, fully equipped common areas, fitness rooms and computer rooms, wireless internet and public phones, powered parking stalls, laundry facilities, and daily towel service. We also offer mobile camp operations, which provide services for remote workforce accommodation facilities throughout Western Canada, currently in British Columbia, Saskatchewan and Alberta, with multiple accommodation types. These include client and open camps, operator camps, and drill camps. Furthermore, hospitality services are available as a standalone service to clients which have other accommodation arrangements.

Safety-Kleen

Our Safety-Kleen business offers an array of environmental services and complementary products to a diverse range of customers including automobile repair shops, car and truck dealers, metal fabricators, machine manufacturers, fleet maintenance shops and other automotive, industrial and retail customers.

As the largest provider of parts cleaning services in North America, Safety-Kleen offers a complete line of specially designed parts washers to customer locations and then delivers recurring service that includes machine cleaning and maintenance and disposal and replacement of clean solvent or aqueous fluids. We also sell automotive and industrial cleaning products which include degreasers, glass and floor cleaners, hand cleaners, absorbents, antifreeze, windshield washer fluid, mats and spill kits.

Utilizing our collection network, we provide pickup and transportation of hazardous and non-hazardous containerized waste for recycling or disposal, primarily through the Clean Harbors network of recycling and waste treatment and disposal

facilities. We also collect used oil which serves as feedstock for our oil re-refineries discussed below, or process the oil into recycled fuel oil, or "RFO," which is then sold to customers such as asphalt plants, industrial plants, pulp and paper companies, and vacuum gas oil and marine diesel oil producers.

Our vacuum services remove solids, residual oily water and sludge and other fluids from customers' oil/water separators, sumps and collection tanks. We also remove and collect waste fluids found at large and small industrial locations, including metal fabricators, auto maintenance providers, and general manufacturers.

Utilizing used oil collected by Safety-Kleen branches, we manufacture, formulate, package, distribute and market high-quality lubricants. We offer these products and services direct to business end-users and customers that can in turn market to retailers and end-consumers. The used oil collected by Safety-Kleen's branch network is processed or re-refined to convert into a variety of products, mostly base lubricating oils, and much smaller quantities of asphalt-like material, glycols and fuels. As the largest re-refiner of used oil in North America, we can process the used oil collected through our six re-refineries located in East Chicago, Indiana; Newark, California; Wichita, Kansas; Tacoma, Washington; Fallon, Nevada; and Breslau, Ontario.

Our primary goal is to produce and sell high-quality blended oils, which are created by combining our re-refined base and other base oils with performance additives in accordance with our proprietary formulations and American Petroleum Institute licenses. Our Performance Plus® brand and "green" proprietary brand EcoPower® are sold to on- and off-road corporate fleets, government entities, automotive service shops and industrial plants, which are serviced through our internal distribution network, as well as an extensive United States and Canada-wide independent distributor network. We also sell unbranded blended oils to distributors that resell them under their private label brands. Our OilPlus® program consists of selling our renewable oil products directly to our end customers. We sell the base oil that we do not blend and sell ourselves to independent blenders/packagers that use it to blend their own branded or private label oils. With more than 200 million gallons of used oil processed annually, we were able to return in 2018 approximately 192 million gallons of new re-refined oil, lubricants and byproducts back into the marketplace. We believe our position as the largest collector and re-refiner of used motor oil, along with our vast service and distributions network, provide a distinct competitive advantage in our ability to provide our customers with collection and oil distribution services through our OilPlus® program.

Competition

The hazardous waste management industry is highly competitive. The sources of competition vary by locality and by type of service rendered, with competition coming from national and regional waste services companies and hundreds of privately-owned firms. Veolia North America, Waste Management, Inc., U.S. Ecology, and Stericycle, Inc. are the principal national firms with which we compete. Each of these competitors is able to provide one or more of the environmental services we offer.

Under federal and state environmental laws in the United States, generators of hazardous wastes remain liable for improper disposal of such wastes. Although generators may hire various companies that have the proper permits and licenses, because of the generators' potential liability, they are very interested in the reputation and financial strength of the companies they use for the management of their hazardous wastes. We believe that our technical proficiency, safety record, customer service oriented culture and overall reputation are important considerations to our customers in selecting and continuing to utilize our services. We also believe that the depth of our recycling, treatment and disposal capabilities, our ability to collect and transport waste products efficiently, and pricing are additional significant factors in the market for treatment and disposal services.

Competition within our Environmental Services segment varies by locality and type of service rendered.

- For our landfill and waste services, competitors include several major national and regional environmental services firms, as well as numerous smaller local firms. We believe the availability of skilled technical professional personnel, quality of performance, diversity of services, safety record, quality of assets and use of current and latest technologies, as well as price, are the key competitive factors in this service industry.

- For our industrial, field and emergency responses services, competitors vary by locality and by type of service rendered, with competition coming from national and regional service providers and hundreds of privately-owned firms that offer energy or industrial services. CEDA International Corporation and Newalta in Canada, and Envirosystems and Hydrochem PSC in the United States, are the principal national firms with which we compete. Each of these competitors is able to provide one or more of the industrial and field services we offer. We believe the availability of specialized equipment and latest technologies, skilled technical professional personnel, quality of performance, diversity of services, safety record and price are the key competitive factors in this industry.

- For our energy related services, competitors vary by locality and type of services provided, with competition coming from national, regional and local service providers. Competition is based on a number of factors, including safety, quality, performance, reliability, service, price, response time and, in some cases, breadth of service offering.

For our Safety-Kleen segment, competitors vary by locality and by type of service rendered, with competition coming from Heritage-Crystal Clean and Veolia North America, along with several regional and local firms. With our Safety-Kleen Oil Plus® closed loop offering, we are competing in certain markets with other North American lubricant distributors.

The principal methods of competition for all of our services are quality, price, reliability of service rendered and technical proficiency. We believe that we offer a more comprehensive range of environmental, energy and industrial services than our competitors in major portions of the United States and Canada.

Employees

As of December 31, 2018, we employed approximately 14,200 active full-time employees, of which 898 in the United States and 547 in Canada were represented by labor unions. We believe that our relationship with our employees is positive. As part of our commitment to employee safety and quality customer service, we have an extensive compliance program and trained environmental, health and safety staff. We adhere to a risk management program designed to reduce potential liabilities to us and to our customers. We also continually strive to invest in our employees through training programs as well as competitive compensation and benefit programs

Intellectual Property

We have invested significantly in the development of proprietary technology and also to establish and maintain an extensive knowledge of leading technologies and incorporate these technologies into the services we offer and provide to our customers. As of December 31, 2018, we held a total of 32 U.S. and nine foreign issued or granted patents (which will expire between 2019 and 2031), two U.S. and five foreign pending patent applications, 96 U.S. and 63 foreign trademark registrations, and one U.S. and six foreign trademark applications. We also license software and other intellectual property from various third parties. We enter into confidentiality agreements with certain of our employees, consultants and corporate partners, and control access to software documentation and other proprietary information. We believe that we hold adequate rights to all intellectual property used in our business and that we do not infringe upon any intellectual property rights held by other parties.

Management of Risks

We adhere to a program of risk management policies and practices designed to reduce potential liability, as well as to manage customers' ongoing environmental exposures. This program includes installation of risk management systems at our facilities, such as fire suppression, employee training, environmental, auditing and policy decisions restricting the types of wastes handled. We evaluate all revenue opportunities and decline those that we believe involve unacceptable risks.

We dispose of wastes at our incinerator, wastewater treatment and landfill facilities, or at facilities owned and operated by other firms that we have audited and approved. We apply established technologies to treatment, storage and recovery of hazardous wastes. We believe our operations are conducted in a safe and prudent manner and in substantial compliance with applicable laws and regulations.

Insurance and Financial Assurance

Our insurance programs cover the potential risks associated with our multifaceted operations from two primary exposures: direct physical damage and third-party liability. We maintain a casualty insurance program providing coverage for vehicles, employer's liability and commercial general liability in the aggregate amount of $105.0 million, $102.0 million and $102.0 million, respectively, per year, subject to retentions of $2.0 million per occurrence for auto and commercial general liability and $1.0 million for employers' liability in the United States and $2.0 million in Canada. We also have workers' compensation insurance whose limits are established by state statutes.

We have pollution liability insurance policies covering potential risks in three areas: as a contractor performing services at customer sites, as a transporter of waste, and as a processor of waste at our facilities. The contractor's pollution liability insurance has limits of $20.0 million per occurrence and $25.0 million in the aggregate, covering offsite remedial activities and associated liabilities.

For sudden and accidental in-transit pollution liability, our auto liability policy provides the primary $5.0 million per occurrence of transportation pollution insurance. Our pollution liability policies provide an additional $60.0 million per occurrence and $85.0 million in the aggregate for a total of $65.0 million per occurrence and $90.0 million, respectively. A $2.0 million deductible per occurrence applies to this coverage in the United States and Canada.

Federal and state regulations require liability insurance coverage for all facilities that treat, store or dispose of hazardous waste. RCRA, the Toxic Substances Control Act, and comparable state hazardous waste regulations typically require hazardous waste handling facilities to maintain pollution liability insurance in the amount of $1.0 million per occurrence and $2.0 million in the aggregate for sudden occurrences, and $3.0 million per occurrence and $6.0 million in the aggregate for non-sudden occurrences. Our liability insurance coverage meets or exceeds all federal and state regulations.

Our international operations are insured under locally placed insurance policies that are compulsory in a specific country. In addition, we have a global foreign liability policy that will provide excess and difference in condition coverage in international countries.

Under our insurance programs, coverage is obtained for catastrophic exposures, cyber security as well as those risks required to be insured by law or contract. It is our policy to retain a significant portion of certain expected losses related primarily to employee benefit, workers' compensation, commercial general and vehicle liability. Provisions for losses expected under these programs are recorded based upon our estimates of the actuarial calculation of the aggregate liability for claims. We believe that policy cancellation terms are similar to those of companies in other industries.

Operators of hazardous waste handling facilities are also required by federal, state and provincial regulations to provide financial assurance for closure and post-closure care of those facilities should the facilities cease operation. Closure would include the cost of removing the waste stored at a facility which ceased operating and sending the material to another facility for disposal and the cost of performing certain procedures for decontamination of the facility. As of December 31, 2018, our total estimated closure and post-closure costs requiring financial assurance by regulators were $464.2 million for our U.S. facilities and $42.1 million for our Canadian facilities. We have obtained all of the required financial assurance for our facilities through a combination of surety bonds, funded trusts, letters of credit and insurance from a qualified insurance company. The financial assurance related to closure and post-closure obligations of our U.S. facilities will renew in 2019. Our Canadian facilities utilize surety bonds, which renew at various dates throughout 2019, as well as letters of credit.

Environmental Regulation

While our business has benefited substantially from increased governmental regulation of hazardous waste transportation, storage and disposal, the environmental services industry itself is the subject of extensive and evolving regulation by federal, state, provincial and local authorities. We are required to obtain federal, state, provincial and local permits or approvals for each of our hazardous waste facilities. Such permits are difficult to obtain and, in many instances, extensive studies, tests, and public hearings are required before the approvals can be issued. We have acquired all operating permits and approvals now required for the current operation of our business, and have applied for, or are in the process of applying for, all permits and approvals needed in connection with continued operation and planned expansion or modifications of our operations.

We make a continuing effort to anticipate regulatory, political and legal developments that might affect operations, but are not always able to do so. We cannot predict the extent to which any environmental legislation or regulation that may be enacted or enforced in the future may affect our operations.

A new regulation primarily impacting the shipping business but which we are monitoring closely as it could impact our business is known as "IMO 2020". On January 1, 2020, the International Maritime Organization (the "IMO") will implement a new regulation for a 0.50% global sulphur cap for marine fuels. Under the new global cap, ships that traverse the oceans will be required to use marine fuels with a sulphur content of no more than 0.50%, versus the current limit of 3.50%, in an effort to reduce the amount of sulphur oxide and decrease pollution and greenhouse gas emissions from the global shipping fleet, which now uses an estimated 3.5 - 4 million barrels per day of fuel oil. The shipping industry is the last major transportation sector to utilize fuel with high levels of sulfur, which is the reason the IMO is pushing the industry to more closely align with other transport sectors for pollution reduction.

There are several variables around this regulatory change that are not yet clear, including anticipated levels of compliance and enforcement. However, it is expected that the implementation of IMO 2020 will result in a significant increase in near-term demand for a broad range of low sulfur distillates including diesel, marine gas oil, marine diesel oil and vacuum gas oil ("VGO") among others. There is uncertainty about the global refinery industry's ability to meet that spike in demand, which could have substantial consequences for the pricing of those products, particularly VGO. The price of VGO typically has a direct impact on the pricing and/or levels of production of base oil. Changes in the marine fuel market as a result of IMO 2020 is also expected to affect the availability of used motor oil, which today is frequently used in the marine market and some of which may be displaced as a result of this new rule.

United States Hazardous Waste Regulation

Federal Regulations. The most significant federal environmental laws affecting us are the RCRA, the Comprehensive Environmental Response, Compensation and Liability Act, or "CERCLA," also known as the "Superfund Act," the Clean Air Act, the Clean Water Act, and the Toxic Substances Control Act, or "TSCA."

RCRA. RCRA is the principal federal statute governing hazardous waste generation, treatment, transportation, storage and disposal. Pursuant to RCRA, the EPA has established a comprehensive "cradle-to-grave" system for the management of a wide range of materials identified as hazardous waste. States that have adopted hazardous waste management programs with standards at least as stringent as those promulgated by the EPA have been delegated authority by the EPA to administer their facility permitting programs in lieu of the EPA's program.

Every facility that treats, stores or disposes of hazardous waste must obtain a RCRA permit from the EPA or an authorized state agency unless a specific exemption exists, and must comply with certain operating requirements (the Part B permitting process). RCRA also requires that Part B permits contain provisions for required on-site study and cleanup activities, known as "corrective action," including detailed compliance schedules and provisions for assurance of financial responsibility. See Note 10, "Closure and Post-Closure Liabilities," and Note 11, "Remedial Liabilities," to our consolidated financial statements included in Item 8 of this report for a discussion of our environmental liabilities. See "Insurance and Financial Assurance" above for a discussion of our financial assurance requirements.

The Superfund Act. The Superfund Act is the primary federal statute regulating the cleanup of inactive hazardous substance sites and imposing liability for cleanup on the responsible parties. It also provides for immediate response and removal actions coordinated by the EPA to releases of hazardous substances into the environment, and authorizes the government to respond to the release or threatened release of hazardous substances or to order responsible persons to perform any necessary cleanup. The statute provides for strict and, in certain cases, joint and several liability for these responses and other related costs, and for liability for the cost of damages to natural resources, to the parties involved in the generation, transportation and disposal of hazardous substances. Under the statute, we may be deemed liable as a generator or transporter of a hazardous substance which is released into the environment, or as the owner or operator of a facility from which there is a release of a hazardous substance into the environment. See Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report for a description of the principal such proceedings in which we are now involved.

The Clean Air Act. The Clean Air Act was passed by Congress to control the emissions of pollutants into the air and requires permits to be obtained for certain sources of toxic air pollutants such as vinyl chloride, or criteria pollutants, such as carbon monoxide. In 1990, Congress amended the Clean Air Act to require further reductions of air pollutants with specific targets for non-attainment areas in order to meet certain ambient air quality standards. These amendments also require the EPA to promulgate regulations which (i) control emissions of 189 hazardous air pollutants; (ii) create uniform operating permits for major industrial facilities similar to RCRA operating permits; (iii) mandate the phase-out of ozone depleting chemicals; and (iv) provide for enhanced enforcement.

The Clean Water Act. This legislation prohibits discharge of pollutants into the waters of the United States without governmental authorization and regulates the discharge of pollutants into surface waters and sewers from a variety of sources, including disposal sites and treatment facilities. The EPA has promulgated "pretreatment" regulations under the Clean Water Act, which establish pretreatment standards for introduction of pollutants into publicly owned treatment works. In the course of the treatment process, our wastewater treatment facilities generate wastewater, which we discharge to publicly owned treatment works pursuant to permits issued by the appropriate governmental authorities. We are required to obtain discharge permits and conduct sampling and monitoring programs.

TSCA. We also operate a network of collection, treatment and field services (remediation) activities throughout North America that are regulated under provisions of TSCA. TSCA established a national program for the management of substances classified as polychlorinated biphenyls, or "PCBs," which include waste PCBs as well as RCRA wastes contaminated with PCBs. The rules set minimum design and operating requirements for storage, treatment and disposal of PCB wastes. Since their initial publication, the rules have been modified to enhance the management standards for TSCA-regulated operations including the decommissioning of PCB transformers and articles, detoxification of transformer oils, incineration of PCB liquids and solids, landfill disposal of PCB solids, and remediation of PCB contamination at customer sites.

Other Federal Laws. In addition to regulations specifically directed at our transportation, storage, and disposal facilities, there are a number of regulations that may "pass-through" to the facilities based on the acceptance of regulated waste from affected client facilities. Each facility that accepts affected waste must comply with the regulations for that waste, facility or industry. Examples of this type of regulation are National Emission Standards for Benzene Waste Operations and National

Emissions Standards for Pharmaceuticals Production. Each of our facilities addresses these regulations on a case-by-case basis determined by its ability to comply with the pass-through regulations.

In our transportation operations, we are regulated by the U.S. Department of Transportation, the Federal Railroad Administration, the Federal Aviation Administration and the U.S. Coast Guard, as well as by the regulatory agencies of each state in which we operate or through which our vehicles pass.

Health and safety standards under the Occupational Safety and Health Act, or "OSHA," are also applicable to all of our operations.

State and Local Regulations. Pursuant to the EPA's authorization of their RCRA equivalent programs, a number of U.S. states have regulatory programs governing the operations and permitting of hazardous waste facilities. Accordingly, the hazardous waste treatment, storage and disposal activities of a number of our facilities are regulated by the relevant state agencies in addition to federal EPA regulation.

Some states classify as hazardous some wastes that are not regulated under RCRA. For example, Massachusetts considers used oil as "hazardous waste" while RCRA does not. Accordingly, we must comply with state requirements for handling state regulated wastes, and, when necessary, obtain state licenses for treating, storing, and disposing of such wastes at our facilities.

Our facilities are regulated pursuant to state statutes, including those addressing clean water and clean air. Local sewer discharge and flammable storage requirements are applicable to certain of our facilities. Our facilities are also subject to local siting, zoning and land use restrictions. We believe that each of our facilities is in substantial compliance with the applicable requirements of federal and state licenses which we have obtained. Once issued, such licenses have maximum fixed terms of a given number of years, which differ from state to state, ranging from three to ten years. The issuing state agency may review or modify a license at any time during its term. We anticipate that once a license is issued with respect to a facility, the license will be renewed at the end of its term if the facility's operations are in compliance with applicable requirements. However, there can be no assurance that regulations governing future licensing will remain static, or that we will be able to comply with such requirements.

Canadian Hazardous Waste Regulation

In Canada, the provinces retain control over environmental issues within their boundaries and thus have the primary responsibility for regulating management of hazardous wastes. The federal government regulates issues of national scope or where activities cross provincial boundaries.

Provincial Regulations. Most of Canada's industrial development and the major part of its population are located in four provinces: Ontario, Quebec, Alberta and British Columbia. These provinces have the most detailed environmental regulations. We operate major waste management facilities in each of these provinces, as well as waste transfer facilities in Nova Scotia and Manitoba.

The main provincial acts dealing with hazardous waste management are:

- Ontario—Environmental Protection Act;
- Quebec—Environmental Quality Act;
- Alberta—Environmental Protection and Enhancement Act; and
- British Columbia—Waste Management Act.

These pieces of legislation were developed by the provinces independently and, among other things, generally control the generation, characterization, transport, treatment and disposal of hazardous wastes. Regulations developed by the provinces under the relevant legislation are also developed independently, but are often quite similar in effect and sometimes in application. For example, there is some uniformity in manifest design and utilization.

Provincial legislation also provides for the establishment of waste management facilities. In this case, the facilities are also controlled by provincial statutes and regulations governing emissions to air, groundwater and surface water and prescribing design criteria and operational guidelines.

Waste transporters require a permit to operate under provincial waste management regulations and are subject to the requirements of the Federal Transportation of Dangerous Goods legislation. They are required to report the quantities and disposition of materials shipped.

Canadian Federal Regulations. The Canadian federal government has authority for those matters which are national in scope and in impact and for Canada's relations with other nations. The main federal laws governing hazardous waste management are:

- Canadian Environmental Protection Act (1999) ("CEPA 99"), and
- Transportation of Dangerous Goods Act.

Environment Canada is the federal agency with responsibility for environmental matters and the main legislative instrument is the Canadian Environmental Protection Act. This act charges Environment Canada and Health Canada with protection of human health and the environment and seeks to control the production, importation and use of substances in Canada and to control their impact on the environment.

The Export and Import of Hazardous Wastes Regulations under CEPA 99 control the export and import of hazardous wastes and hazardous recyclable materials. By reference, these regulations incorporate the Transportation of Dangerous Goods Act and Regulations, which address identification, packaging, marking and documentation of hazardous materials during transport. CEPA 99 requires that anyone proposing to export or import hazardous wastes or hazardous recyclable materials or to transport them through Canada notify the Minister of the Environment and obtain a permit to do so. Section 9 of CEPA 99 allows the federal government to enter into administrative agreements with the provinces and territories for the development and improvement of environmental standards. These agreements represent cooperation towards a common goal rather than a delegation of authority under CEPA 99. To facilitate the development of provincial and territorial agreements, the federal, provincial and territorial governments participate in the Canadian Council of Ministers of the Environment ("CCME"). The CCME comprises the 14 environment ministers from the federal, provincial and territorial governments, who normally meet twice a year to discuss national environmental priorities and to determine work to be carried out under the auspices of the CCME.

Canadian Local and Municipal Regulations. Local and municipal regulations seldom reference direct control of hazardous waste management activities. Municipal regulations and by-laws, however, control such issues as land use designation, access to municipal services and use of emergency services, all of which can have a significant impact on facility operation.

Compliance with Environmental Regulations

We incur costs and make capital investments in order to comply with the previously discussed environmental regulations. These regulations require that we remediate contaminated sites, operate our facilities in accordance with enacted regulations, obtain required financial assurance for closure and post-closure care of our facilities should such facilities cease operations, and make capital investments in order to keep our facilities in compliance with environmental regulations.

As further discussed in Note 10, "Closure and Post-Closure Liabilities," and Note 11, "Remedial Liabilities," to our consolidated financial statements included in Item 8 of this report, we have accrued environmental liabilities as of December 31, 2018, of $190.9 million. For the years ended December 31, 2018 and 2017, we spent $10.1 million and $13.0 million, respectively, to address environmental liabilities.

As discussed more fully above under the heading "Insurance and Financial Assurance," we are required to provide financial assurance with respect to certain statutorily required closure, post-closure and corrective action obligations at our facilities. We have placed the required financial assurance primarily through a qualified insurance company.

As described in Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report, we are involved in legal proceedings arising under environmental laws and regulations. Alleged failure to comply with laws and regulations may lead to the imposition of fines or the denial, revocation or delay of the renewal of permits and licenses by governmental entities. In addition, such governmental entities, as well as surrounding landowners, may claim that we are liable for environmental damages. Citizens groups have become increasingly active in challenging the grant or renewal of permits and licenses for hazardous waste facilities, and responding to such challenges has further increased the costs associated with establishing new facilities or expanding current facilities. A significant judgment against us, the loss of a significant permit or license, or the imposition of a significant fine could have a material effect on our business and future prospects.

ITEM 1A. RISK FACTORS

An investment in our securities involves certain risks, including those described below. You should consider carefully these risk factors together with all of the information included in this report before investing in our securities.

Risks Affecting All of Our Businesses

Our businesses are subject to operational and safety risks.

Provision of environmental, energy and industrial services to our customers by both of our business segments involves risks such as equipment defects, malfunctions and failures, and natural disasters, which could potentially result in releases of hazardous materials, damage to or total loss of our property or assets, injury or death of our employees, or a need to shut down or reduce operation of our facilities while remedial actions are undertaken. Our employees often work under potentially hazardous conditions. These risks expose us to potential liability for pollution and other environmental damages, personal injury, loss of life, business interruption, and property damage or destruction. We must also maintain a solid safety record in order to remain a preferred supplier to our major customers.

While we seek to minimize our exposure to such risks through comprehensive training programs, our Environmental Health and Safety Compliance Internal Audit Program, vehicle and equipment maintenance programs, and insurance, such programs and insurance may not be adequate to cover all of our potential liabilities and such insurance may not in the future be available at commercially reasonable rates. If we were to incur substantial liabilities in excess of policy limits or at a time when we were not able to obtain adequate liability insurance on commercially reasonable terms, our business, results of operations and financial condition could be adversely affected to a material extent. Furthermore, should our safety record deteriorate, we could be subject to a potential reduction of revenues from our major customers.

Our businesses are subject to numerous statutory and regulatory requirements, which may increase in the future.

Our businesses are subject to numerous statutory and regulatory requirements, and our ability to continue to hold licenses and permits required for our businesses is subject to maintaining satisfactory compliance with such requirements. These requirements may increase in the future as a result of statutory and regulatory changes. Although we are very committed to compliance and safety, we may not, either now or in the future, be in full compliance at all times with such statutory and regulatory requirements. Consequently, we could be required to incur significant costs to maintain or improve our compliance with such requirements.

Failure to effectively manage acquisitions and divestitures could adversely impact our future results.

We continuously evaluate potential acquisition candidates and from time to time acquire companies that we believe will strategically fit into our business and growth objectives. If we are unable to successfully integrate and develop acquired businesses, we could fail to achieve anticipated synergies and cost savings, including any expected increases in revenues and operating results, which could have a material adverse effect on our financial results. We also continually review our portfolio of assets to determine the extent to which they are contributing to our objectives and growth strategy.

Natural disasters or other catastrophic events could negatively affect our business, financial condition and results of operations.

Natural disasters such as hurricanes, typhoons or earthquakes could negatively affect our operations and financial performance. Such events could result in physical damage to one or more of our facilities or equipment, the temporary lack of an adequate work force in a market, and the temporary disruption in rail or truck transportation services which we rely on to deliver waste to our facilities. These events could prevent or delay shipments and reduce both volumes and revenue. Weather conditions and other event driven special projects also cause interim variations in our results. We may be required to suspend operations in some or all of our locations, which could have a material adverse effect on our business, financial condition and results of operations.

Our acquisitions may expose us to unknown liabilities.

Because we have acquired, and expect generally to acquire, all the outstanding shares of most of our acquired companies, our investment in those companies are or will be subject to all of their liabilities other than their respective debts which we paid or will pay at the time of the acquisitions. If there are unknown liabilities or other obligations, our business could be materially affected. We may also experience issues relating to internal controls over financial reporting that could affect our ability to comply with the Sarbanes-Oxley Act, or that could affect our ability to comply with other applicable laws.

A cyber security incident could negatively impact our business and our relationships with customers.

We use computers in substantially all aspects of our business operations and also mobile devices and other online activities to connect with our employees and customers. Such uses give rise to cyber security risks, including security breach, espionage, system disruption, theft and inadvertent release of information. Our business involves the storage and transmission of numerous classes of sensitive and/or confidential information and intellectual property including, but not limited to, private information about employees, and financial and strategic information about our Company and our business partners.

Furthermore, as we pursue our strategy to grow through acquisitions and new initiatives that improve our operations and cost structure, we are also expanding and improving our information technologies, resulting in a larger technological presence and corresponding exposure to cyber security risk. If we fail to assess and identify cyber security risks associated with acquisitions and new initiatives, we may become increasingly vulnerable to such risks. Additionally, while we have implemented measures to prevent security breaches and cyber incidents, our preventative measures and incident response efforts may not be entirely effective. The theft, destruction, loss, misappropriation, or release of sensitive and/or confidential information or intellectual property, or interference with our information technology systems or the technology systems of third parties on which we rely, could result in business disruption, negative publicity, brand damage, violation of privacy laws, loss of customers, potential liability and competitive disadvantage.

Tax interpretations and changes in tax regulations and legislation could adversely affect our results of operations.

We are subject to income taxes in the United States, Canada and various state and local jurisdictions. Tax interpretations, regulations and legislation in the various jurisdictions in which we operate are subject to change and uncertainty and can impact net income, income tax expense or recovery and deferred income tax assets or liabilities. Our interpretation of tax rules and regulations, including those relating to foreign jurisdictions, requires judgment that may be challenged by taxation authorities upon audit. Although we believe our assumptions, judgments and estimates are reasonable, changes in tax laws or our interpretation of tax laws and the resolution of any tax audits could significantly impact the amounts provided for income taxes in our consolidated financial statements.

Fluctuations in foreign currency exchange could affect our financial results.

We earn revenues, pay expenses, own assets and incur liabilities in countries using currencies other than the U.S. dollar. In fiscal 2018, we recorded approximately 17.5% of our direct revenues in Canada. Because our consolidated financial statements are presented in U.S. dollars, we must translate revenues, income and expenses as well as assets and liabilities into U.S. dollars at exchange rates in effect during or at the end of each reporting period. Therefore, increases or decreases in the value of the U.S. dollar against other currencies in countries where we operate affect our results of operations and the value of balance sheet items denominated in foreign currencies.

Certain adverse conditions have required, and future conditions might require, us to make substantial write-downs in our assets, which have adversely affected or would adversely affect our balance sheet and results of operations.

We review our long-lived tangible and intangible assets for impairment whenever events or changes in circumstances indicate that the carrying value of an asset may not be recoverable. We also test our goodwill and indefinite-lived intangible assets for impairment at least annually on December 31, or when events or changes in the business environment indicate that the carrying value of a reporting unit may exceed its fair value. Based on those results, during the third quarter of 2016, we determined that the then carrying amount of one of our then reporting units exceeded the estimated fair value of that unit and we therefore then recognized a goodwill impairment charge of $34.0 million with respect to that unit. During and as of the end of each of 2018, 2017 and 2016, we determined that no additional asset write-downs were required. However, if conditions in any of the businesses in which we compete were to deteriorate, we could determine that certain of our assets are impaired and we would then be required to write-off all or a portion of our costs for such assets. Any significant write-offs would adversely affect our balance sheet and results of operations.

Additional Risks of Our Environmental Services Business

The hazardous waste management business which our Environmental Services segment conducts is subject to significant environmental liabilities.

We have accrued environmental liabilities valued as of December 31, 2018, at $190.9 million, substantially all of which we assumed in connection with certain acquisitions. We calculate our environmental liabilities on a present value basis in accordance with generally accepted accounting principles, which take into consideration both the amount of such liabilities and the timing when we project that we will be required to pay such liabilities. We anticipate our environmental liabilities will be payable over many years and that cash flows generated from our operations will generally be sufficient to fund the payment of such liabilities when required. However, events not now anticipated (such as future changes in environmental laws and regulations or their enforcement) could require that such payments be made earlier or in greater amounts than we now estimate, which could adversely affect our financial condition and results of operations.

We may also assume additional environmental liabilities as part of future acquisitions. Although we will endeavor to accurately estimate and limit environmental liabilities presented by the businesses or facilities to be acquired, some liabilities, including ones that may exist only because of the past operations of an acquired business or facility, may prove to be more difficult or costly to address than we then estimate. It is also possible that government officials responsible for enforcing

environmental laws may believe an environmental liability is more significant than we then estimate, or that we will fail to identify or fully appreciate an existing liability before we become legally responsible to address it.

If we become unable to obtain at reasonable cost the insurance, surety bonds, letters of credit and other forms of financial assurance required for our facilities and operations, our business and results of operations would be adversely affected.

We are required to provide substantial amounts of financial assurance to governmental agencies for closure and post-closure care of our licensed hazardous waste treatment facilities should those facilities cease operation, and we are also occasionally required to post surety, bid and performance bonds in connection with certain projects. As of December 31, 2018, our total estimated closure and post-closure costs requiring financial assurance by regulators were $464.2 million for our U.S. facilities and $42.1 million for our Canadian facilities. We have obtained all of the required financial assurance for our facilities through a combination of surety bonds, funded trusts, letters of credit and insurance from a qualified insurance company. The financial assurance related to closure and post-closure obligations of our U.S. facilities will renew in 2019. Our Canadian facilities utilize surety bonds, which renew at various dates throughout 2019, as well as letters of credit.

Our ability to continue operating our facilities and conducting our other operations would be adversely affected if we became unable to obtain sufficient insurance, surety bonds, letters of credit and other forms of financial assurance at reasonable cost to meet our regulatory and other business requirements. The availability of insurance, surety bonds, letters of credit and other forms of financial assurance is affected by our insurers', sureties' and lenders' assessment of our risk and by other factors outside of our control such as general conditions in the insurance and credit markets.

The hazardous waste management industry in which we participate is subject to significant economic and business risks.

The future operating results of our Environmental Services segment may be affected by such factors as our ability to utilize our facilities and workforce profitably in the face of intense price competition, maintain or increase market share in an industry which has in the past experienced significant downsizing and consolidation, realize benefits from cost reduction programs, invest in new technologies for treatment of hazardous waste, generate incremental volumes of waste to be handled through our facilities from existing and acquired sales offices and service centers, obtain sufficient volumes of waste at prices which produce revenue sufficient to offset the operating costs of our facilities, minimize downtime and disruptions of operations, and develop our field services business. In particular, economic downturns or recessionary conditions in North America, and increased outsourcing by North American manufacturers to plants located in countries with lower wage costs and less stringent environmental regulations, have adversely affected and may in the future adversely affect the demand for our services. Our Environmental Services business is also cyclical to the extent that it is dependent upon a stream of waste from cyclical industries such as chemical and petrochemical. If those cyclical industries slow significantly, the business that we receive from them would likely decrease.

The extensive environmental regulations to which we are subject may increase our costs and potential liabilities and limit our ability to expand our facilities.

Our operations and those of others in the environmental services industry are subject to extensive federal, state, provincial and local environmental requirements in both the United States and Canada, including those relating to emissions to air, discharged wastewater, storage, treatment, transport and disposal of regulated materials, and cleanup of soil and groundwater contamination. In particular, if we fail to comply with governmental regulations governing the transport of hazardous materials, such failure could negatively impact our ability to collect, process and ultimately dispose of hazardous wastes generated by our customers. While increasing environmental regulation often presents new business opportunities for us, it often also results in increased operating and compliance costs. Efforts to conduct our operations in compliance with all applicable laws and regulations, including environmental rules and regulations, require programs to promote compliance, such as training employees and customers, purchasing health and safety equipment, and in some cases hiring outside consultants and lawyers. Even with these programs, we and other companies in the environmental services industry are routinely faced with governmental enforcement proceedings, which can result in fines or other sanctions and require expenditures for remedial work on waste management facilities and contaminated sites. Certain of these laws impose strict and, under certain circumstances, joint and several liability on current and former owners and operators of facilities that release regulated materials or that generate those materials and arrange for their disposal or treatment at contaminated sites. Such liabilities can relate to required cleanup of releases of regulated materials and related natural resource damages.

From time to time, we have paid fines or penalties in governmental environmental enforcement proceedings, usually involving our waste treatment, storage and disposal facilities. Although none of these fines or penalties that we have paid in the past has had a material adverse effect upon us, we might in the future be required to make substantial expenditures as a result of governmental proceedings which would have a negative impact on our earnings. Furthermore, regulators have the power to

suspend or revoke permits or licenses needed for operation of our plants, equipment, and vehicles based on, among other factors, our compliance record, and customers may decide not to use a particular disposal facility or do business with us because of concerns about our compliance record. Suspension or revocation of permits or licenses would impact our operations and could have a material impact on our financial results. Although we have never had any of our facilities' operating permits revoked, suspended or non-renewed involuntarily, it is possible that such an event could occur in the future.

Some environmental laws and regulations impose liability and responsibility on present and former owners, operators or users of facilities and sites for contamination at such facilities and sites without regard to causation or knowledge of contamination. In the past, practices have resulted in releases of regulated materials at and from certain of our facilities, or the disposal of regulated materials at third-party sites, which may require investigation and remediation, and potentially result in claims of personal injury, property damage and damages to natural resources. In addition, we occasionally evaluate various alternatives with respect to our facilities, including possible dispositions or closures. Investigations undertaken in connection with these activities may lead to discoveries of contamination that must be remediated, and closures of facilities might trigger compliance requirements that are not applicable to operating facilities. We are currently conducting remedial activities at certain of our facilities and paying a portion of the remediation costs at certain sites owned by third parties. While, based on available information, we believe these remedial activities will not result in a material effect upon our operations or financial condition, these activities or the discovery of previously unknown conditions could result in material costs.

In addition to the costs of complying with environmental laws and regulations, we incur costs defending against environmental litigation brought by governmental agencies and private parties. We are now, and may in the future be, a defendant in lawsuits brought by parties alleging environmental damage, personal injury, and/or property damage, which may result in our payment of significant amounts.

Environmental and land use laws also impact our ability to expand our facilities. In addition, we are required to obtain governmental permits to operate our facilities, including all of our landfills. Even if we comply with all applicable environmental laws, we might not be able to obtain requisite permits from applicable governmental authorities to extend or modify such permits to fit our business needs.

If our assumptions relating to expansion of our landfills should prove inaccurate, our results of operations and cash flow could be adversely affected.

When we include expansion airspace in our calculation of available airspace, we adjust our landfill liabilities to the present value of projected costs for cell closure and landfill closure and post-closure. It is possible that our estimates or assumptions could ultimately turn out to be significantly different from actual results. In some cases we may be unsuccessful in obtaining an expansion permit or we may determine that an expansion permit that we previously thought was probable has become unlikely. To the extent that such estimates, or the assumptions used to make those estimates, prove to be significantly different than actual results, or our belief that we will receive an expansion permit changes adversely in a significant manner, our landfill assets, including the assets incurred in the pursuit of the expansion, may be subject to impairment testing. Furthermore, lower prospective profitability may result due to increased interest accretion and depreciation or asset impairments related to the removal of previously included expansion airspace. In addition, if our assumptions concerning expansion airspace should prove inaccurate, certain of our cash expenditures for closure of landfills could be accelerated and adversely affect our results of operations and cash flow.

A significant portion of our Environmental Services business depends upon the demand for cleanup of major spills and other remedial projects and regulatory developments over which we have no control.

Our operations can be affected by the commencement and completion of cleanup of major spills and other events, customers' decisions to undertake remedial projects, seasonal fluctuations due to weather and budgetary cycles influencing the timing of customers' spending for remedial activities, the timing of regulatory decisions relating to hazardous waste management projects, changes in regulations governing the management of hazardous waste, secular changes in the waste processing industry towards waste minimization and the propensity for delays in the demand for remedial services, and changes in the myriad of governmental regulations governing our diverse operations. We do not control such factors and, as a result, our revenue and income can vary from quarter to quarter, and past financial performance for certain quarters may not be a reliable indicator of future performance for comparable quarters in subsequent years.

Additional Risks of Our Safety-Kleen Business

Fluctuations in oil prices may negatively affect our Safety-Kleen business.

A significant portion of our Safety-Kleen business involves collecting used oil from certain of our customers, re-refining a portion of such used oil into base and blended lubricating oils, and then selling both such re-refined oil and the recycled oil, or ‘‘RFO,’’ collectively "oil products", to other customers. Changes in the reported spot market prices of oil affect the prices at

which we can sell our re-refined oil and RFO. If applicable rates increase or decrease, we typically will charge a higher or lower corresponding price for our oil products. The prices at which we sell our oil products can also be affected by changes in certain indices measuring changes in the price of heavy fuel oil, with increases and decreases in the indices typically translating into a higher or lower price for our oil products. The cost to collect used oil, including the amounts we pay to obtain a portion of our used oil and therefore ability to collect necessary volumes and the fuel costs of our oil collection fleet, typically also increases or decreases when the relevant indices increase or decrease. However, even though the prices we can charge for our oil products and the costs to collect and re-refine used oil and process RFO typically increase and decrease together, there is no assurance that when our costs to collect and re-refine used oil and process RFO increase we will be able to increase the prices we charge for our oil products to cover such increased costs, or that our costs to collect and re-refine used oil and process RFO will decline when the prices we can charge for such oil products decline. These risks are exacerbated when there are rapid fluctuations in these oil indices.

Environmental laws and regulations have adversely affected and may adversely affect Safety-Kleen's parts cleaning and other solvent related services.

In connection with its parts cleaning and other solvent related services, Safety-Kleen has been subject to fines and certain orders requiring it to take environmental remedial action. Safety-Kleen may also be subject to monetary fines, civil or criminal penalties, remediation, cleanup or stop orders, injunctions, orders to cease or suspend certain practices or denial of permits required for the operation of its facilities. The outcome of any proceeding and associated costs and expenses could have a material adverse impact on Safety-Kleen’s financial condition and results of operations.

Recent and potential changes in environmental laws and regulations may also adversely affect future Safety-Kleen parts cleaning and other solvent related services. Interpretation or enforcement of existing laws and regulations, or the adoption of new laws and regulations, may require Safety-Kleen to modify or curtail its operations or replace or upgrade its facilities or equipment at substantial cost, which we may not be able to pass on to our customers, and we may choose to indemnify our customers from any fines or penalties they may incur as a result of these new laws and regulations. On the other hand, in some cases if new laws and regulations are less stringent, Safety-Kleen’s customers or competitors may be able to manage waste more effectively themselves, which could decrease the need for Safety-Kleen’s services or increase competition, which could adversely affect Safety-Kleen’s results of operations.

Safety-Kleen is subject to existing and potential product liability lawsuits.

Safety-Kleen has been named from time to time as a defendant in product liability lawsuits in various courts and jurisdictions throughout the United States. As of December 31, 2018, Safety-Kleen was involved in approximately 67 such proceedings (including cases which have been settled but not formally dismissed) wherein persons claim personal injury resulting from the use of its parts cleaning equipment or cleaning products. These proceedings typically involve allegations that the solvents used in Safety-Kleen’s parts cleaning equipment contain contaminants or that Safety-Kleen’s recycling process does not effectively remove the contaminants that become entrained in the solvents during their use. In addition, certain claimants assert that Safety-Kleen failed to adequately warn the product user of potential risks, including a historic failure to warn that such solvents contain trace amounts of toxic or hazardous substances such as benzene. Although Safety-Kleen maintains insurance that we believe will provide coverage for these claims (over amounts accrued for self-insured retentions and deductibles in certain limited cases), this insurance may not provide coverage for potential awards of punitive damages against Safety-Kleen. Although Safety-Kleen has vigorously defended and will continue to vigorously defend itself and the safety of its products against all of these claims, these lawsuits are subject to many uncertainties and outcomes cannot be predicted with assurance. Safety-Kleen may also be named in similar additional lawsuits in the future, including claims for which insurance coverage may not be available. If any one or more of these lawsuits were decided unfavorably against Safety-Kleen and the plaintiffs were awarded punitive damages, or if insurance coverage were not available for any such claim, our financial condition and results of operations could be materially and adversely affected. Additionally, if any one or more of these lawsuits were decided unfavorably against Safety-Kleen, such outcome may encourage more lawsuits against us.

Safety-Kleen is dependent on third parties for manufacturing the majority of its equipment.

Safety-Kleen does not manufacture the majority of the equipment, including parts washers, that Safety-Kleen places at customer sites. Accordingly, Safety-Kleen relies on a limited number of third-party suppliers for manufacturing this equipment. The supply of third-party equipment could be interrupted or halted by a termination of Safety-Kleen's relationships, a failure of quality control or other operational problems at such suppliers or a significant decline in their financial condition. If Safety-Kleen were not able to retain these providers or obtain its requests from them, Safety-Kleen may not be able to obtain alternate providers in a timely manner or on economically attractive terms and, as a result, Safety-Kleen may not be able to compete successfully for new business, complete existing engagements profitably or retain its existing customers. Additionally, if Safety-Kleen's third-party suppliers provide defective equipment, Safety-Kleen may be subject to reputational damage or product liability claims which may negatively impact its reputation, financial condition and results of operations. Further, Safety-Kleen generally does not have long-term contracts with its third-party suppliers, and as a result those suppliers may increase the price of the equipment they provide, which may hurt Safety-Kleen's results of operations.

Risks Relating to Our Levels of Debt and Letters of Credit

Our substantial levels of outstanding debt and letters of credit could adversely affect our financial condition and ability to fulfill our obligations.

As of December 31, 2018, we had outstanding $845.0 million of senior unsecured notes, $742.2 million of senior secured term loans, and $130.1 million of letters of credit. Our substantial levels of outstanding debt and letters of credit may:

- adversely impact our ability to obtain additional financing in the future for working capital, capital expenditures, acquisitions or other general corporate purposes or to repurchase our senior unsecured notes from holders upon any change of control;
- require us to dedicate a substantial portion of our cash flow to payment of interest on our debt and fees on our letters of credit, which reduces the availability of our cash flow to fund working capital, capital expenditures, acquisitions and other general corporate purposes;
- subject us to the risk of increased sensitivity to interest rate increases based upon variable interest rates, including $392.2 million of our $742.2 million senior secured term loans for which we do not currently have interest rate hedges and borrowings (if any) under our revolving credit facility;
- increase the possibility of an event of default under the financial and operating covenants contained in our debt instruments; and
- limit our ability to adjust to rapidly changing market conditions, reduce our ability to withstand competitive pressures and make us more vulnerable to a downturn in general economic conditions of our business than our competitors with less debt.

Our ability to make scheduled payments of principal or interest with respect to our debt, including our outstanding senior unsecured notes, our secured term loans, any revolving loans and our capital leases, and to pay fee obligations with respect to our letters of credit, will depend on our ability to generate cash and our future financial results. If we were unable to generate sufficient cash flow from operations in the future to service our debt and letter of credit fee obligations, we might be required to refinance all or a portion of our existing debt and letter of credit facilities or to obtain new or additional such facilities. However, we might not be able to obtain any such new or additional facilities on favorable terms or at all.

Despite our substantial levels of outstanding debt and letters of credit, we could incur substantially more debt and letter of credit obligations in the future.

Although our revolving credit agreement and the indentures and loan agreement governing our other outstanding debt contain restrictions on the incurrence of additional debt (including, for this purpose, reimbursement obligations under outstanding letters of credit), these restrictions are subject to a number of qualifications and exceptions and the additional debt which we might incur in the future in compliance with these restrictions could be substantial. In particular, we had available at December 31, 2018, up to approximately $235.4 million for additional borrowings and letters of credit under our revolving credit facility. Our revolving credit agreement and the indentures and loan agreement governing our other outstanding debt also allow us to borrow significant amounts of money from other sources. These restrictions also do not prevent us from incurring obligations (such as operating leases) that do not constitute "debt" or "indebtedness" as defined in the relevant agreements. To the extent we incur in the future additional debt and letter of credit or other obligations, the related risks would increase.

The covenants in our debt agreements restrict our ability to operate our business and might lead to a default under our debt agreements.

Our revolving credit agreement and the indentures and loan agreement governing our other outstanding debt limit, among other things, our ability and the ability of our restricted subsidiaries to:

- incur or guarantee additional indebtedness (including, for this purpose, reimbursement obligations under letters of credit) or issue preferred stock;
- pay dividends or make other distributions to our stockholders;
- purchase or redeem capital stock or subordinated indebtedness;
- make investments;
- create liens;
- incur restrictions on the ability of our restricted subsidiaries to pay dividends or make other payments to us;
- sell assets, including capital stock of our subsidiaries;
- consolidate or merge with or into other companies or transfer all or substantially all of our assets; and
- engage in transactions with affiliates.

As a result of these covenants, we may not be able to respond to changes in business and economic conditions and to obtain additional financing, if needed, and we may be prevented from engaging in transactions that might otherwise be beneficial to us. Our revolving credit facility requires, and our future credit facilities may require, us to maintain under certain circumstances certain financial ratios and satisfy certain other financial condition tests. Our ability to meet these financial ratios and tests can be affected by events beyond our control, and we may not be able to meet those tests. The breach of any of these covenants could result in a default under our outstanding or future debt. Upon the occurrence of an event of default, the lenders could elect to declare all amounts outstanding under such debts, including accrued interest or other obligations, to be immediately due and payable. If amounts outstanding under such debt were accelerated, our assets might not be sufficient to repay in full that debt and our other debt.

Our revolving credit agreement and the indentures and loan agreement governing our other outstanding debt also contain cross-default and cross-acceleration provisions. Under these provisions, a default or acceleration under one instrument governing our debt may constitute a default under our other debt instruments that contain cross-default and cross-acceleration provisions, which could result in the related debt and the debt under such other instruments becoming immediately due and payable. In such event, we would need to raise funds from alternative sources, which funds might not be available to us on favorable terms, on a timely basis or at all. Alternatively, such a default could require us to sell assets and otherwise curtail operations to pay our creditors. The proceeds of such a sale of assets, or curtailment of operations, might not enable us to pay all of our liabilities.

Other Risks Relating to Our Common Stock

The Massachusetts Business Corporation Act and our By-Laws contain certain anti-takeover provisions.

Sections 8.06 and 7.02 of the Massachusetts Business Corporation Act provide that Massachusetts corporations which are publicly-held must have a staggered board of directors and that written demand by holders of at least 40% of the outstanding shares of each relevant voting group of stockholders is required for stockholders to call a special meeting unless such corporations take certain actions to affirmatively "opt-out" of such requirements. In accordance with these provisions, our By-Laws provide for a staggered board of directors which consists of three classes of directors of which one class is elected each year for a three-year term, and require that written application by holders of at least 25% (which is less than the 40% which would otherwise be applicable without such a specific provision in our By-Laws) of our outstanding shares of common stock is required for stockholders to call a special meeting. In addition, our By-Laws prohibit the removal by the stockholders of a director except for cause. These provisions could inhibit a takeover of our Company by restricting stockholders' action to replace the existing directors or approve other actions which a party seeking to acquire us might propose. A takeover transaction would frequently afford stockholders an opportunity to sell their shares at a premium over then market prices.

ITEM 1B. UNRESOLVED STAFF COMMENTS

Not applicable.

ITEM 2. PROPERTIES

Our principal executive offices are in Norwell, Massachusetts, where we lease approximately 151,000 square feet under arrangements which may not expire until 2042. We also have regional administrative offices in Texas, South Carolina, and Alberta, Canada. Our properties are sufficient and suitable for our current needs.

We have a network of more than 480 service locations across 49 states, nine Canadian provinces, Puerto Rico, and Mexico. Those service locations include service centers, satellite locations, branches, active hazardous waste management properties, lodging facilities and oil processing facilities. The service centers and branches are the principal sales and service

centers from which we provide our environmental, energy and industrial services. The active hazardous waste management properties include incinerator facilities, commercial and non-commercial landfills, wastewater treatment facilities, treatment, storage and disposal facilities ("TSDFs"), solvent recovery management and recycling facilities, oil accumulation centers, oil terminals and oil re-refineries. Some of our properties offer multiple capabilities. The following sets forth certain information as of December 31, 2018 regarding our properties.

Service Centers, Satellite Locations and Branches

We have approximately 365 service centers, satellite locations and branches throughout the United States and Canada which serve as principal sales and service centers from which we provide parts cleaning services, containerized waste services, oil collection services and other environmental services.

Active Hazardous Waste Management Properties

Incinerator Facilities. We own five operating incinerator facilities that have a total of nine incinerators with 561,721 tons of total practical capacity and an overall average utilization rate for 2018 of 86.7%. Our practical capacity is not based on a theoretical 24-hour, seven-day operation, but rather is determined as the production level at which our incinerators can operate with an acceptable degree of efficiency, taking into consideration factors such as longer term customer demand, permanent staffing levels, operating shifts, holidays, scheduled maintenance and mix of product. Capacity utilization is calculated by dividing actual production pounds by practical capacity at each incinerator.

	# of Incinerators	Practical Capacity (Tons)	Utilization Rate Year Ended December 31, 2018
Arkansas	3	145,072	94.8%
Nebraska	1	58,808	73.8%
Utah	1	66,815	88.7%
Texas	3	165,500	82.7%
Ontario, Canada	1	125,526	87.4%
	9	561,721	86.7%

Our incinerators offer a wide range of technological capabilities to customers through this network. We provide incineration in the United States through one fluidized bed thermal oxidation unit and three solids and liquids-capable incinerator facilities and we operate in Canada one active hazardous waste liquid injection incinerator.

Commercial and Non-Commercial Landfills. In the United States and Canada, we operate nine commercial landfills with approximately 29.4 million cubic yards of remaining highly probable airspace. Seven of our commercial landfills are designed and permitted for the disposal of hazardous wastes and two landfills are operated for nonhazardous industrial waste disposal and, to a lesser extent, municipal solid waste. In addition to our commercial landfills, we also own and operate two non-commercial landfills that only accept waste from our on-site incinerators. See "Landfill Accounting" within Note 2, "Significant Accounting Policies," to our consolidated financial statements included in Item 8 of this report for additional information on our commercial and non-commercial landfills.

Wastewater Treatment Facilities. We operate a total of nine facilities, of which six are owned and three are leased, that offer a range of wastewater treatment technologies and customer services. Wastewater treatment consists primarily of three types of services: hazardous wastewater treatment, sludge de-watering or drying, and non-hazardous wastewater treatment.

Treatment, Storage and Disposal Facilities. We operate 18 TSDFs, of which 16 are owned and two are leased, in the United States and Canada. Our TSDFs facilitate the movement of materials among our network of service centers and treatment and disposal facilities. Transportation may be accomplished by truck, rail, barge or a combination of modes, with our own assets or in conjunction with third-party transporters. Specially designed containment systems, vehicles and other equipment permitted for hazardous and industrial waste transport, together with drivers trained in transportation and waste handling procedures, provide for the movement of customer waste streams.

Solvent Recovery Management and Recycling Operations. We own two facilities specializing in solvent recovery management.

Oil Processing, Blending and Packaging Facilities

Oil Accumulation Centers. We operate a total of nine accumulation centers, of which eight are owned and one is leased, used for accumulating waste oil from our branches.

Oil Terminals. We operate a total of 54 oil terminals, of which 31 are owned and 23 are leased, which collect or process used oil prior to delivery to re-refineries or distribution as RFO.

Oil Recycling and Re-refining Facilities. We own six oil re-refineries, five in the United States and one in Canada. With more than 200 million gallons of used oil processed annually, we were able to return in 2018 192 million gallons of new re-refined oil, lubricants and byproducts back into the marketplace.

Oil Packaging and Blending Facilities. We operate a total of five oil packaging and blending facilities, of which three are owned and two are leased and used for blending and packaging oil from our branches.

Lodging Facilities

Lodge Operations. We operate five fixed lodges, all of which are owned and located on sites in Alberta, Canada that are leased under long-term operating agreements.

Camps. We operate various camp facilities that can grow and shrink in size and location. Generally, we have ongoing operations at 1-2 larger facilities that we expect to operate on a multi-year basis. Additionally, we have in our fleet that can operate at any time, five office complexes, eight mini-camps, and approximately 35 single and double occupancy drill camps. All of our camp facilities are owned and located on various sites throughout Western Canada. Sites for the larger facilities are generally leased, whereas sites for our smaller facilities are generally provided by our customers.

ITEM 3. LEGAL PROCEEDINGS

See Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report for a description of legal proceedings.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Common Stock

Our common stock trades on the New York Stock Exchange (the "NYSE") under the symbol CLH. On February 15, 2019, there were 258 stockholders of record of our common stock, excluding stockholders whose shares were held in nominee, or "street," name. On our last record date, approximately 22,975 additional stockholders beneficially held shares in street name.

We have never declared nor paid any cash dividends on our common stock, and we do not intend to pay any dividends on our common stock in the foreseeable future. We intend to retain our future earnings, if any, for use in the operation and expansion of our business and payment of our outstanding debt, and for our stock repurchase program. In addition, our current credit agreement and indentures limit the amount we could pay as cash dividends on, or for repurchase of, our common stock. For additional information surrounding our stock repurchase program, see Note 15, "Stockholder's Equity," to our consolidated financial statements included in Item 8 of this report.

Securities Authorized For Issuance Under Equity Compensation Plans

See Item 12, "Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters," for a description of the securities which are authorized for issuance under our equity compensation plans.

Issuer Purchases of Equity Securities

Period	Total Number of Shares Purchased (1)	Average Price Paid Per Share (2)	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Approximate Dollar Value of Shares that May Yet Be Purchased Under the Plans or Programs (3)
October 1, 2018 through October 31, 2018	3,000	$ 70.89	—	$ 317,571,511
November 1, 2018 through November 30, 2018	164,559	$ 65.07	162,000	$ 307,027,656
December 1, 2018 through December 31, 2018	21,520	$ 59.38	16,000	$ 306,072,512
Total	189,079	$ 64.52	178,000	$ 306,072,512

(1) Includes 11,079 shares withheld by us from employees to satisfy employee tax obligations upon vesting of restricted shares granted under our long-term equity incentive programs.

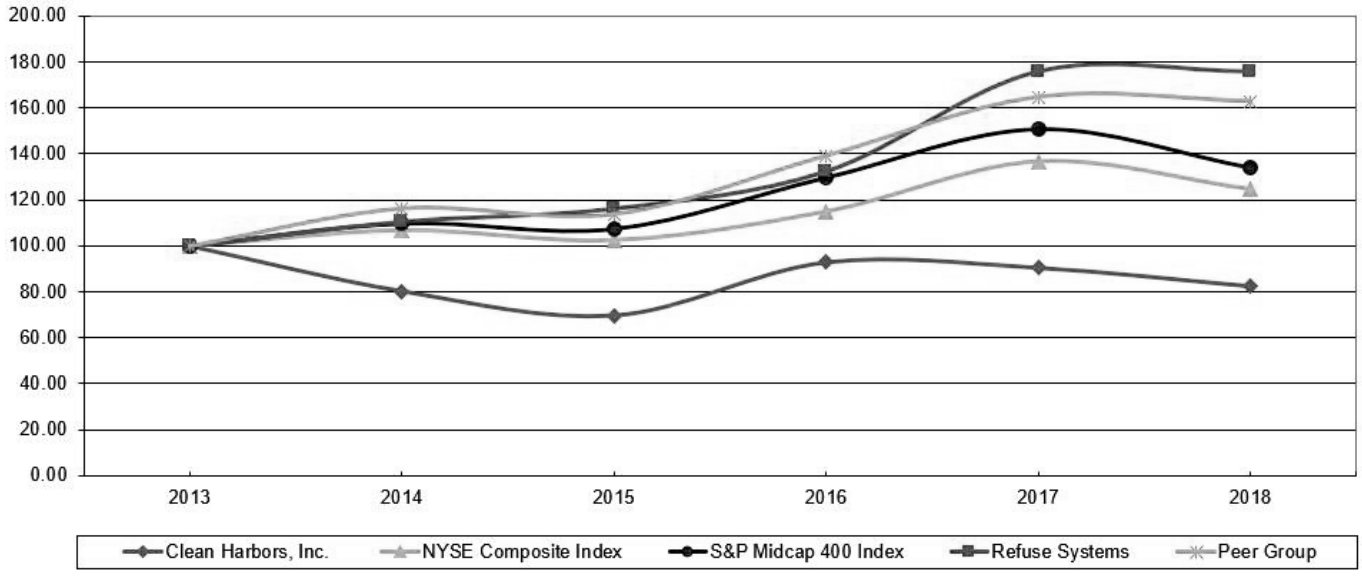
(2) The average price paid per share of common stock repurchased under our stock repurchase program includes commissions paid to the brokers.

(3) Our board of directors has authorized the repurchase of up to $600 million of our common stock. We have funded and intend to fund the repurchases through available cash resources. The stock repurchase program authorizes us to purchase our common stock on the open market or in privately negotiated transactions periodically in a manner that complies with applicable U.S. securities laws. The number of shares purchased and the timing of the purchases has depended and will depend on a number of factors, including share price, cash required for business plans, trading volume and other conditions. During April 2018, we implemented a repurchase plan in accordance with Rule 10b5-1 promulgated under the Securities Exchange Act of 1934, as amended. Future repurchases will be made under the Rule 10b5-1 plan as well as open market or privately negotiated transactions as described above. We have no obligation to repurchase stock under this program and may suspend or terminate the repurchase program at any time.

COMPARISON OF 5-YEAR CUMULATIVE TOTAL RETURN
AMONG CLEAN HARBORS, INC.,
NYSE COMPOSITE INDEX, S&P MIDCAP 400 INDEX, REFUSE SYSTEMS AND CUSTOM PEER GROUP

Performance Graph

The following graph compares the five-year return from investing $100 in each of our common stock, the NYSE Composite Index, the S&P Midcap 400 Index, and indices of comparable companies compiled by CoreData, consisting of companies whose listed line-of-business is SIC Code 4953 (refuse systems) and a custom peer group. We selected a peer group comprised of American Water Works Company, Inc., Casella Waste Systems, Inc., Civeo Corporation, Covanta Holding Corporation, Heritage-Crystal Clean, Inc., Iron Mountain Incorporated, Newpark Resources, Inc., Oil States International, Inc., Republic Services, Inc., Stericycle, Inc., Superior Energy Services, Inc., US Ecology, Inc., and Waste Management, Inc. The values illustrated assume reinvestment of dividends on the ex-dividend date and compares relative performance since a particular starting date. In this instance, the starting date was December 31, 2013, when our common stock closed at $59.96 per share. The graph is presented pursuant to SEC rules and is not meant to be an indication of our future performance.



ITEM 6. SELECTED FINANCIAL DATA

The following summary of consolidated financial information has been derived from the audited consolidated financial statements included in Item 8, "Financial Statements and Supplementary Data," of this report and in the annual reports we previously filed with the SEC. This information should be reviewed in conjunction with Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations," and the financial statements and notes thereto included in Item 8, "Financial Statements and Supplementary Data," of this report.

	For the Year Ended December 31,				
(in thousands except per share amounts)	2018	2017	2016	2015	2014
Statement of Operations Data:					
Total revenues	$3,300,303	$2,944,978	$2,755,226	$3,275,137	$3,401,636
Net income (loss) (1)	$ 65,636	$ 100,739	$ (39,873)	$ 44,102	$ (28,328)
Earnings (loss) per share: (1)					
Basic	$ 1.17	$ 1.77	$ (0.69)	$ 0.76	$ (0.47)
Diluted	$ 1.16	$ 1.76	$ (0.69)	$ 0.76	$ (0.47)
Other Financial Data:					
Adjusted EBITDA (2)	$ 491,005	$ 425,657	$ 400,354	$ 504,167	$ 521,919

	At December 31,				
(in thousands)	2018	2017	2016	2015	2014
Balance Sheet Data:					
Total assets	$ 3,738,321	$ 3,706,570	$ 3,681,920	$ 3,431,428	$ 3,689,423
Long-term obligations (including current portion)	1,572,556	1,629,537	1,633,272	1,382,543	1,380,681
Stockholders' equity	1,169,756	1,188,202	1,084,241	1,096,282	1,262,871

(1) The 2018 results include a $2.5 million pre-tax loss on early extinguishment of debt. The 2017 results include a net benefit of $93.0 million resulting from impacts of the tax law changes enacted in December of 2017, a $7.9 million pre-tax loss on early extinguishment of debt and a $30.7 million pre-tax gain on the sale of a non-core line of business within our Environmental Services segment. The 2016 results include a $34.0 million goodwill impairment charge and a $16.9 million pre-tax gain on the sale of a non-core line of business within our Environmental Services segment. The 2015 results include a $32.0 million goodwill impairment charge in our Environmental Services segment, and the 2014 results include a $123.4 million goodwill impairment charge in our Kleen Performance Products reporting unit. In 2016, we did not record any income tax benefit as a result of the goodwill impairment charge. In 2015 and 2014, we recorded income tax benefits of $2.0 million and $2.7 million, respectively, as a result of the goodwill impairment charges.

(2) The following is a reconciliation of net income (loss) to Adjusted EBITDA for the following periods (in thousands). See additional information regarding this non-GAAP measure under the heading *"Adjusted EBITDA"* in Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations," of this report.

	For the Year Ended December 31,				
	2018	2017	2016	2015	2014
Net income (loss)	$ 65,636	$ 100,739	$ (39,873)	$ 44,102	$ (28,328)
Accretion of environmental liabilities	9,806	9,460	10,177	10,402	10,612
Depreciation and amortization	298,625	288,422	287,002	274,194	276,083
Goodwill impairment charges	—	—	34,013	31,992	123,414
Other expense (income), net	4,510	6,119	(6,195)	1,380	(4,380)
Loss on early extinguishment of debt	2,488	7,891	—	—	—
Gain on sale of businesses	—	(30,732)	(16,884)	—	—
Interest expense, net	81,094	85,808	83,525	76,553	77,668
Provision (benefit) for income taxes	28,846	(42,050)	48,589	65,544	66,850
Adjusted EBITDA	$ 491,005	$ 425,657	$ 400,354	$ 504,167	$ 521,919

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Overview

We are North America's leading provider of environmental, energy and industrial services. We believe we operate, in the aggregate, the largest number of hazardous waste incinerators, landfills and treatment, storage and disposal facilities ("TSDFs") in North America. We serve a diverse customer base, including Fortune 500 companies, across the chemical, energy, manufacturing and additional markets, as well as numerous government agencies. These customers rely on us to deliver a broad range of services including but not limited to end-to-end hazardous waste management, emergency response, industrial cleaning and maintenance, and recycling services. We are also the largest re-refiner and recycler of used oil in the world and the largest provider of parts cleaning and related environmental services to commercial, industrial and automotive customers in North America.

During the first quarter of fiscal year 2018, certain of our businesses undertook a reorganization which included changes to the underlying business and management structures. The reorganization resulted in combining the Environmental Services businesses from an operational and management perspective, deepening customer relationships and allowing for efficiencies across our operations through the sharing of resources, namely labor and equipment, which will reduce third party spending and promote cross selling of our business offerings. In connection with this reorganization, our chief operating decision maker requested changes in the information that he regularly reviews for purposes of allocating resources and assessing performance. These changes required a reconsideration of our operating segments in the first quarter of 2018 and resulted in a change in our assessment of our operating segments. We concluded that there are now two operating segments for disclosure purposes; (i) the Environmental Services segment which consists of our historical Technical Services, Industrial Services, Field Services and Oil, Gas and Lodging businesses, and (ii) the Safety-Kleen segment.

Performance of our segments is evaluated on several factors of which the primary financial measure is Adjusted EBITDA as described more fully below. The following is a discussion of how management evaluates its segments in regards to other factors including key performance indicators that management uses to assess the segments' results, as well as certain macroeconomic trends and influences that impact each reportable segment:

- **Environmental Services -** Environmental Services segment results are predicated upon the demand by our customers for waste services directly attributable to waste volumes generated by them and project work for which waste handling and/or disposal is required. In managing the business and evaluating performance, management tracks the volumes and average price of waste handled and disposed of through our owned incinerators and landfills, as well as utilization of such incinerators, labor and billable hours and equipment among other key metrics. Levels of activity and ultimate performance associated with this segment can be impacted by several factors including overall U.S. GDP and U.S. industrial production, weather conditions, efficiency of our operations, competition and market pricing of our services and the management of our related operating costs. Environmental Services results are also impacted by the demand for planned and unplanned industrial related cleaning and maintenance services at customer sites and for environmental cleanup services on a scheduled or emergency basis, including response to national events such as major oil spills, natural disasters or other events where immediate and specialized services are required.

- **Safety-Kleen -** Safety-Kleen segment results are impacted by an array of core service offerings that serve to attract small quantity waste producers as customers and integrate them into the Clean Harbors waste network. Core service offerings include parts washer services, containerized waste services, vac services, used motor oil collection and sale of base and blended oil products as well as complementary products including automotive related fluids and shop supplies. Key performance indicators tracked by management relative to these services include the number of parts washer services performed and used motor oil and waste volumes collected. Results from these services are primarily driven by the overall number of parts washers placed at customer sites and volumes of waste collected. These factors can be impacted by overall economic conditions in the marketplace, especially in the automotive related area. Safety-Kleen offers high quality base and blended oil products to end users including fleet customers, distributors and manufacturers of oil products. Relative to these oil related products, management tracks the Company's volumes and relative percentages of base and blended oil sales along with various pricing metrics associated with the commodity driven marketplace. The segment's results are significantly impacted by the overall market pricing and product mix associated with base and blended oil products and, more specifically, the market prices of Group II base oils, which historically have correlated with overall crude oil prices. Costs incurred in connection with the collection of used oils and other raw materials associated with the segment's oil related products can also be volatile. The implementation of our OilPlus® closed

loop initiative resulting in the sale of our renewable oil products directly to our end customers will also impact future operating results.

Highlights

Total revenues for 2018 increased 12.1% to $3.3 billion, compared with $2.9 billion in 2017. Our Environmental Services segment increased direct revenues $283.7 million in 2018 compared with 2017 due to incremental revenues resulting from our recent acquisitions, primarily the Veolia Business in the first quarter of 2018, as well as improved average pricing driven by a more profitable mix of waste streams handled by the business. Direct revenues recorded by Safety-Kleen increased $73.4 million in 2018 as compared to 2017 as a result of improved pricing conditions related to our renewable oil products and continued growth across Safety-Kleen's core service offerings and our direct lubricant sales. The fluctuation of the Canadian dollar minimally impacted our consolidated revenues in 2018 as compared to 2017.

Income from operations in 2018 was $182.6 million, compared with $127.8 million in 2017. We reported net income in 2018 and 2017 of $65.6 million and $100.7 million, respectively. Net income in 2017 included a $93.0 million net benefit recorded as a component of income tax expense which resulted from impacts of tax reform law changes which were signed into law in December 2017. Adjusted EBITDA, which is the primary financial measure by which our segments are evaluated, increased 15.4% to $491.0 million in 2018 from $425.7 million in 2017. The increased level of Adjusted EBITDA in 2018 was primarily attributable to higher revenue amounts as described above, which provided improved operating margins from leveraging our existing infrastructure network and additional benefits from the reorganization undertaken in the Environmental Services segment which occurred in the first quarter of 2018. Additional information regarding Adjusted EBITDA, which is a non-GAAP measure, including a reconciliation of Adjusted EBITDA to net income (loss), appears below under *"Adjusted EBITDA."*

Net cash from operating activities for 2018 was $373.2 million, an increase of $87.5 million from 2017. Adjusted free cash flow, which management uses to measure our financial strength and ability to generate cash, was $195.3 million in 2018, which represented a $55.1 million increase over 2017 primarily due to greater levels of operating income, lower interest payments and a reduction in environmental expenditures, offset by higher working capital levels and capital spending. Additional information regarding adjusted free cash flow, which is a non-GAAP measure, including a reconciliation of adjusted free cash flow to net cash from operating activities, appears below under "*Adjusted Free Cash Flow*."

Segment Performance

The primary financial measure by which we evaluate the performance of our segments is Adjusted EBITDA. The following table sets forth certain financial information associated with our results of operations for the years ended December 31, 2018, 2017 and 2016.

	Summary of Operations (in thousands)						
	Year Ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
Direct Revenues[1]:							
Environmental Services	$ 2,141,194	$ 1,857,474	$ 1,758,833	$ 283,720	15.3%	$ 98,641	5.6%
Safety-Kleen	1,161,282	1,087,886	996,083	73,396	6.7	91,803	9.2
Corporate Items	(2,173)	(382)	310	(1,791)	N/M	(692)	N/M
Total	3,300,303	2,944,978	2,755,226	355,325	12.1	189,752	6.9
Cost of Revenues[2]:							
Environmental Services	1,576,705	1,373,789	1,287,629	202,916	14.8	86,160	6.7
Safety-Kleen	725,734	690,344	645,275	35,390	5.1	45,069	7.0
Corporate Items	3,112	(1,460)	(47)	4,572	N/M	(1,413)	N/M
Total	2,305,551	2,062,673	1,932,857	242,878	11.8	129,816	6.7
Selling, General and Administrative Expenses:							
Environmental Services	183,633	162,375	152,129	21,258	13.1	10,246	6.7
Safety-Kleen	153,519	147,731	131,262	5,788	3.9	16,469	12.5
Corporate Items	166,595	146,542	138,624	20,053	13.7	7,918	5.7
Total	503,747	456,648	422,015	47,099	10.3	34,633	8.2
Adjusted EBITDA							
Environmental Services	380,856	321,310	319,075	59,546	18.5	2,235	0.7
Safety-Kleen	282,029	249,811	219,546	32,218	12.9	30,265	13.8
Corporate Items	(171,880)	(145,464)	(138,267)	(26,416)	(18.2)	(7,197)	(5.2)
Total	$ 491,005	$ 425,657	$ 400,354	$ 65,348	15.4%	$ 25,303	6.3%

N/M = not meaningful

(1) Direct revenue is revenue allocated to the segment performing the provided service.

(2) Cost of revenue is shown exclusive of items presented separately on the statements of operations, which consist of (i) accretion of environmental liabilities and (ii) depreciation and amortization.

Direct Revenues

There are many factors which have impacted and continue to impact our revenues. These factors include, but are not limited to: overall industrial activity and growth in North America, existence or non-existence of large scale environmental waste and remediation projects, competitive industry pricing, impacts of acquisitions and divestitures, the level of emergency response projects, general conditions of the energy related industries, base and blended oil pricing, market changes relative to the collection of used oil, the number of parts washers placed at customer sites and foreign currency translation. In addition, customer efforts to minimalize hazardous waste and changes in regulation can also impact our revenues.

Environmental Services

	For the years ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
Direct revenues	$ 2,141,194	$ 1,857,474	$ 1,758,833	$ 283,720	15.3%	$ 98,641	5.6%

Environmental Services direct revenues for the year ended December 31, 2018 increased $283.7 million from the comparable period in 2017. Included in the current year revenues was $154.0 million of direct revenues from the Veolia

Business, which we acquired on February 23, 2018. Excluding the impacts from the Veolia Business, Environmental Services direct revenue increased $129.5 million primarily due to greater levels of activity at our sales and service branches and increased levels of disposal related revenues from improved pricing conditions and mix associated with waste streams at our incinerators in 2018. For the year ended December 31, 2018, landfill volumes increased slightly as compared to 2017. The utilization rate at our incinerator facilities was 86.7% for the year ended December 31, 2018, as compared to 87.6% for the year ended December 31, 2017. The decrease in utilization rates in 2018 was impacted by a slightly higher number of down days at our facilities during 2018; however, impacts on the profitability of the business from an increase in down days was more than offset by improved pricing conditions and an increase in volumes of higher margin waste streams received in 2018. The impact of foreign currency translation on our Canadian operations within the Environmental Services segment was minimal in the year ended December 31, 2018 as compared to 2017.

Environmental Services direct revenues for the year ended December 31, 2017 increased $98.6 million from the comparable period in 2016. Excluding the impacts from divestiture and acquisition activity having occurred in 2016 and 2017, Environmental Services revenues increased $142.1 million from the comparable period in 2016 primarily due to greater levels of activity at our sales and service branches, increased revenues associated with waste projects and higher waste volumes disposed of in our incinerators and landfills from improving economic conditions and business initiatives focused on waste volumes. For the year ended December 31, 2017, landfill volumes increased 12.1% from the comparable period in 2016. The utilization rate at our incinerators was 87.6% on a practical capacity of 561,721 tons for the year ended December 31, 2017, compared with 88.8% on a practical capacity of 491,721 tons in 2016. The increase in practical capacity was the result of the start-up of our waste incinerator at our El Dorado, Arkansas facility, which came online in the first quarter of 2017 and added 70,000 tons of capacity to our network. Inclusive in the year-over-year changes within this segment was also the positive impact of foreign currency translation on our Canadian operations of approximately $8.3 million for the year ended December 31, 2017 from the comparable period in 2016.

Safety-Kleen

	For the years ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
Direct revenues	$ 1,161,282	$ 1,087,886	$ 996,083	$ 73,396	6.7%	$ 91,803	9.2%

Safety-Kleen direct revenues for the year ended December 31, 2018 increased $73.4 million from the comparable period in 2017 primarily due to more favorable pricing on oil products and growth in the business' core service offerings. Revenues generated through our core service offerings such as handling of containerized waste and vac services, parts washer services as well as sales of automotive and industrial cleaning products accounted for $21.3 million of incremental revenues. Increased base and blended volumes and oil pricing accounted for $34.7 million of incremental direct revenue from the comparable period in 2017. Sales of contract packaging and blending services, specialty refinery products and recycled fuel oil also increased by $38.9 million from the comparable period in 2017. These increases were partially offset by a decrease in used motor oil collection revenues of $19.5 million as market pricing for these services was negatively impacted as crude oil prices generally rose throughout the earlier parts of 2018. The impact of foreign currency translation on our Canadian operations within the Safety-Kleen segment was minimal in the year ended December 31, 2018 as compared to 2017.

Safety-Kleen direct revenues for the year ended December 31, 2017 increased $91.8 million from the comparable period in 2016. This increase was derived from more favorable pricing on oil products, incremental revenues from acquisitions and growth in the business. Increased base and blended oil pricing and volumes accounted for $87.2 million of incremental direct revenue from the comparable period in 2016. This increase was partially offset by lower revenue of $15.6 million from a decrease in prices charged for used motor oil collection in 2017. Inclusive in the year-over-year changes within the Safety-Kleen segment was also the positive impact of foreign currency translation on our Canadian operations of approximately $2.8 million in the year ended December 31, 2017 from the comparable period in 2016.

Cost of Revenues

We believe that our ability to manage operating costs is important to our ability to remain price competitive. We continue to upgrade the quality and efficiency of our services through the development of new technology and continued modifications at our facilities, invest in new business opportunities and aggressively implement strategic sourcing and logistics solutions as well as other cost reduction initiatives while also continuing to optimize our management and operating structure in an effort to maintain and increase operating margins.

Environmental Services

	For the years ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
Cost of revenues	$1,576,705	$1,373,789	$1,287,629	$ 202,916	14.8 %	$ 86,160	6.7%
As a % of Direct Revenue	73.6%	74.0%	73.2%		(0.4)%		0.8%

Environmental Services cost of revenues for the year ended December 31, 2018 increased $202.9 million from the comparable period in 2017. The acquired Veolia Business had cost of revenues of $131.2 million in the year ended December 31, 2018. Excluding these costs, Environmental Services cost of revenues for the year ended December 31, 2018 increased $71.7 million primarily due to increases in labor related costs of $45.4 million, transportation, disposal and fuel costs of $16.2 million and equipment, supply and various other expenses of $10.0 million. The incremental operating costs were commensurate with greater activity levels in 2018 and overall inflationary pressure across several cost categories including certain commodity supplies such as fuel and other supplies. Costs as a percentage of direct revenues decreased slightly over the comparable period of 2017, which can be attributed to a more favorable mix of waste streams in our incineration network which increased profitability.

Environmental Services cost of revenues for the year ended December 31, 2017 increased $86.2 million from the comparable period in 2016. Excluding the impacts from divestitures, Environmental Services cost of revenues for the year ended December 31, 2017 increased $133.0 million from the comparable period in 2016 primarily due to increases in labor and subcontractor related costs of $59.9 million, equipment and supply costs of $46.6 million, and transportation, disposal and fuel costs of $28.4 million, partially offset by $1.9 million of reductions across various expense categories. The incremental operating costs were primarily driven by the El Dorado incinerator which came online in early 2017 and its relevant start-up activities, higher down days across our network associated with the hurricanes that impacted the gulf region of the U.S. in 2017 and overall increased economic activity. The higher concentration of lower margin waste in our incineration network decreased profitability as we focused on driving network utilization in response to the increased capacity. Continued pricing pressures felt in 2017 in the industries in which we operate and integration costs also contributed to the increase in cost of revenues as a percentage of direct revenue from the comparable period in 2016.

Safety-Kleen

	For the years ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
Cost of revenues	$ 725,734	$ 690,344	$ 645,275	$ 35,390	5.1 %	$ 45,069	7.0 %
As a % of Direct Revenue	62.5%	63.5%	64.8%		(1.0)%		(1.3)%

Safety-Kleen cost of revenues for the year ended December 31, 2018 increased $35.4 million from the comparable period in 2017 primarily due to increased costs of raw materials associated with oil products of $15.8 million, increased transportation, disposal and fuel costs of $12.3 million and labor related costs of $6.3 million. These increases were in line with the overall growth of the business and increased costs of commodities. Our costs as a percentage of direct revenues decreased over the comparable period of 2017 due to our effective management of the spread between used oil input costs and base oil pricing, as well as the implementation of new pricing strategies, which generated greater levels of direct revenue.

Safety-Kleen cost of revenues for the year ended December 31, 2017 increased $45.1 million from the comparable period in 2016 primarily due to increased equipment and supply costs of $19.0 million, increased labor related costs of $13.8 million and increased transportation, disposal and fuel costs of $8.3 million. As a percentage of direct revenue, these costs decreased 1.3% in the year ended December 31, 2017 from the comparable period in 2016 primarily as a result of greater direct revenue levels driven by pricing partially offset by higher maintenance costs in the re-refinery network.

Selling, General and Administrative Expenses

We strive to manage our selling, general and administrative expenses commensurate with the overall performance of our segments and corresponding revenue levels. We believe that our ability to properly align these costs with business performance is reflective of our strong management of the businesses and further promotes our ability to remain competitive in the marketplace.

Environmental Services

	For the years ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
SG&A	$ 183,633	$ 162,375	$ 152,129	$ 21,258	13.1 %	$ 10,246	6.7%
As a % of Direct Revenue	8.6%	8.7%	8.6%		(0.1)%		0.1%

Environmental Services selling, general and administrative expenses for the year ended December 31, 2018 increased $21.3 million from the comparable period in 2017 due to increases in salary, benefits and variable compensation related costs of $14.7 million and bad debt expense of $7.0 million, partially offset by cost reductions across various expense categories. The increases in salary, benefits and variable compensation are in line with the growth of the business in 2018 as compared to 2017. As a percentage of direct revenue, our costs remained consistent for the year ended December 31, 2018 as compared to 2017.

Environmental Services selling, general and administrative expenses for the year ended December 31, 2017 increased $10.2 million from the comparable period in 2016. Excluding costs associated with divestitures impacting the comparability of these fiscal years, Environmental Services selling, general and administrative expenses for the year ended December 31, 2017 increased $13.4 million primarily due to increased labor related costs including increased variable compensation and commissions. These increases were consistent with the growth of the business during 2017 as compared to 2016. As a percentage of direct revenue, these costs remained consistent for the year ended December 31, 2017 as compared to 2016.

Safety-Kleen

	For the years ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
SG&A	$ 153,519	$ 147,731	$ 131,262	$ 5,788	3.9 %	$ 16,469	12.5%
As a % of Direct Revenue	13.2%	13.6%	13.2%		(0.4)%		0.4%

Safety-Kleen selling, general and administrative expenses for the year ended December 31, 2018 increased $5.8 million from the comparable period in 2017 primarily due to increased salaries, benefits and variable compensation of $5.7 million as we continue to grow the business. As a percentage of direct revenue, Safety-Kleen SG&A costs decreased for the year ended December 31, 2018 as compared to 2017 as the additional direct revenues outpaced incremental SG&A costs.

Safety-Kleen selling, general and administrative expenses for the year ended December 31, 2017 increased $16.5 million from the comparable period in 2016 primarily due to increased labor related costs of $11.6 million, and an additional $4.9 million related to costs generated from strategic initiatives in the areas of the OilPlus® closed loop initiative and centralization activities associated with this segment. As a percentage of direct revenue, our costs remained consistent for the year ended December 31, 2017 as compared to 2016.

Corporate Items

	For the years ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
SG&A	$ 166,595	$ 146,542	$ 138,624	$ 20,053	13.7%	$ 7,918	5.7%

Corporate Items selling, general and administrative expenses for the year ended December 31, 2018 increased $20.1 million from the comparable period in 2017 primarily due to increased salaries and benefits resulting from continued commitments to investing in our employees and variable compensation totaling $14.8 million as well as increased stock-based compensation of $4.3 million primarily attributable to the achievement of performance metrics associated with performance based awards in 2018. Incremental costs associated with the acquired Veolia Business also contributed to the increased costs.

Corporate Items selling, general and administrative expenses for the year ended December 31, 2017 increased $7.9 million from the comparable period in 2016 primarily due to an increase in variable compensation of $7.4 million and stock-based compensation of $3.4 million attributable to greater revenue and earnings results in 2017, partially offset by a reduction in severance costs of $3.5 million.

Adjusted EBITDA

Management considers Adjusted EBITDA to be a measurement of performance which provides useful information to both management and investors. Adjusted EBITDA should not be considered an alternative to net income (loss) or other measurements under generally accepted accounting principles ("GAAP"). Adjusted EBITDA is not calculated identically by all companies and, therefore our measurements of Adjusted EBITDA, while defined consistently and in accordance with our existing credit agreement, may not be comparable to similarly titled measures reported by other companies.

We use Adjusted EBITDA to enhance our understanding of our operating performance, which represents our views concerning our performance in the ordinary, ongoing and customary course of our operations. We historically have found it helpful, and believe that investors have found it helpful, to consider an operating measure that excludes certain expenses relating to transactions not reflective of our core operations.

The information about our operating performance provided by this financial measure is used by our management for a variety of purposes. We regularly communicate Adjusted EBITDA results to our lenders since our loan covenants are based upon levels of Adjusted EBITDA achieved and to our board of directors and we discuss with the board our interpretation of such results. We also compare our Adjusted EBITDA performance against internal targets as a key factor in determining cash and equity bonus compensation for executives and other employees, largely because we believe that this measure is indicative of how the fundamental business is performing and is being managed.

We also provide information relating to our Adjusted EBITDA so that analysts, investors and other interested persons have the same data that we use to assess our core operating performance. We believe that Adjusted EBITDA should be viewed only as a supplement to the GAAP financial information. We also believe, however, that providing this information in addition to, and together with, GAAP financial information permits the foregoing persons to obtain a better understanding of our core operating performance and to evaluate the efficacy of the methodology and information used by management to evaluate and measure such performance on a standalone and a comparative basis.

The following is a reconciliation of net income (loss) to Adjusted EBITDA for the following periods (in thousands):

	Year Ended December 31,		
	2018	2017	2016
Net income (loss)	$ 65,636	$ 100,739	$ (39,873)
Accretion of environmental liabilities	9,806	9,460	10,177
Depreciation and amortization	298,625	288,422	287,002
Goodwill impairment charge	—	—	34,013
Other expense (income), net	4,510	6,119	(6,195)
Loss on early extinguishment of debt	2,488	7,891	—
Gain on sale of businesses	—	(30,732)	(16,884)
Interest expense, net	81,094	85,808	83,525
Provision (benefit) for income taxes	28,846	(42,050)	48,589
Adjusted EBITDA	$ 491,005	$ 425,657	$ 400,354

Depreciation and Amortization

	Year Ended December 31,			2018 over 2017		2017 over 2016	
(in thousands)	2018	2017	2016	$ Change	% Change	$ Change	% Change
Depreciation of fixed assets and landfill amortization	$ 264,254	$ 251,403	$ 246,960	$ 12,851	5.1 %	$ 4,443	1.8 %
Permits and other intangibles amortization	34,371	37,019	40,042	(2,648)	(7.2)%	(3,023)	(7.5)%
Total depreciation and amortization	$ 298,625	$ 288,422	$ 287,002	$ 10,203	3.5 %	$ 1,420	0.5 %

Depreciation and amortization for the year ended December 31, 2018 increased $10.2 million from the comparable period in 2017, primarily due to incremental depreciation from acquisitions and a slight increase in volumes at our landfills that drove higher landfill amortization. Depreciation and amortization for the year ended December 31, 2017 remained consistent with the comparable period in 2016.

Goodwill impairment charge

	Year Ended December 31,			2018 over 2017		2017 over 2016	
(in thousands)	2018	2017	2016	$ Change	% Change	$ Change	% Change
Goodwill impairment charge	$ —	$ —	$ 34,013	$ —	—%	$ (34,013)	(100.0)%

During the year ended December 31, 2016, we recorded a $34.0 million goodwill impairment charge in our Lodging Services line of business. Information regarding our 2016 goodwill impairment charge was disclosed in prior years' annual reports on Form 10-K.

Other (Expense) Income, net

	Year Ended December 31,			2018 over 2017		2017 over 2016	
(in thousands)	2018	2017	2016	$ Change	% Change	$ Change	% Change
Other (expense) income, net	$ (4,510)	$ (6,119)	$ 6,195	$ 1,609	(26.3)%	$ (12,314)	(198.8)%

For the year ended December 31, 2018, other (expense) income, net decreased $1.6 million from the comparable period in 2017 primarily due to smaller losses recognized on sales or disposals of fixed assets in 2018. Other (expense) income, net decreased $12.3 million from 2016 to 2017 primarily due to losses recognized on sales or disposals of fixed assets in 2017 compared to gains recognized on sales or disposals of fixed assets in 2016.

Loss on early extinguishment of debt

	Year Ended December 31,			2018 over 2017		2017 over 2016	
(in thousands)	2018	2017	2016	$ Change	% Change	$ Change	% Change
Loss on early extinguishment of debt	$ (2,488)	$ (7,891)	$ —	$ 5,403	(68.5)%	$ (7,891)	100.0%

During the year ended December 31, 2018, we recorded a $2.5 million loss in connection with the extinguishment of the remaining $400.0 million previously outstanding senior unsecured notes which were refinanced in connection with the Incremental Facility Amendment to our Term Loan Agreement completed during the third quarter of 2018. During the year ended December 31, 2017, we recorded a $7.9 million loss on early extinguishment of debt in connection with the extinguishment of the $400.0 million previously outstanding senior unsecured notes which were refinanced in connection with the issuance of $400.0 million Term Loan Agreement which was completed in the second quarter of 2017. The losses consisted of amounts paid in excess of par in order to extinguish the debt prior to maturity and non-cash expenses related to the write-off of unamortized financing costs. For additional information regarding our financing arrangements, see Note 12, "Financing Arrangements," under Item 8, "Financial Statements and Supplementary Data," of this report.

Gain on sale of businesses

	Year Ended December 31,			2018 over 2017		2017 over 2016	
	2018	2017	2016	$ Change	% Change	$ Change	% Change
Gain on sale of businesses	$ —	$ 30,732	$ 16,884	$ (30,732)	(100)%	$ 13,848	82%

During the year ended December 31, 2017, we recorded a $30.7 million gain on the sale of our Transformer Services business. During the year ended December 31, 2016, we recorded a $16.9 million gain on the sale of our Catalyst Services business. For additional information regarding these gains on sale of businesses, see Note 5, "Disposition of Businesses," under Item 8, "Financial Statements and Supplementary Data," of this report.

Provision (benefit) for Income Taxes

	Year Ended December 31,			2018 over 2017		2017 over 2016	
(in thousands)	2018	2017	2016	$ Change	% Change	$ Change	% Change
Provision (benefit) for income taxes	$ 28,846	$ (42,050)	$ 48,589	$ 70,896	(168.6)%	$ (90,639)	(186.5)%

Provision (benefit) for income taxes for fiscal years 2018, 2017 and 2016 was $28.8 million, $(42.1) million, and $48.6 million, respectively. The effective tax rate for 2018 was 30.5% and was impacted by the overall reduced federal tax rates

enacted in 2018 under the Tax Cuts and Jobs Act (the "Tax Act") signed into law in December 2017, the recognition of valuation allowances on certain Canadian operations and offset in the current year by tax benefits resulting from amended prior year tax return filings. The income tax benefit in 2017 was primarily driven by impacts from the enactment of the Tax Act in 2017. Impacts of the Tax Act resulted in a net benefit of $93.0 million being recorded in 2017. See Note 13, "Income Taxes," under Item 8, "Financial Statements and Supplementary Data," of this report for more information related to the Tax Act and its impacts. Excluding the impacts of the Tax Act, a provision of $51.0 million would have been recognized, yielding an effective tax rate of 86.8% in 2017.

The mix of U.S. and Canadian taxable income and losses in recent years, combined largely with the impacts of valuation allowances being recorded relative to taxable losses generated in certain Canadian jurisdictions has had significant impacts on the recorded income tax expense amounts and has caused such amounts and resulting effective tax rates to represent significant variations from more customary relationships between pre-tax income and the provision for income taxes. In 2018, the Company recognized a $10.7 million valuation allowance from Canadian losses. Aside from the impact of the Tax Act, the variation from a more customary effective tax rate in 2017 was primarily related to a $14.5 million valuation allowance recorded relative to net operating loss carryforwards generated by certain Canadian subsidiaries in 2017 and the impacts of recording $3.7 million of unrecognized tax benefits associated with current and prior years' tax positions taken. Variations from a more customary effective tax rate in 2016 was primarily due to the recognition of a $12.9 million valuation allowance related to net operating loss carryforwards generated by certain Canadian subsidiaries in 2016, as well as an additional $9.7 million valuation allowance recorded as a result of a change in the likelihood of realizing a benefit from foreign tax credits and other net deferred tax assets. Additionally, the $34.0 million goodwill impairment charge in our Lodging Services line of business recorded in 2016 was a non-deductible tax item, and therefore no tax benefit was recorded on that loss and further caused the 2016 effective tax rate to vary from a more typical relationship between income before taxes and the recorded provision for income taxes.

Liquidity and Capital Resources

	For the years ended December 31,		
(in thousands)	**2018**	**2017**	**2016**
Net cash from operating activities	$ 373,210	$ 285,698	$ 259,624
Net cash used in investing activities	(349,659)	(203,267)	(361,777)
Net cash (used in) from financing activities	(110,997)	(72,760)	220,235

Net cash from operating activities

Net cash from operating activities for the year ended December 31, 2018 was $373.2 million, an increase of $87.5 million compared to net cash from operating activities for the year ended December 31, 2017. The increase in operating cash flows as compared to the comparable period of 2017 was most directly attributable to greater levels of operating income, lower interest payments and a reduction in environmental expenditures, which was offset by higher working capital levels due to overall growth in our business.

Net cash from operating activities for the year ended December 31, 2017 was $285.7 million, an increase of $26.1 million compared to net cash from operating activities for the year ended December 31, 2016. The change primarily resulted from higher income levels generated during the year ended December 31, 2017 and the impacts of changes in net working capital related to increases in cash flows from other current assets, partially offset by an increase in accounts receivable and unbilled accounts receivable as a result of increased incremental revenues during the year ended December 31, 2017.

Net cash used in investing activities

Net cash used in investing activities for the year ended December 31, 2018 was $349.7 million, an increase of $146.4 million compared to cash used in investing activities for the year ended December 31, 2017. The change was primarily driven by the 2018 use of cash to fund acquisitions, increased capital expenditure levels net of proceeds primarily related to sales of manufacturing assets in Western Canada, a reduction in net purchases of marketable securities and the lack in 2018 of proceeds from sale of a business, which occurred in 2017 with the Transformer Services divestiture.

Net cash used in investing activities for the year ended December 31, 2017 was $203.3 million, a decrease of $158.5 million compared to cash used in investing activities for the year ended December 31, 2016. The change was primarily driven by a decrease in cash paid for acquisitions in 2017, proceeds from the sale of the Transformer Services business and a decrease in capital expenditures, which were greater during 2016 due to the construction of our hazardous waste incinerator at our El Dorado, Arkansas facility, which came online in the first quarter of 2017. The decrease in cash used in investing activities was partially offset by cash used to purchase highly liquid marketable securities during the year ended December 31, 2017.

Net cash (used in) from financing activities

Net cash used in financing activities for the year ended December 31, 2018 was $111.0 million, an increase of $38.2 million compared to cash used in financing activities for the year ended December 31, 2017. The primary reason for the increase in financing cash outflows in 2018 was the net pay down of debt obligations totaling $55.8 million which occurred during the year. Offsetting this increase was decreased outflows related to stock repurchases of $3.9 million, premiums paid on the extinguishment of debt of $4.8 million, and changes in uncashed checks of $5.8 million.

Net cash used in financing activities for the year ended December 31, 2017 was $72.8 million, a decrease of $293.0 million compared to cash from financing activities for the year ended December 31, 2016. The change was primarily due to the issuance in March 2016 of $250.0 million in additional aggregate principal amount of 5.125% senior unsecured notes due 2021. During the year ended December 31, 2017, there were no net proceeds from issuance of debt as we entered into a $400.0 million senior secured term loan agreement and used the proceeds to purchase approximately $400.0 million aggregate principal amount of our previously outstanding 5.25% senior unsecured notes due 2020. In addition, during the year ended December 31, 2017, we increased repurchases of our common stock from $22.2 million in 2016 to $49.0 million in 2017.

Adjusted Free Cash Flow

Management considers adjusted free cash flow to be a measurement of liquidity which provides useful information to both management, creditors and investors about our financial strength and our ability to generate cash. Additionally, adjusted free cash flow is a metric on which a portion of management incentive compensation is based. We define adjusted free cash flow as net cash from operating activities excluding cash impacts of items derived from non-operating activities, such as taxes paid in connection with divestitures, less additions to property, plant and equipment plus proceeds from sales or disposals of fixed assets. Adjusted free cash flow should not be considered an alternative to net cash from operating activities or other measurements under GAAP. Adjusted free cash flow is not calculated identically by all companies, and therefore our measurements of adjusted free cash flow may not be comparable to similarly titled measures reported by other companies.

The following is a reconciliation from net cash from operating activities to adjusted free cash flow for the following periods (in thousands):

	For the years ended December 31,	
	2018	2017
Net cash from operating activities	$ 373,210	$ 285,698
Additions to property, plant and equipment	(193,344)	(167,007)
Proceeds from sale and disposal of fixed assets	15,445	7,124
Tax liability on sale of business	—	14,423
Adjusted free cash flow	$ 195,311	$ 140,238

Working Capital

At December 31, 2018, cash and cash equivalents and marketable securities totaled $279.4 million, compared to $357.6 million at December 31, 2017. At December 31, 2018, cash and cash equivalents held by foreign subsidiaries totaled $84.7 million and were readily convertible into other currencies including U.S. dollars. At December 31, 2018, the cash and cash equivalents and marketable securities balance for our U.S. operations was $194.7 million, and our U.S. operations had net operating cash flows of $309.4 million for the year ended December 31, 2018. Additionally, we have a $400.0 million revolving credit facility, of which approximately $235.4 million was available to borrow at December 31, 2018. Based on the above and our current plans, we believe that our operations have adequate financial resources to satisfy their current liquidity needs.

We assess our liquidity in terms of our ability to generate cash to fund our operating, investing, and financing activities. Our primary ongoing cash requirements will be to fund operations, capital expenditures, interest payments and investments in line with our business strategy. We believe our future operating cash flows will be sufficient to meet our future operating and internal investing cash needs as well as any cash needs relating to our stock repurchase program. Furthermore, our existing cash balance and the availability of additional borrowings under our revolving credit facility provide additional potential sources of liquidity should they be required.

Financing Arrangements

The financing arrangements and principal terms of our $845.0 million principal amount of 5.125% senior unsecured notes due 2021 and $742.2 million senior secured notes due 2024 which were outstanding at December 31, 2018, and our

$400.0 million revolving credit facility, are discussed further in Note 12, “Financing Arrangements,” to our consolidated financial statements included in Item 8 of this report.

As of December 31, 2018, we were in compliance with the covenants of all of our debt agreements, and we believe we will continue to meet such covenants.

As discussed in Note 12, “Financing Arrangements,” to our consolidated financial statements, we refinanced during 2018 our debt portfolio whereby the $400.0 million of previously outstanding 5.25% senior unsecured notes due 2020 was replaced by $350.0 million of incremental term loans under our variable rate Term Loan Agreement. In connection with the addition of this variable rate debt, we entered into interest rate swap agreements in order to hedge the future risk of rising interest rates and effectively fix the interest rate on $350.0 million of our variable rate debt at an annual rate of approximately 4.67%.

Environmental Liabilities

	As of December 31,		2018 over 2017	
(in thousands)	**2018**	**2017**	**$ Change**	**% Change**
Closure and post-closure liabilities	$ 69,931	$ 61,037	$ 8,894	14.6 %
Remedial liabilities	121,017	124,468	(3,451)	(2.8)%
Total environmental liabilities	$ 190,948	$ 185,505	$ 5,443	2.9 %

Total environmental liabilities as of December 31, 2018 were $190.9 million, an increase of $5.4 million compared to the liabilities as of December 31, 2017. This increase was primarily due to accretion of $9.8 million, new asset retirement obligations and liabilities assumed in acquisitions of $3.2 million, and changes in estimates recorded to our statement of operations of $2.1 million, partially offset by expenditures of $10.1 million.

We anticipate our environmental liabilities, substantially all of which we assumed in connection with our acquisitions, will be payable over many years and that cash flow from operations will generally be sufficient to fund the payment of such liabilities when required. However, events not anticipated (such as future changes in environmental laws and regulations) could require that such payments be made earlier or in greater amounts than currently anticipated, which could adversely affect our results of operations, cash flow and financial condition.

During 2018, we recognized a net charge for changes in estimates of recorded environmental liabilities, whereas in each of 2017 and 2016 we benefited from reductions in our environmental liabilities due to changes in estimates recorded to our statement of operations. The benefits over these years were primarily due to the successful introduction of new technology for remedial activities, favorable results from environmental studies of the on-going remediation, including favorable regulatory approvals, and lower project costs realized by utilizing internal labor and equipment. The principal changes in estimates were from the following items:

In 2018, the net increase in our environmental liabilities from changes in estimates recorded to the statement of operations was $2.1 million and primarily related to an increase in projected cleanup costs at third party Superfund sites where we are a potentially responsible party.

In 2017, the net reduction in our environmental liabilities from changes in estimates recorded to the statement of operations was $0.2 million and primarily related to reduced remedial spending at one of our locations resulting from new technologies and cost savings realized during the completed cell closure at one of our landfills.

In 2016, the net reduction in our environmental liabilities from changes in estimates recorded to the statement of operations was $4.3 million and primarily related to reduced remedial spending at one of our locations resulting from new technologies and cost savings realized during the completed cell closure at one of our landfills.

Contractual Obligations

The following table has been included to assist understanding our debt and similar obligations as of December 31, 2018 and our ability to meet such obligations (in thousands):

		Payments Due by Period			
Contractual Obligations	**Total**	**Less than 1 year**	**1-3 years**	**4-5 years**	**After 5 years**
Closure, post-closure and remedial liabilities	$ 462,879	$ 24,549	$ 50,425	$ 35,138	$ 352,767
Current and long-term obligations, at par	1,587,232	7,535	860,071	15,071	704,555
Interest on current and long-term obligations (1)	273,559	76,192	126,114	63,420	7,833
Operating leases	211,051	56,480	79,031	39,762	35,778
Total contractual obligations	$ 2,534,721	$ 164,756	$ 1,115,641	$ 153,391	$ 1,100,933

(1) Interest on our variable-rate $742.2 million senior secured term loan agreement was calculated based on the effective interest rate as of December 31, 2018 of 4.27%. Our interest rate swap agreements effectively fix the interest rate on $350.0 million of our variable rate debt at an annual rate of approximately 4.67% and therefore the assumed rate on this variable debt after considering the swap agreements is 4.45%.

The undiscounted value of closure, post-closure and remedial liabilities of $462.9 million is equivalent to the present value of $190.9 million based on discounting of $178.7 million and the undiscounted remainder of $93.2 million to be accrued for closure and post-closure liabilities over the remaining site lives.

The following table has been included to assist in understanding our other contractual obligations as of December 31, 2018 and our ability to meet such obligations (in thousands):

		Payments Due by Period			
Other Commercial Commitments	**Total**	**Less than 1 year**	**1-3 years**	**4-5 years**	**After 5 years**
Standby letters of credit	$ 130,100	$ 130,100	$ —	$ —	$ —

We obtained the standby letters of credit described in the above table primarily as security for financial assurances we have been required to provide to regulatory bodies for our hazardous waste facilities and which would be called only in the event that we fail to satisfy closure, post-closure and other obligations under the permits issued by those regulatory bodies for such licensed facilities. See Note 12, "Financing Arrangements," to our consolidated financial statements included in Item 8 of this report for further discussion of our standby letters of credit and other financing arrangements.

Off-Balance Sheet Arrangements

Except for our obligations under operating leases and letters of credit described above under "Contractual Obligations" and performance obligations incurred in the ordinary course of business, we are not party to any off-balance sheet arrangements involving guarantee, contingency or similar obligations to entities whose financial statements are not consolidated with our results, and that have or are reasonably likely to have a current or future effect on our financial condition, changes in financial condition, revenues or expenses, results of operations, liquidity, capital expenditures or capital resources that would be material to investors in our securities.

Capital Expenditures

In 2018, our capital expenditures, net of disposals, were $177.9 million. We anticipate that 2019 capital spending, net of disposals, will be in the range of $190.0 million to $210.0 million. However, unanticipated changes in environmental regulations could require us to make significant capital expenditures for our facilities and adversely affect our results of operations and cash flow.

Critical Accounting Policies and Estimates

The preparation of our financial statements requires us to make estimates and judgments that affect the reported amounts of our assets, liabilities, revenues and expenses, and related disclosures of contingent liabilities. The following are the areas that we believe require the greatest amount of judgments or estimates in the preparation of the financial statements: accounting for landfills, non-landfill closure and post-closure liabilities, remedial liabilities, goodwill, permits and other intangible assets and legal matters. Our management reviews critical accounting estimates with the Audit Committee of our Board of Directors on an ongoing basis and as needed prior to the release of our annual financial statements. See also Note 2, "Significant Accounting Policies," to our consolidated financial statements included in Item 8 of this report, which discusses the significant assumptions used in applying our accounting policies.

Landfill Accounting. We amortize landfill improvements and certain landfill-related permits over their estimated useful lives. The units-of-consumption method is used to amortize land, landfill cell construction, asset retirement costs and remaining landfill cells and sites. We also utilize the units-of-consumption method to record closure and post-closure obligations for landfill cells and sites. Under the units-of-consumption method, we include future estimated construction and asset retirement costs, as well as costs incurred to date, in the amortization base of the landfill assets. Additionally, where appropriate, as discussed below, we include probable expansion airspace yet to be permitted in the calculation of the total remaining useful life of the landfill. If we determine that expansion capacity should no longer be considered in calculating the recoverability of a landfill asset, we may be required to recognize an asset impairment or incur significantly higher amortization expense. If at any time we decide to abandon the expansion effort, the capitalized costs related to the expansion effort are expensed immediately.

Landfill Assets. Landfill assets include the costs of landfill site acquisition, permits and cell construction incurred to date. These amounts are amortized under the units-of-consumption method such that the asset is completely amortized when the landfill ceases accepting waste.

Landfill Capacity. Landfill capacity, which is the basis for the amortization of landfill assets and for the accrual of final closure and post-closure obligations, represents total permitted airspace plus unpermitted airspace that management believes is probable of ultimately being permitted based on established criteria. Our management applies the following criteria for evaluating the probability of obtaining a permit for future expansion airspace at existing sites, which provides management a basis to evaluate the likelihood of success of unpermitted expansions:

- Personnel are actively working to obtain the permit or permit modifications (land use, state and federal) necessary for expansion of an existing landfill, and progress is being made on the project.
- Management expects to submit the application within the next year and to receive all necessary approvals to accept waste within the next five years.
- At the time the expansion is included in management's estimate of the landfill's useful economic life, it is probable that the required approvals will be received within the normal application and processing time periods for approvals in the jurisdiction in which the landfill is located.
- We or the other owner of the landfill has a legal right to use or obtain the right to use the land associated with the expansion plan.
- There are no significant known political, technical, legal or business restrictions or other issues that could impair the success of such expansion.
- A financial feasibility analysis has been completed and the results demonstrate that the expansion will have a positive financial and operational impact such that management is committed to pursuing the expansion.
- Additional airspace and related additional costs, including permitting, final closure and post-closure costs, have been estimated based on the conceptual design of the proposed expansion.

As of December 31, 2018, there was one unpermitted expansion at one location included in management's landfill calculation, which represented 16.2% of our remaining airspace at that date. If actual expansion airspace is significantly different from management's estimate of expansion airspace, the amortization rates used for the units-of-consumption method would change, therefore impacting our profitability. If we determine that there is less actual expansion airspace at a landfill, this would increase amortization expense recorded and decrease profitability, while if we determine a landfill has more actual expansion airspace, amortization expense would decrease and profitability would increase.

Landfill Final Closure and Post-Closure Liabilities. The balance of landfill final closure and post-closure liabilities at December 31, 2018 and 2017 was $37.8 million and $32.4 million, respectively. We have material financial commitments for the costs associated with requirements of the EPA and the comparable regulatory agency in Canada for landfill final closure and post-closure activities. In the United States, the landfill final closure and post-closure requirements are established under the

standards of the EPA, and are implemented and applied on a state-by-state basis. We develop estimates for the cost of these activities based on our evaluation of site-specific facts and circumstances, such as the existence of structures and other landfill improvements that would need to be dismantled, the amount of groundwater monitoring and leachate management expected to be performed, and the length of the post-closure period as determined by the applicable regulatory agency. Included in our cost estimates are our interpretation of current regulatory requirements and proposed regulatory changes. Such estimates may change in the future due to various circumstances including, but not limited to, permit modifications, changes in legislation or regulations, technological changes and results of environmental studies. We perform zero-based reviews of these estimated liabilities based upon a planned schedule, typically every five years or sooner if the occurrence of a significant event is likely to change the timing or amount of the currently estimated expenditures. We consider a significant event to be a new regulation or an amendment to an existing regulation, a new permit or modification to an existing permit, or a change in the market price of a significant cost item. Our cost estimates are calculated using internal sources as well as input from third-party experts. These costs are measured at estimated fair value using present value techniques, and therefore changes in the estimated timing of closure and post-closure activities would affect the liability, the value of the related asset, and our results of operations.

Final closure costs are the costs incurred after the site ceases to accept waste, but before the landfill is certified as closed by the applicable state or provincial regulatory agency. These costs generally include the costs required to cap the final cell of the landfill (if not included in cell closure), to dismantle certain structures for landfills and other landfill improvements and regulation-mandated groundwater monitoring, and for leachate management. Post-closure costs involve the maintenance and monitoring of a landfill site that has been certified closed by the applicable regulatory agency. These costs generally include groundwater monitoring and leachate management. Regulatory post-closure periods are generally 30 years after landfill closure. Final closure and post-closure obligations are accrued on a units-of-consumption basis, such that the present value of the final closure and post-closure obligations are fully accrued at the date the landfill discontinues accepting waste.

Non-Landfill Closure and Post-Closure Liabilities. The balance of our non-landfill closure and post-closure liabilities at December 31, 2018 and 2017 was $32.1 million and $28.6 million, respectively. We base estimates for non-landfill closure and post-closure liabilities on our interpretations of existing permit and regulatory requirements for closure and post-closure maintenance and monitoring. Our cost estimates are calculated using internal sources as well as input from third-party experts. We use probability scenarios to estimate when future operations will cease and inflate the current cost of closing the non-landfill facility on a probability weighted basis using the appropriate inflation rate and then discounting the future value to arrive at an estimated present value of closure and post-closure costs. The estimates for non-landfill closure and post-closure liabilities are inherently uncertain due to the possibility that permit and regulatory requirements will change in the future, impacting the estimation of total costs and the timing of the expenditures. We review non-landfill closure and post-closure liabilities for changes to key assumptions that would impact the amount of the recorded liabilities. Changes that would prompt us to revise a liability estimate include changes in legal requirements that impact our expected closure plan or scope of work, in the market price of a significant cost item, in the probability scenarios as to when future operations at a location might cease, or in the expected timing of the cost expenditures. Changes in estimates for non-landfill closure and post-closure events immediately impact the required liability and the value of the corresponding asset. If a change is made to a fully-consumed asset, the adjustment is charged immediately to expense. When a change in estimate relates to an asset that has not been fully consumed, the adjustment to the asset is recognized in income prospectively as a component of amortization. Historically, material changes to non-landfill closure and post-closure estimates have been infrequent. See Note 10, "Closure and Post-Closure Liabilities," to our consolidated financial statements included in Item 8 of this report for the changes to these Landfill and Non-Landfill Closure and Post-Closure liabilities during the years ended December 31, 2018 and 2017.

Remedial Liabilities. The balance of our remedial liabilities at December 31, 2018 and 2017 was $121.0 million and $124.5 million, respectively. See Note 11, "Remedial Liabilities," to our consolidated financial statements included in Item 8 of this report for the changes to the remedial liabilities during the years ended December 31, 2018 and 2017. Remedial liabilities are obligations to investigate, alleviate and/or eliminate the effects of a release (or threat of a release) of hazardous substances into the environment and may also include corrective action under RCRA. Our remediation obligations can be further characterized as Long-term Maintenance, One-Time Projects, Legal and Superfund. Legal liabilities are typically comprised of litigation matters that involve potential liability for certain aspects of environmental cleanup and can include third-party claims for property damage or bodily injury allegedly arising from or caused by exposure to hazardous substances originating from our activities or operations or, in certain cases, from the actions or inactions of other persons or companies. Superfund liabilities are typically claims alleging that we are a potentially responsible party ("PRP") and/or are potentially liable for environmental response, removal, remediation and cleanup costs at/or from either a facility we own or a site owned by a third-party. As described in Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report, Superfund liabilities also include certain liabilities payable to governmental entities for which we are potentially liable to reimburse the sellers in connection with our 2002 acquisition of substantially all of the assets of the Chemical Services Division (the "CSD assets") of Safety-Kleen Corp. Long-term maintenance liabilities include the costs of groundwater monitoring, treatment system operations, permit fees and facility maintenance for inactive operations. One-Time Projects

liabilities include the costs necessary to comply with regulatory requirements for the removal or treatment of contaminated materials.

Amounts recorded related to the costs required to remediate a location are determined by internal engineers and operational personnel and incorporate input from external third parties. The estimates consider such factors as the nature and extent of environmental contamination (if any); the terms of applicable permits and agreements with regulatory authorities as to cleanup procedures and whether modifications to such permits and agreements will likely need to be negotiated; the cost of performing anticipated cleanup activities based upon current technology; and in the case of Superfund and other sites where other parties will also be responsible for a portion of the cleanup costs, the likely allocation of such costs and the ability of such other parties to pay their share. Each quarter, our management discusses if any events have occurred or milestones have been met that would warrant the creation of a new remedial liability or the revision of an existing remedial liability. Such events or milestones include identification and verification as a PRP, receipt of a unilateral administrative order under Superfund or requirement for RCRA interim corrective measures, completion of the feasibility study under Superfund or the corrective measures study under RCRA, new or modifications to existing permits, changes in property use, or a change in the market price of a significant cost item. Remedial liabilities are inherently difficult to estimate and there is a risk that the actual quantities of contaminants could differ from the results of the site investigation, which could materially impact the amount of our liability. It is also possible that chosen methods of remedial solutions will not be successful and funds will be required for alternative solutions.

Remedial liabilities are discounted only when the timing of the payments is estimable and the amounts are determinable, with the exception of remedial liabilities assumed as part of an acquisition that are measured at fair value.

We establish reserves for estimated environmental liabilities based on acceptable technologies when we determine the liability is appropriate. Introductions of new technologies are subject to successful demonstration of the effectiveness of the alternative technology and regulatory approval. We routinely review and evaluate the sites for which we have established estimated environmental liabilities reserves to determine if there should be changes in the established reserves. The changes in estimates are reflected as adjustments in the ordinary course of business in the period when we determine that an adjustment is appropriate as new information becomes available. Upon demonstration of the effectiveness of the alternative technology and applicable regulatory approval, we update our estimated cost of remediating the affected sites.

Goodwill and Other Long-Lived Assets. Goodwill is not amortized but is reviewed for impairment annually as of December 31 or when events or changes in the business environment indicate the carrying value of a reporting unit may exceed its fair value. This review is performed by comparing the fair value of each reporting unit to its carrying value, including goodwill. If the fair value is less than the carrying amount, a loss is recorded for the excess of the carrying value over the fair value up to the carrying amount of goodwill.

We determine our reporting units by identifying the components of each operating segment, and then in some circumstances aggregate components having similar economic characteristics based on quantitative and/or qualitative factors. During the first quarter of fiscal year 2018, we reassigned certain components among our operating segments to be in line with management reporting changes and as a result concluded there was a change in our operating segments resulting in two such segments in 2018, namely (i) the Environmental Services segment and (ii) the Safety-Kleen segment. As a result of our identification of operating segments, we also concluded that, for purposes of reviewing for potential goodwill impairment, we now have four reporting units, consisting of Environmental Sales and Service, Environmental Facilities, Kleen Performance Products and Safety-Kleen Environmental Services. We allocated goodwill to the newly identified reporting units using a relative fair value approach. In addition, we completed an assessment of any potential goodwill impairment for all reporting units immediately prior and subsequent to the reallocation and determined that no impairment existed.

We conducted our annual impairment test of goodwill for all of our reporting units to which goodwill was allocated as of December 31, 2018 and determined that no adjustment to the carrying value of goodwill for any reporting unit was then necessary. In all cases the estimated fair value of each reporting unit significantly exceeded its carrying value. We measure fair value for all of our reporting units using an income approach (a discounted cash flow analysis) which incorporates several estimates and assumptions with varying degrees of uncertainty. The discounted cash flow analyses include estimated cash flows for a discrete period and for a terminal period thereafter. We corroborate our estimates of fair values by also considering other factors such as the fair value of comparable companies to businesses contained in our reporting units, as well as performing a reconciliation of the total estimated fair value of all reporting units to our market capitalization.

Indefinite-lived intangible assets are not amortized but are reviewed for impairment annually as of December 31, or when events or changes in the business environment indicate that the carrying value may be impaired. If the fair value of the asset is less than the carrying amount, we perform a quantitative test to determine the fair value. The impairment loss, if any, is measured as the excess of the carrying value of the asset over its fair value. The estimated fair values of the indefinite-lived

intangibles exceeded their carrying values at December 31, 2018. However, we will continue to monitor the performance of our indefinite-lived intangible assets, and future events might result in an impairment of indefinite-lived intangible assets.

Our long-lived assets are carried on our financial statements based on their cost less accumulated depreciation or amortization. Long-lived assets with finite lives are reviewed for impairment whenever events or changes in circumstances indicate that their carrying value may not be entirely recoverable. When such factors and circumstances exist, our management compares the projected undiscounted future cash flows associated with the related asset or group of assets to the respective carrying amounts. The impairment loss, if any, would be measured as the excess of the carrying amount over the fair value of the asset and is recorded in the period in which the determination is made. Any resulting impairment losses recorded by us would have an adverse impact on our results of operations.

In consideration of historical goodwill impairments for our Oil and Gas Field Services and Lodging Services operations and continued lower than historical results in the oil and gas related industries, specifically in Western Canada, we continue to monitor the carrying value of those business' long-lived assets and assess the risk of asset impairment. As of December 31, 2018, our Oil and Gas Field Services and Lodging Services operations had property, plant and equipment, net of $55.2 million and $65.9 million, respectively, and intangible assets of $0.6 million and $1.4 million, respectively. We concluded that no events or circumstances have arisen during 2018 which would indicate that the carrying values of those asset groups are not recoverable.

We will continue to evaluate all of our goodwill and other long-lived assets impacted by economic downturns most predominantly in the oil and energy related markets in which we operate. If further economic difficulties resulting from depressed oil and gas related pricing and lower overall activity levels, particularly in our Canadian operations, continue for a significant foreseeable period of time and thus future operating results are significantly less than current expectations, additional impairment charges may be recognized. The market conditions which could lead to such future impairments are currently most prevalent in our Oil and Gas Field Services and Lodging Services operations.

Legal Matters. As described in Note 18, "Commitments and Contingencies," to our consolidated financial statements included in Item 8 of this report, we are subject to legal proceedings which relate to our past acquisitions or which have arisen in the ordinary course of business. Accruals are established for legal matters when, in our opinion, it is probable that a liability exists and the liability can be reasonably estimated. As of December 31, 2018, we had reserves of $25.4 million consisting of (i) $17.9 million related to pending legal or administrative proceedings, including Superfund liabilities, which were included in remedial liabilities on the consolidated balance sheets and (ii) $7.5 million primarily related to legal claims as well as federal, state and provincial enforcement actions, which were included in accrued expenses on the consolidated balance sheets. We also estimate that it is "reasonably possible," as that term is defined ("more than remote but less than likely"), that the amount of such total liabilities could be as much as $1.8 million more. Actual expenses incurred in future periods could differ materially from accruals established.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

In the normal course of business, we are exposed to market risks, including changes in interest rates and certain foreign currency rates, primarily relating to the Canadian dollar. Our philosophy in managing interest rate risk is to maintain a debt portfolio inclusive of both variable and fixed-rate debt so as to limit our interest expense and exposure to interest rate volatility. During the third quarter of 2018, we entered into interest rate swap agreements with the intention of hedging interest rate exposure on a portion of our outstanding LIBOR-based variable rate senior secured term loans. Under the terms of the swaps, we receive interest based on the 1-month LIBOR index and pay interest at a weighted average rate of approximately 2.92% on an initial notional amount of $350.0 million. When combined with the 1.75% interest rate margin for Eurocurrency borrowings, the effective annual interest rate on such $350.0 million aggregate principal amount of term loans is therefore approximately 4.67%.

We have designated our interest rate swap agreements as effective cash flow hedges at inception, and therefore the change in fair value is recorded in stockholders' equity as a component of accumulated other comprehensive loss and included in interest expense at the same time as interest expense is affected by the hedged transactions. Differences paid or received over the life of the agreements are recorded as additions to or reductions of interest expense on the underlying debt.

The following table provides information regarding our fixed and variable rate borrowings at December 31, 2018 (in thousands):

Scheduled Maturity Dates	2019	2020	2021	2022	2023	Thereafter	Total
Senior secured term loans due 2024	$ 7,535	$ 7,535	$ 7,535	$ 7,535	$ 7,535	$ 704,557	$ 742,232
Senior unsecured notes due 2021	—	—	845,000	—	—	—	845,000
Long term obligations, at par	$ 7,535	$ 7,535	$ 852,535	$ 7,535	$ 7,535	$ 704,557	$ 1,587,232

The interest rate on the $845 million senior unsecured notes due June 1, 2021 is fixed at 5.125%. Interest payments are due in the amount of $21.7 million each related to the $845.0 million senior unsecured notes payable semi-annually on June 1 and December 1 of each year.

We continue to have interest rate risk relative to our term loan borrowing exceeding $350 million or $392.2 million as of December 31, 2018. The effective interest rate of the term loans as of December 31, 2018 was 4.27%. Should the average interest rate on the variable rate portion of our long-term obligations change by 100 basis points, we estimate that our annual interest expense would change by up to approximately $4.0 million.

In addition to the fixed and variable rate borrowings described in the above table, we have a revolving credit facility with maximum borrowings of up to $400.0 million (with a $325.0 million sub-limit for letters of credit), under which no borrowings were outstanding at December 31, 2018.

We view our investment in our foreign subsidiaries as long-term; thus, we have not entered into any hedging transactions between any two foreign currencies or between any of the foreign currencies and the U.S. dollar. Given this significant investment in Canada and the fluctuations that have and can occur between the U.S. Dollar and Canadian Dollar exchange rates, significant movements in cumulative translation adjustment amounts recorded as a component of other comprehensive income (loss) can occur in any given period.

During 2018, our Canadian subsidiaries transacted business in U.S. dollars and at any period end had cash on deposit in U.S. dollars and outstanding U.S. dollar accounts receivable related to those transactions. Those cash and receivable accounts are vulnerable to foreign currency transaction gains or losses. Exchange rate movements also affect the translation of Canadian generated profits and losses into U.S. dollars. Had the Canadian dollar been 10.0% stronger or weaker against the U.S. dollar, we would have reported increased or decreased net income of $4.8 million and $5.6 million for the years ended December 31, 2018 and 2017, respectively.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Clean Harbors, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Clean Harbors, Inc. and subsidiaries (the "Company") as of December 31, 2018 and 2017, the related consolidated statements of operations, comprehensive income, cash flows, and stockholders' equity for each of the three years in the period ended December 31, 2018, and the related notes and the schedule listed in the Index at Item 15 (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated February 27, 2019, expressed an unqualified opinion on the Company's internal control over financial reporting.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Deloitte & Touche LLP

Boston, Massachusetts
February 27, 2019

We have served as the Company's auditor since 2005.

CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED BALANCE SHEETS
(dollars in thousands)

	As of December 31,	
	2018	2017
ASSETS		
Current assets:		
Cash and cash equivalents	$ 226,507	$ 319,399
Short-term marketable securities	52,856	38,179
Accounts receivable, net of allowances aggregating $44,315 and $27,799, respectively	606,952	528,924
Unbilled accounts receivable	54,794	35,922
Deferred costs	18,770	20,445
Inventories and supplies	199,479	176,012
Prepaid expenses and other current assets	42,800	35,175
Total current assets	1,202,158	1,154,056
Property, plant and equipment, net	1,561,978	1,587,365
Other assets:		
Goodwill	514,189	478,523
Permits and other intangibles, net	441,875	469,128
Other	18,121	17,498
Total other assets	974,185	965,149
Total assets	$ 3,738,321	$ 3,706,570
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Current portion of long-term obligations	$ 7,535	$ 4,000
Accounts payable	276,461	224,231
Deferred revenue	61,843	67,822
Accrued expenses	233,405	187,982
Current portion of closure, post-closure and remedial liabilities	23,034	19,782
Total current liabilities	602,278	503,817
Other liabilities:		
Closure and post-closure liabilities, less current portion of $9,592 and $6,444, respectively	60,339	54,593
Remedial liabilities, less current portion of $13,442 and $13,338, respectively	107,575	111,130
Long-term obligations, less current portion	1,565,021	1,625,537
Deferred taxes, unrecognized tax benefits and other long-term liabilities	233,352	223,291
Total other liabilities	1,966,287	2,014,551
Commitments and contingent liabilities (See Note 18)		
Stockholders' equity:		
Common stock, $.01 par value:		
Authorized 80,000,000 shares; issued and outstanding 55,847,261 and 56,501,190 shares, respectively	558	565
Additional paid-in capital	655,415	686,962
Accumulated other comprehensive loss	(223,371)	(172,407)
Accumulated earnings	737,154	673,082
Total stockholders' equity	1,169,756	1,188,202
Total liabilities and stockholders' equity	$ 3,738,321	$ 3,706,570

The accompanying notes are an integral part of these consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF OPERATIONS
(in thousands except per share amounts)

	For the years ended December 31,		
	2018	**2017**	**2016**
Revenues:			
Service revenues	$ 2,709,239	$ 2,398,650	$ 2,280,809
Product revenues	591,064	546,328	474,417
Total revenues	3,300,303	2,944,978	2,755,226
Cost of revenues: (exclusive of items shown separately below)			
Service revenues	1,861,975	1,641,798	1,543,210
Product revenues	443,576	420,875	389,647
Total cost of revenues	2,305,551	2,062,673	1,932,857
Selling, general and administrative expenses	503,747	456,648	422,015
Accretion of environmental liabilities	9,806	9,460	10,177
Depreciation and amortization	298,625	288,422	287,002
Goodwill impairment charge	—	—	34,013
Income from operations	182,574	127,775	69,162
Other (expense) income, net	(4,510)	(6,119)	6,195
Loss on early extinguishment of debt	(2,488)	(7,891)	—
Gain on sale of businesses	—	30,732	16,884
Interest expense, net of interest income of $2,958, $1,897, and $784, respectively	(81,094)	(85,808)	(83,525)
Income before provision (benefit) for income taxes	94,482	58,689	8,716
Provision (benefit) for income taxes	28,846	(42,050)	48,589
Net income (loss)	$ 65,636	$ 100,739	$ (39,873)
Earnings (loss) per share:			
Basic	$ 1.17	$ 1.77	$ (0.69)
Diluted	$ 1.16	$ 1.76	$ (0.69)
Shares used to compute earnings (loss) per share — Basic	56,148	57,072	57,532
Shares used to compute earnings (loss) per share — Diluted	56,340	57,200	57,532

The accompanying notes are an integral part of these consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(in thousands)

	For the years ended December 31,		
	2018	2017	2016
Net income (loss)	$ 65,636	$ 100,739	$ (39,873)
Other comprehensive (loss) income:			
Unrealized gains (losses) on available-for-sale securities (net of taxes (benefits) of $105, $152, and ($214), respectively)	77	32	(321)
Unrealized loss on interest rate hedge	(9,579)	—	—
Reclassification adjustment for losses on available-for-sale securities and interest rate hedge included in net income (loss) (net of taxes of $0, $79, and $0, respectively)	806	143	—
Foreign currency translation adjustments (including tax benefits of $5.0 million and $16.8 million in 2018 and 2016, respectively)	(42,350)	41,636	40,728
Unfunded pension liability (net of taxes of $42, $38, and $57, respectively)	82	108	159
Other comprehensive (loss) income	(50,964)	41,919	40,566
Comprehensive income	$ 14,672	$ 142,658	$ 693

The accompanying notes are an integral part of these consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	For the years ended December 31,		
	2018	**2017**	**2016**
Cash flows from operating activities:			
Net income (loss)	$ 65,636	$ 100,739	$ (39,873)
Adjustments to reconcile net income (loss) to net cash from operating activities:			
Depreciation and amortization	298,625	288,422	287,002
Goodwill impairment charge	—	—	34,013
Allowance for doubtful accounts	15,817	7,901	6,907
Amortization of deferred financing costs and debt discount	3,846	3,482	3,537
Accretion of environmental liabilities	9,806	9,460	10,177
Changes in environmental liability estimates	2,147	(195)	(4,254)
Deferred income taxes	19,089	(83,335)	15,184
Other expense (income), net	4,510	6,119	(5,685)
Stock-based compensation	16,792	13,146	10,481
Excess tax benefit of stock-based compensation	—	—	(1,198)
Net tax benefit on stock-based awards	—	—	1,165
Gain on sale of businesses	—	(30,732)	(16,884)
Loss on early extinguishment of debt	2,488	7,891	—
Environmental expenditures	(10,115)	(12,965)	(12,170)
Changes in assets and liabilities, net of acquisitions:			
Accounts receivable and unbilled accounts receivable	(79,563)	(33,764)	(15,009)
Inventories and supplies	(26,958)	(5,002)	(16,080)
Other current assets	(7,946)	16,720	(8,036)
Accounts payable	46,915	(10,684)	(3,503)
Other current and long-term liabilities	12,121	8,495	13,850
Net cash from operating activities	373,210	285,698	259,624
Cash flows used in investing activities:			
Additions to property, plant and equipment	(193,344)	(167,007)	(219,384)
Proceeds from sale and disposal of fixed assets	15,445	7,124	20,817
Acquisitions, net of cash acquired	(151,023)	(49,227)	(206,915)
Additions to intangible assets including costs to obtain or renew permits	(4,688)	(1,617)	(2,831)
Purchases of available-for-sale securities	(44,772)	(38,342)	(598)
Proceeds from sale of available-for-sale securities	28,723	376	—
Proceeds from sale of businesses, net of transactional costs	—	45,426	47,134
Net cash used in investing activities	(349,659)	(203,267)	(361,777)
Cash flows (used in) from financing activities:			
Change in uncashed checks	132	(5,940)	(3,177)
Proceeds from exercise of stock options	—	46	627
Tax payments related to withholdings on vested restricted stock	(3,266)	(3,149)	(2,819)
Repurchases of common stock	(45,080)	(48,971)	(22,188)
Excess tax benefit of stock-based compensation	—	—	1,198
Deferred financing costs paid	(4,027)	(5,718)	(4,031)
Premiums paid on early extinguishment of debt	(1,238)	(6,028)	—
Principal payments on debt	(405,768)	(402,000)	—
Issuance of senior secured notes, net of discount	348,250	399,000	—
Issuance of senior unsecured notes, including premium	—	—	250,625
Borrowing from revolving credit facility	50,000	—	—
Payment on revolving credit facility	(50,000)	—	—
Net cash (used in) from financing activities	(110,997)	(72,760)	220,235
Effect of exchange rate change on cash	(5,446)	2,731	4,207
(Decrease) increase in cash and cash equivalents	(92,892)	12,402	122,289
Cash and cash equivalents, beginning of year	319,399	306,997	184,708
Cash and cash equivalents, end of year	$ 226,507	$ 319,399	$ 306,997
Supplemental information:			
Cash payments for interest and income taxes:			
Interest paid	$ 89,171	$ 93,174	$ 88,669
Income taxes paid	20,036	18,682	29,255
Non-cash investing activities:			
Property, plant and equipment accrued	15,657	16,109	9,214
Transfer of inventory to property, plant and equipment	—	12,641	—
(Payable) receivable for estimated purchase price adjustment	(4,032)	—	1,910

The accompanying notes are an integral part of these consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(in thousands)

	Common Stock		Shares Held Under Employee Participation Plan	Additional Paid-in Capital	Accumulated Other Comprehensive loss	Accumulated Earnings	Total Stockholders' Equity
	Number of Shares	$0.01 Par Value					
Balance at January 1, 2016	57,593	$ 576	$ (469)	$ 738,401	$ (254,892)	$ 612,666	$ 1,096,282
Net loss	—	—	—	—	—	(39,873)	(39,873)
Other comprehensive income	—	—	—	—	40,566	—	40,566
Stock-based compensation	—	—	—	10,481	—	—	10,481
Issuance of restricted shares, net of shares remitted and tax withholdings	136	1	—	(2,820)	—	—	(2,819)
Exercise of stock options	22	—	—	627	—	—	627
Repurchases of common stock	(453)	(4)	—	(22,184)	—	—	(22,188)
Net tax benefit on stock-based awards	—	—	—	1,165	—	—	1,165
Balance at December 31, 2016	57,298	$ 573	$ (469)	$ 725,670	$ (214,326)	$ 572,793	$ 1,084,241
Net income	—	—	—	—	—	100,739	100,739
Cumulative effect of change in accounting for stock-based compensation	—	—	—	681	—	(450)	231
Other comprehensive income	—	—	—	—	41,919	—	41,919
Stock-based compensation	—	—	—	13,146	—	—	13,146
Issuance of restricted shares, net of shares remitted and tax withholdings	133	1	—	(3,150)	—	—	(3,149)
Exercise of stock options	2	—	—	46	—	—	46
Shares held under employee participation plan	(25)	—	469	(469)	—	—	—
Repurchases of common stock	(907)	(9)	—	(48,962)	—	—	(48,971)
Balance at December 31, 2017	56,501	$ 565	$ —	$ 686,962	$ (172,407)	$ 673,082	$ 1,188,202
Net income	—	—	—	—	—	65,636	65,636
Cumulative effect of change in accounting principle	—	—	—	—	—	(1,564)	(1,564)
Other comprehensive loss	—	—	—	—	(50,964)	—	(50,964)
Stock-based compensation	—	—	—	16,792	—	—	16,792
Issuance of restricted shares, net of shares remitted and tax withholdings	160	1	—	(3,267)	—	—	(3,266)
Repurchases of common stock	(814)	(8)	—	(45,072)	—	—	(45,080)
Balance at December 31, 2018	55,847	$ 558	$ —	$ 655,415	$ (223,371)	$ 737,154	$ 1,169,756

The accompanying notes are an integral part of these consolidated financial statements.

(1) OPERATIONS

Clean Harbors, Inc., through its subsidiaries (collectively, the "Company"), is a leading provider of environmental, energy and industrial services throughout North America. We are also the largest re-refiner and recycler of used oil in the world and the largest provider of parts cleaning and related environmental services to commercial, industrial and automotive customers in North America.

(2) SIGNIFICANT ACCOUNTING POLICIES

The accompanying consolidated financial statements of the Company reflect the application of certain significant accounting policies as described below:

Principles of Consolidation

The accompanying consolidated statements include the accounts of Clean Harbors, Inc. and its majority-owned subsidiaries. All intercompany accounts and transactions have been eliminated in consolidation.

Use of Estimates

The preparation of consolidated financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions, which are evaluated on an ongoing basis, that affect the amounts reported in the Company's consolidated financial statements and accompanying notes. Management bases its estimates on historical experience and on various other assumptions it believes to be reasonable at the time under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities and disclosure, if any, of contingent assets and liabilities and reported amounts of revenues and expenses. Actual results could differ from those estimates and judgments.

Cash, Cash Equivalents and Uncashed Checks

Cash consists primarily of cash on deposit and money market accounts. Marketable securities with maturities of three months or less from the date of purchase are classified as cash equivalents. The Company's cash management program with its revolving credit lender allows for the maintenance of a zero balance in the U.S. bank disbursement accounts that are used to issue vendor and payroll checks. The program can result in checks outstanding in excess of bank balances in the disbursement accounts. When checks are presented to the bank for payment, cash deposits in amounts sufficient to fund the checks are made, at the Company's discretion, either from funds provided by other accounts or under the terms of the Company's revolving credit facility. Therefore, until checks are presented for payment, there is no right of offset by the bank and the Company continues to have control over cash relating to both released as well as unreleased checks. Checks that have been written to vendors or employees but have not yet been presented for payment at the Company's bank are classified as uncashed checks as part of accounts payable and changes in the balance are reported as a financing activity in the statement of cash flows.

Marketable Securities

The Company, through its wholly-owned captive insurance subsidiary, invests in marketable securities consisting of U.S. Treasury securities, corporate notes and bonds and commercial paper. Marketable securities with original maturities greater than three months from the purchase date and remaining maturities less than one year are classified as short-term marketable securities. As of December 31, 2018 and 2017 the Company has recorded total marketable securities and cash equivalents of $61.0 million and $40.2 million, respectively, as shown below (in thousands).

(2) SIGNIFICANT ACCOUNTING POLICIES (Continued)

	December 31, 2018	December 31, 2017
Commercial paper	$ 8,126	$ 2,048
Total cash equivalents	8,126	2,048
U.S. Treasury securities	10,133	3,855
Corporate notes and bonds	38,036	32,729
Commercial paper	4,687	1,595
Total short-term marketable securities	52,856	38,179
Total financial assets	$ 60,982	$ 40,227

Realized gains and losses on sales of available-for-sale securities in the years ended December 31, 2018, 2017 and 2016 were immaterial. The majority of the marketable securities have a remaining maturity of less than one year and fair value approximates cost.

Allowances for Doubtful Accounts

On a regular basis, the Company evaluates its accounts receivable and establishes the allowance for doubtful accounts based on an evaluation of certain criteria and evidence of collection certainty including historical collection trends, current economic trends and changes in customer payment patterns. Past-due receivable balances are written off when the Company's internal collection efforts have been deemed unsuccessful in collecting the outstanding balance due.

Credit Concentration

Concentration of credit risks in accounts receivable is limited due to the large number of customers comprising the Company's customer base throughout North America. The Company maintains policies over credit extension that include credit evaluations, credit limits and collection monitoring procedures on a customer-by-customer basis. However, the Company generally does not require collateral before services are performed. No individual customer accounted for more than 10% of accounts receivable or more than 10% of total revenues in the periods presented.

Inventories and Supplies

Inventories are stated at the lower of cost or market. The cost of oil and oil products is principally determined on a first-in, first-out ("FIFO") basis. The cost of supplies and drums, solvent and solution and other inventories is determined on a FIFO or a weighted average cost basis. The Company continually reviews its inventories for obsolete or unsalable items and adjusts its carrying value to reflect estimated realizable values.

Property, Plant and Equipment (excluding landfill assets)

Property, plant and equipment are stated at cost. Expenditures for major renewals and improvements which extend the life or usefulness of the asset are capitalized. Items of an ordinary repair or maintenance nature are charged directly to operating expense as incurred. During the construction and development period of an asset, the costs incurred, including applicable interest costs, are classified as construction-in-progress.

(2) SIGNIFICANT ACCOUNTING POLICIES (Continued)

The Company depreciates and amortizes the cost of these assets, using the straight-line method as follows:

Asset Classification	Estimated Useful Life
Buildings and building improvements	
Buildings	20–42 years
Leasehold and building improvements	2–45 years
Camp and lodging equipment	8–15 years
Vehicles	2–15 years
Equipment	
Capitalized software and computer equipment	3–5 years
Containers and railcars	8–16 years
All other equipment	4–30 years
Furniture and fixtures	5–8 years

The Company recognizes an impairment in the carrying value of long-lived assets when the expected future undiscounted cash flows derived from the assets, or group of assets, are less than their carrying value. For the years ended December 31, 2018, 2017 and 2016, the Company did not record impairment charges related to long-lived assets.

Goodwill

Goodwill is comprised of the purchase price of business acquisitions in excess of the fair value of the net assets acquired. Goodwill is not amortized but is reviewed for impairment annually as of December 31, or when events or circumstances indicate that the carrying value of the reporting unit may exceed its fair value. Upon adoption of Accounting Standards Update ("ASU") 2017-04 in the fourth quarter of 2017, if the fair value is less than the carrying amount, a loss will be recorded for the excess of the carrying value of the goodwill over the implied value of the goodwill. Prior to adoption of ASU 2017-04, if the fair value was less than the carrying amount, a Step II goodwill impairment test was performed to determine if goodwill was impaired. The loss, if any, was measured as the excess of the carrying value of the goodwill over the implied value of the goodwill. See Note 8, "Goodwill and Other Intangible Assets," for additional information related to the Company's goodwill impairment tests.

Permits and other intangibles

Costs related to acquiring licenses, permits and intangible assets, such as legal fees, site surveys, engineering costs and other expenditures are capitalized. Other intangible assets consist primarily of customer and supplier relationships, trademarks and trade names, and non-compete agreements. Permits relating to landfills are amortized on a units-of-consumption basis. All other permits are amortized over periods ranging from 5 to 30 years on a straight-line basis. Other intangible assets are amortized on a straight-line basis over their respective useful lives, which range from 5 to 20 years.

Finite-lived intangible assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying value may not be recoverable. When such factors and circumstances exist, management compares the projected undiscounted future cash flows associated with the related asset or group of assets to the carrying amount. The impairment loss, if any, is measured as the excess of the carrying amount over the fair value of the asset or group of assets.

Indefinite-lived intangible assets are not amortized but are reviewed for impairment annually as of December 31, or when events or changes in the business environment indicate that the carrying value may be impaired. If the fair value of the asset is less than the carrying amount, the impairment loss is measured as the excess of the carrying value of the asset over its fair value.

Leases

The Company leases rolling stock, rail cars, equipment, real estate and office equipment under operating leases. Certain real estate leases contain rent holidays and rent escalation clauses. Most of the Company's real estate lease agreements include renewal periods at the Company's option. For its operating leases, the Company recognizes rent holiday periods and scheduled

(2) SIGNIFICANT ACCOUNTING POLICIES (Continued)

rent increases on a straight-line basis over the lease term beginning with the date the Company takes possession of the leased assets.

Landfill Accounting

The Company amortizes landfill improvements and certain landfill-related permits over the estimated useful lives. The units-of-consumption method is used to amortize land, landfill cell construction, asset retirement costs and remaining landfill cells and sites. The Company also utilizes the units-of-consumption method to record closure and post-closure obligations for landfill cells and sites. Under the units-of-consumption method, the Company includes future estimated construction and asset retirement costs, as well as costs incurred to date, in the amortization base of the landfill assets. Additionally, where appropriate, as described below, the Company includes probable expansion airspace that has yet to be permitted in the calculation of the total remaining useful life of the landfill. If it is determined that expansion capacity should no longer be considered in calculating the recoverability of a landfill asset, the Company may be required to recognize an asset impairment or incur significantly higher amortization expense. If at any time the Company makes the decision to abandon the expansion effort, the capitalized costs related to the expansion effort are expensed immediately.

Landfill assets—Landfill assets include the costs of landfill site acquisition, permits and cell construction incurred to date. These amounts are recorded at cost, which includes capitalized interest as applicable. Landfill assets, net of amortization, are combined with management's estimate of the costs required to complete construction of the landfill to determine the amount to be amortized over the remaining estimated useful economic life of a site. Amortization of landfill assets is recorded on a units-of-consumption basis, such that the landfill assets should be completely amortized at the date the landfill ceases accepting waste. Amortization totaled $10.3 million, $9.5 million and $9.7 million for the years ended December 31, 2018, 2017 and 2016, respectively. Changes in estimated costs to complete construction are applied prospectively to the amortization rate.

Landfill capacity—Landfill capacity, which is the basis for the amortization of landfill assets and for the accrual of final closure and post-closure obligations, represents total permitted airspace plus unpermitted airspace that management believes is probable of ultimately being permitted based on established criteria. The Company applies the following criteria for evaluating the probability of obtaining a permit for future expansion airspace at existing sites, which provides management a basis to evaluate the likelihood of success of unpermitted expansions:

- Personnel are actively working to obtain the permit or permit modifications (land use, state, provincial and federal) necessary for expansion of an existing landfill, and progress is being made on the project.
- Management expects to submit the application within the next year and to receive all necessary approvals to accept waste within the next 5 years.
- At the time the expansion is included in the Company's estimate of the landfill's useful economic life, it is probable that the required approvals will be received within the normal application and processing time periods for approvals in the jurisdiction in which the landfill is located.
- The Company or other owner of the landfill has a legal right to use or obtain the right to use the land associated with the expansion plan.
- There are no significant known political, technical, legal or business restrictions or issues that could impair the success of such expansion.
- A financial feasibility analysis has been completed and the results demonstrate that the expansion will have a positive financial and operational impact such that management is committed to pursuing the expansion.
- Additional airspace and related additional costs, including permitting, final closure and post-closure costs, have been estimated based on the conceptual design of the proposed expansion.

As of December 31, 2018, there was one unpermitted expansion at one location included in the Company's landfill accounting model, which represented 16.2% of the Company's remaining airspace at that date. If actual expansion airspace is significantly different from the Company's estimate of expansion airspace, the amortization rates used for the units-of-consumption method would change, therefore impacting the Company's profitability. If the Company determines that there is less actual expansion airspace at a landfill, this would increase amortization expense recorded and decrease profitability, while

(2) SIGNIFICANT ACCOUNTING POLICIES (Continued)

if the Company determines a landfill has more actual expansion airspace, amortization expense would decrease and profitability would increase.

As of December 31, 2018, the Company had 11 active landfill sites (including the Company's two non-commercial landfills), which have estimated remaining lives (based on anticipated waste volumes and remaining highly probable airspace) as follows:

Facility Name	Location	Remaining Lives (Years)	Remaining Highly Probable Airspace (cubic yards) (in thousands)		
			Permitted	Unpermitted	Total
Altair	Texas	3	311	—	311
Buttonwillow	California	21	6,234	—	6,234
Deer Park	Texas	4	141	—	141
Deer Trail	Colorado	28	1,755	—	1,755
Grassy Mountain	Utah	51	194	4,830	5,024
Kimball	Nebraska	9	190	—	190
Lambton	Ontario	64	4,821	—	4,821
Lone Mountain	Oklahoma	18	4,124	—	4,124
Ryley	Alberta	7	906	—	906
Sawyer	North Dakota	87	3,522	—	3,522
Westmorland	California	64	2,732	—	2,732
			24,930	4,830	29,760

At December 31, 2018 and 2017, the Company had no cubic yards of permitted, but not highly probable, airspace.

The following table presents the remaining highly probable airspace from January 1, 2016 through December 31, 2018 (in thousands of cubic yards):

	2018	2017	2016
Remaining capacity at January 1,	31,113	32,228	29,786
Changes in highly probable airspace, net	(223)	—	3,464
Consumed	(1,130)	(1,115)	(1,022)
Remaining capacity at December 31,	29,760	31,113	32,228

Amortization of cell construction costs and accrual of cell closure obligations—Landfills are typically comprised of a number of cells, which are constructed within a defined acreage (or footprint). The cells are typically discrete units, which require both separate construction and separate capping and closure procedures. Cell construction costs are the costs required to excavate and construct the landfill cell. These costs are typically amortized on a units-of-consumption basis, such that they are completely amortized when the specific cell ceases accepting waste. In some instances, the Company has landfills that are engineered and constructed as "progressive trenches." In progressive trench landfills, a number of contiguous cells form a progressive trench. In those instances, the Company amortizes cell construction costs over the airspace within the entire trench, such that the cell construction costs will be fully amortized at the end of the trench useful life.

The design and construction of a landfill does not create a landfill asset retirement obligation. Rather, the asset retirement obligation for cell closure (the cost associated with capping each cell) is incurred in relatively small increments as waste is placed in the landfill. Therefore, the cost required to construct the cell cap is capitalized as an asset retirement cost and a liability of an equal amount is established, based on the discounted cash flow associated with each capping event, as airspace is consumed. Spending for cell capping is reflected as environmental expenditures within operating activities in the statement of cash flows.

Landfill final closure and post-closure liabilities—The balance of landfill final closure and post-closure liabilities at December 31, 2018 and 2017 was $37.8 million and $32.4 million, respectively. The Company has material financial commitments for the costs associated with requirements of the Environmental Protection Agency ("EPA") and the comparable regulatory agency in Canada for landfill final closure and post-closure activities. In the United States, the landfill final closure

(2) SIGNIFICANT ACCOUNTING POLICIES (Continued)

and post-closure requirements are established under the standards of the EPA, and are implemented and applied on a state-by-state basis. The Company develops estimates for the cost of these activities based on an evaluation of site-specific facts and circumstances, including the Company's interpretation of current regulatory requirements and proposed regulatory changes. Such estimates may change in the future due to various circumstances including, but not limited to, permit modifications, changes in legislation or regulations, technological changes and results of environmental studies.

Final closure costs are the costs incurred after the site ceases to accept waste, but before the landfill is certified as closed by the applicable state regulatory agency. These costs generally include the costs required to cap the final cell of the landfill (if not included in cell closure), the costs required to dismantle certain structures for landfills and other landfill improvements, and regulation-mandated groundwater monitoring, and leachate management. Post-closure costs involve the maintenance and monitoring of a landfill site that has been certified closed by the applicable regulatory agency. These costs generally include groundwater monitoring and leachate management. Regulatory post-closure periods are generally 30 years after landfill closure. Final closure and post-closure obligations are accrued on a units-of-consumption basis, such that the present value of the final closure and post-closure obligations are fully accrued at the date the landfill discontinues accepting waste.

Cell closure, final closure and post-closure costs (also referred to as "asset retirement obligations") are calculated by estimating the total obligation in current dollars, adjusted for inflation (1.02% during 2018 and 2017) and discounted at the Company's credit-adjusted risk-free interest rate (5.66% and 6.32% during 2018 and 2017, respectively.)

Non-Landfill Closure and Post-Closure Liabilities

Non-landfill closure costs include costs required to dismantle and decontaminate certain structures and other costs incurred during the closure process. Post-closure costs, if required, include associated maintenance and monitoring costs as required by the closure permit. Post-closure periods are performance-based and are not generally specified in terms of years in the closure permit, but generally range from 10 to 30 years or more.

The Company records its non-landfill closure and post-closure liability by: (i) estimating the current cost of closing a non-landfill facility and the post-closure care of that facility, if required, based upon the closure plan that the Company is required to follow under its operating permit, or in the event the facility operates with a permit that does not contain a closure plan, based upon legally enforceable closure commitments made by the Company to various governmental agencies; (ii) using probability scenarios as to when in the future operations may cease; (iii) inflating the current cost of closing the non-landfill facility on a probability weighted basis using the inflation rate to the time of closing under each probability scenario; and (iv) discounting the future value of each closing scenario back to the present using the credit-adjusted risk-free interest rate. Non-landfill closure and post-closure obligations arise when the Company commences non-landfill facility operations. The carrying value of non-landfill closure and post-closure liabilities at December 31, 2018 and 2017 was $32.1 million and $28.6 million, respectively.

The estimates for non-landfill closure and post-closure liabilities are inherently uncertain due to the possibility that permit and regulatory requirements will change in the future, impacting the estimation of total costs and the timing of the expenditures. Management reviews non-landfill closure and post-closure liabilities for changes to key assumptions that would impact the amount of the recorded liabilities. Changes that would prompt management to revise a liability estimate include changes in legal requirements that impact the Company's expected closure plan or scope of work, in the market price of a significant cost item, in the probability scenarios as to when future operations at a location might cease, or in the expected timing of the cost. Changes in estimates for non-landfill closure and post-closure events immediately impact the required liability and the value of the corresponding asset. If a change is made to a fully-consumed asset, the adjustment is charged immediately to expense. When a change in estimate relates to an asset that has not been fully consumed, the adjustment to the asset recognized in income prospectively as a component of amortization. Historically, material changes to non-landfill closure and post-closure estimates have been infrequent.

Remedial Liabilities

The balance of remedial liabilities at December 31, 2018 and 2017 was $121.0 million and $124.5 million, respectively. Remedial liabilities, including Superfund liabilities, include the costs of removal or containment of contaminated material, treatment of potentially contaminated groundwater and maintenance and monitoring costs necessary to comply with regulatory requirements. Most of the Company's remedial liabilities relate to the active and inactive hazardous waste treatment and disposal facilities which the Company acquired in the last 16 years and Superfund sites owned by third parties for which the Company, or the prior owners of certain of the Company's facilities for which the Company may have certain indemnification

(2) SIGNIFICANT ACCOUNTING POLICIES (Continued)

obligations, have been identified as potentially responsible parties ("PRPs") or potential PRPs. The Company's estimate of remedial liabilities involved an analysis of such factors as: (i) the nature and extent of environmental contamination (if any); (ii) the terms of applicable permits and agreements with regulatory authorities as to cleanup procedures and whether modifications to such permits and agreements will likely need to be negotiated; (iii) the cost of performing anticipated cleanup activities based upon current technology; and (iv) in the case of Superfund and other sites where other parties will also be responsible for a portion of the cleanup costs, the likely allocation of such costs and the ability of such other parties to pay their share. The measurement of remedial liabilities is reviewed at least quarterly and changes in estimates are recognized when identified.

The Company periodically evaluates potential remedial liabilities at sites that it owns or operates or to which the Company or the sellers of the CSD assets (or the respective predecessors of the Company or such sellers) transported or disposed of waste, including 128 Superfund sites as of December 31, 2018. The Company periodically reviews and evaluates sites requiring remediation, including Superfund sites, giving consideration to the nature (i.e., owner, operator, arranger, transporter or generator) and the extent (i.e., amount and nature of waste hauled to the location, number of years of site operations or other relevant factors) of the Company's (or such sellers') alleged connection with the site, the extent (if any) to which the Company believes it may have an obligation to indemnify cleanup costs in connection with the site, the regulatory context surrounding the site, the accuracy and strength of evidence connecting the Company (or such sellers) to the location, the number, connection and financial ability of other named and unnamed potentially responsible parties ("PRPs") and the nature and estimated cost of the likely remedy. Where the Company concludes that it is probable that a liability has been incurred and an amount can be estimated, a provision is made, based upon management's judgment and prior experience, of such estimated liability.

Remedial liabilities are inherently difficult to estimate. Estimating remedial liabilities requires that the existing environmental contamination be understood. There are risks that the actual quantities of contaminants differ from the results of the site investigation, and that contaminants exist that have not been identified by the site investigation. In addition, the amount of remedial liabilities recorded is dependent on the remedial method selected. There is a risk that funds will be expended on a remedial solution that is not successful, which could result in the additional incremental costs of an alternative solution. Such estimates, which are subject to change, are subsequently revised if and when additional or new information becomes available.

Remedial liabilities are discounted only when the timing of the payments is determinable and the amounts are estimable. Management's experience has been that the timing of payments for remedial liabilities is not usually estimable, and therefore the amounts of remedial liabilities are not generally discounted. In the case of remedial liabilities assumed in connection with acquisitions, acquired liabilities are recorded at fair value as of the dates of the acquisitions calculated by inflating costs in current dollars using an estimate of future inflation rates as of the respective acquisition dates until the expected time of payment, and then discounting the amount of the payments to their present value using a risk-free discount rate as of the acquisition dates. Discounts have been and will be applied to the remedial liabilities as follows:

- Remedial liabilities assumed relating to acquisitions are and will continue to be inflated using the inflation rates at the time of each acquisition (ranging from 1.01% to 2.57%) until the expected time of payment, then discounted at the risk-free interest rate at the time of such acquisition (ranging from 1.37% to 5.99%).
- Remedial liabilities incurred subsequent to the acquisitions and remedial liabilities of the Company that existed prior to the acquisitions have been and will continue to be recorded at the estimated current value of the liabilities, which is usually neither increased for inflation nor reduced for discounting.

Foreign Currency

The Company has operations in Canada. The functional currencies of those operations are their local currency and therefore assets and liabilities of those foreign operations are translated to U.S. dollars at the exchange rate in effect at the balance sheet date and revenue and expenses at the average exchange rate for the period. Gains and losses from the translation of the consolidated financial statements of foreign subsidiaries into U.S. dollars are included in stockholders' equity as a component of accumulated other comprehensive loss. Gains and losses resulting from foreign currency transactions are recognized in the consolidated statements of operations. Recorded balances that are denominated in a currency other than the functional currency are remeasured to the functional currency using the exchange rate at the balance sheet date and gains or losses are recorded in the statements of operations.

(2) SIGNIFICANT ACCOUNTING POLICIES (Continued)

Advertising Expense

Advertising costs are expensed as incurred. Advertising expense was approximately $10.5 million in 2018, $11.8 million in 2017 and $10.8 million in 2016.

Stock-Based Compensation

Stock-based compensation cost is measured at the grant date based on the fair value of the award and is recognized as expense over the requisite service period, which generally represents the vesting period. In addition, the Company issues awards with performance targets which are recognized as expense over the requisite service period when management believes it is probable those targets will be achieved. The fair value of the Company's grants of restricted stock are based on the quoted market price for the Company's common stock on the respective dates of grant. Forfeitures are recognized as they occur.

Income Taxes

Current income tax expense approximates cash to be paid or refunded for taxes for the applicable period. Deferred tax expense or benefit is the result of changes between deferred tax assets and liabilities. Deferred tax assets and liabilities are determined based upon the temporary differences between the financial statement basis and tax basis of assets and liabilities as well as from net operating loss and tax credit carryforwards as measured by the enacted tax rates, which will be in effect when these differences reverse. The effect of a change in tax rates on deferred tax assets and liabilities is generally recognized in income in the period that includes the enactment date. The Company evaluates the recoverability of future tax deductions and credits and a valuation allowance is established by tax jurisdiction when, based on an evaluation of both positive and negative objective verifiable evidence, it is more likely than not that some portion or all of deferred tax assets will not be realized.

The Company recognizes and measures a tax benefit from uncertain tax positions when it is more likely than not that the tax position will be sustained on examination by the taxing authorities, based on the technical merits of the position. The Company recognizes a liability for unrecognized tax benefits resulting from uncertain tax positions taken or expected to be taken in a tax return. The Company adjusts these liabilities when its judgment changes as a result of the evaluation of new information not previously available. Due to the complexity of some of these uncertainties, the ultimate resolution may result in a payment that is materially different from the current estimate or future recognition of an unrecognized benefit. These differences will be reflected as increases or decreases to income tax expense in the period in which they are determined.

The Company recognizes interest and penalties related to unrecognized tax benefits within the income tax expense line in the consolidated statements of operations. Accrued interest and penalties are included within deferred taxes, unrecognized tax benefits and other long-term liabilities line in the consolidated balance sheet.

Earnings per Share ("EPS")

Basic EPS is calculated by dividing net income by the weighted average number of common shares outstanding during the period. Diluted EPS gives effect to all potentially dilutive common shares that were outstanding during the period.

Recent Accounting Pronouncements

Standards implemented

In May 2014, the Financial Accounting Standards Board ("FASB") issued ASU 2014-09, *Revenue from Contracts with Customers (Topic 606)*, which replaces numerous requirements in U.S. GAAP, including industry-specific requirements, and provides companies with a single revenue recognition model for recognizing revenue from contracts with customers.

On January 1, 2018, the Company adopted Topic 606 using the modified retrospective method for all contracts. Results for reporting periods beginning on the date of adoption are presented under ASC 606, while prior period amounts have not been adjusted and continue to be reported in accordance with the Company's historical accounting methodology pursuant to ASC 605, *Revenue Recognition*. The only significant impact from the adoption of this standard relates to incremental disclosures now required. Upon adoption, a cumulative effect adjustment was not recorded.

In January 2016, FASB issued ASU 2016-01, *Financial Instruments - Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities*. The amendment requires equity investments (except those accounted for under the equity method of accounting, or those that result in consolidation of the investee) to be measured at fair value with changes in fair value recognized in net income. The Company adopted the amendment in the fourth quarter of 2018,

(2) SIGNIFICANT ACCOUNTING POLICIES (Continued)

which resulted in a $1.4 million charge to other (expense) income, net for the change in fair value of equity securities purchased in 2018.

In October 2016, the FASB issued ASU 2016-16, *Income Tax - Intra-Entity Transfers of Assets Other than Inventory*. The amendment improves the accounting for the income tax consequences of intra-entity transfers of assets other than inventory. The Company adopted this standard on a modified retrospective basis effective January 1, 2018. As a result of adoption, the Company recorded a cumulative effect adjustment that reduced retained earnings by $1.6 million. The impact on the annual provision for income taxes was not material.

In August 2017, the FASB issued ASU 2017-12, *Derivatives and Hedging (Topic 815): Targeted Improvements to Accounting for Hedging Activities.* The amendment better aligns an entity's risk management activities and financial reporting for hedging relationships through changes to both the designation and measurement guidance for qualifying hedging relationships and the presentation of hedge results. The Company adopted the amendment in the third quarter of 2018. Adoption did not have a material impact on the Company's consolidated financial statements.

Standards to be implemented

The Company is evaluating the impact that the below standards to be implemented will have on the Company's consolidated financial statements.

In February 2016, FASB issued ASU 2016-02, *Leases (Topic 842)*. The amendment increases transparency and comparability among organizations by recognizing lease assets and lease liabilities on the balance sheet and disclosing key information about leasing arrangements. The Company is currently finalizing the accounting and internal controls relative to this new pronouncement and will adopt Topic 842 and related amendments on January 1, 2019 using the modified retrospective method of adoption. The Company expects to elect most of the available practical expedients, including the package of practical expedients, which permits entities not to reassess under the new standard their prior conclusions about lease identification, lease classification and initial direct costs. In preparation for adoption of the standard, the Company has implemented internal controls and key system functionality to enable the preparation of financial information. The Company has concluded that the adoption of this standard will have a material impact on the Company's consolidated balance sheets related to the recognition of right-of-use assets and lease liabilities, but is not expected to have a material impact on the consolidated statements of operations or cash flows. On adoption, the Company currently expects to recognize additional right-of-use assets and lease obligations in the range of $180.0 million to $220.0 million.

(3) REVENUES

Revenue Recognition

The Company generates services and product revenues through the following operating segments: Environmental Services and Safety-Kleen. The Company recognizes revenue when control of the promised goods or services is transferred to the Company's customers, in an amount that reflects the consideration the Company expects to be entitled to in exchange for those goods or services. Product revenues are recognized when the products are delivered and control transfers to the customer.

Nature of Goods and Services

The majority of the Company's contracts are for services, which are recognized based on time and materials incurred at contractually agreed-upon rates. The Company's payment terms vary by the type and location of its customers and the products or services offered. The periods between invoicing and when payments are due are not significant. For all periods presented, any amounts billed to customers related to shipping and handling are classified as revenue and the Company's shipping and handling costs are included in costs of revenues. In the course of the Company's operations, it collects sales tax and other excise taxes from its customers and recognizes a current liability which is then relieved when the taxes are remitted to the appropriate governmental authorities. The Company excludes sales and other excise taxes that it collects from customers from its revenues.

(3) REVENUES (Continued)

Disaggregation of Revenue

The following table presents the Company's third party revenues disaggregated by revenue source (in thousands):

	For the Year Ended December 31, 2018			
	Environmental Services	Safety-Kleen	Corporate	Total
Primary Geographical Markets				
United States	$ 1,598,402	$ 1,196,661	$ 1,082	$ 2,796,145
Canada	405,441	98,694	23	504,158
Total third party revenues	$ 2,003,843	$ 1,295,355	$ 1,105	$ 3,300,303
Sources of Revenue (1)				
Technical Services	$ 1,037,388	$ —	$ —	$ 1,037,388
Field and Emergency Response Services	304,727	—	—	304,727
Industrial Services	541,895	—	—	541,895
Oil, Gas and Lodging Services and Other	119,833	—	1,105	120,938
Safety-Kleen Environmental Services	—	795,077	—	795,077
Kleen Performance Products	—	500,278	—	500,278
Total third party revenues	$ 2,003,843	$ 1,295,355	$ 1,105	$ 3,300,303

1. All revenue except oil and oil product sales within Kleen Performance Products and product sales within Safety-Kleen Environmental Services, which include various automotive related fluids, shop supplies and direct blended oil sales, are recognized over time. Kleen Performance Products and Safety-Kleen Environmental Services product sales are recognized at a point in time.

Technical Services. Technical Services revenues are generated from fees charged for waste material management and disposal services including onsite environmental management services, collection and transportation, packaging, recycling, treatment and disposal of waste. Revenue is primarily generated by short-term projects, most of which are governed by master service agreements that are long-term in nature. These master service agreements are typically entered into with the Company's larger customers and outline the pricing and legal frameworks for such arrangements. Services are provided based on purchase orders or agreements with the customer and include prices based upon units of volume of waste, and transportation and other fees. Collection and transportation revenues are recognized over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. Revenues for treatment and disposal of waste are recognized upon completion of treatment, final disposition in a landfill or incineration, or when the waste is shipped to a third party for processing and disposal. The Company periodically enters into bundled arrangements for the collection and transportation and disposal of waste. For such arrangements, transportation and disposal are considered distinct performance obligations and the Company allocates revenue to each based on their relative standalone selling price (i.e. the estimated price that a customer would pay for the services on a standalone basis). Revenues from waste that is not yet completely processed and disposed and the related costs are deferred. The revenue is recognized and the deferred costs are expensed when the related services are completed. The period between collection and transportation and the final processing and disposal ranges depending on location of the customer, but generally is measured in days.

Field and Emergency Response Services. Field Services revenues are generated from cleanup services at customer sites, including municipalities and utilities, or other locations on a scheduled or emergency response basis. Services include confined space entry for tank cleaning, site decontamination, large remediation projects, demolition, spill cleanup on land and water, railcar cleaning, product recovery and transfer and vacuum services. Additional services include filtration and water treatment services. Response services for environmental emergencies include any scale from man-made disasters such as oil spills, to natural disasters such as hurricanes. These services are provided based on purchase orders or agreements with customers and include prices generally based upon daily, hourly or job rates for equipment, materials and personnel. The Company recognizes revenue for these services over time, as the customer receives and consumes the benefits of the service as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to

(3) REVENUES (Continued)

recognize revenue over time, based on time and materials incurred. The duration of such services can be over a number of hours, several days or even months for larger scale projects.

Industrial Services. Industrial Services revenues are generated from industrial and specialty services provided to refineries, mines, upgraders, chemical plants, pulp and paper mills, manufacturing facilities, power generation facilities and other industrial customers throughout North America. Services include in-plant cleaning and maintenance services, plant outage and turnaround services, decoking and pigging, chemical cleaning, high and ultra-high pressure water cleaning, pipeline inspection and coating services, large tank and surface impoundment cleaning, oilfield transport, daylighting, production services and directional boring services (previously included in Oil, Gas and Lodging service offerings) supporting drilling, completions and production programs. These services are provided based on purchase orders or agreements with the customer and include prices based upon daily, hourly or job rates for equipment, materials and personnel. The Company recognizes revenue for these services over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred.

Oil, Gas and Lodging Services and Other. Oil, Gas and Lodging Services and Other is primarily comprised of revenues generated from providing Oil and Gas Field Services that support upstream activities such as exploration and drilling for oil and gas companies and Lodging Services to customers in Western Canada. The Company recognizes Oil and Gas Field Services revenue over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. Revenue for lodging accommodation services is recognized over time based on passage of time.

Safety-Kleen Environmental Services. Safety-Kleen Environmental Services revenues are generated from providing parts washer services, containerized waste handling and disposal services, oil collection services, direct sales of blended oil products, and other complementary services and product sales. Containerized waste services consist of profiling, collecting, transporting and recycling or disposing of a wide variety of waste. Other products and services include vacuum services, sale of complementary supply products including automotive fluids and shop supplies and other environmental services. Revenues from parts washer services include fees charged to customers for their use of parts washer equipment, to clean and maintain parts washer equipment and to remove and replace used cleaning fluids. Parts washer services are considered a single performance obligation due to the highly integrated and interdependent nature of the arrangement. Revenue from parts washer services is recognized over the service interval as the customer receives the benefit of the services. Collection and transportation revenues are recognized over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. Product revenue is recognized upon the transfer of control whereby control transfers when the products are delivered to the customer.

Kleen Performance Products. Kleen Performance Products revenues are generated from sales of high quality base and blended lubricating oils to third-party distributors, government agencies, fleets, railroads and industrial customers. The business also sells recycled fuel oil to asphalt plants, industrial plants, blenders, pulp and paper companies, vacuum gas oil producers and marine diesel oil producers. Revenue for oil products is recognized at a point in time, upon the transfer of control. Control transfers when the products are delivered to the customer.

Contract Balances

	December 31, 2018	December 31, 2017
Receivables	$ 606,952	$ 528,924
Contract Assets (Unbilled Receivables)	54,794	35,922
Contract Liabilities (Deferred Revenue)	61,843	67,822

The timing of revenue recognition, billings and cash collections results in billed accounts receivable, unbilled receivables (contract assets), and customer advances and deposits or deferred revenue (contract liabilities) on the Consolidated Balance Sheet. Generally, billing occurs subsequent to revenue recognition, as a right to payment is not just subject to passage of time, resulting in contract assets. Contract assets are generally classified as current. The Company sometimes receives advances or deposits from its customers before revenue is recognized, resulting in contract liabilities. These assets and liabilities are

(3) REVENUES (Continued)

reported on the Consolidated Balance Sheet on a contract-by-contract basis at the end of each reporting period. As part of the acquisition of the Veolia Business (as defined in Note 4, "Business Combinations") on February 23, 2018, the Company acquired receivables and contract assets of $20.8 million and $17.4 million, respectively. Changes in the contract asset and liability balances during the years ended December 31, 2018 and December 31, 2017 were not materially impacted by any other factors. The contract liability balances at the beginning of each period presented were generally fully recognized in the subsequent three-month period.

Variable Consideration

The nature of the Company's contracts give rise to certain types of variable consideration, including in limited cases volume discounts. Accordingly, management establishes a revenue allowance to cover the estimated amounts of revenue that may need to be credited to customers' accounts in future periods. The Company estimates the amount of variable consideration to include in the estimated transaction price based on historical experience, anticipated performance and its best judgment at the time and to the extent it is probable that a significant reversal of cumulative revenue recognized will not occur when the uncertainty associated with the variable consideration is resolved.

Contract Costs

Contract costs include direct and incremental costs to obtain or fulfill a contract. The Company’s contract costs that are subject to capitalization are comprised of costs associated with parts washer services and costs associated with the treatment and disposal of waste. Parts washer costs include costs of solvent, commissions paid relating to revenue generated from parts washer services, and transportation costs associated with transferring the product picked up from the services as it is returned to the Company’s facilities or a third party site. Costs related to the treatment of waste include costs for waste receiving, drum movement and storage, waste consolidation and transportation between facilities. Deferred costs associated with parts washer services are amortized ratably over the average service interval, which ranges between seven and 14 weeks. Deferred costs related to treatment and disposal of waste are recognized when the corresponding waste is disposed of and are included in deferred costs within total current assets in the Company’s consolidated balance sheets. The deferred contract cost balances at the beginning of each period presented were fully recognized in cost of revenue in the subsequent three-month period.

Prior Accounting

Prior to January 1, 2018 and the adoption of ASC 606, the Company recognized revenue when persuasive evidence of an arrangement existed, delivery had occurred or services had been rendered, the price was fixed or determinable, and collection was reasonably assured. Management established a revenue allowance to cover the estimated amounts of revenue that may need to be credited to customers' accounts in future periods due to discounts, billing disputes and other adjustments. The Company recorded a provision for revenue allowances based on specific review of particular customers, historical trends and other relevant information.

(4) BUSINESS COMBINATIONS

2018 Acquisitions

On August 31, 2018, the Company acquired a privately-owned company which expands the environmental services and waste oil capabilities of the Company for a $27.3 million purchase price, net of cash. The acquired company is included in the Safety-Kleen and Environmental Services segments. In connection with this acquisition, a preliminary goodwill amount of $15.8 million was recognized. The results of operations of this acquired business were not material in 2018.

On February 23, 2018, the Company completed the acquisition of the U.S. Industrial Cleaning Business of Veolia Environmental Services North America LLC (the "Veolia Business"). The acquisition provides significant scale and industrial services capabilities while increasing the size of the Company's existing U.S. Industrial Services business. The Company acquired the Veolia Business for a preliminary purchase price of $124.0 million, which remains subject to certain post-closing adjustments. The amount of revenue from the Veolia Business included in the Company's results of operations for the year ended December 31, 2018 was $154.0 million. The amount of pre-tax loss from the Veolia Business included in the Company's results of operations for the year ended December 31, 2018 was $0.9 million, which included $14.6 million in depreciation expense as well as $0.6 million of amortization expense related to intangible assets. During the year ended December 31, 2018, the Company incurred acquisition-related costs of approximately $1.4 million in connection with the transaction which

(4) BUSINESS COMBINATIONS (Continued)

are included in selling, general and administrative expenses in the consolidated statements of operations. The Veolia Business is included in the Environmental Services segment.

The components and preliminary allocation of the purchase price for the Veolia Business consist of the following amounts (in thousands):

	At Acquisition Date As Reported December 31, 2018
Accounts receivable, including unbilled receivable	$ 38,201
Inventories and supplies	1,126
Prepaid expenses and other current assets	828
Property, plant and equipment	72,243
Permits and other intangibles	5,140
Current liabilities	(18,025)
Closure and post-closure liabilities	(354)
Total identifiable net assets	99,159
Goodwill	24,873
Total purchase price	$ 124,032

The weighted average amortization period for the intangibles acquired is 8.2 years. The excess of the total purchase price, which includes the aggregate cash consideration paid in excess of the fair value of the tangible net assets and intangible assets acquired, was recorded as goodwill. The goodwill recognized is attributable to the expected operating synergies and growth potential that the Company expects to realize from this acquisition. Goodwill generated from the acquisition is deductible for tax purposes.

Pro forma revenue and earnings amounts on a combined basis as if these acquisitions had been completed on January 1, 2017 are immaterial to the consolidated financial statements of the Company since that date.

2017 Acquisitions

On July 14, 2017, the Company acquired Lonestar West Inc. ("Lonestar"), a public company headquartered in Alberta, Canada, for approximately CAD $41.8 million, ($33.1 million USD), net of cash acquired, which included an equity payout of CAD $0.72 per share to Lonestar shareholders and the assumption of approximately CAD $21.3 million ($16.8 million USD) in outstanding debt, which Clean Harbors subsequently repaid. The acquisition supports the Company's growth in the daylighting and hydro excavation services markets. In addition to increasing the size of the Company's hydro vac fleet, Lonestar's network of locations provides the Company with direct access to key geographic markets in both the United States and Canada. The acquired company is included in the Environmental Services segment. In connection with this acquisition a goodwill amount of $2.8 million was recognized.

On January 31, 2017, the Company acquired a privately held company for a purchase price of approximately $11.9 million in cash, net of cash acquired. The acquired business produces and distributes oil products and therefore complements the Company's closed loop model as it relates to the sale of its oil products. The acquired company is included in the Safety-Kleen segment. In connection with this acquisition a goodwill amount of $5.0 million was recognized.

The combined amount of direct revenue from the acquisitions included in the Company's results of operations for the year ended December 31, 2017 was approximately $14.5 million. Pro forma revenue and earnings amounts on a combined basis as if these acquisitions had been completed on January 1, 2016 are immaterial to the consolidated financial statements of the Company since that date.

(4) BUSINESS COMBINATIONS (Continued)

2016 Acquisitions

During 2016, the Company acquired seven businesses that complement the strategy to create a closed loop model as it relates to the sale of the Company's oil products. These acquisitions provided the Company with three additional oil re-refineries while also expanding its used motor oil collection network and providing greater blending and packaging capabilities. These acquisitions also provide the Company with greater access to customers in the West Coast region of the United States and additional locations with Part B permits. Operations of these acquisitions were primarily integrated into the Safety-Kleen operating segment with certain operations also integrated into the Environmental Services segment.

The combined purchase price for the seven acquisitions was $204.8 million paid in cash and subject to customary post-closing adjustments. The combined amount of direct revenue from the acquisitions included in the Company's results of operations for the year ended December 31, 2016 was approximately $69.8 million. Upon acquisition, the acquired entities were immediately integrated into the Company's operating segments. Therefore it is impracticable to measure earnings attributable to the acquired businesses. During the year ended December 31, 2016, the Company incurred acquisition-related costs of approximately $1.7 million in connection with the transactions which are included in selling, general and administrative expenses in the consolidated statements of operations.

The allocation of the purchase price was based on estimates of the fair value of assets acquired and liabilities assumed as of the acquisition dates. The Company believes that such information provides a reasonable basis for estimating the fair values of assets acquired and liabilities assumed. The Company finalized the purchase accounting for the seven acquisitions in the second quarter of 2017.

The allocation of the purchase price consists of the following amounts (in thousands):

	Final Allocation
Accounts receivable	$ 16,242
Inventories and supplies	12,688
Prepaid expenses and other current assets	752
Property, plant and equipment	143,916
Permits and other intangibles	28,856
Current liabilities	(19,905)
Closure and post-closure liabilities, less current portion	(3,004)
Remedial liabilities, less current portion	(2,545)
Deferred taxes, unrecognized tax benefits and other long-term liabilities	(20,219)
Total identifiable net assets	156,781
Goodwill	47,977
Total purchase price, net of cash acquired	$ 204,758

The excess of the total purchase price, which includes the aggregate cash consideration paid in excess of the fair value of the tangible net assets and intangible assets acquired, was recorded as goodwill. The goodwill recognized is attributable to the expected operating synergies and growth potential that the Company expects to realize from these acquisitions. Goodwill generated from the acquisitions was not deductible for tax purposes.

(5) DISPOSITION OF BUSINESSES

2017 Disposition

On June 30, 2017, the Company completed the sale of its Transformer Services business, as part of its continuous focus on improving or divesting certain non-core operations. The Transformer Services business was a non-core business previously included within the former Technical Services operating segment and was sold for $45.5 million ($43.4 million net of $2.1 million in transactional related costs). As a result of the sale, the Company recognized during the year ended December 31,

(5) DISPOSITION OF BUSINESSES (Continued)

2017, a pre-tax gain of $30.7 million which was included in gain on sale of business in the Company's consolidated statement of operations.

The following table presents the carrying amounts of the Company's Transformer Services business that was disposed of on June 30, 2017 (in thousands):

	June 30, 2017
Total current assets	$ 7,241
Property, plant and equipment, net	8,773
Total other assets	1,681
Total assets divested	17,695
Total current liabilities	3,849
Total other liabilities	1,170
Total liabilities divested	5,019
Net carrying value divested	$ 12,676

The Company evaluated the disposition and determined it did not meet the "major effect" criteria for classification as a discontinued operation largely due to the nature and size of the operations of the disposed entity. However, the Company determined that the disposition represented an individually significant component of the Company's business. The following table presents income attributable to the Transformer Services business included in the Company's consolidated results of operations for each of the periods shown and through its disposition on June 30, 2017 (in thousands):

	For the years ended December 31,	
	2017	2016
Income before provision (benefit) for income taxes	$ 2,771	$ 4,187

2016 Disposition

On September 1, 2016, the Company completed the sale of its Catalyst Services business, which was a non-core business previously included within the former Industrial Services operating segment, for approximately $50.6 million ($49.2 million net of cash retained by the Catalyst Services business). As a result of the sale, the Company recognized during the year ended December 31, 2016, a pre-tax gain of $16.9 million which was included in gain on sale of business in the Company's consolidated statement of operations. Inclusive within this gain was $1.6 million of transactional related costs. During the first quarter of 2017, the Company and the buyer of the Catalyst Services business agreed to final working capital amounts and as a result the Company received $2.0 million of final sale proceeds.

(5) DISPOSITION OF BUSINESSES (Continued)

The following table presents the carrying amounts of the Company's Catalyst Services business immediately preceding the disposition on September 1, 2016 (in thousands):

	September 1, 2016
Total current assets	$ 19,019
Property, plant and equipment, net	11,154
Total other assets	6,500
Total assets divested	36,673
Total current liabilities	4,040
Total other liabilities	566
Total liabilities divested	4,606
Net carrying value divested	$ 32,067

The Company evaluated the disposition and determined it did not meet the “major effect” criteria for classification as a discontinued operation largely due to the nature and size of the operations of the disposed of entity. However, the Company determined that the disposition did represent an individually significant component of its business. The following table presents income attributable to the Catalyst Services business included in the Company's consolidated results of operations for the period shown and through its disposition on September 1, 2016 (in thousands):

	For the year ended December 31,
	2016
Income before provision (benefit) for income taxes	$ 290

(6) INVENTORIES AND SUPPLIES

Inventories and supplies consisted of the following (in thousands):

	December 31, 2018	December 31, 2017
Oil and oil related products	$ 70,823	$ 58,142
Supplies and drums	104,609	94,242
Solvent and solutions	10,657	9,167
Modular camp accommodations	—	1,826
Other	13,390	12,635
Total inventories and supplies	$ 199,479	$ 176,012

Supplies and drums consist primarily of drums and containers used in providing the Company's products and services as well as critical spare parts to support the Company's incinerator and re-refinery operations. Other inventories consisted primarily of parts washer components, cleaning fluids, absorbents and automotive fluids, such as windshield washer fluid and antifreeze.

(7) PROPERTY, PLANT AND EQUIPMENT

Property, plant and equipment consisted of the following (in thousands):

	December 31, 2018	December 31, 2017
Land	$ 123,734	$ 121,658
Asset retirement costs (non-landfill)	15,148	14,593
Landfill assets	154,918	144,539
Buildings and improvements	440,188	414,384
Camp and lodging equipment	152,998	170,012
Vehicles	721,735	617,959
Equipment	1,697,490	1,644,102
Furniture and fixtures	5,453	5,708
Construction in progress	20,931	57,618
	3,332,595	3,190,573
Less - accumulated depreciation and amortization	1,770,617	1,603,208
Total property, plant and equipment, net	$ 1,561,978	$ 1,587,365

Interest in the amount of $0.6 million, $0.6 million and $5.5 million was capitalized to property, plant and equipment during the years ended December 31, 2018, 2017 and 2016, respectively. Depreciation expense, inclusive of landfill amortization was $264.3 million, $251.4 million and $247.0 million for the years ended December 31, 2018, 2017 and 2016, respectively.

(8) GOODWILL AND OTHER INTANGIBLE ASSETS

The changes in goodwill for the years ended December 31, 2018 and 2017 were as follows (in thousands):

	Environmental Services	Safety-Kleen	Totals
Balance at January 1, 2017	$ 169,084	$ 296,070	$ 465,154
Increase from current period acquisitions	3,000	5,687	8,687
Measurement period adjustments from prior period acquisitions	—	2,186	2,186
Decrease from disposition of business	(1,300)	—	(1,300)
Foreign currency translation	1,602	2,194	3,796
Balance at December 31, 2017	$ 172,386	$ 306,137	$ 478,523
Increase from current period acquisitions	37,007	3,697	40,704
Measurement period adjustments from prior period acquisitions	(78)	—	(78)
Foreign currency translation	(2,296)	(2,664)	(4,960)
Balance at December 31, 2018	$ 207,019	$ 307,170	$ 514,189

The Company assesses goodwill for impairment on an annual basis as of December 31, or at an interim date when events or changes in the business environment would more likely than not reduce the fair value of a reporting unit below its carrying value.

The Company conducted its annual impairment test of goodwill as of December 31, 2018 and determined that no adjustment to the carrying value of goodwill for any reporting unit was then necessary because the fair values of the reporting units exceeded their respective carrying values. The fair value of all reporting units was determined using an income approach based upon estimates of future discounted cash flows. The resulting estimates of fair value were validated through the consideration of other factors such as the fair value of comparable companies to the reporting units and a reconciliation of the sum of all estimated fair values of the reporting units to the Company's overall market capitalization. In all cases, the estimated fair values of the reporting units significantly exceeded their carrying values.

(8) GOODWILL AND OTHER INTANGIBLE ASSETS (Continued)

Significant judgments and unobservable inputs categorized as Level 3 in the fair value hierarchy are inherent in the impairment tests performed and include assumptions about the amount and timing of expected future cash flows, growth rates, and the determination of appropriate discount rates. Level 3 inputs are unobservable inputs for the asset or liability in which there is little, if any, market activity for the asset or liability at the measurement date. The Company believes that the assumptions used in its annual and any interim date impairment tests are reasonable, but variations in any of the assumptions may result in different calculations of fair values.

The impacts of any adverse business and market conditions which impact the overall performance of the Company's reporting units will continue to be monitored. If the Company's reporting units do not achieve the financial performance that the Company expects, it is possible that goodwill impairment charges may result. There can therefore be no assurance that future events will not result in an impairment of goodwill.

At December 31, 2018, the total of accumulated goodwill impairment charges was $189.4 million, of which $34.0 million was recorded during the year ended December 31, 2016 within the Environmental Services reporting unit, due to economic conditions in Western Canada's Oil Sands region and the impacts on the Company's lodging operations.

As of December 31, 2018 and 2017, the Company's finite-lived and indefinite-lived intangible assets consisted of the following (in thousands):

	December 31, 2018			December 31, 2017		
	Cost	Accumulated Amortization	Net	Cost	Accumulated Amortization	Net
Permits	$ 177,583	$ 79,358	$ 98,225	$ 174,721	$ 74,347	$ 100,374
Customer and supplier relationships	393,487	179,824	213,663	399,224	158,972	240,252
Other intangible assets	37,262	29,743	7,519	36,766	31,592	5,174
Total amortizable permits and other intangible assets	608,332	288,925	319,407	610,711	264,911	345,800
Trademarks and trade names	122,468	—	122,468	123,328	—	123,328
Total permits and other intangible assets	$ 730,800	$ 288,925	$ 441,875	$ 734,039	$ 264,911	$ 469,128

The Company regularly monitors and assesses whether events or changes in circumstances relative to the Company's business might indicate that future cash flows attributable to the Company's asset groups may not be sufficient to recover the current value of those assets. During the year ended and as of December 31, 2018, there were no events or changes in circumstances which would indicate that the carrying values of the Company's asset groups would not be recoverable and thus no impairment charge was recorded related to the Company's long-lived assets. If expectations of future cash flows were to decrease in the future as a result of worse than expected or prolonged periods of depressed activity, future impairments may become evident.

Amortization expense of permits and other intangible assets for the years ended December 31, 2018, 2017 and 2016 were $34.4 million, $37.0 million and $40.0 million, respectively.

The expected amortization of the net carrying amount of finite-lived intangible assets at December 31, 2018 is as follows (in thousands):

Years Ending December 31,	Expected Amortization
2019	$ 33,091
2020	30,195
2021	27,553
2022	27,386
2023	23,468
Thereafter	177,714
	$ 319,407

(9) ACCRUED EXPENSES

Accrued expenses consisted of the following at December 31 (in thousands):

	December 31, 2018	December 31, 2017
Insurance	$ 70,217	$ 57,889
Interest	3,930	12,660
Accrued compensation and benefits	77,881	55,861
Income, real estate, sales and other taxes	25,670	27,330
Other	55,707	34,242
	$ 233,405	$ 187,982

As of December 31, 2018 and 2017, accrued insurance included health insurance costs of $14.7 million and $9.0 million, respectively, and accruals for losses under our workers' compensation, comprehensive general liability and vehicle liability self-insurance programs of $53.9 million and $47.9 million, respectively. The increase in our self-insurance liabilities from the comparable period in 2017 was primarily due to the acquisition of the Veolia Business, for which the Company assumed workers' compensation, general liability and vehicle liability claims reserves.

Accrued compensation and benefits increased by $22.0 million from the comparable period in 2017 due to an increase in variable compensation, which was attributable to greater revenue and earnings achieved in 2018.

As of December 31, 2018 and 2017, other accrued expenses included accrued legal matters of $7.5 million and $1.4 million, respectively, and accrued severance charges of $2.7 million and $3.5 million, respectively. The increase in accrued legal matters was primarily due to the acquisition of the Veolia Business and certain liabilities assumed by the Company. Also included in the December 31, 2018 other accrued expenses balance was an $8.8 million derivative liability, recorded at fair value, related to the Company's cash flow hedges.

(10) CLOSURE AND POST-CLOSURE LIABILITIES

The changes to closure and post-closure liabilities (also referred to as "asset retirement obligations") from January 1, 2017 through December 31, 2018 were as follows (in thousands):

	Landfill Retirement Liability	Non-Landfill Retirement Liability	Total
Balance at January 1, 2017	$ 30,630	$ 27,701	$ 58,331
Liabilities assumed in acquisitions	—	59	59
Measurement period adjustments from prior period acquisitions	—	596	596
New asset retirement obligations	1,881	—	1,881
Adjustment related to disposition of business	—	(1,170)	(1,170)
Accretion	2,243	2,505	4,748
Changes in estimates recorded to statement of operations	(131)	(109)	(240)
Changes in estimates recorded to balance sheet	364	(591)	(227)
Expenditures	(2,777)	(448)	(3,225)
Currency translation and other	172	112	284
Balance at December 31, 2017	32,382	28,655	61,037
Liabilities assumed in acquisitions	—	685	685
New asset retirement obligations	2,518	—	2,518
Accretion	2,537	2,567	5,104
Changes in estimates recorded to statement of operations	(37)	1,497	1,460
Changes in estimates recorded to balance sheet	1,867	64	1,931
Expenditures	(1,224)	(1,057)	(2,281)
Currency translation and other	(234)	(289)	(523)
Balance at December 31, 2018	$ 37,809	$ 32,122	$ 69,931

(10) CLOSURE AND POST-CLOSURE LIABILITIES (Continued)

All of the landfill facilities included in the above table were active as of December 31, 2018 and 2017. The 2018 environmental change in estimate recorded to the statement of operations includes $1.2 million related to increased facility closure costs at one of our locations. There were no significant (benefits) charges in 2017 resulting from changes in estimates for closure and post-closure liabilities.

New asset retirement obligations incurred during 2018 and 2017 were discounted at the credit-adjusted risk-free rate of 5.66% and 6.32%, respectively.

Anticipated payments (based on current estimated costs and anticipated timing of necessary regulatory approvals to commence work on closure and post-closure activities) for each of the next five years and thereafter are as follows (in thousands):

Year ending December 31,		
2019	$	10,574
2020		9,424
2021		10,941
2022		7,626
2023		9,264
Thereafter		271,314
Undiscounted closure and post-closure liabilities		319,143
Less: Discount at credit-adjusted risk-free rate		(155,999)
Less: Undiscounted estimated closure and post-closure liabilities relating to airspace not yet consumed		(93,213)
Present value of closure and post-closure liabilities	$	69,931

(11) REMEDIAL LIABILITIES

The changes to remedial liabilities from January 1, 2017 through December 31, 2018 were as follows (in thousands):

	Remedial Liabilities for Landfill Sites	Remedial Liabilities for Inactive Sites	Remedial Liabilities (Including Superfund) for Non-Landfill Operations	Total
Balance at January 1, 2017	$ 1,777	$ 64,151	$ 62,079	$ 128,007
Measurement period adjustments from prior period acquisitions	—	—	504	504
Accretion	86	2,648	1,978	4,712
Changes in estimates recorded to statement of operations	(21)	(289)	355	45
Expenditures	(42)	(3,906)	(5,792)	(9,740)
Currency translation and other	—	2,738	(1,798)	940
Balance at December 31, 2017	1,800	65,342	57,326	124,468
Accretion	86	2,745	1,871	4,702
Changes in estimates recorded to statement of operations	(1)	130	558	687
Expenditures	(47)	(3,759)	(4,028)	(7,834)
Currency translation and other	—	857	(1,863)	(1,006)
Balance at December 31, 2018	$ 1,838	$ 65,315	$ 53,864	$ 121,017

(11) REMEDIAL LIABILITIES (Continued)

There were no significant (benefits) charges in 2018 and 2017 resulting from changes in estimates for remedial liabilities. Anticipated payments at December 31, 2018 (based on current estimated costs and anticipated timing of necessary regulatory approvals to commence work on remedial activities) for each of the next five years and thereafter were as follows (in thousands):

Year ending December 31,		
2019	$	13,975
2020		15,467
2021		14,593
2022		9,560
2023		8,688
Thereafter		81,453
Undiscounted remedial liabilities		143,736
Less: Discount		(22,719)
Total remedial liabilities	$	121,017

Based on currently available facts and legal interpretations, existing technology, and presently enacted laws and regulations, the Company estimates that its aggregate liabilities as of December 31, 2018 for future remediation relating to all of its owned or leased facilities and the Superfund sites for which the Company has current or potential future liability is approximately $121.0 million. The Company also estimates that it is reasonably possible that the amount of such total liabilities could be as much as $22.8 million more. Future changes in either available technology or applicable laws or regulations could affect such estimates of remedial liabilities. Since the Company's satisfaction of the liabilities will occur over many years, the Company cannot now reasonably predict the nature or extent of future changes in either available technology or applicable laws or regulations and the impact that those changes, if any, might have on the current estimates of remedial liabilities.

The following tables show, respectively, (i) the amounts of such estimated liabilities associated with the types of facilities and sites involved and (ii) the amounts of such estimated liabilities associated with each facility or site which represents at least 5% of the total and with all other facilities and sites as a group and as of December 31, 2018.

Estimates Based on Type of Facility or Site (in thousands):

Type of Facility or Site		Remedial Liability	% of Total		Reasonably Possible Additional Liabilities(1)
Facilities now used in active conduct of the Company's business (41 facilities)	$	48,506	40.1%	$	11,171
Inactive facilities not now used in active conduct of the Company's business but most of which were acquired because the assumption of remedial liabilities for such facilities was part of the purchase price for the CSD assets (35 facilities)		64,344	53.2		10,782
Superfund sites owned by third parties (17 sites)		8,167	6.7		817
Total	$	121,017	100.0%	$	22,770

(1) Amounts represent the high end of the range of management's best estimate of the reasonably possible additional liabilities.

(11) REMEDIAL LIABILITIES (Continued)

Estimates Based on Amount of Potential Liability (in thousands):

Location	Type of Facility or Site	Remedial Liability	% of Total	Reasonably Possible Additional Liabilities(1)
Baton Rouge, LA(2)	Closed incinerator and landfill	$ 23,314	19.3%	$ 3,963
Bridgeport, NJ	Closed incinerator	18,616	15.4	2,577
Mercier, Quebec(2)	Idled incinerator and legal proceedings	9,809	8.1	1,037
Linden, NJ	Operating solvent recycling center	7,487	6.2	790
Various(2)	All other incinerators, landfills, wastewater treatment facilities and service centers (72 facilities)	53,624	44.3	13,586
Various(2)	Superfund sites (each representing less than 5% of total liabilities) owned by third parties (17 sites)	8,167	6.7	817
Total		$ 121,017	100.0%	$ 22,770

(1) Amounts represent the high end of the range of management's best estimate of the reasonably possible additional liabilities.

(2) $17.9 million of the $121.0 million remedial liabilities and $1.8 million of the $22.8 million reasonably possible additional liabilities include estimates of remediation liabilities related to the legal and administrative proceedings discussed in Note 18, "Commitments and Contingencies," as well as other such estimated remedial liabilities.

Revisions to remediation reserve requirements may result in upward or downward adjustments to income from operations in any given period. The Company believes that its extensive experience in the environmental services business, as well as its involvement with a large number of sites, provides a reasonable basis for estimating its aggregate liability. It is possible, however, that technological, regulatory or enforcement developments, the results of environmental studies, or other factors could necessitate the recording of additional liabilities or the revision of currently recorded liabilities that could be material. The impact of such future events cannot be estimated at the current time.

(12) FINANCING ARRANGEMENTS

The following table is a summary of the Company's financing arrangements (in thousands):

Current Obligations:	December 31, 2018	December 31, 2017
Senior secured Term Loan Agreement ("Term Loan Agreement")	$ 7,535	$ 4,000
Long-Term Obligations:		
Senior secured Term Loan Agreement due June 30, 2024	$ 734,697	$ 394,000
Senior unsecured notes, at 5.25%, due August 1, 2020 ("2020 Notes")	—	400,000
Senior unsecured notes, at 5.125%, due June 1, 2021 ("2021 Notes")	845,000	845,000
Long-term obligations, at par	$ 1,579,697	$ 1,639,000
Unamortized debt issuance costs and premium, net	$ (14,676)	$ (13,463)
Long-term obligations, at carrying value	$ 1,565,021	$ 1,625,537

Financing Activities

Senior Secured Term Loans. On April 17, 2018, the Company, and substantially all of the Company's domestic subsidiaries as guarantors, entered into the first amendment (the “First Amendment”) of the Term Loan Agreement. The First Amendment reduced the applicable interest rate margin for the Company’s initial term loans (the "Term Loans") outstanding under the Term Loan Agreement by 25 basis points for both Eurocurrency borrowings and base rate borrowings. After giving effect to the repricing, the applicable interest rate margins for the Term Loans are 1.75% for Eurocurrency borrowings and 0.75% for base rate borrowings.

(12) FINANCING ARRANGEMENTS (Continued)

On July 19, 2018, the Company, and substantially all of the Company's domestic subsidiaries as guarantors, entered into an Incremental Facility Amendment (the "Incremental Facility Amendment") to the Company's Term Loan Agreement. The Incremental Facility Amendment increased the principal amount of the Term Loans outstanding under the Term Loan Agreement by $350.0 million. Term Loans under the Term Loan Agreement will mature on June 30, 2024 and may be prepaid at any time without premium or penalty other than customary breakage costs with respect to Eurodollar based loans. The Company's obligations under the Term Loan Agreement are guaranteed by all of the Company's domestic restricted subsidiaries and secured by liens on substantially all of the assets of the Company and the guarantors. The effective interest rate of the Term Loans on December 31, 2018 was 4.27%.

Concurrently with the closing on July 19, 2018 of the Incremental Facility Amendment, the Company purchased $322.0 million aggregate principal of the 2020 Notes. The total amount paid in purchasing the 2020 Notes was $330.9 million inclusive of $7.9 million of accrued interest and $1.0 million of debt redemption fees. On August 1, 2018, the Company redeemed the remaining $78.0 million of outstanding 2020 Notes.

At December 31, 2018 and December 31, 2017, the fair value of the Term Loan Agreement debt was $707.0 million and $400.5 million, respectively, based on quoted market prices or other available market data. The fair value of the Term Loan Agreement debt is considered a Level 2 measure according to the fair value hierarchy.

Senior Unsecured Notes. In 2012, the Company issued $800.0 million aggregate principal amount of 5.25% senior unsecured notes due August 1, 2020 (the "2020 Notes") with semi-annual fixed interest payments on February 1 and August 1 of each year. The Company repurchased or redeemed $400.0 million principal amount of the 2020 Notes during 2017 and, as described above, the Company repurchased or redeemed the remaining $400.0 million principal amount of the 2020 Notes during 2018. At December 31, 2017, the fair value of the 2020 Notes was $404.6 million based on quoted market prices for the instrument. The fair value of the 2020 Notes was considered a Level 2 measure according to the fair value hierarchy.

In 2012, the Company issued $600.0 million aggregate principal amount of 5.125% senior unsecured notes due June 1, 2021 (the "2021 Notes") with semi-annual fixed interest payments on June 1 and December 1 of each year. The Company repurchased $5.0 million principal amount of 2021 Notes during 2014. On March 14, 2016, the Company issued an additional $250.0 million aggregate principal amount of 2021 Notes as additional notes under the related indenture. At December 31, 2018 and 2017, the fair value of the Company's 2021 Notes was $845.0 million and $855.7 million, respectively, based on quoted market prices or other available market data. The fair value of the 2021 Notes is considered a Level 2 measure according to the fair value hierarchy. Upon proper notice to the holders of the 2021 Notes, the Company may presently redeem some or all of the 2021 Notes at par value plus unpaid interest.

The 2021 Notes and the related indentures contain various customary non-financial covenants and are guaranteed by substantially all of the Company's current and future domestic restricted subsidiaries. The 2021 Notes are the Company's and the guarantors' senior unsecured obligations ranking equally with the Company's and the guarantors' existing and future senior unsecured obligations and senior to any future indebtedness that is expressly subordinated to the 2021 Notes and the guarantees. The 2021 Notes are effectively subordinated to all of the Company's and the Company subsidiaries' secured indebtedness under the Company's Term Loan Agreement, revolving credit facility and capital lease obligations to the extent of the value of the assets securing such secured indebtedness. The 2021 Notes are not guaranteed by the Company's existing and future Canadian or other foreign subsidiaries, and are structurally subordinated to all indebtedness and other liabilities, including trade payables, of the Company's subsidiaries that are not guarantors of the 2021 Notes.

Revolving Credit Facility. On November 1, 2016, the Company and one of the Company's subsidiaries (the "Canadian Borrower") entered into an amended and restated credit agreement for the Company's revolving credit facility with Bank of America, N.A. ("BofA"), as agent for the lenders under the facility (the "Agent"). Under the amended and restated facility, the Company has the right to obtain revolving loans and letters of credit for a combined maximum of up to $300.0 million (with a sub-limit of $250.0 million for letters of credit) and the Canadian Borrower has the right to obtain revolving loans and letters of credit for a combined maximum of up to $100.0 million (with a $75.0 million sub-limit for letters of credit). Availability under the U.S. line is subject to a borrowing base basically comprised of 85% of the eligible accounts receivable of the Company and its U.S. subsidiaries plus 100% of cash deposited in a controlled account with the Agent, and availability under the Canadian line is subject to a borrowing base basically comprised of 85% of the eligible accounts receivable of the Company's Canadian subsidiaries plus 100% of cash deposited in a controlled account with the Agent's Canadian affiliate. Subject to certain conditions, the facility will expire on November 1, 2021.

(12) FINANCING ARRANGEMENTS (Continued)

Borrowings under the revolving credit facility bear interest at a rate of, at the Company's option, either (i) LIBOR plus an applicable margin ranging from 1.25% to 1.50% per annum based primarily on the level of the Company's average liquidity for the most recent 30 day period or (ii) BofA's base rate plus an applicable margin ranging from 0.25% to 0.50% per annum based primarily on such average liquidity. There is also an unused line fee, calculated on the then unused portion of the lenders' $400.0 million maximum commitments, ranging from 0.25% to 0.30% per annum of the unused commitment. For outstanding letters of credit, the Company will pay to the lenders a fee equal to the then applicable LIBOR margin described above, and to the issuing banks a standard fronting fee and customary fees and charges in connection with all amendments, extensions, draws and other actions with respect to letters of credit.

The Company's obligations under the revolving credit facility (including revolving loans and reimbursement obligations for outstanding letters of credit) are guaranteed by substantially all of the Company's U.S. subsidiaries and secured by a first lien on the Company's and its U.S. subsidiaries' accounts receivable. The Canadian Borrower's obligations under the facility are guaranteed by substantially all of the Company's Canadian subsidiaries and secured by a first lien on the accounts receivable of the Canadian subsidiaries.

The Company utilizes letters of credit primarily as security for financial assurance which it has been required to provide to regulatory bodies for its hazardous waste facilities and which would be called only in the event that the Company fails to satisfy closure, post-closure and other obligations under the permits issued by those regulatory bodies for such licensed facilities. On August 1, 2018, the Company borrowed $50.0 million under the revolving credit facility in connection with the redemption of $78.0 million of 2020 Notes. The Company repaid the $50.0 million borrowing during the fourth quarter of 2018. At December 31, 2018 and 2017, the revolving credit facility had no outstanding loan balances, availability of $235.4 million and $217.8 million, respectively, and outstanding letters of credit of $130.1 million and $134.1 million, respectively.

Cash Flow Hedges

The Company's strategy to hedge against fluctuations in variable interest rates involves entering into interest rate derivative agreements to hedge against adverse movements in interest rates. For interest rate derivatives deemed to be effective cash flow hedges, the change in fair value is recorded in stockholders' equity as a component of accumulated other comprehensive loss and included in interest expense at the same time as interest expense is affected by the hedged transaction. Differences paid or received over the life of the agreements are recorded as additions to or reductions of interest expense on the underlying debt.

Although the interest rate on all $742.2 million aggregate principal amount of Term Loans which were outstanding on December 31, 2018 is variable under the Term Loan Agreement, the Company has effectively fixed the interest rate on $350.0 million aggregate principal amount of the Term Loans outstanding by entering into interest rate swap agreements in 2018 with a notional amount of $350.0 million. Under the terms of the interest rate swap agreements, the Company receives interest based on the 1-month LIBOR index and pays interest at a weighted average rate of approximately 2.92%. When combined with the 1.75% interest rate margin for Eurocurrency borrowings, the effective annual interest rate on such $350.0 million aggregate principal amount of Term Loans is therefore approximately 4.67%.

The Company recognizes derivative instruments as either assets or liabilities on the balance sheet at fair value. No ineffectiveness has been identified on these swaps and, therefore, all unrealized changes in fair value are recorded in accumulated other comprehensive loss. Amounts are reclassified from accumulated other comprehensive loss into interest expense on the Statement of Operations in the same period or periods during which the hedged transaction affects earnings.

As of December 31, 2018, the Company recorded a derivative liability with a fair value of $8.8 million within accrued expenses in connection with these cash flow hedges.

The fair value of the interest rate swaps included in the Level 2 tier of the fair value hierarchy is calculated using discounted cash flow valuation methodologies based upon the one month LIBOR yield curves that are observable at commonly quoted intervals for the full term of the swaps. Level 2 utilizes quoted market prices in markets that are not active, broker or dealer quotations, or alternative pricing sources with reasonable levels of price transparency for similar assets and liabilities.

(13) INCOME TAXES

The domestic and foreign components of income before provision (benefit) for income taxes were as follows (in thousands):

	For the Year Ended December 31,		
	2018	2017	2016
Domestic	$ 115,070	$ 101,714	$ 87,328
Foreign	(20,588)	(43,025)	(78,612)
Total	$ 94,482	$ 58,689	$ 8,716

The provision (benefit) for income taxes consisted of the following (in thousands):

	For the Year Ended December 31,		
	2018	2017	2016
Current:			
Federal	$ (7,677)	$ 25,613	$ 14,798
State	12,653	11,083	8,763
Foreign	4,781	4,589	9,844
	9,757	41,285	33,405
Deferred			
Federal	19,899	(85,488)	21,814
State	(1,205)	1,085	1,644
Foreign	395	1,068	(8,274)
	19,089	(83,335)	15,184
Provision (benefit) for income taxes	$ 28,846	$ (42,050)	$ 48,589

The Company's effective tax rate for fiscal years 2018, 2017 and 2016 was 30.5%, (71.6)% and 557.5%, respectively. The effective income tax rate varied from the amount computed using the statutory federal income tax rate as follows (in thousands):

	For the Year Ended December 31,		
	2018	2017	2016
Tax expense at US statutory rate	$ 19,841	$ 20,541	$ 3,051
State income taxes, net of federal benefit	8,711	4,547	6,010
Foreign rate differential	(1,124)	3,733	3,646
Valuation allowance	10,466	16,552	22,564
Uncertain tax position interest and penalties	(1,806)	3,730	107
Goodwill impairment	—	—	11,905
Tax credits	(9,799)	—	—
Other	2,845	1,856	1,306
Adjustment for Tax Cuts and Jobs Act	(288)	(93,009)	—
Provision (benefit) for income taxes	$ 28,846	$ (42,050)	$ 48,589

Effects of the Tax Cuts and Jobs Act. On December 22, 2017, the "Tax Cuts and Jobs Act" (the "Tax Act") was signed into law, making significant changes to the federal tax law. Changes include, but are not limited to, a corporate tax rate decrease from 35% to 21% effective for tax years beginning after December 31, 2017, the transition of U.S. international taxation from a worldwide tax system to a territorial tax system, and a one-time transition tax on the mandatory deemed repatriation of cumulative foreign earnings as of December 31, 2017. For the year ended December 31, 2017, the Company calculated its best estimate of the impact of the Tax Act in its year end income tax provision in accordance with its understanding of the Tax Act and guidance available as of the date of the 2017 Form 10-K filing and as a result recorded a net benefit of $93.0 million as a component of the 2017 income tax expense. This provisional net income tax benefit was comprised of a $100.5 million tax benefit for the remeasurement of deferred tax assets and liabilities to the 21% rate at which they are expected to reverse, offset

(13) INCOME TAXES (Continued)

by a one-time tax expense on deemed repatriation of $7.5 million. This one-time charge was after the utilization of $7.5 million of foreign tax credits which had full valuation allowances applied to them previously.

During 2018, the Company completed its analysis of impacts of the Tax Act and specific to the one-time deemed repatriation, adjusted the previous amount recorded of $7.5 million to $6.6 million resulting in a $0.9 million benefit to tax expense recorded in 2018. The Company also recorded the final remeasurement of its deferred tax assets and liabilities and adjusted the deferred tax benefit from $100.5 million to $99.9 million or approximately $0.6 million of deferred expense recorded in 2018. The total net impact of changes in tax law resulted in a net benefit of approximately $0.3 million in 2018.

During 2018, the Company also completed an analysis of certain federal manufacturing and research and development credit benefits for tax years 2014 through 2017. Upon the filing of its 2017 tax return in October 2018, the Company recognized $3.3 million of tax benefits and recognized an additional $7.1 million upon the amendments of its 2014 through 2016 tax returns for a net benefit recorded as a component of the 2018 tax provision of $9.8 million.

During the year ended December 31, 2018, the Company recorded $5.0 million of tax benefits related to tax deductible foreign currency losses to accumulated other comprehensive loss and as such these benefits are not included within the provision (benefit) for income taxes.

The components of the total net deferred tax assets and liabilities at December 31, 2018 and 2017 were as follows (in thousands):

	2018	2017
Deferred tax assets:		
Provision for doubtful accounts	$ 10,715	$ 7,417
Closure, post-closure and remedial liabilities	28,380	28,189
Accrued expenses	15,686	15,382
Accrued compensation	7,774	1,903
Net operating loss carryforwards(1)	43,284	46,650
Tax credit carryforwards(2)	16,909	17,504
Uncertain tax positions accrued interest and federal benefit	519	921
Stock-based compensation	3,440	2,268
Other	7,067	3,258
Total deferred tax assets	133,774	123,492
Deferred tax liabilities:		
Property, plant and equipment	(164,246)	(144,325)
Permits and other intangible assets	(103,539)	(107,407)
Prepaids	(9,187)	(8,080)
Total deferred tax liabilities	(276,972)	(259,812)
Total net deferred tax liability before valuation allowance	(143,198)	(136,320)
Less valuation allowance	(79,295)	(68,355)
Net deferred tax liabilities	$ (222,493)	$ (204,675)

(1) As of December 31, 2018, the net operating loss carryforwards included (i) state net operating loss carryovers of $185.1 million which will begin to expire in 2019, (ii) federal net operating loss carryforwards of $49.8 million which will begin to expire in 2025, and (iii) foreign net operating loss carryforwards of $103.3 million which will begin to expire in 2019.

(2) As of December 31, 2018, the foreign tax credit carryforwards of $16.5 million will expire between 2020 and 2024.

(13) INCOME TAXES (Continued)

The Company has not accrued for any remaining undistributed foreign earnings not subject to the one-time transition tax on mandatory deemed repatriation of cumulative foreign earnings. These amounts continue to be indefinitely reinvested in foreign operations.

A valuation allowance is required to be established when, based on an evaluation of available evidence, it is more likely than not that some portion or all of the deferred tax assets will not be realized. Accordingly, as of December 31, 2018 and 2017, the Company had a valuation allowance of $79.3 million and $68.4 million, respectively. The total allowance as of December 31, 2018 consisted of $16.5 million of foreign tax credits, $0.8 million of acquired federal net operating losses, $9.6 million of state net operating loss carryforwards, $22.7 million of foreign net operating loss carryforwards, $26.6 million of deferred tax assets of a Canadian subsidiary and $3.1 million for tax attributes that if realized would generate capital losses. The allowance as of December 31, 2017 consisted of $17.5 million of foreign tax credits, $3.9 million of acquired federal net operating losses, $11.9 million of state net operating loss carryforwards and $22.6 million of foreign net operating loss carryforwards and $12.5 million of deferred tax assets of a Canadian subsidiary.

The changes to unrecognized tax benefits (excluding related penalties and interest) from January 1, 2016 through December 31, 2018, were as follows (in thousands):

	2018	2017	2016
Unrecognized tax benefits as of January 1	$ 5,121	$ 1,738	$ 2,064
Additions to current year tax positions	—	1,457	—
(Reductions) additions to prior year tax positions	(625)	2,031	—
Expirations	(1,115)	(231)	(533)
Foreign currency translation	(222)	126	207
Unrecognized tax benefits as of December 31	$ 3,159	$ 5,121	$ 1,738

At December 31, 2018, 2017 and 2016, the Company had recorded $3.2 million, $5.1 million and $1.7 million, respectively, of unrecognized tax benefits that if recognized would affect the annual effective tax rate.

The Company's policy is to recognize interest and penalties related to income tax matters as a component of income tax expense. At December 31, 2018, 2017 and 2016 the Company has accrued interest of $0.8 million, $0.9 million and $0.3 million, respectively, relative to unrecognized tax benefits. Interest expense that is recorded as a tax expense against the liability for unrecognized tax benefits for the years ended December 31, 2018, 2017 and 2016 included interest and penalties of $(0.1) million, $0.5 million and $0.1 million, respectively.

The Company files U.S. federal income tax returns as well as income tax returns in various states and foreign jurisdictions. The Company may be subject to examination by the Internal Revenue Service (the "IRS") for calendar years 2014 through 2017. Additionally, any net operating losses that were generated in prior years and utilized in these years may also be subject to examination by the IRS. The Company may also be subject to examinations by state and local revenue authorities for calendar years 2013 through 2017. The Company is currently not under examination by the IRS. The Company has ongoing U.S. state and local jurisdictional audits, as well as Canadian federal and provincial audits, all of which the Company believes will not result in material liabilities.

Due to expiring statute of limitation periods and the resolution of tax audits, the Company believes that total unrecognized tax benefits will decrease by approximately $0.6 million within the next 12 months.

(14) EARNINGS (LOSS) PER SHARE

The following are computations of basic and diluted earnings (loss) per share (in thousands except for per share amounts):

	Years Ended December 31,		
	2018	2017	2016
Numerator for basic and diluted earnings (loss) per share:			
Net income (loss)	$ 65,636	$ 100,739	$ (39,873)
Denominator:			
Weighted basic shares outstanding	56,148	57,072	57,532
Dilutive effect of equity-based compensation awards	192	128	—
Weighted dilutive shares outstanding	56,340	57,200	57,532
Basic earnings (loss) per share	$ 1.17	$ 1.77	$ (0.69)
Diluted earnings (loss) per share	$ 1.16	$ 1.76	$ (0.69)

For the years ended December 31, 2018 and 2017, all then outstanding performance awards and restricted stock awards were included in the calculation of diluted earnings per share except for 79,390 and 152,831, respectively, of performance stock awards for which the performance criteria were not attained at the time and 121,803 and 49,373, respectively, of restricted stock awards which were excluded as their inclusion would have an antidilutive effect. As a result of the net loss reported for the year ended December 31, 2016, all outstanding stock options, restricted stock awards and performance awards, totaling 730,929 potentially dilutive shares, were excluded from the calculation of diluted loss per share as their inclusion would have an antidilutive effect.

(15) STOCKHOLDERS' EQUITY

The Company's board of directors has authorized the repurchase of up to $600 million of the Company's common stock. The Company has funded and intends to continue to fund the repurchases through available cash resources. The repurchase program authorizes the Company to purchase the Company's common stock on the open market or in privately negotiated transactions periodically in a manner that complies with applicable U.S. securities laws. The number of shares purchased and the timing of the purchases have depended and will depend on a number of factors including share price, cash required for future business plans, trading volume and other conditions. The Company has no obligation to repurchase stock under this program and may suspend or terminate the repurchase program at any time. During the years ended December 31, 2018, 2017 and 2016, the Company repurchased and retired a total of approximately 0.8 million, 0.9 million and 0.5 million shares, respectively, of the Company's common stock for total costs of approximately $45.1 million, $49.0 million and $22.2 million, respectively. Through December 31, 2018, the Company has repurchased and retired a total of approximately 5.6 million shares of its common stock for approximately $293.9 million under this program. As of December 31, 2018, an additional $306.1 million remained available for repurchase of shares under this program.

(16) ACCUMULATED OTHER COMPREHENSIVE LOSS

The changes in accumulated other comprehensive loss by component and related tax effects for the years ended December 31, 2018, 2017 and 2016 were as follows (in thousands):

	Foreign Currency Translation Adjustments	Unrealized (Losses) Gains on Available-for-Sale Securities	Unrealized Loss on Interest Rate Hedge	Unfunded Pension Liability	Total
Balance at January 1, 2016	$ (252,939)	$ —	$ —	$ (1,953)	$ (254,892)
Other comprehensive income (loss) before reclassifications	23,967	(535)	—	216	23,648
Amounts reclassified out of accumulated other comprehensive loss	—	—	—	—	—
Tax benefit (loss)	16,761	214	—	(57)	16,918
Other comprehensive income (loss)	40,728	(321)	—	159	40,566
Balance at December 31, 2016	(212,211)	(321)	—	(1,794)	(214,326)
Other comprehensive income before reclassifications	41,636	184	—	146	41,966
Amounts reclassified out of accumulated other comprehensive loss	—	222	—	—	222
Tax loss	—	(231)	—	(38)	(269)
Other comprehensive income	41,636	175	—	108	41,919
Balance at December 31, 2017	(170,575)	(146)	—	(1,686)	(172,407)
Other comprehensive (loss) income before tax effects	(47,374)	182	(9,579)	124	(56,647)
Amounts reclassified out of accumulated other comprehensive loss	—	—	806	—	806
Tax benefit (loss)	5,024	(105)	—	(42)	4,877
Other comprehensive (loss) income	(42,350)	77	(8,773)	82	(50,964)
Balance at December 31, 2018	$ (212,925)	$ (69)	$ (8,773)	$ (1,604)	$ (223,371)

During the years ended December 31, 2018 and December 31, 2016, the Company converted intercompany loans with a foreign subsidiary to equity, which resulted in losses for tax purposes. The loans had been historically treated as components of the Company's investments in that subsidiary, and as a result, foreign currency gains and losses on the loans had been accumulated as a component of other comprehensive (loss) income. The subsidiary continues to operate as part of the Company. The tax benefits of $5.0 million and $16.8 million, respectively, which were triggered by the conversion, were therefore allocated to other comprehensive (loss) income rather than net income (loss).

The amounts reclassified out of accumulated other comprehensive loss into the consolidated statement of operations, with presentation location, during the years ended December 31, 2018 and 2017 were as follows (in thousands):

	For the years ended December 31,		
Other Comprehensive Income Components	2018	2017	Location
Unrealized (losses) gains on available-for-sale securities	$ —	$ (222)	Other (expense) income, net
Unrealized loss on interest rate hedge	(806)	—	Interest expense, net of interest income

There were no reclassifications out of accumulated other comprehensive loss during the year ended December 31, 2016.

(17) STOCK-BASED COMPENSATION

Stock-Based Compensation

In 2010, the Company adopted an equity incentive plan (the "2010 Plan"), which provides for awards of up to 6,000,000 shares of common stock (subject to certain anti-dilution adjustments) in the form of (i) stock options, (ii) stock appreciation rights, (iii) restricted stock, (iv) restricted stock units, and (v) certain other stock-based awards. The Company ceased issuing

(17) STOCK-BASED COMPENSATION (Continued)

stock options in 2008, and all awards issued to date under the 2010 Plan have been in the form of restricted stock awards and performance stock awards as described below.

As of December 31, 2018 and 2017, the Company had the following types of stock-based compensation awards outstanding under the 2010 Plan: restricted stock awards and performance stock awards. The restricted stock awards generally vest over three to five years subject to continued employment. The performance stock awards vest depending on the satisfaction of certain performance criteria and continued service conditions as described below.

Total stock-based compensation cost charged to selling, general and administrative expenses for the years ended December 31, 2018, 2017 and 2016 was $16.8 million, $13.1 million and $10.5 million, respectively. The total income tax benefit recognized in the consolidated statements of operations from stock-based compensation was $3.2 million, $3.7 million and $2.8 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Restricted Stock Awards

The following information relates to restricted stock awards that have been granted to employees and directors under the Company's 2010 Plan. The restricted stock awards are not transferable until vested and the restrictions generally lapse upon the achievement of continued employment over a three-to-five-year period or service as a director until the following annual meeting of shareholders. The fair value of each restricted stock grant is based on the closing price of the Company's common stock on the date of grant and is amortized to expense over its vesting period.

The following table summarizes information about restricted stock awards for the year ended December 31, 2018:

Restricted Stock	Number of Shares	Weighted Average Grant-Date Fair Value
Unvested at January 1, 2018	604,933	$ 54.23
Granted	327,466	55.02
Vested	(198,673)	54.22
Forfeited	(76,486)	54.00
Unvested at December 31, 2018	657,240	$ 54.65

As of December 31, 2018, there was $24.9 million of total unrecognized compensation cost arising from restricted stock awards. This cost is expected to be recognized over a weighted average period of 2.6 years. The total fair value of restricted stock vested during 2018, 2017 and 2016 was $10.8 million, $7.3 million and $8.3 million, respectively.

Performance Stock Awards

The following information relates to performance stock awards that have been granted to employees. The compensation committee of the Company's board of directors established two-year performance targets which could potentially be achieved in the year granted or one year thereafter. Performance stock awards are subject to performance criteria established by the compensation committee of the Company's board of directors. The vesting of the performance stock awards is based on achieving such targets typically based on revenue, Adjusted EBITDA margin, free cash flow and a measure of workplace safety. In addition, performance stock awards include continued service conditions.

The fair value of each performance stock award is based on the closing price of the Company's common stock on the date of grant and is amortized to expense over the service period if achievement of performance measures is then considered probable.

(17) STOCK-BASED COMPENSATION (Continued)

The following table summarizes information about performance stock awards for the year ended December 31, 2018:

Performance Stock	Number of Shares	Weighted Average Grant-Date Fair Value
Unvested at January 1, 2018	190,129	$ 55.63
Granted	171,584	55.71
Vested	(21,416)	54.82
Forfeited	(126,807)	53.59
Unvested at December 31, 2018	213,490	$ 55.71

As of December 31, 2018, there was $3.2 million of total unrecognized compensation cost arising from non-vested compensation related to performance stock awards then deemed probable of vesting under the Company's 2010 Plan. The total fair value of performance awards vested during 2018, 2017 and 2016 was $1.2 million, $3.0 million and $1.0 million, respectively.

(18) COMMITMENTS AND CONTINGENCIES

Legal and Administrative Proceedings

The Company and its subsidiaries are subject to legal proceedings and claims arising in the ordinary course of business. Actions filed against the Company arise from commercial and employment-related claims including alleged class actions related to sales practices and wage and hour claims. The plaintiffs in these actions may be seeking damages or injunctive relief or both. These actions are in various jurisdictions and stages of proceedings, and some are covered in part by insurance. In addition, the Company's waste management services operations are regulated by federal, state, provincial and local laws enacted to regulate discharge of materials into the environment, remediation of contaminated soil and groundwater or otherwise protect the environment. This ongoing regulation results in the Company frequently becoming a party to legal or administrative proceedings involving all levels of governmental authorities and other interested parties. The issues involved in such proceedings generally relate to alleged violations of existing permits and licenses or alleged responsibility under federal or state Superfund laws to remediate contamination at properties owned either by the Company or by other parties ("third-party sites") to which either the Company or the prior owners of certain of the Company's facilities shipped wastes.

At December 31, 2018 and December 31, 2017, the Company had recorded reserves of $25.4 million and $19.3 million, respectively, in the Company's financial statements for actual or probable liabilities related to the legal and administrative proceedings in which the Company was then involved, the principal of which are described below. At December 31, 2018 and December 31, 2017, the Company also believed that it was reasonably possible that the amount of these potential liabilities could be as much as $1.8 million more. The Company periodically adjusts the aggregate amount of these reserves when actual or probable liabilities are paid or otherwise discharged, new claims arise, or additional relevant information about existing or probable claims becomes available. As of December 31, 2018 and December 31, 2017, the $25.4 million and $19.3 million, respectively, of reserves consisted of (i) $17.9 million for each of the periods presented related to pending legal or administrative proceedings, including Superfund liabilities, which were included in remedial liabilities on the consolidated balance sheets, and (ii) $7.5 million and $1.4 million, respectively, primarily related to federal, state and provincial enforcement actions, which were included in accrued expenses on the consolidated balance sheets.

As of December 31, 2018, the principal legal and administrative proceedings in which the Company was involved, or which had been terminated during 2018, were as follows:

Ville Mercier. In September 2002, the Company acquired the stock of a subsidiary (the "Mercier Subsidiary") which owns a hazardous waste incinerator in Ville Mercier, Quebec (the "Mercier Facility"). The property adjacent to the Mercier Facility, which is also owned by the Mercier Subsidiary, is now contaminated as a result of actions dating back to 1968, when the Government of Quebec issued to a company unrelated to the Mercier Subsidiary two permits to dump organic liquids into lagoons on the property. In 1999, Ville Mercier and three neighboring municipalities filed separate legal proceedings against the Mercier Subsidiary and the Government of Quebec. In 2012, the municipalities amended their existing statement of claim to seek $2.9 million (CAD $) in general damages and $10.0 million (CAD $) in punitive damages, plus interest and costs, as well as injunctive relief. Both the Government of Quebec and the Company have filed summary judgment motions against the municipalities. The parties are attempting to negotiate a resolution and hearings on the motions have been delayed. In

(18) COMMITMENTS AND CONTINGENCIES (Continued)

September 2007, the Quebec Minister of Sustainable Development, Environment and Parks issued a notice pursuant to Section 115.1 of the Environment Quality Act, superseding notices issued in 1992, which are the subject of the pending litigation. The more recent notice notifies the Mercier Subsidiary that, if the Mercier Subsidiary does not take certain remedial measures at the site, the Minister intends to undertake those measures at the site and claim direct and indirect costs related to such measures. The Company has accrued for costs expected to be incurred relative to the resolution of this matter and believes this matter will not have future material effect on its financial position or results of operations.

Safety-Kleen Legal Proceedings. On December 28, 2012, the Company acquired Safety-Kleen, Inc. ("Safety-Kleen") and thereby became subject to the legal proceedings in which Safety-Kleen was a party on that date. In addition to certain Superfund proceedings in which Safety-Kleen has been named as a potentially responsible party as described below under "Superfund Proceedings," the principal such legal proceedings involving Safety-Kleen which were outstanding as of December 31, 2018 were as follows:

Product Liability Cases. Safety-Kleen has been named as a defendant in various lawsuits that are currently pending in various courts and jurisdictions throughout the United States, including approximately 67 proceedings (excluding cases which have been settled but not formally dismissed) as of December 31, 2018, wherein persons claim personal injury resulting from the use of Safety-Kleen's parts cleaning equipment or cleaning products. These proceedings typically involve allegations that the solvent used in Safety-Kleen's parts cleaning equipment contains contaminants and/or that Safety-Kleen's recycling process does not effectively remove the contaminants that become entrained in the solvent during their use. In addition, certain claimants assert that Safety-Kleen failed to warn adequately the product user of potential risks, including a historic failure to warn that solvent contains trace amounts of toxic or hazardous substances such as benzene.

Safety-Kleen maintains insurance that it believes will provide coverage for these product liability claims (over amounts accrued for self-insured retentions and deductibles in certain limited cases), except for punitive damages to the extent not insurable under state law or excluded from insurance coverage. Safety-Kleen also believes that these claims lack merit and has historically vigorously defended, and intends to continue to vigorously defend, itself and the safety of its products against all of these claims. Such matters are subject to many uncertainties and outcomes are not predictable with assurance. Consequently, Safety-Kleen is unable to ascertain the ultimate aggregate amount of monetary liability or financial impact with respect to these matters as of December 31, 2018. From January 1, 2018 to December 31, 2018, 10 product liability claims were settled or dismissed. Due to the nature of these claims and the related insurance, the Company did not incur any expense as Safety-Kleen's insurance provided coverage in full for all such claims. Safety-Kleen may be named in similar, additional lawsuits in the future, including claims for which insurance coverage may not be available.

Superfund Proceedings

The Company has been notified that either the Company (which, since December 28, 2012, includes Safety-Kleen) or the prior owners of certain of the Company's facilities for which the Company may have certain indemnification obligations have been identified as potentially responsible parties ("PRPs") or potential PRPs in connection with 128 sites which are subject to or are proposed to become subject to proceedings under federal or state Superfund laws. Of the 128 sites, five (including the BR Facility described below) involve facilities that are now owned or leased by the Company and 123 involve third-party sites to which either the Company or the prior owners of certain of the Company's facilities shipped wastes. Of the 123 third-party sites, 30 are now settled, 16 are currently requiring expenditures on remediation and 77 are not currently requiring expenditures on remediation.

In connection with each site, the Company has estimated the extent, if any, to which it may be subject, either directly or as a result of any indemnification obligations, for cleanup and remediation costs, related legal and consulting costs associated with PRP investigations, settlements, and related legal and administrative proceedings. The amount of such actual and potential liability is inherently difficult to estimate because of, among other relevant factors, uncertainties as to the legal liability (if any) of the Company or the prior owners of certain of the Company's facilities to contribute a portion of the cleanup costs, the assumptions that must be made in calculating the estimated cost and timing of remediation, the identification of other PRPs and their respective capability and obligation to contribute to remediation efforts, and the existence and legal standing of indemnification agreements (if any) with prior owners, which may either benefit the Company or subject the Company to potential indemnification obligations. The Company believes its potential liability could exceed $100,000 at 12 of the 123 third-party sites.

(18) COMMITMENTS AND CONTINGENCIES (Continued)

BR Facility. The Company acquired in 2002 a former hazardous waste incinerator and landfill in Baton Rouge (the "BR Facility"), for which operations had been previously discontinued by the prior owner. In September 2007, the EPA issued a special notice letter to the Company related to the Devil's Swamp Lake Site ("Devil's Swamp") in East Baton Rouge Parish, Louisiana. Devil's Swamp includes a lake located downstream of an outfall ditch where wastewater and storm water have been discharged, and Devil's Swamp is proposed to be included on the National Priorities List due to the presence of Contaminants of Concern ("COC") cited by the EPA. These COCs include substances of the kind found in wastewater and storm water discharged from the BR Facility in past operations. The EPA originally requested COC generators to submit a good faith offer to conduct a remedial investigation feasibility study directed towards the eventual remediation of the site. In 2018 the Company completed performing corrective actions at the BR Facility under an order issued by the Louisiana Department of Environmental Quality, and has also completed conducting the remedial investigation and feasibility study for Devil's Swamp under an order issued by the EPA. The Company cannot presently estimate the potential additional liability for the Devil's Swamp cleanup until a final remedy is selected by the EPA with issuance of a Record of Decision.

Third-Party Sites. Of the 123 third-party sites at which the Company has been notified it is a PRP or potential PRP or may have indemnification obligations, Clean Harbors has an indemnification agreement at 11 of these sites with ChemWaste, a former subsidiary of Waste Management, Inc., and at six additional of these third-party sites, Safety-Kleen has a similar indemnification agreement with McKesson Corporation. These agreements indemnify the Company (which now includes Safety-Kleen) with respect to any liability at the 17 sites for waste disposed prior to the Company's (or Safety-Kleen's) acquisition of the former subsidiaries of Waste Management and McKesson which had shipped wastes to those sites. Accordingly, Waste Management or McKesson are paying all costs of defending those subsidiaries in those 17 cases, including legal fees and settlement costs. However, there can be no guarantee that the Company's ultimate liabilities for those sites will not exceed the amount recorded or that indemnities applicable to any of these sites will be available to pay all or a portion of related costs. Except for the indemnification agreements which the Company holds from ChemWaste, McKesson and two other entities, the Company does not have an indemnity agreement with respect to any of the 123 third-party sites discussed above.

Federal, State and Provincial Enforcement Actions

From time to time, the Company pays fines or penalties in regulatory proceedings relating primarily to waste treatment, storage or disposal facilities. As of December 31, 2018 and 2017, there were ten and five proceedings, respectively, for which the Company reasonably believes that the sanctions could equal or exceed $100,000. The Company believes that the fines or other penalties in these or any of the other regulatory proceedings will, individually or in the aggregate, not have a material effect on its financial condition, results of operations or cash flows.

Leases

The Company leases facilities, service centers and personal property under certain operating leases. Some of these lease agreements contain an escalation clause for increased taxes and operating expenses and are renewable at the option of the Company. Lease terms range from 1 to 25 years. The following is a summary of future minimum payments under operating leases that have initial or remaining non-cancelable lease terms in excess of one year at December 31, 2018 (in thousands):

Year	Total Operating Leases
2019	$ 56,480
2020	45,467
2021	33,564
2022	24,509
2023	15,253
Thereafter	35,778
Total minimum lease payments	$ 211,051

During the years ended December 31, 2018, 2017 and 2016, rent expense including short-term rentals was approximately $141.1 million, $125.4 million, and $121.9 million, respectively.

(18) COMMITMENTS AND CONTINGENCIES (Continued)

Other Contingencies

Under the Company's insurance programs, coverage is obtained for catastrophic exposures, as well as those risks required to be insured by law or contract. The Company's policy is to retain a significant portion of certain expected losses related to workers' compensation, health insurance, comprehensive general liability and vehicle liability. A portion of these self-insured liabilities are managed through its wholly-owned captive insurance subsidiary.

Provisions for losses expected under these programs are recorded based upon the Company's estimates of the aggregate liability for claims. The current deductible per participant per year for the health insurance policy is $0.7 million. The current deductible per occurrence for workers' compensation is $1.0 million, general liability is $2.0 million and vehicle liability is $2.0 million. The retention per claim for the environmental impairment policy is $1.0 million. At December 31, 2018 and 2017, the Company had accrued $53.9 million and $47.9 million, respectively, for its self-insurance liabilities (exclusive of health insurance) using a risk-free discount rate of 2.96% and 1.87%, respectively. A significant portion of the increase in the liabilities as of December 31, 2018 is attributable to amounts assumed in connection with the acquisition of the Veolia Business which occurred in 2018. Actual expenditures in future periods can differ materially from accruals based on estimates.

Anticipated payments for contingencies related to workers' compensation, comprehensive general liability and vehicle liability related claims at December 31, 2018 for each of the next five years and thereafter were as follows (in thousands):

Years ending December 31,		
2019	$	20,171
2020		12,799
2021		7,964
2022		4,992
2023		4,082
Thereafter		6,385
Undiscounted self-insurance liabilities		56,393
Less: Discount		2,492
Total self-insurance liabilities (included in accrued expenses)	$	53,901

(19) SEGMENT REPORTING

Segment reporting is prepared on the same basis that the Company's chief executive officer, who is the Company's chief operating decision maker, manages the business, makes operating decisions and assesses performance. During the first quarter of fiscal year 2018, certain of the Company's businesses undertook a reorganization which included changes to the underlying business and management structures. The reorganization resulted in combining the Environmental Services businesses from an operational and management perspective, deepening customer relationships and allowing for efficiencies across the Company's operations through the sharing of resources, namely labor and equipment, which will reduce third party spending and promote cross selling of such business offerings. In connection with this reorganization, the Company's chief operating decision maker requested changes in the information that he regularly reviews for purposes of allocating resources and assessing performance. These changes required a reconsideration of the Company's operating segments in the first quarter of 2018 and resulted in a change in the Company's assessment of its operating segments. Upon reconsideration of the identification of the Company's operating segments, the Company concluded that there are now two operating segments for disclosure purposes*;* (i) the Environmental Services segment which consists of the Company's historical Technical Services, Industrial Services, Field Services and Oil, Gas and Lodging businesses, and (ii) the Safety-Kleen segment. The amounts presented for the years ended December 31, 2017 and 2016 have been reclassified to conform to the new segment presentation. These reclassifications and adjustments had no effect on the consolidated statements of operations, consolidated statements of comprehensive income, consolidated statements of cash flows or consolidated statements of stockholders' equity for any of the periods presented.

Third-party revenue is revenue billed to outside customers by a particular segment. Direct revenue is revenue allocated to the segment providing the product or service. Intersegment revenues represent the sharing of third-party revenues among the segments based on products and services provided by each segment as if the products and services were sold directly to the third-party. The intersegment revenues are shown net. The operations not managed through the Company's operating segments described above are recorded as "Corporate Items."

(19) SEGMENT REPORTING (Continued)

The following table reconciles third-party revenues to direct revenues for the years ended December 31, 2018, 2017 and 2016 (in thousands):

	For the Year Ended December 31, 2018			
	Environmental Services	Safety-Kleen	Corporate Items	Totals
Third-party revenues	$ 2,003,843	$ 1,295,355	$ 1,105	$ 3,300,303
Intersegment revenues, net	134,104	(134,104)	—	—
Corporate Items, net	3,247	31	(3,278)	—
Direct revenues	$ 2,141,194	$ 1,161,282	$ (2,173)	$ 3,300,303

	For the Year Ended December 31, 2017			
	Environmental Services	Safety-Kleen	Corporate Items	Totals
Third-party revenues	$ 1,728,700	$ 1,213,703	$ 2,575	$ 2,944,978
Intersegment revenues, net	125,822	(125,822)	—	—
Corporate Items, net	2,952	5	(2,957)	—
Direct revenues	$ 1,857,474	$ 1,087,886	$ (382)	$ 2,944,978

	For the Year Ended December 31, 2016			
	Environmental Services	Safety-Kleen	Corporate Items	Totals
Third-party revenues	$ 1,641,432	$ 1,110,727	$ 3,067	$ 2,755,226
Intersegment revenues, net	115,013	(115,013)	—	—
Corporate Items, net	2,388	369	(2,757)	—
Direct revenues	$ 1,758,833	$ 996,083	$ 310	$ 2,755,226

The primary financial measure by which the Company evaluates the performance of its segments is Adjusted EBITDA, which consists of net income (loss) plus accretion of environmental liabilities, depreciation and amortization, net interest expense, loss on early extinguishment of debt, provision (benefit) for income taxes, other gains or non-cash charges (including gain on sale of businesses and goodwill impairment charge) not deemed representative of fundamental segment results and excludes other expense (income), net. Transactions between the segments are accounted for at the Company's best estimate based on similar transactions with outside customers.

(19) SEGMENT REPORTING (Continued)

The following table presents Adjusted EBITDA information used by management by reported segment (in thousands):

	For the Year Ended December 31,		
	2018	2017	2016
Adjusted EBITDA:			
Environmental Services	$ 380,856	$ 321,310	$ 319,075
Safety-Kleen	282,029	249,811	219,546
Corporate Items	(171,880)	(145,464)	(138,267)
Total	491,005	425,657	400,354
Reconciliation to Consolidated Statements of Operations:			
Accretion of environmental liabilities	9,806	9,460	10,177
Depreciation and amortization	298,625	288,422	287,002
Goodwill impairment charge	—	—	34,013
Income from operations	182,574	127,775	69,162
Other expense (income), net	4,510	6,119	(6,195)
Loss on early extinguishment of debt	2,488	7,891	—
Gain on sale of businesses	—	(30,732)	(16,884)
Interest expense, net of interest income	81,094	85,808	83,525
Income from operations before provision (benefit) for income taxes	$ 94,482	$ 58,689	$ 8,716

Geographical Information

For the years ended December 31, 2018, 2017, and 2016, the Company generated direct revenues in the following geographic locations (in thousands):

	For the Year Ended December 31,					
	2018		2017		2016	
	Revenue	% of Total	Revenue	% of Total	Revenue	% of Total
United States	$ 2,721,814	82.5%	$ 2,392,000	81.2%	$ 2,213,355	80.3%
Canada	578,489	17.5%	552,978	18.8%	541,871	19.7%
Total Revenues	$ 3,300,303	100.0%	$ 2,944,978	100.0%	$ 2,755,226	100.0%

As of December 31, 2018 and 2017, the Company had property, plant and equipment, net of depreciation and amortization and permits and other intangible assets in the following geographic locations (in thousands):

	For the Year Ended December 31,			
	2018		2017	
	Total	% of Total	Total	% of Total
Property, plant and equipment, net				
United States	$ 1,233,949	79.0%	$ 1,175,437	74.0%
Canada	328,029	21.0%	411,928	26.0%
Total property, plant and equipment, net	$ 1,561,978	100.0%	$ 1,587,365	100.0%
Permits and other intangibles, net				
United States	$ 393,045	88.9%	$ 408,654	87.1%
Canada	48,830	11.1%	60,474	12.9%
Total permits and other intangibles, net	$ 441,875	100.0%	$ 469,128	100.0%

(19) SEGMENT REPORTING (Continued)

The following table presents assets by reported segment and in the aggregate (in thousands):

	December 31, 2018	December 31, 2017
Property, plant and equipment, net		
Environmental Services	$ 951,867	$ 927,139
Safety-Kleen	553,220	582,162
Corporate Items	56,891	78,064
Total property, plant and equipment, net	$ 1,561,978	$ 1,587,365
Goodwill and Permits and other intangibles, net		
Environmental Services		
Goodwill	$ 207,019	$ 172,386
Permits and other intangibles, net	93,313	97,519
Total Environmental Services	300,332	269,905
Safety-Kleen		
Goodwill	$ 307,170	$ 306,137
Permits and other intangibles, net	348,562	371,609
Total Safety-Kleen	655,732	677,746
Total	$ 956,064	$ 947,651

The following table presents the total assets by reported segment (in thousands):

	December 31, 2018	December 31, 2017
Environmental Services	$ 1,640,706	$ 1,541,241
Safety-Kleen	1,431,381	1,471,291
Corporate Items	666,234	694,038
Total	$ 3,738,321	$ 3,706,570

The following table presents the total assets by geographical area (in thousands):

	December 31, 2018	December 31, 2017
United States	$ 3,090,311	$ 2,985,394
Canada	648,010	721,176
Total	$ 3,738,321	$ 3,706,570

(20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES

The previously outstanding 2020 Notes and the currently outstanding 2021 Notes (collectively, the "Senior Unsecured Notes") and the Company's obligations under its Term Loan Agreement were or are guaranteed by substantially all of the Company’s subsidiaries organized in the United States. Each guarantor was or is a 100% owned subsidiary of Clean Harbors, Inc. and its guarantee was or is both full and unconditional and joint and several. The guarantees were or are, however, subject to customary release provisions under which, in particular, the guarantee of any domestic restricted subsidiary will be released if the Company sells such subsidiary to an unrelated third party in accordance with the terms of the indentures which govern the Senior Unsecured Notes and of the Term Loan Agreement. The Senior Unsecured Notes and the Company's obligations under its Term Loan Agreement are not guaranteed by the Company’s subsidiaries organized outside the United States. The following supplemental condensed consolidating financial information for the parent company, the guarantor subsidiaries and the non-guarantor subsidiaries, respectively, is presented in conformity with the requirements of Rule 3-10 of SEC Regulation S-X (“Rule 3-10”).

(20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES (Continued)

Following is the condensed consolidating balance sheet at December 31, 2018 (in thousands):

	Clean Harbors, Inc.	Guarantor Subsidiaries	Non-Guarantor Subsidiaries	Consolidating Adjustments	Total
Assets:					
Cash and cash equivalents	$ 27,308	$ 101,302	$ 97,897	$ —	$ 226,507
Short-term marketable securities	67	—	52,789	—	52,856
Intercompany receivables	262,475	721,521	60,693	(1,044,689)	—
Accounts receivable, net	—	520,785	86,167	—	606,952
Other current assets	—	289,869	49,631	(23,657)	315,843
Property, plant and equipment, net	—	1,233,578	328,400	—	1,561,978
Investments in subsidiaries	3,162,704	571,304	—	(3,734,008)	—
Intercompany debt receivable	—	14,669	21,000	(35,669)	—
Goodwill	—	456,307	57,882	—	514,189
Permits and other intangibles, net	—	393,045	48,830	—	441,875
Other long-term assets	1,551	13,545	3,025	—	18,121
Total assets	$ 3,454,105	$ 4,315,925	$ 806,314	$ (4,838,023)	$ 3,738,321
Liabilities and Stockholders' Equity:					
Current liabilities	$ 20,170	$ 457,164	$ 148,601	$ (23,657)	$ 602,278
Intercompany payables	699,158	321,846	23,685	(1,044,689)	—
Closure, post-closure and remedial liabilities, net	—	151,480	16,434	—	167,914
Long-term obligations	1,565,021	—	—	—	1,565,021
Intercompany debt payable	—	21,000	14,669	(35,669)	—
Other long-term liabilities	—	212,924	20,428	—	233,352
Total liabilities	2,284,349	1,164,414	223,817	(1,104,015)	2,568,565
Stockholders' equity	1,169,756	3,151,511	582,497	(3,734,008)	1,169,756
Total liabilities and stockholders' equity	$ 3,454,105	$ 4,315,925	$ 806,314	$ (4,838,023)	$ 3,738,321

(20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES (Continued)

Following is the condensed consolidating balance sheet at December 31, 2017 (in thousands):

	Clean Harbors, Inc.	Guarantor Subsidiaries	Non-Guarantor Subsidiaries	Consolidating Adjustments	Total
Assets:					
Cash and cash equivalents	$ 51,638	$ 207,777	$ 59,984	$ —	$ 319,399
Short-term marketable securities	—	—	38,179	—	38,179
Intercompany receivables	238,339	590,100	52,909	(881,348)	—
Accounts receivable, net	—	433,042	95,882	—	528,924
Other current assets	897	233,602	52,947	(19,892)	267,554
Property, plant and equipment, net	—	1,174,975	412,390	—	1,587,365
Investments in subsidiaries	3,112,547	569,568	—	(3,682,115)	—
Intercompany debt receivable	—	92,530	21,000	(113,530)	—
Goodwill	—	415,641	62,882	—	478,523
Permits and other intangibles, net	—	408,655	60,473	—	469,128
Other long-term assets	2,084	12,064	3,350	—	17,498
Total assets	$ 3,405,505	$ 4,137,954	$ 859,996	$ (4,696,885)	$3,706,570
Liabilities and Stockholders' Equity:					
Current liabilities	$ 16,954	$ 371,135	$ 135,620	$ (19,892)	$ 503,817
Intercompany payables	574,812	289,531	17,005	(881,348)	—
Closure, post-closure and remedial liabilities, net	—	148,872	16,851	—	165,723
Long-term obligations	1,625,537	—	—	—	1,625,537
Intercompany debt payable	—	21,000	92,530	(113,530)	—
Other long-term liabilities	—	201,086	22,205	—	223,291
Total liabilities	2,217,303	1,031,624	284,211	(1,014,770)	2,518,368
Stockholders' equity	1,188,202	3,106,330	575,785	(3,682,115)	1,188,202
Total liabilities and stockholders' equity	$ 3,405,505	$ 4,137,954	$ 859,996	$ (4,696,885)	$3,706,570

(20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES (Continued)

Following is the consolidating statement of operations for the year ended December 31, 2018 (in thousands):

	Clean Harbors, Inc.	Guarantor Subsidiaries	Non-Guarantor Subsidiaries	Consolidating Adjustments	Total
Revenues					
Service revenues	$ —	$ 2,145,310	$ 621,435	$ (57,506)	$ 2,709,239
Product revenues	—	537,400	66,210	(12,546)	591,064
Total revenues	—	2,682,710	687,645	(70,052)	3,300,303
Cost of revenues (exclusive of items shown separately below)					
Service cost of revenues	—	1,421,693	497,788	(57,506)	1,861,975
Product cost of revenues	—	419,377	36,745	(12,546)	443,576
Total cost of revenues	—	1,841,070	534,533	(70,052)	2,305,551
Selling, general and administrative expenses	347	419,984	83,416	—	503,747
Accretion of environmental liabilities	—	8,797	1,009	—	9,806
Depreciation and amortization	—	219,530	79,095	—	298,625
(Loss) income from operations	(347)	193,329	(10,408)	—	182,574
Other expense, net	(1,384)	(1,284)	(1,842)	—	(4,510)
Loss on early extinguishment of debt	(2,488)	—	—	—	(2,488)
Interest (expense) income, net	(83,362)	1,252	1,016	—	(81,094)
Equity in earnings of subsidiaries, net of tax	129,082	(25,765)	—	(103,317)	—
Intercompany interest income (expense)	—	2,841	(2,841)	—	—
Income (loss) before (benefit) provision for income taxes	41,501	170,373	(14,075)	(103,317)	94,482
(Benefit) provision for income taxes	(24,135)	46,267	6,714	—	28,846
Net income (loss)	65,636	124,106	(20,789)	(103,317)	65,636
Other comprehensive loss	(50,964)	(50,964)	(44,292)	95,256	(50,964)
Comprehensive income (loss)	$ 14,672	$ 73,142	$ (65,081)	$ (8,061)	$ 14,672

(20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES (Continued)

Following is the consolidating statement of operations for the year ended December 31, 2017 (in thousands):

	Clean Harbors, Inc.	Guarantor Subsidiaries	Non-Guarantor Subsidiaries	Consolidating Adjustments	Total
Revenues					
Service revenues	$ —	$ 1,870,256	$ 582,042	$ (53,648)	$ 2,398,650
Product revenues	—	492,036	66,511	(12,219)	546,328
Total revenues	—	2,362,292	648,553	(65,867)	2,944,978
Cost of revenues (exclusive of items shown separately below)					
Service cost of revenues	—	1,224,326	471,120	(53,648)	1,641,798
Product cost of revenues	—	386,455	46,639	(12,219)	420,875
Total cost of revenues	—	1,610,781	517,759	(65,867)	2,062,673
Selling, general and administrative expenses	—	373,050	83,598	—	456,648
Accretion of environmental liabilities	—	8,479	981	—	9,460
Depreciation and amortization	—	205,034	83,388	—	288,422
Income (loss) from operations	—	164,948	(37,173)	—	127,775
Other expense, net	(222)	(5,156)	(741)	—	(6,119)
Loss on early extinguishment of debt	(7,891)	—	—	—	(7,891)
Gain on sale of business	—	30,732	—	—	30,732
Interest (expense) income, net	(87,113)	1,523	(218)	—	(85,808)
Equity in earnings of subsidiaries, net of tax	157,963	(48,683)	—	(109,280)	—
Intercompany interest income (expense)	—	5,288	(5,288)	—	—
Income (loss) before (benefit) provision for income taxes	62,737	148,652	(43,420)	(109,280)	58,689
(Benefit) provision for income taxes	(38,002)	(10,117)	6,069	—	(42,050)
Net income (loss)	100,739	158,769	(49,489)	(109,280)	100,739
Other comprehensive income	41,919	41,919	38,131	(80,050)	41,919
Comprehensive income (loss)	$ 142,658	$ 200,688	$ (11,358)	$ (189,330)	$ 142,658

20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES (Continued)

Following is the consolidating statement of operations for the year ended December 31, 2016 (in thousands):

	Clean Harbors, Inc.	Guarantor Subsidiaries	Non-Guarantor Subsidiaries	Consolidating Adjustments	Total
Revenues					
Service revenues	$ —	$ 1,747,985	$ 582,075	$ (49,251)	$ 2,280,809
Product revenues	—	410,868	73,793	(10,244)	474,417
Total revenues	—	2,158,853	655,868	(59,495)	2,755,226
Cost of revenues (exclusive of items shown separately below)					
Service cost of revenues	—	1,116,132	476,329	(49,251)	1,543,210
Product cost of revenues	—	349,069	50,822	(10,244)	389,647
Total cost of revenues	—	1,465,201	527,151	(59,495)	1,932,857
Selling, general and administrative expenses	85	341,963	79,967	—	422,015
Accretion of environmental liabilities	—	9,261	916	—	10,177
Depreciation and amortization	—	201,153	85,849	—	287,002
Goodwill impairment charge	—	—	34,013	—	34,013
(Loss) income from operations	(85)	141,275	(72,028)	—	69,162
Other income (expense), net	—	7,713	(1,518)	—	6,195
Gain on sale of business	—	1,704	15,180	—	16,884
Interest (expense) income, net	(88,984)	5,391	68	—	(83,525)
Equity in earnings of subsidiaries, net of tax	13,568	(80,244)	—	66,676	—
Intercompany interest income (expense)	—	19,855	(19,855)	—	—
(Loss) income before (benefit) provision for income taxes	(75,501)	95,694	(78,153)	66,676	8,716
(Benefit) provision for income taxes	(35,628)	82,643	1,574	—	48,589
Net (loss) income	(39,873)	13,051	(79,727)	66,676	(39,873)
Other comprehensive income	40,566	40,566	15,291	(55,857)	40,566
Comprehensive income (loss)	$ 693	$ 53,617	$ (64,436)	$ 10,819	$ 693

(20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES (Continued)

Following is the condensed consolidating statement of cash flows for the year ended December 31, 2018 (in thousands):

	Clean Harbors, Inc.	Guarantor Subsidiaries	Non-Guarantor Subsidiaries	Consolidating Adjustments	Total
Net cash from operating activities	$ 34,135	$ 260,101	$ 78,974	$ —	$ 373,210
Cash flows used in investing activities:					
Additions to property, plant and equipment	—	(161,342)	(32,002)	—	(193,344)
Proceeds from sale and disposal of fixed assets	—	4,174	11,271	—	15,445
Proceeds from sale of available-for-sale securities	—	—	28,723	—	28,723
Acquisitions, net of cash acquired	—	(151,023)	—	—	(151,023)
Additions to intangible assets, including costs to obtain or renew permits	—	(4,326)	(362)	—	(4,688)
Purchases of available-for-sale securities	(1,450)	—	(43,322)	—	(44,772)
Intercompany	—	(54,114)	—	54,114	—
Net cash used in investing activities	(1,450)	(366,631)	(35,692)	54,114	(349,659)
Cash flows (used in) from financing activities:					
Change in uncashed checks	—	55	77	—	132
Tax payments related to withholdings on vested restricted stock	(3,266)	—	—	—	(3,266)
Deferred financing costs paid	(4,027)	—	—	—	(4,027)
Repurchases of common stock	(45,080)	—	—	—	(45,080)
Principal payments on debt	(405,768)	—	—	—	(405,768)
Premium paid on early extinguishment of debt	(1,238)	—	—	—	(1,238)
Issuance of senior secured notes, net of discount	348,250	—	—	—	348,250
Borrowing from revolving credit facility	50,000	—	—	—	50,000
Payment on revolving credit facility	(50,000)	—	—	—	(50,000)
Intercompany	54,114	—	—	(54,114)	—
Net cash (used in) from financing activities	(57,015)	55	77	(54,114)	(110,997)
Effect of exchange rate change on cash	—	—	(5,446)	—	(5,446)
(Decrease) increase in cash and cash equivalents	(24,330)	(106,475)	37,913	—	(92,892)
Cash and cash equivalents, beginning of year	51,638	207,777	59,984	—	319,399
Cash and cash equivalents, end of year	$ 27,308	$ 101,302	$ 97,897	$ —	$ 226,507

(20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES (Continued)

Following is the condensed consolidating statement of cash flows for the year ended December 31, 2017 (in thousands):

	Clean Harbors, Inc.	Guarantor Subsidiaries	Non-Guarantor Subsidiaries	Consolidating Adjustments	Total
Net cash from operating activities	$ 16,292	$ 217,001	$ 52,405	$ —	$ 285,698
Cash flows from (used in) investing activities:					
Additions to property, plant and equipment	—	(142,211)	(24,796)	—	(167,007)
Proceeds from sale and disposal of fixed assets	—	1,979	5,145	—	7,124
Proceeds from sale of available-for-sale securities	376	—	—	—	376
Proceeds from sale of business, net of transactional costs	—	45,245	181	—	45,426
Acquisitions, net of cash acquired	—	(11,427)	(37,800)	—	(49,227)
Additions to intangible assets, including costs to obtain or renew permits	—	(1,153)	(464)	—	(1,617)
Purchases of available-for-sale securities	—	—	(38,342)	—	(38,342)
Intercompany	—	(54,074)	—	54,074	—
Intercompany debt	—	—	3,701	(3,701)	—
Net cash from (used in) investing activities	376	(161,641)	(92,375)	50,373	(203,267)
Cash flows used in financing activities:					
Change in uncashed checks	—	(3,526)	(2,414)	—	(5,940)
Proceeds from exercise of stock options	46	—	—	—	46
Tax payments related to withholdings on vested restricted stock	(3,149)	—	—	—	(3,149)
Deferred financing costs paid	(5,718)	—	—	—	(5,718)
Repurchases of common stock	(48,971)	—	—	—	(48,971)
Principal payments on debt	(402,000)	—	—	—	(402,000)
Premium paid on early extinguishment of debt	(6,028)	—	—	—	(6,028)
Issuance of senior secured notes, net of discount	399,000	—	—	—	399,000
Intercompany	54,074	—	—	(54,074)	—
Intercompany debt	(3,701)	—	—	3,701	—
Net cash used in financing activities	(16,447)	(3,526)	(2,414)	(50,373)	(72,760)
Effect of exchange rate change on cash	—	—	2,731	—	2,731
Increase (decrease) in cash and cash equivalents	221	51,834	(39,653)	—	12,402
Cash and cash equivalents, beginning of year	51,417	155,943	99,637	—	306,997
Cash and cash equivalents, end of year	$ 51,638	$ 207,777	$ 59,984	$ —	$ 319,399

(20) GUARANTOR AND NON-GUARANTOR SUBSIDIARIES (Continued)

Following is the condensed consolidating statement of cash flows for the year ended December 31, 2016 (in thousands):

	Clean Harbors, Inc.	Guarantor Subsidiaries	Non-Guarantor Subsidiaries	Consolidating Adjustments	Total
Net cash from operating activities	$ 51,033	$ 125,591	$ 83,000	$ —	$ 259,624
Cash flows used in investing activities:					
Additions to property, plant and equipment	—	(194,184)	(25,200)	—	(219,384)
Proceeds from sale and disposal of fixed assets	—	12,926	7,891	—	20,817
Proceeds on sale of business, net of transactional costs	—	18,885	28,249	—	47,134
Acquisitions, net of cash acquired	—	(196,915)	(10,000)	—	(206,915)
Additions to intangible assets including costs to obtain or renew permits	—	(1,749)	(1,082)	—	(2,831)
Purchases of available-for-sale securities	(102)	—	(496)	—	(598)
Intercompany	—	(23,182)	—	23,182	—
Intercompany debt	—	63,118	(21,000)	(42,118)	—
Investment in subsidiaries	(257,125)	—	—	257,125	—
Net cash used in investing activities	(257,227)	(321,101)	(21,638)	238,189	(361,777)
Cash flows from (used in) financing activities:					
Change in uncashed checks	—	(3,651)	474	—	(3,177)
Proceeds from exercise of stock options	627	—	—	—	627
Tax payments related to withholdings on vested restricted stock	(2,819)	—	—	—	(2,819)
Deferred financing costs paid	(4,031)	—	—	—	(4,031)
Repurchases of common stock	(22,188)	—	—	—	(22,188)
Excess tax benefit of stock-based compensation	1,198	—	—	—	1,198
Issuance of senior unsecured notes, including premium	250,625	250,625	—	(250,625)	250,625
Intercompany	23,182	—	6,500	(29,682)	—
Intercompany debt	—	21,000	(63,118)	42,118	—
Net cash from (used in) financing activities	246,594	267,974	(56,144)	(238,189)	220,235
Effect of exchange rate change on cash	—	—	4,207	—	4,207
Increase in cash and cash equivalents	40,400	72,464	9,425	—	122,289
Cash and cash equivalents, beginning of year	11,017	83,479	90,212	—	184,708
Cash and cash equivalents, end of year	$ 51,417	$ 155,943	$ 99,637	$ —	$ 306,997

(21) QUARTERLY DATA (UNAUDITED)

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(in thousands except per share amounts)			
2018				
Revenues	$ 749,778	$ 849,140	$ 843,181	$ 858,204
Cost of revenues (1)	546,425	583,584	580,685	594,857
Income from operations	10,991	64,353	65,745	41,485
Other (expense) income, net	(299)	846	(996)	(4,061)
Net (loss) income (2)	(12,631)	30,747	31,089	16,431
Basic (loss) earnings per share (3)	(0.22)	0.55	0.55	0.29
Diluted (loss) earnings per share (3)	(0.22)	0.54	0.55	0.29

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(in thousands except per share amounts)			
2017				
Revenues	$ 688,941	$ 752,788	$ 755,846	$ 747,403
Cost of revenues (1)	496,585	519,803	519,595	526,690
Income from operations	5,433	46,744	47,663	27,935
Other expense, net	(1,549)	(833)	(432)	(3,305)
Net (loss) income (2)	(21,393)	25,880	12,058	84,194
Basic (loss) earnings per share (3)	(0.37)	0.45	0.21	1.48
Diluted (loss) earnings per share (3)	(0.37)	0.45	0.21	1.48

(1) Items shown separately on the statements of operations consist of (i) accretion of environmental liabilities and (ii) depreciation and amortization.

(2) The second quarter of 2017 net income includes a $31.7 million pre-tax gain on the sale of a non-core line of business within the Company's Environmental Services segment and a $6.0 million loss on early extinguishment of debt. The third quarter of 2018 and 2017 net income had a $2.5 million and $1.9 million loss on early extinguishment of debt, respectively. As a result of the Tax Act, the fourth quarter of 2017 net income includes a $93.0 million tax benefit related to a reduction of the Company's net deferred tax liability.

(3) (Loss) earnings per share are computed independently for each of the quarters presented. Accordingly, the quarterly basic and diluted (loss) earnings per share may not equal the total computed for the year.

CLEAN HARBORS, INC. AND SUBSIDIARIES

SCHEDULE II

VALUATION AND QUALIFYING ACCOUNTS

For the Three Years Ended December 31, 2018

(in thousands)

Allowance for Doubtful Accounts	Balance Beginning of Period	Additions Charged to Operating Expense	Deductions from Reserves(a)	Balance End of Period
2016	$ 15,194	$ 6,907	$ 7,055	$ 15,046
2017	$ 15,046	$ 7,901	$ 6,774	$ 16,173
2018	$ 16,173	$ 15,817	$ 5,622	$ 26,368

(a) Amounts deemed uncollectible, net of recoveries.

Revenue Allowance(b)	Balance Beginning of Period	Additions Charged to Revenue	Deductions from Reserves	Balance End of Period
2016	$ 16,232	$ 24,252	$ 26,281	$ 14,203
2017	$ 14,203	$ 24,862	$ 27,439	$ 11,626
2018	$ 11,626	$ 41,338	$ 35,017	$ 17,947

(b) Due to the nature of the Company's businesses and the invoices that result from the services provided, customers may withhold payments and attempt to renegotiate amounts invoiced. In addition, for some of the services provided, the Company's invoices are based on quotes that can either generate credits or debits when the actual revenue amount is known. Based on industry knowledge and historical trends, the Company records a revenue allowance accordingly. This practice causes the volume of activity flowing through the revenue allowance during the year to be higher than the balance at the end of the year. Increases in overall sales volumes and the expansion of the customer base in recent years have also increased the volume of additions and deductions to the allowance during the year. The revenue allowance is intended to cover the net amount of revenue adjustments that may need to be credited to customers' accounts in future periods. Management determines the appropriate total revenue allowance by evaluating the following factors on a customer-by-customer basis as well as on a consolidated level: trends in adjustments to previously billed amounts, existing economic conditions and other information as deemed applicable. Revenue allowance estimates can differ materially from the actual adjustments, but historically the revenue allowance has been sufficient to cover the net amount of the reserve adjustments issued in subsequent reporting periods.

Valuation Allowance on Deferred Tax Assets	Balance Beginning of Period	Additions Charged to Income Tax Expense	Other Changes to Reserves	Balance End of Period
2016	$ 30,916	$ 22,564	$ 1,709	$ 55,189
2017	$ 55,189	$ 9,052	$ 4,114	$ 68,355
2018	$ 68,355	$ 10,466	$ 474	$ 79,295

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Based on an evaluation under the supervision and with the participation of our Chief Executive Officer and Chief Financial Officer, as of the end of the period covered by this Annual Report on Form 10-K, our Chief Executive Officer and Chief Financial Officer have concluded that our disclosure controls and procedures (as defined under Rule 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the "Exchange Act")) were effective as of December 31, 2018 to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in Securities and Exchange Commission rules and forms and is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

Management's Annual Report on Internal Control Over Financial Reporting

The Company's management is responsible for establishing and maintaining adequate internal control over financial reporting, as that term is defined in Exchange Act Rule 13a-15(f). Under the supervision and with the participation of the Company's management, including the Chief Executive Officer and Chief Financial Officer, the Company conducted an evaluation of its internal control over financial reporting based on the framework in *Internal Control—Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

The Company's management evaluated the effectiveness of Clean Harbors internal control over financial reporting as of December 31, 2018. Based on their evaluation under the framework in *Internal Control—Integrated Framework (2013)*, the Company's management concluded that the Company maintained effective internal control over financial reporting as of December 31, 2018 based on the criteria in the *Internal Control—Integrated Framework (2013)*.

Deloitte & Touche LLP, the independent registered public accounting firm that audited the Company's consolidated financial statements, has issued an attestation report on the effectiveness of the Company's internal control over financial reporting as of December 31, 2018, which is included below in this Item 9A of this annual report on Form 10-K.

Changes in Internal Control over Financial Reporting

There were no changes in the Company's internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Exchange Act Rules 13a-15 or 15d-15 that was conducted during the quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, the Company's internal control over financial reporting.

Limitations on the Effectiveness of Controls

The Company's management, including the Chief Executive Officer and Chief Financial Officer, does not expect that the Company's disclosure controls and procedures or the Company's internal control over financial reporting will prevent all errors and all fraud.

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Further, the design of disclosure controls and procedures and internal control over financial reporting must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Because of the inherent limitations of controls and procedures and internal control over financial reporting, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within the Company have been detected.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Clean Harbors, Inc.

Opinion on Internal Control over Financial Reporting

We have audited the internal control over financial reporting of Clean Harbors, Inc. and subsidiaries (the "Company") as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by COSO.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated financial statements as of and for the year ended December 31, 2018, of the Company and our report dated February 27, 2019 expressed an unqualified opinion on those financial statements.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying *Management's Annual Report on Internal Control Over Financial Reporting*. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Deloitte & Touche LLP

Boston, Massachusetts
February 27, 2019

ITEM 9B. OTHER INFORMATION

Not applicable.

PART III

Except for the information set forth below under Item 12 with respect to securities authorized for issuance under the registrant's equity compensation plans, the information called for by Item 10 (Directors, Executive Officers and Corporate Governance), Item 11 (Executive Compensation), Item 12 (Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters), Item 13 (Certain Relationships and Related Transactions, and Director Independence), and Item 14 (Principal Accountant Fees and Services) is incorporated herein by reference to the registrant's definitive proxy statement for its 2019 annual meeting of shareholders, which definitive proxy statement will be filed with the Securities and Exchange Commission by April 30, 2019.

For the purpose of calculating the aggregate market value of the voting stock of the registrant held by non-affiliates as shown on the cover page of this report, it has been assumed that the directors and executive officers of the registrant, as will be set forth in the Company's definitive proxy statement for its 2019 annual meeting of shareholders, are the only affiliates of the registrant. However, this should not be deemed to constitute an admission that all of such persons are, in fact, affiliates or that there are not other persons who may be deemed affiliates of the registrant.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

In addition to the information about the security ownership of certain beneficial owners and management and related stockholder matters which is incorporated herein by reference to the Company's definitive proxy statement for the Company's 2019 annual meeting of shareholders, the following table includes information as of December 31, 2018 regarding shares of common stock authorized for issuance under the Company's equity compensation plan. The Company's shareholders previously approved the plan.

Plan Category	Number of securities to be issued upon exercise of outstanding options and rights(a)	Weighted average exercise price of outstanding options and rights(b)	Number of securities remaining available for future issuance under equity compensation plan (excluding securities reflected in column (a))(c)
Equity compensation plan approved by security holders(1)	—	$ —	4,059,988

(1) Includes the Company's 2010 Stock Incentive Plan (the "2010 Plan") under which there were on December 31, 2018 no outstanding options but 4,059,988 shares were available for grant of future options, stock appreciation rights, restricted stock awards, restricted stock units and certain other forms of equity incentives. See Note 17, "Stock-Based Compensation," to the Company's consolidated financial statements included in Item 8, "Financial Statements and Supplementary Data," in this report.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) Documents Filed as a Part of this Report

All other schedules are omitted because they are not applicable, not required, or because the required information is included in the financial statements or notes thereto.

3. Exhibits:

The list of exhibits filed as part of this annual report on Form 10-K is set forth on the Exhibit Index immediately following the signature page to this report, and such Exhibit Index is incorporated herein by reference.

Exhibits to this annual report on Form 10-K have been included only with the copies of the Form 10-K filed with the Securities and Exchange Commission. Upon request to the Company and payment of a reasonable fee, copies of the individual exhibits will be furnished. The Company undertakes to furnish to the Commission upon request copies of instruments (in addition to the exhibits listed below) relating to the Company's acquisitions and long-term debt.

ITEM 16. FORM 10-K SUMMARY

None

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this annual report to be signed on its behalf by the undersigned, thereunto duly authorized on February 27, 2019.

CLEAN HARBORS, INC.

By: /s/ ALAN S. MCKIM
Alan S. McKim
Chief Executive Officer

Pursuant to the requirements of the Securities Exchange Act of 1934, this annual report has been signed below by the following persons on behalf of the registrant and in the capacities and on the dates indicated.

Signature	Title	Date
/s/ ALAN S. MCKIM Alan S. McKim	Chairman, President and Chief Executive Officer	February 27, 2019
/s/ MICHAEL L. BATTLES Michael L. Battles	Executive Vice President and Chief Financial Officer	February 27, 2019
/s/ ERIC J. DUGAS Eric J. Dugas	Senior Vice President, Finance and Chief Accounting Officer	February 27, 2019
* Gene Banucci	Director	February 27, 2019
* Edward G. Galante	Director	February 27, 2019
* Rod Marlin	Director	February 27, 2019
* John T. Preston	Director	February 27, 2019
* Andrea Robertson	Director	February 27, 2019
* Thomas J. Shields	Director	February 27, 2019
* Lauren C. States	Director	February 27, 2019
* John R. Welch	Director	February 27, 2019

*By: /s/ ALAN S. MCKIM
Alan S. McKim
Attorney-in-Fact

EXHIBIT INDEX

Item No.	Description	Location
2.1	Acquisition Agreement by and between Safety-Kleen Services, Inc., as Seller, and Clean Harbors, Inc., as Purchaser, dated as of February 22, 2002	(1)
2.2	First Amendment to Acquisition Agreement by and between Safety-Kleen Services, Inc., as Seller, and Clean Harbors, Inc., as Purchaser, dated as of March 8, 2002	(2)
2.3	Second Amendment to Acquisition Agreement by and between Safety-Kleen Services, Inc. as Seller, and Clean Harbors, Inc. as Purchaser, dated as of April 30, 2002	(3)
2.4	Third Amendment to Acquisition Agreement by and between Safety-Kleen Services, Inc., as Seller, and Clean Harbors, Inc., as Purchaser, dated as of September 6, 2002	(4)
2.5	Fourth Amendment to Acquisition Agreement by and between Safety-Kleen Services, Inc., as Seller and Clean Harbors, Inc., as Purchaser, dated as of July 14, 2003	(5)
2.6	Agreement and Plan of Merger dated as of October 26, 2012 among Safety-Kleen, Inc., Clean Harbors, Inc., and CH Merger Sub, Inc.	(6)
3.1A	Restated Articles of Organization of Clean Harbors, Inc.	(7)
3.1B	Articles of Amendment [as filed on May 9, 2011] to Restated Articles of Organization of Clean Harbors	(8)
3.4D	Amended and Restated By-Laws of Clean Harbors, Inc.	(9)
4.34	Fifth Amended and Restated Credit Agreement dated as of November 1, 2016 among Clean Harbors, Inc., as the U.S. Borrower, Clean Harbors Industrial Services Canada, Inc., as the Canadian Borrower, Bank of America, N.A., as Administrative Agent, and the Lenders party thereto	(10)
4.34B	Amended and Restated Security Agreement (Canadian Domiciled Loan Parties) dated as of November 1, 2016 among Clean Harbors Industrial Services Canada, Inc., as the Canadian Borrower and a Grantor, the subsidiaries of Clean Harbors, Inc. listed on Annex A thereto or that thereafter become a party thereto as Grantors, and Bank of America, N.A., as Agent	(10)
4.34C	Amended and Restated Guarantee (U.S. Domiciled Loan Parties-U.S. Facility Obligations) dated as of November 1, 2016 executed by the U.S. Domiciled Subsidiaries of Clean Harbors, Inc. named therein in favor of Bank of America, N.A., as Agent for itself and the other U.S. Facility Secured Parties	(10)
4.34D	Amended and Restated Guarantee (Canadian Domiciled Loan Parties-Canadian Facility Obligations) dated as of November 1, 2016 executed by the Canadian Domiciled Subsidiaries of Clean Harbors, Inc. named therein in favor of Bank of America, N.A., as Agent for itself and the other Canadian Facility Secured Parties	(10)
4.34E	Amended and Restated Guarantee (U.S. Domiciled Loan Parties-Canadian Facility Obligations) dated as of November 1, 2016 executed by Clean Harbors, Inc. and the U.S. Domiciled Subsidiaries of Clean Harbors, Inc. named therein in favor of Bank of America, N.A., as Agent for itself and the other Canadian Facility Secured Parties	(10)
4.34F	First Amendment to Credit Agreement, dated as of June 30, 2017, by and among Clean Harbors, Inc., Clean Harbors Industrial Services Canada, Inc., the other Loan Parties party thereto, certain of the Lenders party thereto, which constitute the "Required Lenders", and Bank of America, N.A., as Administrative Agent	(11)
4.34G	Second Amended and Restated Security Agreement (U.S. Domiciled Loan Parties) dated as of June 30, 2017, among Clean Harbors, Inc., as the U.S. Borrower and a Grantor, the subsidiaries of Clean Harbors, Inc. listed on Annex A thereto or that thereafter become a party thereto as Grantors, and Bank of America, N.A., as Agent	(11)
4.34H	Second Amendment to Credit Agreement, dated as of July 19, 2018, by and among Clean Harbors, Inc., Clean Harbors Industrial Services Canada, the Other Loan Parties party thereto, certain of the Lenders party thereto which constitute the "Required Lenders," and Bank of America, N.A., as Agent.	(12)
4.42	Indenture dated as of December 7, 2012, among Clean Harbors, Inc., as Issuer, the subsidiaries of Clean Harbors, Inc. named therein as Guarantors, and U.S. Bank National Association, as Trustee	(13)
4.43	Credit Agreement dated as of June 30, 2017, among the Financial Institutions party thereto, as Lenders, Goldman Sachs Lending Partners LLC, as Administrative Agent and Collateral Agent, Clean Harbors, Inc., as Borrower, and the Loan Guarantors from time to time party thereto	(11)

Item No.	Description	Location
4.43A	Security Agreement dated as of June 20, 2017, among Clean Harbors, Inc. and its subsidiaries listed on Annex A thereto or that become a party thereto as the Grantors, and Goldman Sachs Lending Partners LLC, as the Agent	(11)
4.43B	First Amendment to Credit Agreement dated as of June 30, 2017, among the Financial Institutions party thereto, as Lenders, Goldman Sachs Lending Partners LLC, as Administrative Agent and Collateral Agent, Clean Harbors, Inc., as Borrower, and the Loan Guarantors from time to time party thereto.	(14)
4.43C	Incremental Facility Amendment dated July 19, 2018, to Credit Agreement dated as of June 30, 2017, among the Financial Institutions party thereto, as Lenders, Goldman Sachs Lending Partners LLC, as Administrative Agent and Collateral Agent, Clean Harbors, Inc., as Borrower, and the Loan Guarantors from time to time party thereto	(12)
4.44	Intercreditor Agreement dated as of June 30, 2017, among Clean Harbors, Inc., and the subsidiaries of Clean Harbors, Inc. listed on the signature pages thereto (together with any subsidiary that becomes a party thereto after the date thereof), Bank of America, N.A., as the Initial ABL Agent, and Goldman Sachs Lending Partners LLC, as agent under the Term Loan Agreement	(11)
10.43*	Key Employee Retention Plan	(15)
10.43A*	Form of Severance Agreement under Key Employee Retention Plan with Confidentiality and Non-Competition Agreement	(16)
10.52C*	Clean Harbors, Inc. Management Incentive Plan [as amended and restated effective January 1, 2017]	(17)
10.54*	Clean Harbors, Inc. 2010 Stock Incentive Plan [as amended on May 10, 2010]	(18)
10.54A*	Revised form of Restricted Stock Award Agreement [Non-Employee Director] [for use under 2010 Stock Incentive Plan]	(16)
10.54B*	Revised form of Restricted Stock Award Agreement [Employee] [for use under Clean Harbors, Inc. 2010 Stock Incentive Plan]	(16)
10.54C*	Revised form of Performance-Based Restricted Stock Award Agreement [for use under Clean Harbors, Inc. 2010 Stock Incentive Plan]	(16)
10.54D*	Amendment to Section 8 and 10(i) of the Company's 2010 Stock Incentive Plan	(19)
10.55*	Clean Harbors, Inc. 2014 CEO Annual Incentive Plan	(20)
10.55A*	Amendment to Section 6(m) of Clean Harbors, Inc. 2014 Annual CEO Incentive Plan	(21)
10.55B*	Clean Harbors, Inc. Amendment to Section 6(m) of 2014 Annual CEO Incentive Plan	(22)
10.56*	Mike Battles accepted offer letter effective as of January 6, 2016	(23)
21	Subsidiaries	Filed herewith
23	Consent of Independent Registered Public Accounting Firm	Filed herewith
24	Power of Attorney	Filed herewith
31.1	Rule 13a-14a/15d-14(a) Certification of the CEO Alan S. McKim	Filed herewith
31.2	Rule 13a-14a/15d-14(a) Certification of the CFO Michael L. Battles	Filed herewith
32	Section 1350 Certifications	Filed herewith
101	The following materials from the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2018, formatted in XBRL (Extensible Business Reporting Language): (i) Consolidated Balance Sheets, (ii) Consolidated Statements of Operations, (iii) Consolidated Statements of Comprehensive Income (Loss), (iv) Consolidated Statements of Cash Flows, (v) Consolidated Statements of Stockholders' Equity, and (vi) Notes to Consolidated Financial Statements, tagged as blocks of text	(24)

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* A "management contract or compensatory plan or arrangement" filed as an exhibit to this report pursuant to Item 15(a)(3) of Form 10-K.

(1) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on February 28, 2002.

(2) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-K Annual Report for the Year ended December 31, 2001.

(3) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-Q Quarterly Report for the Quarterly Period ended March 31, 2002.

(4) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on September 25, 2002.

(5) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-Q Quarterly Report for the Quarterly Period ended June 30, 2003.

(6) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on October 31, 2012.

(7) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on May 19, 2005.

(8) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on May 12, 2011.

(9) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on December 22, 2014.

(10) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on November 2, 2016.

(11) Incorporated by reference to the similarly numbered exhibit to the Company’s 8-K Report filed on June 30, 2017.

(12) Incorporated by reference to the similarly numbered exhibit to the Company's Report on Form 8-K filed on July 20, 2018.

(13) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on December 10, 2012.

(14) Incorporated by reference to the similarly numbered exhibit to the Company’s Form 8-K Report filed on April 17, 2018.

(15) Incorporated by reference to the similarly numbered exhibit to the Company’s Form 10-Q Quarterly Report for the quarterly period ended March 31, 1999.

(16) Incorporated by reference to the similarly numbered exhibit to the Company's Form 10-K Annual Report for the Year ended December 31, 2010.

(17) Incorporated by reference to Appendix B to the Company’s definitive proxy statement for its 2017 annual meeting of shareholders filed on April 26, 2017.

(18) Incorporated by reference to the similarly numbered exhibit to the Company’s Form 8-K Report filed on May 14, 2010.

(19) Incorporated by reference to Appendix B to the Company’s definitive proxy statement for its annual meeting of shareholders filed on March 22, 2013.

(20) Incorporated by reference to Appendix A to the Company's definitive proxy statement for its 2013 annual meeting of shareholders filed on March 22, 2013.

(21) Incorporated by reference to Appendix A to the Company’s definitive proxy statement for its 2017 annual meeting of shareholders filed on April 26, 2017.

(22) Incorporated by reference to Appendix A to the Company’s definitive proxy statement for its 2017 annual meeting of shareholders filed on April 26, 2017.

(23) Incorporated by reference to the similarly numbered exhibit to the Company's Form 8-K Report filed on January 11, 2016.

(24) These interactive data files are furnished herewith and deemed not filed or part of a registration statement or prospectus for purposes of Sections 11 or 12 of the Securities Act of 1933, as amended, are deemed not filed for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, and otherwise are not subject to liability under those sections.

Form 10-K
Copies of the Company's Annual Report on Form 10-K for the year ended December 31, 2018, filed with the Securities and Exchange Commission on February 27, 2019, may be obtained without charge online at www.cleanharbors.com, or by writing to our corporate headquarters:

42 Longwater Drive
P.O. Box 9149
Norwell, MA 02061-9149
Attention: Investor Relations
781.792.5100

Annual Shareholders Meeting
Wednesday, June 5, 2019
10:00 a.m. EDT
Clean Harbors Training Facility
101 Philip Drive
Norwell, MA 02061-9149

Auditors
Deloitte & Touche LLP
200 Berkeley Street
Boston, MA 02116

Secretary of the Corporation
C. Michael Malm, Esq.
Davis, Malm & D'Agostine, P.C.

Corporate Counsel
Davis, Malm & D'Agostine, P.C.
One Boston Place
Boston, MA 02108

Transfer Agent
American Stock Transfer &
Trust Company
6201 15th Avenue
New York, NY 11219
800.937.5449

Corporate Headquarters
42 Longwater Drive
P.O. Box 9149
Norwell, MA 02061-9149
781.792.5000
www.cleanharbors.com

Common Stock

Our common stock trades on the New York Stock Exchange (NYSE) under the symbol CLH. On February 15, 2019, there were 258 stockholders of record of our common stock, excluding stockholders whose shares were held in nominee, or "street," name. On our last record date, approximately 22,975 additional stockholders beneficially held shares in street name.

We have never declared nor paid any cash dividends on our common stock, and we do not intend to pay any dividends on our common stock in the foreseeable future. We intend to retain our future earnings, if any, for use in the operation and expansion of our business, payment of our outstanding debt and the continuation of our stock repurchase program. In addition, our current credit agreement and indentures limit the amount we could pay as cash dividends on, or for the repurchase of, our common stock.

Safe Harbor Statement

Any statements contained herein that are not historical facts are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. These forward-looking statements are generally identifiable by use of the words "believes," "expects," "intends," "anticipates," "plans to," "estimates," "projects," "may," "likely," or similar expressions. Such statements may include, but are not limited to, statements about future financial and operating results, the Company's plans, objectives, expectations and intentions and other statements that are not historical facts. Forward-looking statements are neither historical facts nor assurances of future performance. Such statements are based upon the beliefs and expectations of Clean Harbors' management as of this date only and are subject to certain risks and uncertainties that could cause actual results to differ materially, including, without limitation, those items identified as "Risk Factors" in Clean Harbors' most recently filed Form 10-K and Form 10-Q. Therefore, readers are cautioned not to place undue reliance on these forward-looking statements. Our actual results and financial condition may differ materially from those indicated in the forward-looking statements. Clean Harbors undertakes no obligation to revise or publicly release the results of any revision to these forward-looking statements other than through its filings with the Securities and Exchange Commission, which may be viewed in the "Investors" section of the Clean Harbors website.

Clean Harbors is an Affirmative Action/Equal Opportunity Employer.

Clean Harbors, Inc. • 42 Longwater Drive, P.O. BOX 9149 Norwell, MA 02061-9149 • 781.792.5000
www.cleanharbors.com

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UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-Q

☒ **QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

FOR THE QUARTERLY PERIOD ENDED MARCH 31, 2020

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

FOR THE TRANSITION PERIOD FROM TO

Commission File Number 001-34223

CLEAN HARBORS, INC .

(Exact name of registrant as specified in its charter)

Massachusetts	**04-2997780**
(State or Other Jurisdiction of Incorporation or Organization)	(IRS Employer Identification No.)
42 Longwater Drive Norwell MA	**02061-9149**
(Address of Principal Executive Offices)	(Zip Code)

Registrant's Telephone Number, Including area code: **(781) 792-5000**

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	**Trading Symbol**	**Name of each exchange on which registered**
Common Stock, $0.01 par value	CLH	New York Stock Exchange

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports) and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer ☒	Accelerated filer ☐
Non-accelerated filer ☐	Smaller reporting company ☐
	Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined by Rule 12b-2 of the Exchange Act). Yes ☐ No ☒

The number of shares of Common Stock, $0.01 par value, of the registrant outstanding at April 24, 2020 was 55,579,207 .

CLEAN HARBORS, INC.

QUARTERLY REPORT ON FORM 10-Q

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CLEAN HARBORS, INC. AND SUBSIDIARIES

CONSOLIDATED BALANCE SHEETS

(in thousands)

	March 31, 2020	December 31, 2019
ASSETS	(unaudited)	
Current assets:		
Cash and cash equivalents	$ 432,205	$ 371,991
Short-term marketable securities	62,143	42,421
Accounts receivable, net of allowances aggregating $42,781 and $38,711, respectively	658,482	644,738
Unbilled accounts receivable	51,215	56,326
Deferred costs	21,270	21,746
Inventories and supplies	216,532	214,744
Prepaid expenses and other current assets	44,629	48,942
Total current assets	1,486,476	1,400,908
Property, plant and equipment, net	1,547,119	1,588,151
Other assets:		
Operating lease right-of-use assets	160,526	162,206
Goodwill	519,627	525,013
Permits and other intangibles, net	406,881	419,066
Other	11,392	13,560
Total other assets	1,098,426	1,119,845
Total assets	$ 4,132,021	$ 4,108,904
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Current portion of long-term obligations	$ 7,535	$ 7,535
Accounts payable	267,892	298,375
Deferred revenue	71,243	73,370
Accrued expenses	255,513	276,540
Current portion of closure, post-closure and remedial liabilities	16,231	23,301
Current portion of operating lease liabilities	39,998	40,979
Total current liabilities	658,412	720,100
Other liabilities:		
Closure and post-closure liabilities, less current portion of $4,333 and $7,283, respectively	76,106	68,368
Remedial liabilities, less current portion of $11,898 and $16,018, respectively	98,966	98,155
Long-term obligations, less current portion	1,702,992	1,554,116
Operating lease liabilities, less current portion	120,649	121,020
Deferred taxes, unrecognized tax benefits and other long-term liabilities	269,091	277,332
Total other liabilities	2,267,804	2,118,991
Commitments and contingent liabilities (See Note 16)		
Stockholders' equity:		
Common stock, $0.01 par value:		
Authorized 80,000,000 shares; issued and outstanding 55,554,925 and 55,797,734 shares, respectively	556	558
Additional paid-in capital	628,140	644,412
Accumulated other comprehensive loss	(269,357)	(210,051)
Accumulated earnings	846,466	834,894
Total stockholders' equity	1,205,805	1,269,813
Total liabilities and stockholders' equity	$ 4,132,021	$ 4,108,904

The accompanying notes are an integral part of these unaudited consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

UNAUDITED CONSOLIDATED STATEMENTS OF OPERATIONS

(in thousands, except per share amounts)

	Three Months Ended March 31,	
	2020	**2019**
Revenues:		
Service revenues	$ 719,867	$ 656,658
Product revenues	138,696	124,181
Total revenues	858,563	780,839
Cost of revenues: (exclusive of items shown separately below)		
Service revenues	492,716	463,483
Product revenues	113,950	100,881
Total cost of revenues	606,666	564,364
Selling, general and administrative expenses	129,307	114,812
Accretion of environmental liabilities	2,561	2,574
Depreciation and amortization	74,533	75,355
Income from operations	45,496	23,734
Other (expense) income, net	(2,365)	2,983
Loss on sale of businesses	(3,074)	—
Interest expense, net of interest income of $998 and $926, respectively	(18,787)	(19,764)
Income before provision for income taxes	21,270	6,953
Provision for income taxes	9,698	5,977
Net income	$ 11,572	$ 976
Earnings per share:		
Basic	$ 0.21	$ 0.02
Diluted	$ 0.21	$ 0.02
Shares used to compute earnings per share - Basic	55,757	55,848
Shares used to compute earnings per share - Diluted	56,055	56,082

The accompanying notes are an integral part of these unaudited consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

UNAUDITED CONSOLIDATED STATEMENTS OF COMPREHENSIVE (LOSS) INCOME

(in thousands)

	Three Months Ended March 31,	
	2020	**2019**
Net income	$ 11,572	$ 976
Other comprehensive (loss) income, net of tax:		
Unrealized (losses) gains on available-for-sale securities	(64)	143
Unrealized loss on interest rate hedge	(18,382)	(5,017)
Reclassification adjustment for losses on interest rate hedge included in net income	1,098	358
Foreign currency translation adjustments	(41,958)	8,540
Other comprehensive (loss) income, net of tax	(59,306)	4,024
Comprehensive (loss) income	$ (47,734)	$ 5,000

The accompanying notes are an integral part of these unaudited consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

UNAUDITED CONSOLIDATED STATEMENTS OF CASH FLOWS

(in thousands)

	Three Months Ended March 31,	
	2020	**2019**
Cash flows from operating activities:		
Net income	$ 11,572	$ 976
Adjustments to reconcile net income to net cash from operating activities:		
Depreciation and amortization	74,533	75,355
Allowance for doubtful accounts	4,700	(3,425)
Amortization of deferred financing costs and debt discount	891	1,000
Accretion of environmental liabilities	2,561	2,574
Changes in environmental liability estimates	3,470	(774)
Other expense (income), net	2,365	(2,983)
Stock-based compensation	3,291	5,809
Loss on sale of businesses	3,074	—
Environmental expenditures	(3,435)	(3,264)
Changes in assets and liabilities, net of acquisitions:		
Accounts receivable and unbilled accounts receivable	(24,960)	12,086
Inventories and supplies	(7,024)	(832)
Other current and non-current assets	8,714	(11,738)
Accounts payable	(5,169)	(27,956)
Other current and long-term liabilities	(40,902)	(17,088)
Net cash from operating activities	33,681	29,740
Cash flows used in investing activities:		
Additions to property, plant and equipment	(82,767)	(58,947)
Proceeds from sale and disposal of fixed assets	2,150	4,321
Acquisitions, net of cash acquired	—	(14,870)
Proceeds from sale of businesses, net of transactional costs	7,856	—
Additions to intangible assets including costs to obtain or renew permits	(448)	(1,132)
Proceeds from sale of available-for-sale securities	12,180	8,600
Purchases of available-for-sale securities	(32,058)	(12,941)
Net cash used in investing activities	(93,087)	(74,969)
Cash flows from (used in) financing activities:		
Change in uncashed checks	(1,775)	(4,769)
Tax payments related to withholdings on vested restricted stock	(2,224)	(2,276)
Repurchases of common stock	(17,341)	(6,324)
Payments on finance leases	(329)	(115)
Principal payments on debt	(1,884)	(1,884)
Borrowing from revolving credit facility	150,000	—
Net cash from (used in) financing activities	126,447	(15,368)
Effect of exchange rate change on cash	(6,827)	1,461
Increase (decrease) in cash and cash equivalents	60,214	(59,136)
Cash and cash equivalents, beginning of period	371,991	226,507
Cash and cash equivalents, end of period	$ 432,205	$ 167,371
Supplemental information:		
Cash payments for interest and income taxes:		
Interest paid	$ 30,648	$ 8,712
Income taxes paid	971	967
Non-cash investing activities:		
Property, plant and equipment accrued	12,173	13,002
ROU assets obtained in exchange for operating lease liabilities	12,410	(3,896)
ROU assets obtained in exchange for finance lease liabilities	(856)	23,027

The accompanying notes are an integral part of these unaudited consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

UNAUDITED CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

(in thousands)

	Common Stock					
	Number of Shares	$ 0.01 Par Value	Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Earnings	Total Stockholders' Equity
Balance at January 1, 2020	55,798	$ 558	$ 644,412	$ (210,051)	$ 834,894	$ 1,269,813
Net income	—	—	—	—	11,572	11,572
Other comprehensive loss	—	—	—	(59,306)	—	(59,306)
Stock-based compensation	—	—	3,291	—	—	3,291
Issuance of common stock for restricted share vesting, net of employee tax withholdings	59	1	(2,225)	—	—	(2,224)
Repurchases of common stock	(302)	(3)	(17,338)	—	—	(17,341)
Balance at March 31, 2020	55,555	$ 556	$ 628,140	$ (269,357)	$ 846,466	$ 1,205,805

	Common Stock					
	Number of Shares	$ 0.01 Par Value	Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Earnings	Total Stockholders' Equity
Balance at January 1, 2019	55,847	$ 558	$ 655,415	$ (223,371)	$ 737,154	$ 1,169,756
Net income	—	—	—	—	976	976
Other comprehensive income	—	—	—	4,024	—	4,024
Stock-based compensation	—	—	5,809	—	—	5,809
Issuance of common stock for restricted share vesting, net of employee tax withholdings	78	1	(2,277)	—	—	(2,276)
Repurchases of common stock	(97)	(1)	(6,323)	—	—	(6,324)
Balance at March 31, 2019	55,828	$ 558	$ 652,624	$ (219,347)	$ 738,130	$ 1,171,965

The accompanying notes are an integral part of these unaudited consolidated financial statements.

CLEAN HARBORS, INC. AND SUBSIDIARIES

NOTES TO UNAUDITED CONSOLIDATED FINANCIAL STATEMENTS

(1) BASIS OF PRESENTATION

The accompanying consolidated interim financial statements are unaudited and include the accounts of Clean Harbors, Inc. and its subsidiaries (collectively, “Clean Harbors,” the “Company” or "we") and have been prepared pursuant to the rules and regulations of the Securities and Exchange Commission (the “SEC”) and, in the opinion of management, include all adjustments which are of a normal recurring nature and are necessary for a fair presentation of the financial position, results of operations and cash flows for the periods presented. Management has made estimates and assumptions affecting the amounts reported in the Company's consolidated interim financial statements and accompanying footnotes; actual results could differ from those estimates and judgments. The results for interim periods are not necessarily indicative of results for the entire year or any other interim periods. The financial statements presented herein should be read in conjunction with the financial statements included in the Company’s Annual Report on Form 10-K for the year ended December 31, 2019 .

A novel strain of coronavirus ("COVID-19") was first identified in December 2019, and subsequently declared a global pandemic by the World Health Organization on March 11, 2020. As a result of the outbreak, many companies have experienced disruptions in their operations, workforce and markets served, including a significant reduction in the demand for petroleum-based products. The Company's businesses and operations began being adversely impacted by effects of COVID-19 in March of 2020 when circumstances surrounding and responses to the pandemic, including stay-at-home orders, began to materialize in North America. These disruptions are expected to have a significant adverse impact on the Company's operating results during the second quarter of 2020 and the remainder of the year. The full extent of the COVID-19 outbreak and changes in demand for oil and the impact on the Company’s operations is uncertain. A prolonged disruption could have a material adverse impact on financial results and business operations of the Company.

In addition and in response to the COVID-19 outbreak, the Company has seen increased demand in emergency response services. Specifically the Company is addressing the safety of its customers and communities by providing contagion decontamination services. In conducting these services, employee safety is paramount and the Company has been able to provide appropriate personal protective equipment and support to those performing these services.

(2) SIGNIFICANT ACCOUNTING POLICIES

The Company's significant accounting policies are described in Note 2, "Significant Accounting Policies," in the Company's Annual Report on Form 10-K for the year ended December 31, 2019 . There have been no material changes in these policies or their application except for the changes described below.

Landfill Accounting

Landfill capacity - As of March 31, 2020, the Company initiated a plan to close one of the Company's commercial landfill sites. The planned closure will nominally reduce the Company's remaining highly probable airspace. See Note 9, "Closure and Post-Closure Liabilities," for additional information.

(3) REVENUES

The Company generates revenues through its Environmental Services and Safety-Kleen operating segments. The Company's Environmental Services operating segment generally has the following three sources of revenue:

Technical Services —Technical Services revenues are generated from fees charged for waste material management and disposal services including onsite environmental management services, collection and transportation, packaging, recycling, treatment and disposal of waste. Revenue is primarily generated by short-term projects, most of which are governed by master service agreements that are long-term in nature. These master service agreements are typically entered into with the Company's larger customers and outline the pricing and legal frameworks for such arrangements. Services are provided based on purchase orders or agreements with the customer and include prices based upon units of volume of waste and transportation and other fees. Collection and transportation revenues are recognized over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. Revenues for treatment and disposal of waste are recognized upon completion of treatment, final disposition in a landfill or incineration, or when the waste is shipped to a third party for processing and disposal. The Company periodically enters into bundled arrangements for

the collection and transportation and disposal of waste. For such arrangements, transportation and disposal are considered distinct performance obligations and the Company allocates revenue to each based on the relative standalone selling price (i.e. the estimated price that a customer would pay for the services on a standalone basis). Revenues from waste that is not yet completely processed and disposed and the related costs are deferred. The deferred revenues and costs are recognized when the related services are completed. The period between collection and transportation and the final processing and disposal ranges depending on location of the customer, but generally is measured in days.

Field and Emergency Response Services —Field Services revenues are generated from cleanup services at customer sites, including municipalities and utilities, or other locations on a scheduled or emergency response basis. Services include confined space entry for tank cleaning, site decontamination, large remediation projects, demolition, spill cleanup on land and water, railcar cleaning, product recovery and transfer and vacuum services. Additional services include filtration and water treatment services. Response services for environmental, contamination or pandemic related emergencies include any scale from man-made disasters such as oil spills, to natural disasters such as hurricanes. More recently demand has increased for projects involving contagion decontamination services in response to the COVID-19 pandemic. Field and emergency response services are provided based on purchase orders or agreements with customers and include prices generally based upon daily, hourly or job rates for equipment, materials and personnel. The Company recognizes revenue for these services over time, as the customer receives and consumes the benefits of the service as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. The duration of such services can be over a number of hours, several days or even months for larger scale projects.

Industrial Services and Other —Industrial Services revenues are primarily generated from industrial and specialty services provided to refineries, mines, upgraders, chemical plants, pulp and paper mills, manufacturing facilities, power generation facilities and other industrial customers throughout North America. Services include in-plant cleaning and maintenance services, plant outage and turnaround services, decoking and pigging, chemical cleaning, high and ultra-high pressure water cleaning, pipeline inspection and coating services, large tank and surface impoundment cleaning, oilfield transport, daylighting, production services and upstream energy services, such as exploration and drilling for industrial oil and gas customers. Services are provided based on purchase orders or agreements with the customer and include prices based upon daily, hourly or job rates for equipment, materials and personnel. The Company recognizes revenue for these services over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred.

The Company's Safety-Kleen operating segment generally has the following two sources of revenue:

Safety-Kleen Environmental Services —Safety-Kleen Environmental Services revenues are generated from providing parts washer services, containerized waste handling and disposal services, oil collection services, vacuum services, direct sales of blended oil products and other complementary services and product sales. Containerized waste services consist of profiling, collecting, transporting and recycling or disposing of a wide variety of waste. Other products and services include sale of complementary supply products including automotive fluids and shop supplies and other environmental services. Parts washer services include customer use of our parts washer equipment, cleaning and maintenance of the parts washer equipment and removal and replacement of used cleaning fluids. Parts washer services are considered a single performance obligation due to the highly integrated and interdependent nature of the arrangement. Revenue from parts washer services is recognized over the service interval as the customer receives the benefit of the services. Collection and transportation revenues are recognized over time, as the customer receives and consumes the benefits of the services as they are being performed and the Company has a right to payment for performance completed to date. The Company uses the input method to recognize revenue over time, based on time and materials incurred. Product revenue is recognized upon the transfer of control whereby control transfers when the products are delivered to the customer.

Safety-Kleen Oil —Revenues from Safety-Kleen Oil are generated from sales of high-quality base and blended lubricating oils to third-party distributors, government agencies, fleets, railroads and industrial customers. The business also sells recycled fuel oil to asphalt plants, industrial plants and pulp and paper companies. The used oil is also processed into vacuum gas oil which can be further re-refined into lubricant base oils or sold directly into the marine diesel oil fuel market. Revenue for oil products is recognized at a point in time, upon the transfer of control. Control transfers when the products are delivered to the customer.

Disaggregation of Revenue

We disaggregate the Company's third party revenues by geographic location and source of revenue as we believe these categories depict how revenue and cash flows are affected by economic factors (in thousands):

	For the Three Months Ended March 31, 2020			
	Environmental Services	Safety-Kleen	Corporate	Total
Primary Geographical Markets				
United States	$ 440,014	$ 306,533	$ (302)	$ 746,245
Canada	88,090	23,836	392	112,318
Total third-party revenues	$ 528,104	$ 330,369	$ 90	$ 858,563
Sources of Revenue (1)				
Technical Services	$ 275,273	$ —	$ —	$ 275,273
Field and Emergency Response Services	105,912	—	—	105,912
Industrial Services and Other	146,919	—	90	147,009
Safety-Kleen Environmental Services	—	214,481	—	214,481
Safety-Kleen Oil	—	115,888	—	115,888
Total third-party revenues	$ 528,104	$ 330,369	$ 90	$ 858,563

	For the Three Months Ended March 31, 2019			
	Environmental Services	Safety-Kleen	Corporate	Total
Primary Geographical Markets				
United States	$ 388,169	$ 286,574	$ 594	$ 675,337
Canada	85,529	19,973	—	105,502
Total third-party revenues	$ 473,698	$ 306,547	$ 594	$ 780,839
Sources of Revenue (1)				
Technical Services	$ 251,919	$ —	$ —	$ 251,919
Field and Emergency Response Services	71,626	—	—	71,626
Industrial Services and Other (2)	150,153	—	594	150,747
Safety-Kleen Environmental Services	—	207,083	—	207,083
Safety-Kleen Oil	—	99,464	—	99,464
Total third-party revenues	$ 473,698	$ 306,547	$ 594	$ 780,839

(1) All revenue except oil and oil product sales within Safety-Kleen Oil and product sales within Safety-Kleen Environmental Services, which include various automotive related fluids, shop supplies and direct blended oil sales, are recognized over time. Safety-Kleen Oil and Safety-Kleen Environmental Services product sales are recognized at a point in time.
(2) Third-party revenues of $34,055 and $594 , respectively, previously reported as Oil, Gas and Lodging Services and Other for the three months ended March 31, 2019 are now disclosed within Industrial Services and Other based on relative materiality to the business.

Contract Balances

(in thousands)	March 31, 2020	December 31, 2019
Receivables	$ 658,482	$ 644,738
Contract assets (unbilled receivables)	51,215	56,326
Contract liabilities (deferred revenue)	71,243	73,370

The timing of revenue recognition, billings and cash collections results in billed accounts receivable, unbilled receivables (contract assets) and customer advances and deposits or deferred revenue (contract liabilities) on the consolidated balance sheet. Generally, billing occurs subsequent to revenue recognition, as a right to payment is not just subject to passage of time, resulting in contract assets. Contract assets are generally classified as current. The Company sometimes receives advances or deposits from its customers before revenue is recognized, resulting in contract liabilities. These assets and liabilities are

reported on the consolidated balance sheet on a contract-by-contract basis at the end of each reporting period. The contract liability balances at the beginning of each period presented were generally fully recognized in the subsequent three-month period.

(4) BUSINESS COMBINATIONS

2019 Acquisitions

On May 31, 2019 , the Company acquired a privately-owned business for $14.8 million cash consideration. The acquired company expands the environmental services and hazardous materials management services of the Company and is included in the Environmental Services segment. In connection with this acquisition, a preliminary goodwill amount of $7.4 million was recognized.

On March 1, 2019 , the Company acquired certain assets of a privately-owned business for $10.4 million cash consideration. The acquired business complements the Safety-Kleen segment's core service offerings, such as used motor oil collection, parts washers, oil filter recycling and vacuum services. In connection with this acquisition, a goodwill amount of $5.2 million was recognized.

(5) INVENTORIES AND SUPPLIES

Inventories and supplies consisted of the following (in thousands):

	March 31, 2020	December 31, 2019
Oil and oil related products	$ 76,563	$ 75,408
Supplies and drums	116,526	115,128
Solvent and solutions	9,763	9,973
Other	13,680	14,235
Total inventories and supplies	$ 216,532	$ 214,744

Supplies and drums consist primarily of drums and containers used in providing the Company's products and services as well as critical spare parts to support the Company's incinerator and re-refinery operations. Other inventories consisted primarily of parts washer components, cleaning fluids, absorbents and automotive fluids, such as windshield washer fluid and antifreeze.

(6) PROPERTY, PLANT AND EQUIPMENT

Property, plant and equipment consisted of the following (in thousands):

	March 31, 2020	December 31, 2019
Land	$ 134,483	$ 131,023
Asset retirement costs (non-landfill)	15,863	15,924
Landfill assets	179,217	182,276
Buildings and improvements [1]	491,415	499,159
Camp equipment	150,279	158,277
Vehicles [2]	782,669	785,056
Equipment	1,743,261	1,779,366
Furniture and fixtures	6,804	6,054
Construction in progress	23,289	36,679
	3,527,280	3,593,814
Less - accumulated depreciation and amortization	1,980,161	2,005,663
Total property, plant and equipment, net	$ 1,547,119	$ 1,588,151

(1) Balances inclusive of gross ROU assets classified as finance leases of $8.0 million and $31.0 million , respectively.
(2) Balances inclusive of gross ROU assets classified as finance leases of $23.5 million and $2.4 million , respectively.

Depreciation expense, inclusive of landfill and finance lease amortization, was $65.4 million and $65.9 million for the three months ended March 31, 2020 and March 31, 2019 , respectively.

(7) GOODWILL AND OTHER INTANGIBLE ASSETS

The changes in goodwill by segment for the three months ended March 31, 2020 were as follows (in thousands):

	Environmental Services	Safety-Kleen	Totals
Balance at January 1, 2020	$ 212,531	$ 312,482	$ 525,013
Measurement period adjustments from prior period acquisitions	54	—	54
Decrease from disposition of businesses	(649)	—	(649)
Foreign currency translation	(2,223)	(2,568)	(4,791)
Balance at March 31, 2020	$ 209,713	$ 309,914	$ 519,627

The Company assesses goodwill for impairment on an annual basis as of December 31 or at an interim date when events or changes in the business environment (triggering events) would more likely than not reduce the fair value of a reporting unit below its carrying value. During the period ended March 31, 2020, the Company considered the effects of COVID-19 and evolving changes in demand and pricing for oil, but concluded that there were no triggering events requiring an impairment assessment. This conclusion was based on a qualitative analysis incorporating (i) the significant excess fair value that previously existed in each reporting unit and (ii) assessing the current and long-term performance of the Company given the expectation that these negative effects on the operations and cash flows of each reporting unit arising from COVID-19 related disruptions will be short lived.

The Company will continue to evaluate the impact of macroeconomic conditions including, but not limited to, the impact of the COVID-19 pandemic on the Company, customers and the greater economy as well as the impact on trends of oil demand. If these macroeconomic conditions are protracted or result in significant changes in demand for our products and services, a goodwill impairment might be identified and the amount might be material.

As of March 31, 2020 and December 31, 2019 , the Company's intangible assets consisted of the following (in thousands):

	March 31, 2020			December 31, 2019		
	Cost	Accumulated Amortization	Net	Cost	Accumulated Amortization	Net
Permits	$ 181,095	$ 87,790	$ 93,305	$ 184,235	$ 87,228	$ 97,007
Customer and supplier relationships	386,197	199,915	186,282	401,696	207,884	193,812
Other intangible assets	36,632	31,435	5,197	38,331	33,018	5,313
Total amortizable permits and other intangible assets	603,924	319,140	284,784	624,262	328,130	296,132
Trademarks and trade names	122,097	—	122,097	122,934	—	122,934
Total permits and other intangible assets	$ 726,021	$ 319,140	$ 406,881	$ 747,196	$ 328,130	$ 419,066

Amortization expense of permits and other intangible assets was $9.2 million and $9.5 million in the three months ended March 31, 2020 and March 31, 2019 , respectively.

The expected amortization of the net carrying amount of finite-lived intangible assets at March 31, 2020 was as follows (in thousands):

Years Ending December 31,	Expected Amortization
2020 (nine months)	$ 24,393
2021	29,683
2022	29,429
2023	25,245
2024	23,783
Thereafter	152,251
	$ 284,784

(8) ACCRUED EXPENSES

Accrued expenses consisted of the following (in thousands):

	March 31, 2020	December 31, 2019
Accrued insurance	$ 71,565	$ 74,376
Accrued interest	9,224	21,222
Accrued compensation and benefits	43,771	72,473
Accrued income, real estate, sales and other taxes	41,751	35,749
Accrued other	89,202	72,720
	$ 255,513	$ 276,540

(9) CLOSURE AND POST-CLOSURE LIABILITIES

The changes to closure and post-closure liabilities (also referred to as “asset retirement obligations”) from January 1, 2020 through March 31, 2020 were as follows (in thousands):

	Landfill Retirement Liability	Non-Landfill Retirement Liability	Total
Balance at January 1, 2020	$ 39,401	$ 36,250	$ 75,651
New asset retirement obligations	590	—	590
Accretion	705	820	1,525
Changes in estimates recorded to statement of operations	4,180	(67)	4,113
Expenditures	(521)	(320)	(841)
Currency translation and other	(453)	(146)	(599)
Balance at March 31, 2020	$ 43,902	$ 36,537	$ 80,439

As of March 31, 2020, the Company initiated a plan to close one of its the commercial landfill sites resulting in a $4.2 million increase to the related closure and post closure liability. The remaining ten landfill facilities remain active as of March 31, 2020 . In the three months ended March 31, 2020 , other than this charge, there were no significant charges (benefits) resulting from changes in estimates for closure and post-closure liabilities.

New asset retirement obligations incurred during the first three months of 2020 were discounted at the credit-adjusted risk-free rate of 5.60% .

(10) REMEDIAL LIABILITIES

The changes to remedial liabilities from January 1, 2020 through March 31, 2020 were as follows (in thousands):

	Remedial Liabilities for Landfill Sites	Remedial Liabilities for Inactive Sites	Remedial Liabilities (Including Superfund) for Non-Landfill Operations	Total
Balance at January 1, 2020	$ 1,851	$ 61,991	$ 50,331	$ 114,173
Accretion	22	599	415	1,036
Changes in estimates recorded to statement of operations	1	(362)	(282)	(643)
Expenditures	(15)	(1,256)	(1,323)	(2,594)
Currency translation and other	—	(43)	(1,065)	(1,108)
Balance at March 31, 2020	$ 1,859	$ 60,929	$ 48,076	$ 110,864

In the three months ended March 31, 2020 , there were no significant charges (benefits) resulting from changes in estimates for remedial liabilities.

(11) FINANCING ARRANGEMENTS

The following table is a summary of the Company's financing arrangements (in thousands):

Current Obligations:	March 31, 2020	December 31, 2019
Secured senior term loans ("Term Loans")	$ 7,535	$ 7,535
Long-Term Obligations:		
Secured senior Term Loans due June 30, 2024	$ 725,278	$ 727,162
Unsecured senior notes, at 4.875%, due July 15, 2027 ("2027 Notes")	545,000	545,000
Unsecured senior notes, at 5.125%, due July 15, 2029 ("2029 Notes")	300,000	300,000
Revolving credit facility	150,000	—
Long-term obligations, at par	$ 1,720,278	$ 1,572,162
Unamortized debt issuance costs and premium, net	(17,286)	(18,046)
Long-term obligations, at carrying value	$ 1,702,992	$ 1,554,116

Financing Activities

As of March 31, 2020 and December 31, 2019 , the estimated fair value of the Company's outstanding long-term obligations, including the current portion, was $1.7 billion and $1.6 billion , respectively. The Company's estimates of fair value of its long-term obligations, including the current portion, are based on quoted market prices or other available market data which are considered Level 2 measures according to the fair value hierarchy. Level 2 utilizes quoted market prices in markets that are not active, broker or dealer quotation, or alternative pricing sources with reasonable levels of price transparency for similar assets and liabilities.

The Company maintains a $400.0 million revolving credit facility expiring November 1, 2021. On March 31, 2020 , the Company drew down $150.0 million on the revolving credit facility out of an abundance of caution given the macroeconomic uncertainties surrounding the COVID-19 global pandemic. As of March 31, 2020 , the Company had $80.7 million available to borrow under the revolving credit facility and outstanding letters of credit were $141.2 million . At December 31, 2019 , $229.2 million was available to borrow and outstanding letters of credit were $146.9 million .

Cash Flow Hedges

The Company's strategy to hedge against fluctuations in variable interest rates involves entering into interest rate derivative agreements. Although the interest rate on the Term Loans is variable, the Company has effectively fixed the interest rate on $350.0 million aggregate principal amount of the Term Loans outstanding by entering into interest rate swap agreements in 2018 with a notional amount of $350.0 million . Under the terms of the interest rate swap agreements, the Company receives interest based on the one-month LIBOR index and pays interest at a weighted average annual interest rate of approximately 2.92% , resulting in an effective annual interest rate of approximately 4.67% .

The Company recognizes derivative instruments as either assets or liabilities on the balance sheet at fair value. No ineffectiveness has been identified on these swaps and, therefore, all unrealized changes in fair value are recorded in accumulated other comprehensive loss. Amounts are reclassified from accumulated other comprehensive loss into interest expense on the statement of operations in the same period or periods during which the hedged transaction affects earnings.

As of March 31, 2020 and December 31, 2019 , the Company has recorded a derivative liability with a fair value of $38.1 million and $20.8 million , respectively, within accrued expenses in connection with these cash flow hedges.

The fair value of the interest rate swaps is calculated using discounted cash flow valuation methodologies based upon the one-month LIBOR yield curves that are observable at commonly quoted intervals for the full term of the interest rate swaps and as such is considered a Level 2 measure according to the fair value hierarchy.

(12) INCOME TAXES

The Company records a tax provision or benefit on an interim basis using an estimated annual effective tax rate. This rate is applied to the current period ordinary income or loss to determine the income tax provision or benefit allocated to the interim period. Losses from jurisdictions for which no benefit can be recognized and the income tax effects of unusual or infrequent items are excluded from the estimated annual effective tax rate and are recognized in the impacted interim period. The estimated annual effective tax rate may be significantly impacted by projected earnings mix by tax jurisdiction. Adjustments to the estimated annual effective income tax rate are recognized in the period when such estimates are revised.

The Company's effective tax rate for the three months ended March 31, 2020 was 45.6% , compared to 86.0% for the comparable period in 2019 .

As of March 31, 2020 and December 31, 2019 , the Company had recorded $5.9 million and $6.4 million , respectively, of liabilities for unrecognized tax benefits and $1.7 million of interest.

The Company's tax years 2014-2016 are currently under review by the Internal Revenue Service (the "IRS"). The Company does not believe the examination will result in material adjustments to previously filed returns.

The Company believes that within the next 12 months uncertain tax positions may be resolved and statutes of limitations will expire which could result in a decrease in the gross amount of unrecognized tax benefits of $1.0 million .

(13) EARNINGS PER SHARE

The following are computations of basic and diluted earnings per share (in thousands, except per share amounts):

	Three Months Ended March 31,	
	2020	2019
Numerator for basic and diluted earnings per share:		
Net income	$ 11,572	$ 976
Denominator:		
Basic shares outstanding	55,757	55,848
Dilutive effect of outstanding stock awards	298	234
Dilutive shares outstanding	56,055	56,082
Basic earnings per share:	$ 0.21	$ 0.02
Diluted earnings per share:	$ 0.21	$ 0.02

For the three months ended March 31, 2020 and March 31, 2019 , all then outstanding performance awards and restricted stock awards were included in the calculation of diluted earnings per share except for 121,726 and 78,271 , respectively, of performance stock awards for which the performance criteria were not attained at the time and 9,925 and 27,357 , respectively, of restricted stock awards which were excluded as their inclusion would have an antidilutive effect.

(14) ACCUMULATED OTHER COMPREHENSIVE LOSS

The changes in accumulated other comprehensive loss by component and related tax effects for the three months ended March 31, 2020 were as follows (in thousands):

	Foreign Currency Translation	Unrealized (Losses) Gains on Available-For-Sale Securities	Unrealized Loss on Interest Rate Hedge	Unfunded Pension Liability	Total
Balance at January 1, 2020	$ (187,795)	$ 143	$ (20,839)	$ (1,560)	$ (210,051)
Other comprehensive loss before reclassifications	(43,307)	(81)	(18,382)	—	(61,770)
Amounts reclassified out of accumulated other comprehensive loss	—	—	1,098	—	1,098
Tax gain	1,349	17	—	—	1,366
Other comprehensive loss	(41,958)	(64)	(17,284)	—	(59,306)
Balance at March 31, 2020	$ (229,753)	$ 79	$ (38,123)	$ (1,560)	$ (269,357)

The amount reclassified out of accumulated other comprehensive loss into the consolidated statement of operations, with presentation location, during the three months ended March 31, 2020 was as follows (in thousands):

Other Comprehensive (Loss) Income Components	For the Three Months Ended March 31, 2020	Location
Unrealized loss on interest rate hedge	$ (1,098)	Interest expense, net of interest income

(15) STOCK-BASED COMPENSATION

Total stock-based compensation cost charged to selling, general and administrative expenses for the three months ended March 31, 2020 and March 31, 2019 was $3.3 million and $5.8 million , respectively. The total income tax benefit recognized in the consolidated statements of operations from stock-based compensation expense for the three months ended March 31, 2020 and March 31, 2019 was $0.8 million and $1.1 million , respectively.

Restricted Stock Awards

The following table summarizes information about restricted stock awards for the three months ended March 31, 2020 :

Restricted Stock	Number of Shares	Weighted Average Grant-Date Fair Value
Balance at January 1, 2020	522,597	$ 59.57
Granted	9,316	80.07
Vested	(66,779)	55.09
Forfeited	(3,009)	61.85
Balance at March 31, 2020	462,125	60.62

As of March 31, 2020 , there was $17.9 million of total unrecognized compensation cost arising from restricted stock awards. This cost is expected to be recognized over a weighted average period of 2.5 years. The total fair value of restricted stock vested during the three months ended March 31, 2020 and March 31, 2019 was $5.3 million and $3.2 million , respectively.

Performance Stock Awards

Performance stock awards are subject to performance criteria established by the compensation committee of the Company's board of directors prior to or at the date of grant. The vesting of the performance stock awards is based on achieving targets typically based on revenue, Adjusted EBITDA margin, Adjusted Free Cash Flow and Total Recordable Incident Rate. In addition, performance stock awards include continued service conditions.

The following table summarizes information about performance stock awards for the three months ended March 31, 2020 :

Performance Stock	Number of Shares	Weighted Average Grant-Date Fair Value
Balance at January 1, 2020	204,553	$ 64.78
Granted	—	—
Vested	(23,222)	55.75
Forfeited	(1,854)	64.13
Balance at March 31, 2020	179,477	65.95

As of March 31, 2020 , there was $1.2 million of total unrecognized compensation cost arising from unvested performance stock awards deemed probable of vesting. The total fair value of performance awards vested during the three months ended March 31, 2020 and March 31, 2019 was $1.3 million and $2.9 million , respectively.

(16) COMMITMENTS AND CONTINGENCIES

Legal and Administrative Proceedings

The Company and its subsidiaries are subject to legal proceedings and claims arising in the ordinary course of business. Actions filed against the Company arise from commercial and employment-related claims including alleged class actions related to sales practices and wage and hour claims. The plaintiffs in these actions may be seeking damages or injunctive relief or both. These actions are in various jurisdictions and stages of proceedings, and some are covered in part by insurance. In addition, the Company’s waste management services operations are regulated by federal, state, provincial and local laws enacted to regulate discharge of materials into the environment, remediation of contaminated soil and groundwater or otherwise protect the environment. This ongoing regulation results in the Company frequently becoming a party to legal or administrative proceedings involving all levels of governmental authorities and other interested parties. The issues involved in such proceedings generally relate to alleged violations of existing permits and licenses or alleged responsibility under federal or state Superfund laws to remediate contamination at properties owned either by the Company or by other parties (“third-party sites”) to which either the Company or the prior owners of certain of the Company’s facilities shipped waste.

At March 31, 2020 and December 31, 2019 , the Company had recorded reserves of $23.6 million and $26.0 million , respectively, in the Company's financial statements for actual or probable liabilities related to the legal and administrative proceedings in which the Company was then involved, the principal of which are described below. In management's opinion, it is not reasonably possible that the potential liability beyond what has been recorded, if any, that may result from these actions, either individually or collectively, will have a material effect on our financial position, results of operations or cash flows. The Company periodically adjusts the aggregate amount of these reserves when actual or probable liabilities are paid or otherwise discharged, new claims arise or additional relevant information about existing or probable claims becomes available. As of March 31, 2020 and December 31, 2019 , the $23.6 million and $26.0 million , respectively, of reserves consisted of (i) $17.2 million and $18.4 million , respectively, related to pending legal or administrative proceedings, including Superfund liabilities, which were included in remedial liabilities on the consolidated balance sheets, and (ii) $6.4 million and $7.6 million , respectively, primarily related to federal, state and provincial enforcement actions, which were included in accrued expenses on the consolidated balance sheets.

As of March 31, 2020 , the principal legal and administrative proceedings in which the Company was involved, or which had been terminated during 2020 , were as follows:

Ville Mercier. In September 2002, the Company acquired the stock of a subsidiary (the "Mercier Subsidiary") which owns a hazardous waste incinerator in Ville Mercier, Quebec (the "Mercier Facility"). The property adjacent to the Mercier Facility, which is also owned by the Mercier Subsidiary, is now contaminated as a result of actions dating back to 1968, when the Government of Quebec issued two permits to dump organic liquids into lagoons on the property to a company unrelated to the Mercier Subsidiary. In 1999, Ville Mercier and three neighboring municipalities filed separate legal proceedings against the Mercier Subsidiary and the Government of Quebec. In 2012, the municipalities amended their existing statement of claim to seek $2.9 million (CAD) in general damages and $10.0 million (CAD) in punitive damages, plus interest and costs, as well as injunctive relief. Both the Government of Quebec and the Company have filed summary judgment motions against the municipalities. The parties are attempting to negotiate a resolution and hearings on the motions have been delayed. In September 2007, the Quebec Minister of Sustainable Development, Environment and Parks issued a notice pursuant to Section 115.1 of the Environment Quality Act, superseding notices issued in 1992, which are the subject of the pending litigation. The more recent notice notifies the Mercier Subsidiary that, if the Mercier Subsidiary does not take certain remedial measures at the site, the Minister intends to undertake those measures at the site and claim direct and

indirect costs related to such measures. The Company has accrued for costs expected to be incurred relative to the resolution of this matter and believes this matter will not have future material effect on its financial position, results of operations or cash flows.

Safety-Kleen Legal Proceedings. On December 28, 2012, the Company acquired Safety-Kleen, Inc. ("Safety-Kleen") and thereby became subject to the legal proceedings in which Safety-Kleen was a party on that date. In addition to certain Superfund proceedings in which Safety-Kleen has been named as a potentially responsible party as described below under “Superfund Proceedings,” the principal such legal proceedings involving Safety-Kleen which were outstanding as of March 31, 2020 were as follows:

Product Liability Cases. Safety-Kleen has been named as a defendant in various lawsuits that are currently pending in various courts and jurisdictions throughout the United States, including approximately 60 proceedings (excluding cases which have been settled but not formally dismissed) as of March 31, 2020 , wherein persons claim personal injury resulting from the use of Safety-Kleen's parts cleaning equipment or cleaning products. These proceedings typically involve allegations that the solvent used in Safety-Kleen's parts cleaning equipment contains contaminants and/or that Safety-Kleen's recycling process does not effectively remove the contaminants that become entrained in the solvent during their use. In addition, certain claimants assert that Safety-Kleen failed to adequately warn the product user of potential risks, including a historic failure to warn that solvent contains trace amounts of toxic or hazardous substances such as benzene.

The Company maintains insurance that it believes will provide coverage for these product liability claims (over amounts accrued for self-insured retentions and deductibles in certain limited cases), except for punitive damages to the extent not insurable under state law or excluded from insurance coverage. The Company also believes that these claims lack merit and has historically vigorously defended, and intends to continue to vigorously defend, itself and the safety of its products against all these claims. Such matters are subject to many uncertainties and outcomes are not predictable with assurance. Consequently, the Company is unable to ascertain the ultimate aggregate amount of monetary liability or financial impact with respect to these matters as of March 31, 2020 . From January 1, 2020 to March 31, 2020 , three product liability claims were settled or dismissed. Due to the nature of these claims and the related insurance, the Company did not incur any expense as insurance provided coverage in full for all such claims. Safety-Kleen may be named in similar, additional lawsuits in the future, including claims for which insurance coverage may not be available.

Superfund Proceedings

The Company has been notified that either the Company (which, since December 28, 2012, includes Safety-Kleen) or the prior owners of certain of the Company's facilities for which the Company may have certain indemnification obligations have been identified as potentially responsible parties ("PRPs") or potential PRPs in connection with 130 sites which are subject to or are proposed to become subject to proceedings under federal or state Superfund laws. Of the 130 sites, five (including the BR Facility described below) involve facilities that are now owned or leased by the Company and 125 involve third-party sites to which either the Company or the prior owners of certain of the Company’s facilities shipped wastes. Of the 125 third-party sites, 31 are now settled, 78 are currently requiring expenditures on remediation and 16 are not currently requiring expenditures on remediation.

In connection with each site, the Company has estimated the extent, if any, to which it may be subject, either directly or as a result of any indemnification obligations, for cleanup and remediation costs, related legal and consulting costs associated with PRP investigations, settlements and related legal and administrative proceedings. The amount of such actual and potential liability is inherently difficult to estimate because of, among other relevant factors, uncertainties as to the legal liability, if any, of the Company or the prior owners of certain of the Company's facilities to contribute a portion of the cleanup costs, the assumptions that must be made in calculating the estimated cost and timing of remediation, the identification of other PRPs and their respective capability and obligation to contribute to remediation efforts and the existence and legal standing of indemnification agreements, if any, with prior owners, which may either benefit the Company or subject the Company to potential indemnification obligations. The Company believes its potential liability could exceed $100,000 at 10 of the 125 third-party sites.

BR Facility. The Company acquired in 2002 a former hazardous waste incinerator and landfill in Baton Rouge (the "BR Facility"), for which operations had been previously discontinued by the prior owner. In September 2007, the U.S. Environmental Protection Agency ("EPA") issued a special notice letter to the Company related to the Devil's Swamp Lake Site ("Devil's Swamp") in East Baton Rouge Parish, Louisiana. Devil's Swamp includes a lake located downstream of an outfall ditch where wastewater and storm water have been discharged, and Devil's Swamp is proposed to be included on the National Priorities List due to the presence of Contaminants of Concern ("COC") cited by the EPA. These COCs include substances of the kind found in wastewater and storm water discharged from the BR Facility in past operations. The EPA originally requested COC generators to submit a good faith offer to conduct a remedial investigation feasibility study directed towards the eventual remediation of the site. In 2018, the Company completed performing corrective actions at the BR Facility under an order issued by the Louisiana Department of Environmental Quality and has also completed conducting the remedial investigation and feasibility study for Devil's Swamp under an order issued

by the EPA. The Company cannot presently estimate the potential additional liability for the Devil's Swamp cleanup until a final remedy is selected by the EPA with issuance of a Record of Decision.

Third-Party Sites. Of the 125 third-party sites at which the Company has been notified it is a PRP or potential PRP or may have indemnification obligations, Clean Harbors has an indemnification agreement at 11 of these sites with ChemWaste, a former subsidiary of Waste Management, Inc., and at six additional of these third-party sites, Safety-Kleen has a similar indemnification agreement with McKesson Corporation. These agreements indemnify the Company (which now includes Safety-Kleen) with respect to any liability at the 17 sites for waste disposed prior to the Company's (or Safety-Kleen's) acquisition of the former subsidiaries of Waste Management and McKesson which had shipped wastes to those sites. Accordingly, Waste Management or McKesson are paying all costs of defending those subsidiaries in those 17 cases, including legal fees and settlement costs. However, there can be no guarantee that the Company's ultimate liabilities for those sites will not exceed the amount recorded or that indemnities applicable to any of these sites will be available to pay all or a portion of related costs. Except for the indemnification agreements which the Company holds from ChemWaste, McKesson and two other entities, the Company does not have an indemnity agreement with respect to any of the 125 third-party sites discussed above.

Federal, State and Provincial Enforcement Actions

From time to time, the Company pays fines or penalties in regulatory proceedings relating primarily to waste treatment, storage or disposal facilities. As of March 31, 2020 and December 31, 2019 , there were 12 proceedings for which the Company reasonably believes that the sanctions could equal or exceed $100,000 . The Company believes that the fines or other penalties in these or any of the other regulatory proceedings will, individually or in the aggregate, not have a material effect on its financial condition, results of operations or cash flows.

(17) SEGMENT REPORTING

Segment reporting is prepared on the same basis that the Company's chief executive officer, who is the Company's chief operating decision maker, manages the business, makes operating decisions and assesses performance. The Company is managed and reports as two operating segments *;* (i) the Environmental Services segment and (ii) the Safety-Kleen segment.

Third-party revenue is revenue billed to outside customers by a particular segment. Direct revenues is revenue allocated to the segment providing the product or service. Intersegment revenues represent the sharing of third-party revenues among the segments based on products and services provided by each segment as if the products and services were sold directly to the third-party. The intersegment revenues are shown net. The operations not managed through the Company’s operating segments described above are recorded as “Corporate Items.”

The following table reconciles third-party revenues to direct revenues for the three months ended March 31, 2020 and March 31, 2019 (in thousands):

	For the Three Months Ended March 31, 2020				For the Three Months Ended March 31, 2019			
	Third-party revenues	Intersegment revenues, net	Corporate Items, net	Direct revenues	Third-party revenues	Intersegment revenues, net	Corporate Items, net	Direct revenues
Environmental Services	$ 528,104	$ 37,163	$ 1,095	$ 566,362	$ 473,698	$ 34,075	$ 1,249	$ 509,022
Safety-Kleen	330,369	(37,163)	6	293,212	306,547	(34,075)	5	272,477
Corporate Items	90	—	(1,101)	(1,011)	594	—	(1,254)	(660)
Total	$ 858,563	$ —	$ —	$ 858,563	$ 780,839	$ —	$ —	$ 780,839

The primary financial measure by which the Company evaluates the performance of its segments is "Adjusted EBITDA," which consists of net income plus accretion of environmental liabilities, depreciation and amortization, net interest expense, loss on early extinguishment of debt, provision for income taxes and other gains, losses or non-cash charges not deemed representative of fundamental segment results and other expense (income), net. Transactions between the segments are accounted for at the Company’s best estimate based on similar transactions with outside customers.

The following table presents Adjusted EBITDA information used by management by reported segment (in thousands):

	For the Three Months Ended March 31,	
	2020	2019
Adjusted EBITDA:		
Environmental Services	$ 108,914	$ 89,510
Safety-Kleen	61,148	54,793
Corporate Items	(47,472)	(42,640)
Total	122,590	101,663
Reconciliation to Consolidated Statements of Operations:		
Accretion of environmental liabilities	2,561	2,574
Depreciation and amortization	74,533	75,355
Income from operations	45,496	23,734
Other expense (income), net	2,365	(2,983)
Loss on sale of businesses	3,074	—
Interest expense, net of interest income	18,787	19,764
Income before provision for income taxes	$ 21,270	$ 6,953

The following table presents certain assets by reportable segment and in the aggregate (in thousands):

	March 31, 2020	December 31, 2019
Property, plant and equipment, net:		
Environmental Services	$ 909,207	$ 939,352
Safety-Kleen	552,879	555,310
Corporate Items	85,033	93,489
Total property, plant and equipment, net	$ 1,547,119	$ 1,588,151
Goodwill and Permits and other intangibles, net:		
Environmental Services		
Goodwill	$ 209,713	$ 212,531
Permits and other intangibles, net	85,165	89,722
Total Environmental Services	294,878	302,253
Safety-Kleen		
Goodwill	$ 309,914	$ 312,482
Permits and other intangibles, net	321,716	329,344
Total Safety-Kleen	631,630	641,826
Total	$ 926,508	$ 944,079

The following table presents the total assets by geographical area (in thousands):

	March 31, 2020	December 31, 2019
United States	$ 3,521,439	$ 3,413,254
Canada and other foreign	610,582	695,650
Total	$ 4,132,021	$ 4,108,904

ITEM 2. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Forward-Looking Statements

In addition to historical information, this Quarterly Report on Form 10-Q contains forward-looking statements, which are generally identifiable by use of the words "believes," "expects," "intends," "anticipates," "plans to," "seeks," "should," "estimates," "projects," "may," "likely" or similar expressions. Such statements may include, but are not limited to, statements about future financial and operating results, the Company's plans, objectives, expectations and intentions and other statements that are not historical facts. Forward-looking statements are neither historical facts nor assurances of future performance. Such statements are based upon the beliefs and expectations of Clean Harbors' management as of this date only and are subject to certain risks and uncertainties that could cause actual results to differ materially, including, without limitation, the risks and uncertainties surrounding Coronavirus ("COVID-19") and the related impact on our business, and those items identified as "Risk Factors," in this report under Item 1A and in our Annual Report on Form 10-K filed with the Securities and Exchange Commission on February 26, 2020, and in other documents we file from time to time with the SEC. Therefore, readers are cautioned not to place undue reliance on these forward-looking statements, which reflect management's opinions only as of the date hereof. Our actual results and financial condition may differ materially from those indicated in the forward-looking statements. Clean Harbors undertakes no obligation to revise or publicly release the results of any revision to these forward-looking statements other than through its filings with the SEC, which may be viewed in the "Investors" section of the Clean Harbors website.

Overview

We are North America's leading provider of environmental and industrial services supporting our customers in finding environmentally responsible solutions to further their sustainability goals in today's world. We believe we operate, in the aggregate, the largest number of hazardous waste incinerators, landfills and treatment, storage and disposal facilities ("TSDFs") in North America. We serve a diverse customer base, including Fortune 500 companies, across the chemical, energy, manufacturing and additional markets, as well as numerous government agencies. These customers rely on us to deliver a broad range of services including but not limited to end-to-end hazardous waste management, emergency response, industrial cleaning and maintenance and recycling services. We are also the largest re-refiner and recycler of used oil in North America and the largest provider of parts cleaning and related environmental services to commercial, industrial and automotive customers in North America.

Performance of our segments is evaluated on several factors of which the primary financial measure is Adjusted EBITDA as described more fully below. The following is a discussion of how management evaluates its segments in regards to other factors including key performance indicators that management uses to assess the segments' results, as well as certain macroeconomic trends and influences that impact each reportable segment:

- **Environmental Services** - Environmental Services segment results are predicated upon the demand by our customers for waste services directly attributable to waste volumes generated by them and project work for which waste handling and/or disposal is required. In managing the business and evaluating performance, management tracks the volumes and mix of waste handled and disposed of through our owned incinerators and landfills, as well as utilization of such incinerators, labor and billable hours and equipment among other key metrics. Levels of activity and ultimate performance associated with this segment can be impacted by several factors including overall U.S. GDP and U.S. industrial production, weather conditions, efficiency of our operations, technology, changing regulations, competition, market pricing of our services and the management of our related operating costs. Environmental Services results are also impacted by the demand for planned and unplanned industrial related cleaning and maintenance services at customer sites, environmental cleanup services on a scheduled or emergency basis, including response to national events such as major chemical spills, natural disasters, or other events where immediate and specialized services are required. As a result of the recent outbreak of COVID-19, the business has also seen increased demand for response services relative to contagion decontamination.

- **Safety-Kleen** - Safety-Kleen segment results are impacted by an array of core service and product offerings that serve to attract small quantity waste producers customers and integrate them into the Clean Harbors waste network. Core service offerings include parts washer services, containerized waste services, vacuum services, used motor oil collection and contract blending and packaging services. Key performance indicators tracked by the Company relative to these services include the number of parts washer services performed and pricing and volume of used motor oil and waste collected. Results from these services are primarily driven by the overall number of parts washers placed at customer sites and volumes of waste collected, as well as the demand for and frequency of other offered services. These factors can be impacted by overall economic conditions in the marketplace, especially in the automotive related area. In addition to its core service offerings, Safety-Kleen offers high quality recycled base and blended oil products to end

users including fleet customers, distributors and manufacturers of oil products. Other product offerings include automotive related fluids and shop supplies. Relative to its oil related products, management tracks the Company's volumes and relative percentages of base and blended oil sales along with various pricing metrics associated with the commodity driven marketplace. The segment's results are significantly impacted by overall market pricing and product mix associated with base and blended oil products and, more specifically, the market prices of Group II base oils. Costs incurred in connection with the collection of used oil and other raw materials associated with the segment's oil related products can also be volatile. Our OilPlus ® closed loop initiative, which results in the sale of our renewable oil products directly to our end customers, may also be impacted by changes in customer demand for high-quality, environmentally responsible recycled oil.

Impact of COVID-19

In response to the COVID-19 pandemic, the Company has created a dedicated crisis response team to proactively monitor and respond to Company and customer operations, implement plans to execute on opportunities of COVID-19 related decontamination services and enhance health and safety measures for all our employees.

Health and safety is our #1 priority. As part of our commitment to ensuring the health and safety of our employees, particularly those performing COVID-19 decontamination services for our customers, thus far we have been able to successfully supply our employees with appropriate personal protective equipment ("PPE") for use in servicing our customers and implemented protocols to actively monitor and report employee illness. To support the safety of all of our employees and operations, precautionary measures have been implemented including suspending non-essential travel, limiting the number of employees attending meetings, reducing the number of people at our locations at any one time, monitoring the health of all employees, arranging administrative employees to work from home and encouraging any employee to work from home where possible.

The Company's financial results for the quarter ended March 31, 2020 were not significantly impacted by the COVID-19 pandemic. In the latter half of March 2020, we began to experience a slowdown or closure at some customer sites, particularly in the Safety-Kleen business while also seeing an increase in demand from several customers for decontamination related services in response to COVID-19. However, the outbreak of COVID-19 has resulted in, and is likely to continue to result in, significant economic disruption. In an effort to contain COVID-19, governments have enacted various measures, including orders to close non-essential businesses and personal and commercial travel restrictions. The essential nature of the Company's operations has not directly required the closure of any of our facilities. However, in order to respond to the impact on the Safety-Kleen business and in particular the reduced availability of used motor oils which are utilized as feedstock in our re-refining processes, in April 2020, the Company temporarily shuttered nearly half of the production capacity of our oil re-refineries.

The Company expects to continue to experience the impacts of COVID-19 throughout the remainder of 2020. In our Environmental Services segment, continued shutdowns of customers' operations could decrease the level of our services that are required and the quantities of commercial and industrial waste disposed of throughout our network of facilities. Lower demand for oil and overall price declines in the global oil market, resulting from COVID-19 impacts, could impact the level of environmental services we provide to our customers in that market. We have seen an increase in emergency response work for COVID-19 related decontamination services which we expect to continue, however these additional services are not expected to fully offset the negative impact of COVID-19 on our Environmental Services segment.

We expect that the services provided by our Safety-Kleen segment, especially in the near term, could be more significantly impacted by continued customer shutdowns and therefore less demand for Safety-Kleen services and products. We have observed declining demand in the primary sectors impacting this business including the overall automotive sector, as consumer activity decelerates across the United States and Canada. Lower oil related demand and price declines in the global oil market, exacerbated by COVID-19 impacts, are also expected to reduce revenues and cash flows generated by the business in 2020. Further, the Company has experienced, and likely will continue to face, a shortage of used motor oil supply primarily due to travel restrictions and the presumed temporary closure of certain customer sites.

The extent to which the COVID-19 pandemic may impact the Company's business, operating results, financial condition or liquidity will depend on future developments, including the duration of the outbreak, travel restrictions, business and workforce disruptions and the effectiveness of actions taken to contain the outbreak and treat its impact. For this reason, the Company expects 2020 profitability to be less than prior expectations, however the Company cannot now reasonably estimate with any degree of certainty the future impact that COVID-19 may have on the Company's results of operations, financial position or liquidity.

The Company considered the impact of COVID-19 on the assumptions and estimates used in the preparation of the financial statements and did not identify any significant changes in estimates. Specifically, management concluded that there had not been any triggering events requiring further assessment of asset impairments. Management also assessed the extent to which the current

macroeconomic events brought about by COVID-19 and significant declines in oil demand impacted the valuation of expected credit losses on accounts receivable and certain inventory items or resulted in modifications to any significant contracts. Ultimately the results of these assessments did not have a material impact on the Company's results as of March 31, 2020.

In regards to liquidity and capital resources, as of March 31, 2020, the Company had $494.3 million in cash and marketable securities and $80.7 million of remaining borrowing availability under the revolving credit facility. Other than $7.5 million of annual payments on the Company's Term Loans, there are no debt maturities until November 2021, when the Company's revolving credit facility expires. To maintain a strong liquidity position through 2020 and beyond, the Company is actively considering, planning and executing cost reduction initiatives, and reducing 2020 capital expenditures by more than $50.0 million from previously forecasted amounts and considering all aspects of eligible government programs.

Highlights

Total revenues for the three months ended March 31, 2020 were $858.6 million , compared with $780.8 million for the three months ended March 31, 2019 . In the three months ended March 31, 2020 , our Environmental Services segment increased direct revenues 11.3% from the comparable period in 2019 primarily due to higher volumes and more profitable waste streams in our network of facilities, most predominately at our incinerators, and our increased emergency response services in the wake of the COVID-19 pandemic. In the three months ended March 31, 2020 , our Safety-Kleen segment increased direct revenues 7.6% from the comparable period in 2019 predominantly due to higher volumes and prices for our base oil and blended oil sales. The fluctuation of the Canadian dollar negatively impacted our consolidated revenues by $1.2 million in the three months ended March 31, 2020 .

We reported income from operations for the three months ended March 31, 2020 of $45.5 million compared with $23.7 million in the three months ended March 31, 2019 . We reported net income for the three months ended March 31, 2020 of $11.6 million compared with net income of $1.0 million in the three months ended March 31, 2019 .

Adjusted EBITDA, which is the primary financial measure by which our segments are evaluated, increased 20.6% to $122.6 million in the three months ended March 31, 2020 from $101.7 million in the three months ended March 31, 2019 . Additional information, including a reconciliation of Adjusted EBITDA to net income, appears below under the heading *"Adjusted EBITDA."*

Net cash from operating activities for the three months ended March 31, 2020 was $ 33.7 million , an increase of $3.9 million from the comparable period in 2019 . Adjusted free cash flow, which management uses to measure our financial strength and ability to generate cash, was an outflow of $26.2 million in the three months ended March 31, 2020 , compared to an outflow of $24.9 million in the comparable period of 2019 . Additional information, including a reconciliation of adjusted free cash flow to net cash from operating activities, appears below under the heading *"Adjusted Free Cash Flow."*

Segment Performance

The primary financial measure by which we evaluate the performance of our segments is Adjusted EBITDA. The following table sets forth certain financial information associated with our results of operations for the three months ended March 31, 2020 and March 31, 2019 (in thousands, except percentages):

	Summary of Operations For the Three Months Ended			
	March 31, 2020	March 31, 2019	$ Change	% Change
Direct Revenues [1]:				
Environmental Services	$ 566,362	$ 509,022	$ 57,340	11.3%
Safety-Kleen	293,212	272,477	20,735	7.6
Corporate Items	(1,011)	(660)	(351)	N/M
Total	858,563	780,839	77,724	10.0
Cost of Revenues [2]:				
Environmental Services	411,472	385,107	26,365	6.8
Safety-Kleen	194,578	180,366	14,212	7.9
Corporate Items	616	(1,109)	1,725	N/M
Total	606,666	564,364	42,302	7.5
Selling, General & Administrative Expenses:				
Environmental Services	45,976	34,405	11,571	33.6
Safety-Kleen	37,486	37,318	168	0.5
Corporate Items	45,845	43,089	2,756	6.4
Total	129,307	114,812	14,495	12.6
Adjusted EBITDA:				
Environmental Services	108,914	89,510	19,404	21.7
Safety-Kleen	61,148	54,793	6,355	11.6
Corporate Items	(47,472)	(42,640)	(4,832)	11.3
Total	$ 122,590	$ 101,663	$ 20,927	20.6%

N/M = not meaningful

(1) Direct revenue is revenue allocated to the segment performing the provided service.

(2) Cost of revenue is shown exclusive of items presented separately on the statements of operations which consist of (i) accretion of environmental liabilities and (ii) depreciation and amortization.

Direct Revenues

There are many factors which have impacted and continue to impact our revenues. These factors include, but are not limited to: overall industrial activity and growth in North America, existence or non-existence of large scale environmental waste and remediation projects, competitive industry pricing, impacts of acquisitions and divestitures, the level of emergency response projects, base and blended oil pricing, market changes relative to the collection of used oil, the number of parts washers placed at customer sites and foreign currency translation. In addition, customer efforts to minimalize hazardous waste and changes in regulation can also impact our revenues.

Environmental Services

	For the Three Months Ended March 31,		2020 over 2019	
(in thousands, except percentages)	2020	2019	$ Change	% Change
Direct revenues	$ 566,362	$ 509,022	$ 57,340	11.3%

Environmental Services direct revenues for the three months ended March 31, 2020 increased $57.3 million from the comparable period in 2019 driven primarily by a greater volume of higher value waste streams at our incinerators and higher service-related revenues. Increased utilization and average pricing at our incinerator facilities contributed $23.7 million to the direct revenue growth in the Environmental Services segment. Utilization at our incinerator facilities was 86% in the first quarter of 2020, a significant increase from the first quarter of 2019, directly resulting from fewer down days in the period. In the first quarter of 2019, utilization was unfavorably impacted by additional down days due to a fire at a neighboring facility. Average price per ton at our incinerators during the first quarter of 2020 increased approximately 11% from the first quarter of 2019.

Emergency response services contributed an incremental $21.2 million to the direct revenue growth of the Environmental Services segment from the comparable period, half of which was related to emergency response services associated with the COVID-19 pandemic, with the remaining increase from other project-based services. Also impacting the year over year change in direct revenues within this segment was the negative impact of foreign currency translation on our Canadian operations of $0.9 million.

Safety-Kleen

	For the Three Months Ended March 31,		2020 over 2019	
(in thousands, except percentages)	2020	2019	$ Change	% Change
Direct revenues	$ 293,212	$ 272,477	$ 20,735	7.6%

Safety-Kleen direct revenues for the three months ended March 31, 2020 increased $20.7 million from the comparable period in 2019 . Increased volumes and pricing in the base oil market accounted for $15.1 million of incremental base oil revenues from the comparable period in 2019. Direct revenue from sales of blended oil products increased $4.2 million, driven both by higher volume and better pricing. The increase in volumes of base and blended oil was largely the result of favorable weather conditions in 2020 as compared to the first quarter of 2019 when adverse weather conditions delayed the delivery of our products. Revenues generated through our core service offerings such as handling of containerized waste and vacuum services increased $3.6 million from the same period in 2019, and revenues from contract blending and packaging also increased $2.5 million. These increases were partially offset by a $4.7 million reduction in direct revenue driven by lower volume of recycled fuel oil and refinery byproducts sales. In the first three months of 2020, parts washer services were relatively consistent with the same quarter in the prior year. The impact of foreign currency translation on our Canadian operations was minimal.

Cost of Revenues

We believe that our ability to manage operating costs is important to our ability to remain price competitive. We continue to upgrade the quality and efficiency of our services through the development of new technology and continued modifications at our facilities, invest in new business opportunities and aggressively implement strategic sourcing and logistics solutions as well as other cost reduction initiatives while also continuing to optimize our management and operating structure in an effort to maintain and increase operating margins.

Environmental Services

(in thousands, except percentages)	For the Three Months Ended March 31, 2020	For the Three Months Ended March 31, 2019	2020 over 2019 $ Change	2020 over 2019 % Change
Cost of revenues	$ 411,472	$ 385,107	$ 26,365	6.8 %
As a % of Direct revenues	72.7%	75.7%		(3.0)%

Environmental Services cost of revenues for the three months ended March 31, 2020 increased $26.4 million from the comparable period in 2019 ; however, these costs improved as a percentage of direct revenues primarily due to increased utilization and higher priced waste streams at our incinerators and a more favorable mix of higher margin services. The overall cost increase was due to increased equipment and supply costs of $12.2 million and increased labor and benefits related costs of $12.1 million. The incremental operating costs were commensurate with greater activity levels in the first quarter of 2020.

Safety-Kleen

(in thousands, except percentages)	For the Three Months Ended March 31, 2020	For the Three Months Ended March 31, 2019	2020 over 2019 $ Change	2020 over 2019 % Change
Cost of revenues	$ 194,578	$ 180,366	$ 14,212	7.9%
As a % of Direct revenues	66.4%	66.2%		0.2%

Safety-Kleen cost of revenues for the three months ended March 31, 2020 increased $14.2 million from the comparable period in 2019 ; however, these costs remained relatively consistent as a percentage of direct revenues. The primary drivers of the cost increase were a $4.2 million increase in labor related costs, a $3.2 million increase in the costs of oil additives and raw materials and a $2.1 million increase in transportation, disposal and fuel costs, with the remaining increase spread across various cost components. These costs were in line with the overall growth in the business in the first quarter of 2020 as compared to the first quarter of 2019.

Selling, General and Administrative Expenses

We strive to manage our selling, general and administrative ("SG&A") expenses commensurate with the overall performance of our segments and corresponding revenue levels. We believe that our ability to properly align these costs with business performance is reflective of our strong management of the businesses and further promotes our ability to remain competitive in the marketplace.

Environmental Services

(in thousands, except percentages)	For the Three Months Ended March 31, 2020	For the Three Months Ended March 31, 2019	2020 over 2019 $ Change	2020 over 2019 % Change
SG&A expenses	$ 45,976	$ 34,405	$ 11,571	33.6%
As a % of Direct revenues	8.1%	6.8%		1.3%

Environmental Services SG&A expenses for the three months ended March 31, 2020 increased $11.6 million from the comparable period in 2019 and SG&A as a percentage of direct revenues increased as well. Contributing to this increase was the favorable resolution of a litigation matter of $5.5 million and recovery of certain trade receivables of $5.4 million, both of which were recorded in the first quarter of 2019. Absent these nonrecurring transactions, Environmental Services SG&A as a percentage of direct revenues improved due to better leverage of our fixed cost base.

Safety-Kleen

(in thousands, except percentages)	For the Three Months Ended March 31, 2020	2019	2020 over 2019 $ Change	% Change
SG&A expenses	$ 37,486	$ 37,318	$ 168	0.5 %
As a % of Direct revenues	12.8%	13.7%		(0.9)%

Safety-Kleen SG&A expenses for the three months ended March 31, 2020 and March 31, 2019 were relatively consistent; however, Safety-Kleen SG&A improved as a percentage of direct revenues for the three months ended March 31, 2020 generally due to better leverage of fixed costs.

Corporate Items

(in thousands, except percentages)	For the Three Months Ended March 31, 2020	2019	2020 over 2019 $ Change	% Change
SG&A expenses	$ 45,845	$ 43,089	$ 2,756	6.4%

Corporate Items SG&A expenses for the three months ended March 31, 2020 increased $2.8 million from the comparable period in 2019 primarily due to increased marketing expenses of $4.0 million to expand brand awareness, partially offset by a $2.5 million decrease in stock-based compensation.

Adjusted EBITDA

Management considers Adjusted EBITDA to be a measurement of performance which provides useful information to both management and investors. Adjusted EBITDA should not be considered an alternative to net income or other measurements under generally accepted accounting principles ("GAAP"). Adjusted EBITDA is not calculated identically by all companies and therefore our measurements of Adjusted EBITDA, while defined consistently and in accordance with our existing credit agreement, may not be comparable to similarly titled measures reported by other companies.

(in thousands, except percentages)	For the Three Months Ended March 31, 2020	2019	2020 over 2019 $ Change	% Change
Adjusted EBITDA:				
Environmental Services	$ 108,914	$ 89,510	$ 19,404	21.7 %
Safety-Kleen	61,148	54,793	6,355	11.6
Corporate Items	(47,472)	(42,640)	(4,832)	(11.3)
Total	$ 122,590	$ 101,663	$ 20,927	20.6 %

We use Adjusted EBITDA to enhance our understanding of our operating performance, which represents our views concerning our performance in the ordinary, ongoing and customary course of our operations. We historically have found it helpful, and believe that investors have found it helpful, to consider an operating measure that excludes certain expenses relating to transactions not reflective of our core operations.

The information about our operating performance provided by this financial measure is used by our management for a variety of purposes. We regularly communicate Adjusted EBITDA results to our lenders since our loan covenants are based upon levels of Adjusted EBITDA achieved and to our board of directors and we discuss with the board our interpretation of such results. We also compare our Adjusted EBITDA performance against internal targets as a key factor in determining cash and stock bonus compensation for executives and other employees, largely because we believe that this measure is indicative of how the fundamental business is performing and is being managed.

We also provide information relating to our Adjusted EBITDA so that analysts, investors and other interested persons have the same data that we use to assess our core operating performance. We believe that Adjusted EBITDA should be viewed only as a supplement to the GAAP financial information. We also believe, however, that providing this information in addition to, and together with, GAAP financial information permits the users of our financial statements to obtain a better understanding of our core operating performance and to evaluate the efficacy of the methodology and information used by management to evaluate and measure such performance on a standalone and a comparative basis.

The following is a reconciliation of net income to Adjusted EBITDA for the following periods (in thousands, except percentages):

	For the Three Months Ended March 31,	
	2020	2019
Net income	$ 11,572	$ 976
Accretion of environmental liabilities	2,561	2,574
Depreciation and amortization	74,533	75,355
Other expense (income), net	2,365	(2,983)
Loss on sale of businesses	3,074	—
Interest expense, net of interest income	18,787	19,764
Provision for income taxes	9,698	5,977
Adjusted EBITDA	$ 122,590	$ 101,663
As a % of Direct revenues	14.3%	13.0%

Depreciation and Amortization

	For the Three Months Ended March 31,		2020 over 2019	
(in thousands, except percentages)	2020	2019	$ Change	% Change
Depreciation of fixed assets and amortization of landfills and finance leases	$ 65,366	$ 65,871	$ (505)	(0.8)%
Permits and other intangibles amortization	9,167	9,484	(317)	(3.3)
Total depreciation and amortization	$ 74,533	$ 75,355	$ (822)	(1.1)%

Depreciation and amortization for the three months ended March 31, 2020 was relatively consistent to the comparable period in 2019 .

Provision for Income Taxes

	For the Three Months Ended March 31,		2020 over 2019	
(in thousands, except percentages)	2020	2019	$ Change	% Change
Provision for income taxes	$ 9,698	$ 5,977	$ 3,721	62.3%

The provision for income taxes for the three months ended March 31, 2020 increased $3.7 million from the comparable period in 2019 . The increase was primarily due to increased taxable income in the United States. Our effective tax rate for the three months ended March 31, 2020 was 45.6% , compared to 86.0% for the same period in 2019 .

For the three months ended March 31, 2020 , we did not record an income tax benefit of $1.1 million associated with the loss on sale of businesses and $0.9 million of income tax benefits generated from losses at certain of our Canadian entities. This compares to $4.1 million of income tax benefits generated in the comparable period of 2019 which also were not recorded in that period's income tax provision.

Liquidity and Capital Resources

(in thousands)	Three Months Ended March 31, 2020	2019
Net cash from operating activities	$ 33,681	$ 29,740
Net cash used in investing activities	(93,087)	(74,969)
Net cash from (used in) financing activities	126,447	(15,368)

Net cash from operating activities

Net cash from operating activities for the three months ended March 31, 2020 was $33.7 million , an increase of $3.9 million from the comparable period in 2019 . The increase in operating cash flows from the comparable period of 2019 was attributable to greater levels of operating income partially offset by an increase in working capital amounts. The increase in working capital was attributable to comparatively higher interest payments in the first quarter of 2020.

Net cash used in investing activities

Net cash used in investing activities for the three months ended March 31, 2020 was $93.1 million , an increase of $18.1 million from the comparable period in 2019 . Net cash used in investing activities increased most notably due to a $23.8 million increase in capital expenditure levels, including the purchase of our Norwell, Massachusetts corporate headquarters in January 2020, as well as the timing of proceeds received from the purchase and sale of marketable securities in the comparative periods. Additionally, levels of investing cash outflows in 2020 were impacted by a $14.9 million decrease in cash paid for acquisitions, net of cash acquired and a $7.9 million cash inflow in the current quarter related to the sale of two small non-core businesses previously included in the Environmental Services segment.

Net cash from (used in) financing activities

Net cash from financing activities for the three months ended March 31, 2020 was $126.4 million , compared to net cash used in financing activities of $15.4 million from the comparable period in 2019 . On March 31, 2020, we borrowed $150.0 million under our revolving credit facility out of an abundance of caution given the macroeconomic uncertainties surrounding the COVID-19 global pandemic. This financing cash inflow was partially offset by an increase in repurchases of common stock. For additional information regarding our financing activities, see Note 11, "Financing Arrangements," to the accompanying unaudited consolidated financial statements.

Adjusted Free Cash Flow

Management considers adjusted free cash flow to be a measurement of liquidity which provides useful information to both management, creditors and investors about our financial strength and our ability to generate cash. Additionally, adjusted free cash flow is a metric on which a portion of management incentive compensation is based. We define adjusted free cash flow as net cash from operating activities, less additions to property, plant and equipment plus proceeds from sales or disposals of fixed assets. We exclude cash impacts of items derived from non-operating activities such as taxes paid in connection with divestitures and in the current period have also excluded cash paid in connection with the purchase of our corporate headquarters and certain capital improvements to the site as these expenditures are considered one-time in nature. Adjusted free cash flow should not be considered an alternative to net cash from operating activities or other measurements under GAAP. Adjusted free cash flow is not calculated identically by all companies, and therefore our measurements of adjusted free cash flow may not be comparable to similarly titled measures reported by other companies.

The following is a reconciliation of net cash from operating activities to adjusted free cash flow for the following periods (in thousands):

	Three Months Ended March 31,	
	2020	2019
Net cash from operating activities	$ 33,681	$ 29,740
Additions to property, plant and equipment	(82,767)	(58,947)
Purchase and capital improvements of corporate headquarters	20,735	—
Proceeds from sale and disposal of fixed assets	2,150	4,321
Adjusted free cash flow	$ (26,201)	$ (24,886)

Working Capital

At March 31, 2020 , cash and cash equivalents and marketable securities totaled $494.3 million , compared to $414.4 million at December 31, 2019 . At March 31, 2020 , cash and cash equivalents held by our foreign subsidiaries totaled $81.7 million and were readily convertible into other currencies including U.S. dollars. At March 31, 2020 , the cash and cash equivalents and marketable securities balance for our U.S. operations was $412.6 million , and our U.S. operations had net operating cash flows of $4.3 million for the three months ended March 31, 2020 . Additionally, we have a $400.0 million revolving credit facility of which approximately $80.7 million was available to borrow at March 31, 2020 . Based on the above and on our current plans, we believe that our U.S. operations have and will continue to have adequate financial resources to satisfy their current liquidity needs.

We assess our liquidity in terms of our ability to generate cash to fund our operating, investing and financing activities. Our primary ongoing cash requirements will be to fund operations, capital expenditures, interest payments and investments in line with our business strategy. We believe our future operating cash flows will be sufficient to meet our future operating and internal investing cash needs as well as any cash needs relating to our stock repurchase program. Furthermore, our existing cash balance and the availability of additional borrowings under our revolving credit facility provide additional potential sources of liquidity should they be required.

Financing Arrangements

Financing arrangements are discussed in Note 11, “Financing Arrangements,” to our unaudited consolidated financial statements included in this report. As discussed therein, the Company maintains a $400.0 million revolving credit facility expiring on November 1, 2021. On March 31, 2020, the Company drew down $150.0 million on the revolving credit facility out of an abundance of caution given the macroeconomic uncertainties surrounding the COVID-19 global pandemic. The $150.0 million is included in the Company's cash and cash equivalents balance as of March 31, 2020 . The Company had $80.7 million available to borrow and outstanding letters of credit were $141.2 million at March 31, 2020 . At December 31, 2019 , $229.2 million was available to borrow and outstanding letters of credit were $146.9 million . We continue to monitor our debt instruments and evaluate opportunities where it may be beneficial to refinance or reallocate the portfolio.

As of March 31, 2020 , we were in compliance with the covenants of all our debt agreements, and we believe it is reasonably likely that we will continue to meet such covenants.

Common Stock Repurchases

During the three months ended March 31, 2020 and March 31, 2019 , the Company repurchased and retired a total of approximately 0.3 million and 0.1 million shares, respectively, of the Company's common stock for total costs of approximately $17.3 million and $6.3 million , respectively. These purchases were pursuant to the previously authorized board approved plan to repurchase up to $600.0 million of the Company's common stock. Through March 31, 2020 , the Company has repurchased and retired a total of approximately 6.2 million shares of its common stock for approximately $332.7 million under this program. As of March 31, 2020 , an additional $267.3 million remained available for repurchase of shares under this program.

Environmental Liabilities

(in thousands, except percentages)	March 31, 2020	December 31, 2019	$ Change	% Change
Closure and post-closure liabilities	$ 80,439	$ 75,651	$ 4,788	6.3 %
Remedial liabilities	110,864	114,173	(3,309)	(2.9)
Total environmental liabilities	$ 191,303	$ 189,824	$ 1,479	0.8 %

Total environmental liabilities as of March 31, 2020 were $191.3 million , an increase of $1.5 million compared to December 31, 2019 primarily due to a $4.2 million increase in the closure and post-closure liabilities associated with one commercial landfill for which the Company has initiated closure plans. The remaining change is resulting from accretion of $2.6 million , partially offset by expenditures of $3.4 million and changes in the balance due to currency translation of approximately $1.7 million.

We anticipate our environmental liabilities, substantially all of which we assumed in connection with our acquisitions, will be payable over many years and that cash flow from operations will generally be sufficient to fund the payment of such liabilities when required. However, events not anticipated (such as future changes in environmental laws and regulations) could require that such payments be made earlier or in greater amounts than currently anticipated, which could adversely affect our results of operations, cash flow and financial condition.

Capital Expenditures

Capital expenditures in the first quarter of 2020 were $82.8 million as compared to $58.9 million in the first quarter of 2019. The increase was primarily due to the purchase of our corporate headquarters in January 2020. We anticipate that in 2020, capital expenditures net of disposals will be less than the prior year. However, unanticipated changes in environmental regulations could require us to make significant capital expenditures for our facilities and adversely affect our results of operations and cash flow.

Critical Accounting Policies and Estimates

Other than as described below, there were no material changes in the first three months of 2020 to the information provided under the heading “Critical Accounting Policies and Estimates” included in our Annual Report on Form 10-K for the year ended December 31, 2019 .

Goodwill and Other Long-Lived Assets . Goodwill is reviewed for impairment annually as of December 31 or when events or changes in the business environment (triggering events) indicate the carrying value of a reporting unit may exceed its fair value. This review is performed by comparing the fair value of each reporting unit to its carrying value, including goodwill. If the fair value is less than the carrying amount, a loss is recorded for the excess of the carrying value over the fair value up to the carrying amount of goodwill.

We determine our reporting units by identifying the components of each operating segment, and then in some circumstances aggregate components having similar economic characteristics based on quantitative and/or qualitative factors. As of March 31, 2020 and December 31, 2019 , we continue to have four reporting units, consisting of Environmental Sales and Service, Environmental Facilities, Safety-Kleen Oil and Safety-Kleen Environmental Services.

We conducted our annual impairment test of goodwill for all of our reporting units to which goodwill was allocated as of December 31, 2019 and determined that no adjustment to the carrying value of goodwill for any reporting unit was then necessary. In all cases the estimated fair value of each reporting unit significantly exceeded its carrying value.

Our long-lived assets are carried on our financial statements based on their cost less accumulated depreciation or amortization. Long-lived assets with finite lives are reviewed for impairment whenever events or changes in circumstances (triggering events) indicate that their carrying value may not be entirely recoverable. When such factors and circumstances exist, management compares the projected undiscounted future cash flows associated with the related asset or group of assets to the respective carrying amounts. The impairment loss, if any, would be measured as the excess of the carrying amount over the fair value of the asset and is recorded in the period in which the determination is made.

During the period ended March 31, 2020, we considered the expected adverse impact of COVID-19 and the overall sharp decline in oil pricing, partially driven by the global response to COVID-19 and partially driven by increased production from certain oil producing countries, and concluded that a triggering event had not occurred. This conclusion was based on a qualitative analysis incorporating (i) the significant excess fair value that previously existed in each reporting unit and (ii) assessing the current and long-term performance of the Company given expectations that the effects on the operations and cash flows of each reporting unit arising from these disruptions will be short lived.

We will continue to evaluate all of our goodwill and other long-lived assets impacted by economic downturns. The market conditions which could lead to such future impairments are currently most prevalent for assets supporting our oil and gas field services and lodging services operations within the Environmental Sales & Services reporting unit and goodwill associated with our Safety-Kleen Oil reporting unit.

Our assumptions with respect to future cash flows and conclusions with respect to asset impairments could be impacted by changes arising from (i) a further significant deterioration in market conditions arising from COVID-19, (ii) a sustained period of economic and industrial slow downs resulting from social distancing guidelines, (iii) inability to price our oil related products and

services to maintain profitability, (iv) inability to scale our operations and implement cost reduction efforts in light of reduced demand or (v) a further decline in our share price for a sustained period of time. These factors, among others, could significantly impact the impairment analysis and may result in future goodwill or asset impairment charges that, if incurred, could have a material adverse effect on our financial condition and results of operations.

ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Other than the draw down on March 31, 2020, of $150.0 million from our available borrowings under our revolving credit facility, there were no material changes in the first three months of 2020 to the information provided under Item 7A. “Quantitative and Qualitative Disclosures about Market Risk” in the Company's Annual Report on Form 10-K for the year ended December 31, 2019 . The revolving credit facility will expire on November 1, 2021, at which point, the amount of then outstanding borrowings will be due. However, the Company can repay the borrowings without penalty (other than customary LIBOR breakage fees) at any point. Interest on the credit facility is based on the one-month LIBOR, and as of March 31, 2020, the effective interest rate on the $150.0 million borrowed was 2.25%. Commencing on April 30, 2020, interest payments are due monthly until the borrowing is repaid.

ITEM 4. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

Based on an evaluation under the supervision and with the participation of our Chief Executive Officer and Chief Financial Officer, as of the end of the period covered by this Quarterly Report on Form 10-Q, our Chief Executive Officer and Chief Financial Officer have concluded that our disclosure controls and procedures (as defined under Rule 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the “Exchange Act”)) were effective as of March 31, 2020 to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in Securities and Exchange Commission rules and forms and is accumulated and communicated to our management, including our Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There were no changes in the Company's internal control over financial reporting identified in connection with the evaluation required by paragraph (d) of Exchange Act Rules 13a-15 or 15d-15 that was conducted during the quarter ended March 31, 2020 that have materially affected, or are reasonably likely to materially affect, the Company’s internal control over financial reporting. As a result of the coronavirus ("COVID-19") pandemic, certain employees of the Company began working remotely in March 2020 but these changes to the working environment did not have a material effect on the Company’s internal control over financial reporting. We will continue to monitor the impact of COVID-19 on our internal control over financial reporting.

CLEAN HARBORS, INC. AND SUBSIDIARIES

PART II—OTHER INFORMATION

ITEM 1. LEGAL PROCEEDINGS

See Note 16, “Commitments and Contingencies,” to the unaudited consolidated financial statements included in Item 1 of this report, which description is incorporated herein by reference.

ITEM 1A. RISK FACTORS

Except as set forth below, during the three months ended March 31, 2020 , there were no material changes from the risk factors as previously disclosed in Item 1A in the Company's Annual Report on Form 10-K for the year ended December 31, 2019 other than the update described below.

Natural disasters or other catastrophic events, including pandemics, could negatively affect our business, financial condition and results of operations.

Natural disasters such as hurricanes, tornados or earthquakes or other catastrophic events including public health threats or outbreaks of communicable diseases including the recent novel coronavirus pandemic could negatively affect our operations and financial performance. The impact of such events could include physical damage to one or more of our facilities or equipment, the temporary lack of an adequate workforce in a market and the temporary disruption in rail or truck transportation services upon which we rely. These events could prevent or delay shipments from suppliers or to customers and reduce both volumes and revenue. Weather conditions and other event driven special projects also cause interim variations in our results. These events could adversely impact the ability of the Company's suppliers and customers to conduct business activities and could ultimately do so for an indefinite period of time. As a result, we may be required to suspend operations in some or all of our locations, which could have a material adverse effect on our business, financial condition and results of operations.

ITEM 2. UNREGISTERED SALES OF EQUITY SECURITIES AND USE OF PROCEEDS

Common Stock Repurchase Program

The following table provides information with respect to the shares of common stock repurchased by us for the periods indicated.

Period	Total Number of Shares Purchased [1]	Average Price Paid Per Share [2]	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Approximate Dollar Value of Shares that May Yet Be Purchased Under the Plans or Programs (in thousands) [3]
January 1, 2020 through January 31, 2020	3,327	$ 85.75	—	$ 284,684
February 1, 2020 through February 29, 2020	39,298	76.95	26,841	282,684
March 1, 2020 through March 31, 2020	290,185	56.03	275,136	267,346
Total	332,810	$ —	301,977	

(1) Includes 30,833 shares withheld by us from employees to satisfy employee tax obligations upon vesting of restricted stock units granted to our employees under the Company's equity incentive plans.

(2) The average price paid per share of common stock repurchased under the stock repurchase program includes the commissions paid to brokers.

(3) Our board of directors has authorized the repurchase of up to $600.0 million of our common stock. We have funded and intend to fund the repurchases through available cash resources. The stock repurchase program authorizes us to purchase our common stock on the open market or in privately negotiated transactions periodically in a manner that complies with applicable U.S. securities laws. The number of shares purchased and the timing of the purchases has depended and will depend on several factors, including share price, cash required for business plans, trading volume and other conditions. During April 2018, we implemented a repurchase plan in accordance with Rule 10b5-1 promulgated under the Securities Exchange Act of 1934, as amended. Future repurchases will be made under the Rule 10b5-1 plan as well as open market or privately negotiated transactions as described above. We have no obligation to repurchase stock under this program and may suspend or terminate the repurchase program at any time.

ITEM 3. DEFAULTS UPON SENIOR SECURITIES

None

ITEM 4. MINE SAFETY DISCLOSURE

Not applicable

ITEM 5. OTHER INFORMATION

None

ITEM 6. EXHIBITS

Item No.	Description	Location
31.1	Rule 13a-14a/15d-14(a) Certification of the CEO Alan S. McKim	Filed herewith
31.2	Rule 13a-14a/15d-14(a) Certification of the CFO Michael L. Battles	Filed herewith
32	Section 1350 Certifications	Filed herewith
101	Interactive Data Files Pursuant to Rule 405 of Regulation S-T: Financial statements from the quarterly report on Form 10-Q of Clean Harbors, Inc. for the quarter ended March 31, 2020, formatted in iXBRL (Inline eXtensible Business Reporting Language): (i) Consolidated Balance Sheets, (ii) Unaudited Consolidated Statements of Operations, (iii) Unaudited Consolidated Statements of Comprehensive (Loss) Income, (iv) Unaudited Consolidated Statements of Cash Flows, (v) Unaudited Consolidated Statements of Stockholders' Equity and (vi) Notes to Unaudited Consolidated Financial Statements.	*
104	The cover page from the Company's Quarterly Report on Form 10-Q for the quarter ended March 31, 2020, formatted in iXBRL and contained in Exhibit 101.	

* Interactive data files are furnished and deemed not filed or part of a registration statement or prospectus for purposes of Sections 11 or 12 of the Securities Act of 1933, as amended, are deemed not filed for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, and otherwise are not subject to liability under those sections.

CLEAN HARBORS, INC. AND SUBSIDIARIES

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

CLEAN HARBORS, INC.
Registrant

By: /s/ ALAN S. MCKIM
Alan S. McKim
Chairman, President and Chief Executive Officer

Date: April 29, 2020

By: /s/ MICHAEL L. BATTLES
Michael L. Battles
Executive Vice President and Chief Financial Officer

Date: April 29, 2020

EXHIBIT 31.1

CERTIFICATION OF CHIEF EXECUTIVE OFFICER

I, Alan S. McKim, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Clean Harbors, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

/s/ Alan S. McKim

Alan S. McKim

Chairman, President and Chief Executive Officer

Date: April 29, 2020

EXHIBIT 31.2

CERTIFICATION OF CHIEF FINANCIAL OFFICER

I, Michael L. Battles, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Clean Harbors, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

/s/ Michael L. Battles

Michael L. Battles

Executive Vice President and Chief Financial Officer

Date: April 29, 2020

EXHIBIT 32

CLEAN HARBORS, INC. AND SUBSIDIARIES

CERTIFICATION PURSUANT TO
SECTION 1350, CHAPTER 63 OF TITLE 18, UNITED STATES CODE,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES OXLEY ACT OF 2002

Pursuant to 18 U.S.C. §1350, each of the undersigned certifies that, to his knowledge, this Quarterly Report on Form 10-Q for the period ended March 31, 2020 fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934 and the information contained in this report fairly presents, in all material respects, the financial condition and results of operations of Clean Harbors, Inc.

By: /s/ ALAN S. MCKIM

Alan S. McKim

Chairman, President and Chief Executive Officer

Date: April 29, 2020

By: /s/ MICHAEL L. BATTLES

Michael L. Battles

Executive Vice President and Chief Financial Officer

Date: April 29, 2020

Table VIII.B – Estimated Capital Costs

Table VIII.B is not applicable to this permit renewal because no capacity expansion or new construction is included in this application.

SECTION IX.

RELEASES FROM SOLID WASTE UNITS AND CORRECTIVE ACTION

RCRA FACILITY ASSESSMENT PRELIMINARY REVIEW REPORT

SECTION IX.
RELEASES FROM SOLID WASTE UNITS AND CORRECTIVE ACTION

RCRA FACILITY ASSESSMENT
PRELIMINARY REVIEW REPORT

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Attachments

SECTION IX.
RELEASES FROM SOLID WASTE UNITS AND CORRECTIVE ACTION

PRELIMINARY REVIEW REPORT

1.0 INTRODUCTION

Corrective action for releases of hazardous waste or hazardous constituents to the environment is addressed herein pursuant to the Texas Solid Waste Disposal Act, 30 TAC 335.167, 40 CFR 270.14(d), and Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984 to RCRA. Accordingly, a RCRA Facility Assessment (RFA) has been initiated to identify releases to the environment from any solid waste management unit (SWMU) at the Clean Harbors LaPorte facility (herein referred to as the CHL facility) which are known to have occurred or have a significant potential for having occurred. The first step in the RFA process, a preliminary review (PR), was conducted, and the results are presented herein. This PR report was prepared to present the appropriate information required for Section IX of the Part B Application. The second step will be to perform a Visual Site Assessment to further assess potential releases to the environment. The VSI will be performed, if necessary, upon review and acceptance of the results of the PR.

For purposes of following the TCEQ's Part B Application instructions, the Preliminary Review Facility Checklist follows the main body of this report and is presented as Attachment IX-A. The Preliminary Review Unit Checklists are presented in Attachment IX.-B. Other supporting data, including the required maps are presented in attachments that follow those of the checklists.

2.0 FACILITY DESCRIPTION

The following sections describe the CHL facility, providing relevant background information to the reviewer.

2.1 Facility Location

The facility is located at 500 Independence Parkway South in the corporate limits of the City of La Porte, Harris County, Texas (north latitude $29^0$42'27", west longitude $95^0$05'27", estimated at facility entrance from USGS 7.5-min. quandrangle map). Figure IX-1, is a regional site map (from a USGS topographic 7.5-minute quadrangle map) indicating the general facility location. The facility is located approximately 2.5 miles south of Buffalo Bayou (the Houston Ship Channel). Figure IX-2, shows an overall plan of the facility.

The facility occupies 15 acres of land in a predominantly industrial area of the Houston Ship Channel. The facility is bordered on the west by Highway 134, a major industrial traffic thoroughfare, on the south by State Highway 225 and a light industrial/commercial property, on the east by industrially-owned open land, and on the north by additional industrially-owned land.

2.2 Facility Operation

The CHL facility is a commercial storage facility currently permitted to store hazardous wastes and Class 1 and Class 2 non-hazardous waste under a RCRA hazardous waste permit plus polychlorinated biphenyl (PCBs) under a separate TSCA permit. The facility is also authorized as a less-than-10-day transfer facility for wastes streams not delivered to CHL for waste disposal. Wastes managed at the site can have ignitable, corrosive, toxic, reactive, and acutely hazardous characteristics.

2.3 Waste Generating and Storage Process

The facility receives hazardous wastes from off-site waste generators for interim or long-term storage. Wastes are then shipped off-site for treatment or disposal by another permitted facility. The

current hazardous waste permit allows the facility to accept all EPA waste codes defined in 40 CFR 261, Subpart C (Characteristically Hazardous Waste) and Subpart D (Listed Hazardous Waste) pursuant to RCRA. The facility is also authorized to receive non-hazardous Class 1 and Class 2 wastes, as well as PCB wastes under a separate TSCA permit. The facility also generates certain hazardous and non-hazardous wastes, primarily laboratory wastes and plant refuse. Waste are received in containers, typically ranging in size from one gallon up to 500 gallons in the form of pails, drums, supersacks, boxes, and portable tanks. Wastes in the form of liquids, solids, sludges and compressed gas are received at the facility. The wastes managed at the facility are described in Section 3.0 of this Preliminary Review report.

Upon receipt, the waste shipments are inspected, sampled and analyzed for comparison against approved waste profiles submitted by the generators. The containers themselves are inspected for integrity, and wastes are repackaged or placed into overpack containers if the original container is found to be leaking, excessively damaged, or in any condition determined to be unsuitable for long-term storage. Wastes that fail confirmation against the profile are rejected and returned to the generator, held temporarily until the generator's waste profile is corrected, or a new profile is obtained from the generator.

Upon acceptance, the wastes are transferred to the permitted container storage areas located within one of three fully-enclosed warehouse buildings, designated Warehouses I, II, and III, as shown on Figure IX-2. The wastes are stored in their respective containers which are placed on wooden pallets and set on racks within the storage areas. Pallets are supported on the racks and are typically not stacked on top of each other. The racks store palleted containers a maximum of three pallets high. Storage areas are used for either interim storage by the day (for which the generators are responsible for disposal) or turn-key storage (for which CHL has made arrangements for storage and off-site disposal). As a RCRA-permitted storage facility, CHL must comply with the one-year storage time limitation given in 40 CFR 268, Subpart E. Longer storage periods for certain wastes can be approved by the EPA or TCEQ, if there is not availability or capacity of an appropriate disposal or treatment facility.

Each of the three warehouse container storage areas are subdivided into "subareas" for segregation of wastes into chemically compatible groups and for operational convenience of the facility. Each of the three warehouse storage areas and the respective subareas has engineered controls to reduce the potential for release of wastes or waste constituents to the environment. The primary protective feature of the container storage areas is a system of epoxy-coated concrete flooring and secondary containment curbing which can contain significant volumes of potentially-spilled waste materials and reduce potential for mixing of incompatible wastes. The details of the container storage areas are described more thoroughly in Section V.B of this application.

2.4 Environmental Setting

This section describes the climate, floodplain and surface water, geology and soils and groundwater in the vicinity of the CHL facility. Information, where referenced, was extracted from the previous RFA report prepared by PRC Environmental Management, Inc., in 1992 which is still appropriate.

2.4.1 Climate

The climate in Harris County is humid. The average daily temperature is 79.8°F. The lowest average minimum temperature is 46°F in January. The highest average daily maximum temperature is 93°F in July.

The total annual precipitation for the county is 42.6 inches (Texas Almanac). The mean annual lake evaporation of the area is 52 inches (TDWR, 1983). The 1-year, 24-hour maximum rainfall is 4 inches. The 100-year 24-hour rainfall is 13 inches (Hershfield).

The prevailing wind is from the south-southeast (SSE) with predominant wind speeds between 4 and 12 miles per hour. From the wind rose, the SSE direction represents about 13.5 percent of all observed wind directions, while the predominant quadrant (South to ESE) represents about 42 percent of all observed wind directions.

2.4.2 Floodplain and Surface Water

CHL is not located within a 100-year floodplain (FEMA, 1990). The nearest surface water body, Buffalo Bayou, is located about 2.5 miles north of the facility. Surface water run-off from the facility would flow in one of two general directions. Surface water run-off from the west half of the facility and most of the area north of Warehouse I drains to the west and empties into the drainage ditch along between the facility and Independence Parkway. This drainage flows across and under Independence Parkway via a culvert, then drains westward to the East Fork of Patrick Bayou which, in turn, drains into Buffalo Bayou. Run-off from the eastern half of the facility will drain eastward off the site to a drainage canal which flows east-northeast toward a portion of Upper Galveston Bay called Upper San Jacinto Bay.

All of the drainage channels between the facility and Buffalo Bayou or Upper San Jacinto Bay flow within industrial properties. Buffalo Bayou, in this portion of its length, contains the Houston Ship Channel, and is navigable waters for shipping and industrial traffic. Buffalo Bayou is used for some industrial water supply, but is not known to be a drinking water source. The cities of La Porte and Deer Park receive their drinking water from the City of Houston obtained from Lake Houston, which is located about 14 miles north of the CHL facility and is upstream of any potential surface discharges from the site. No known drinking water intakes are located within 15 downstream miles of the site, as this water would be slightly brackish to saline.

2.4.3 Geology and Soils

The site overlies soils of the Bernard-Edna Complex which is composed of Bernard Clay loam and Edna fine sandy loam. The surface layer is friable neutral dark clay loam underlain by a layer of firm moderately alkaline dark gray clay, underlain by a firm moderately alkaline gray clay with yellow-brown mottles. Soils in this complex are poorly drained, low permeability soils. The average water capacity of the soils is medium to high (Wheeler, 1976).

The area is predominated by formations of the Pleistocene age. The surface sediments consist of deposits composed of gray and red-orange fine sand and yellow and gray clay and silt. The strata, consisting of the Lissie Formation overlain by the Beaumont Formation, is composed of clay marl interbedded with sand lentils. The Beaumont Formation ranges in thickness from 400 to 900 feet. The Beaumont Formation lies unconformably upon the Lissie formation and is overlain by stream deposits (Sellards, 1990).

2.4.4 Groundwater

The groundwater source in the La Porte area is the Gulf Coast Aquifer. The Gulf Coast Aquifer includes the Chicot and Evangeline aquifer. The Gulf Coast Aquifer is composed of alternating beds of clay, silt, sand, and gravel. The Chicot Aquifer consists of the Willis, Lissie, and Beaumont Formations. The Evangeline Aquifer is composed of alternating beds of sand and clay and consists of the Goliad Formation. The principal water bearing units are the Goliad, Willis, and Lissie formations (Muller, 1979). In this area, depth to groundwater is 350 feet. Groundwater is not used for the cities of La Porte or Deer Park's municipal water supply (Jacobs, 1992). Within three miles of the site is a well used as backup to surface water for the city of Deer Park (Williams, 1988). This well is located to the east and is upgradient of the facility (USGS, 1982).

A water well search was conducted in August, 1997 by Agency Information Consultants. Their search indicated that there are nine groundwater wells identified outside the CHL facility boundary and within a one-mile radius of the facility boundary. All but three are located north of State Highway 225, and all are

located within property zoned for industrial use. In addition, there are two wells located onsite at the CHL facility which are both used for potable water purposes, including drinking water.

2.5 Receptors

CHL owns and occupies about 15 acres northwest of the city of La Porte, Texas near the edge of the Corporate Limits between the Cities of La Porte and Deer Park. There are approximately 10 workers currently employed at CHL. La Porte has a population of approximately 32,000 residents, while Deer Park has a population of approximately 33,000 residents, based on 1997 estimates by the respective city engineering and planning departments.

CHL is bordered on the west by Highway 134, and on the south by State Highway 225 and an adjacent light industrial/commercial property. Undeveloped land belonging to adjacent industrial owners bounds the north and east sides of the facility. The La Porte Municipal Airport is located about 3 miles south of the facility. The area within one mile of the facility is mostly industrial, but also includes some general commercial and residential areas. The closest residences to the facility currently exist approximately 3,500 feet west-southwest from the facility with residential growth anticipated primarily southwest of the facility in the City of Deer Park (west of Independence Parkway and south of 13th Street). According to planned development within Deer Park, the closest residences to the facility will be approximately 2,200 feet south-southwest of the facility. Based on the zoning maps of both Deer Park and La Porte, the facility is completely surrounded by industrially-zoned property.

The nearest surface water body is Buffalo Bayou, which is located 2.5 miles north of the facility. Water from Buffalo Bayou is used for industrial purposes and is typically treated by the industrial facilities prior to use. Buffalo Bayou is also the natural water course forming the Houston Ship Channel which has been improved for navigation and dockage for ocean-faring vessels for the petrochemical and shipping industries. The petrochemical industry also uses this waterway for transport of its own raw and finished products.

The two wells are located onsite are used for drinking water by the facility employees and other potable water needs, making this a pathway of receptor exposure should the groundwater zone screened by the wells become affected by waste constituents from the facility.

Sensitive environments in the area include numerous wetlands located within one mile of the site (USDI, 1991, PRC, 1992). Category II sensitive environment plant receptors include Texas Windmill Grass, Chloris Texensis, and the Houston Macherthera plant, *Macheraethera aurea*. These are located within three miles of the facility. Critical habitats for the Houston Toad and Attwater Prairie Chicken are found within 15 downstream miles from the site. Category II sensitive environment animal receptors, including Salt Marsh Snake, *Nerodia Clarkii*, and the Coastal Gay Feathers plant, *Liatris Bracteata*, are found within 15 downstream miles of the facility.

3.0 WASTES MANAGED

Hazardous and non-hazardous wastes managed by the facility are described in the following paragraphs. The facility is permitted to store all EPA-listed RCRA hazardous wastes and non-hazardous solid wastes.

3.1 Hazardous Wastes

The facility is permitted to store all RCRA listed and characteristic hazardous wastes as well as non-hazardous industrial solid wastes. Any of the container storage areas may at any one instant manage all or none of the regulated wastes. These wastes are listed in Table IV.B of the Part B application and Table III-1A of the Part A application. Potential hazardous constituents include all the listed chemical elements and compounds listed in 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX, incorporated herein by reference. Such wastes, however, are segregated between the container

storage areas to separate incompatible waste groups and for other operational convenience. Attachment IX-D is reserved for inclusion of specific waste streams or other pertinent information as may be required.

Based on a cursory review of facility waste records and the operator's knowledge, most of these wastes have been stored at one time or another during the history of the facility. However, certain waste groups would have been segregated between different warehouse container storage areas and the respective sub-areas. Accordingly, it would be difficult to present separately which specific wastes and hazardous constituents have been associated with each container storage area. However, the following generally describes the wastes historically stored or which have been designated by CHL for storage at each of the three container storage areas, Warehouses I, II and III.

- Warehouse I - NOR No. 001

According to normal operating practices, this storage area is designated for storage of all types of hazardous waste and containers and include caustic materials, PCBs, oxidizers and organic peroxides, some dioxin-related wastes and miscellaneous materials that are compatible with the other types of wastes stored in the unit.

- Warehouse II - NOR No. 003

According to normal operating practices, wastes typically stored in this storage area include acids, soils and other media containing toxicity characteristic wastes, mercury containing light bulbs and other equipment, and some dioxin-related wastes. Also, Class 1 and Class 2 industrial solid wastes including empty containers and soils and media contaminated with petroleum hydrocarbons are stored in this area.

- Warehouse III - NOR No. 004

For operational purposes, this storage area has been designated specifically for storage of ignitable wastes. Wastes typically stored in this area include flammable solvents, paint wastes, alcohols, reactive materials, miscellaneous hydrocarbon containing wastes, chlorinated solvents, PCB, dioxin-related and corrosive wastes that are ignitable, miscellaneous lab packed wastes, and miscellaneous materials that are compatible with ignitable wastes.

The facility itself generates certain hazardous wastes as a result of facility operations or has done so in the past. Such wastes have been placed in drums or other containers, stored onsite, and shipped for disposal at a permitted facility. These include the following:

- Sampling and laboratory analysis wastes and retains (laboratory wastes) generated as a result of verifying the waste stream profiles;
- Spent activated carbon and particulate filters from sampling vent hood;
- Mop water from cleaning up rainwater leaks within the container storage or staging areas;
- Personal protective equipment and debris resulting from spill cleanups (the recovered spilled waste is returned to the original waste container);
- Solid laboratory wastes including floor sweepings, from routine housekeeping of laboratory and sampling areas;
- Discarded aerosol cans, including paint, used in site maintenance;
- Leftover paint, solvents and debris from painting of container storage area floors;
- Spent fluorescent light bulbs;
- Discarded flammable and caustic cleaners for cleaning and degreasing; and
- Other previously active wastes similar to these above.

The facility also receives household hazardous waste from community collection programs which is exempt from RCRA restrictions. However, the facility routinely treats the material as hazardous and manifests it as hazardous for offsite shipment and treatment.

Hazardous and non-hazardous PCB wastes are generated primarily as a result of spill and leak cleanups which are covered by provisions of the facility's TSCA permit.

3.2 Non-hazardous Wastes

The facility also stores non-hazardous wastes received from offsite generators. While these wastes are not regulated as hazardous pursuant to RCRA regulations, they may contain hazardous constituents listed in 40 CFR 261, Appendix VIII, or 40 CFR 264, Appendix IX. These wastes may be stored in any warehouse storage area but are typically stored only in Warehouse II for operational convenience. Example non-hazardous wastes stored for off-site generators include the following:

- discarded and off-specification commercial chemical products that are not specifically listed and/or do not contain any toxicity characteristic wastes
- PCB containing wastes and items
- Class 1 ignitable and corrosive wastes, as defined in 30 TAC 335.505(2) and (3) respectively
- used oils and other petroleum products
- soils and other media containing petroleum hydrocarbons
- asbestos and asbestos-containing materials
- empty containers
- spent paints, adhesives and other products that do not contain any characteristic or listed wastes
- RCRA exempt oil and gas exploration and production wastes
- any other industrial solid wastes that are not regulated under RCRA, excluding explosives, radioactive materials and infectious or putrescible wastes
- Class 2 Regulated Medical Waste

The facility also generates certain non-hazardous wastes which are identified on the NOR, including:

<u>Routinely Generated Wastes</u>

- Class 2 plant trash and debris from routine administrative and maintenance operations not associated with waste management operations;
- Discarded wood pallets which were not contaminated by spill or residues from hazardous wastes;
- Mixed lab packs resulting from cleanup and lab retainage of non-hazardous wastes and spent products;

<u>Intermittently Generated or One-Time Events</u> (unplanned PCB spills, planned testing of sprinkler system, etc.)

- Other solid wastes with PCB contamination (from PCBs which were > 50 ppm but < 500 ppm);
- Non-hazardous PCB lab packs;
- PPE and debris from PCB spill cleanup (from PCBs which were > 50 ppm but < 500 ppm);
- Epoxy paint residues;
- Empty and crushed containers;
- Fire fighting foam collected from fire-suppression system testing;

- Contaminated soil from cleanup of diesel fuel spill; and
- PCB dielectric oil (< 500 ppm) from transformer decommissioning;

4.0 EVIDENCE OF RELEASE

During the PR, objective evidence of releases to the environment were investigated by reviewing data from the sources described below.

4.1 Records Review

Available records from the facility and provided from regulatory data base search firms were reviewed in an attempt to identify a known or suspected release of wastes or waste constituents to the environment.

4.1.1 Environmental Data Bases

The first step in this records review process was to perform research of environmental data bases. Such research was performed by Environmental Data Resources (EDR), Inc., of Southport, Connecticut and included:

- Search for Sanborn fire insurance map (no coverage was found for the facility's location);
- A complete search meeting the requirements of ASTM Standard Practice for Environmental Assessments, E1527-97; and
- A review of historical aerial photographs.

Prior research had been conducted by Agency Information Consultants of Austin, Texas in August, 1997, to identify water wells in the vicinity of the facility; however, this research did not identify any water wells at the site.

The ASTM-type Environmental Site Assessment data search by EDR revealed a pertinent entry in the RCRIS data base about the facility's status as a RCRA permitted TSDF, large quantity generator, and a hazardous waste transporter; completion of an RFA in 1992, and minor administrative violations. No entries were found in other relevant environmental data bases such as ECHO, TCEQ Compliance History, CERCLIS, LUST list, or other programs. There were no reported incidents of spills, releases or other unauthorized discharges.

A series of aerial photographs was obtained, taken by the Texas Department of Transportation, for the years 1944, 1954, 1962, 1979, 1986, and 1992 with major findings described below.

- 1944 and 1953 - No development of any kind is seen at the location of the facility. Only State Highways 225 and 134 are visible.

- 1962 - The earliest date where structures were visible on the facility property was 1962 and included what is now Warehouse II and other features associated with a prior property owner.

- 1979 - Additional floor space has been added to what is now Warehouse II (what is currently the staging area between Warehouse II and III), and additional buildings or lumber sheds are visible east of it. Also, a building which is now Warehouse I is shown along with the rail siding serving it, and there is development of the property to the south as well. This photo indicates what may be a fluid-filled depression, possibly a pond, (estimated 75-ft diameter) located northeast of Warehouse I between the rail sidings.

- 1986 - One additional shed is visible located at what is now the concrete pavement area north of Warehouse III. Also, the parking area east of Warehouse I is visible. The fluid-filled

depression identified in the 1979 photo is now not visible; however, there is a small dog-leg in the outline of the paved area which appears to go around the former location of this depression. In addition, this photo indicates another location of what appears to be another fluid-filled earthen structure north of the older location.

- 1992 - This photo shows all the main buildings currently associated with the CHL facility. Neither of the two previously identified ponds were visible.

4.1.2 Facility Records

The second step was to perform a review of relevant facility records. The facility provided access for review of all operating records maintained at the facility plus a copy of the 1992 RFA. The specific records reviewed included the following:

RCRA Permit Applications, Amendments and Modifications

a) Part A Applications
   - Original Application dated September 1987

b) Part B Applications
   - Original Application dated September 1987
   - Amendment dated February 9, 1989
   - Amendment dated September 11, 1989
   - Amendments dated September 4, 1990 and November 20, 1990
   - Class 2 Modification Request dated May 1993
   - Class 1 Modification Request dated March 1994

c) Permits
   - Original Permit dated April 1988
   - Amended permit dated March 26, 1991
   - Class 2 Permit Modification approved August 25, 1993
   - Class 1 Permit Modification dated June 14, 1994
   - Class 2 Permit Modification approved May 17, 1996
   - All Permit Modifications dated 08/23/99 through 2009
   - Class 3 Major Modification and Renewal issued 10/11/2011
   - Class 2 Modification approved 5/26/2011
   - Class 1 Modification dated 7/2011

d) RCRA Facility Assessment, dated June 30, 1992, prepared for the U.S. EPA by PRC Environmental Management, Inc.

e) Annual Site Activity Reports, dated as follows:
   - 1990 Reporting Year, by T.E.S., dated January 23, 1991
   - 1991 Reporting Year, by Laidlaw, dated January 24, 1992
   - 1992 Reporting Year, by Laidlaw, dated January 22, 1993
   - 1993 Reporting Year, by Laidlaw, dated January 24, 1994
   - 1994 Reporting Year, by Laidlaw, dated January 24, 1995
   - 1995 Reporting Year, by Laidlaw, dated January 23, 1996
   - 1996 Reporting Year, by Laidlaw, dated January 24, 1997
   - 2002 – 2020 reporting years by CHL

None of the permit or application data, previous RFA, or Annual Site Activity Reports documented releases to the environment or contained data which would suggest a condition likely to be associated with a current or past release at the facility.

Inspection Reports. TCEQ's RCRA Compliance Inspection Reports from the following selected dates, along with the associated facility responses were reviewed.

- May 23-24, 2012
- April 25-26, 2013
- May 7, 2014
- July 14, 2015
- May 23-24, 2016
- February 7-13, 2017
- December 17-18, 2020

The Compliance Inspection Reports typically indicated minor leaks of a small number of containers at the time of the inspection. In most cases of such alleged violations, the leaking or deficient containers were remediated immediately after the TCEQ inspector made note of such condition. Documentation was reviewed in the files as well as being provided along with the formal responses by Laidlaw to verify that such remedies were indeed made. Relevant alleged violations include a few instances where the epoxy coating on the concrete floor of one or more of the container storage areas was cracked and/or scraped away off the concrete. While the concrete floor itself was not noted by the inspector to be affected by waste contact, the protective epoxy coating was breached. This condition was documented to have been remedied by the application of new epoxy paint. None of the inspection reports indicated any positive release to the environment, although certain conditions may have made it possible. All deficiencies or alleged violations were apparently remedied in an immediate and thorough manner. Most of the alleged violations were of an administrative nature, such as deficient labeling or manifest discrepancies, which were also corrected to the satisfaction of TCEQ.

Other Facility Files. Facility files containing internal reports on spill and leaking container events, near-miss events, injury and OSHA reportable events were reviewed. Specific attention was given to all entries for spills and leaking container events from 1988 through 2009. Leaking containers and associated small spills were the most prevalent events and were usually detected during routine inspections by facility personnel. In no case were any Reportable Quantities of wastes noted. In all cases, appropriate action was documented which usually involved placing the leaking containers into overpack containers and cleaning up the spilled contents. In each of these cases, the leak or minor spill occurred within the permitted storage areas and were sufficiently protected by the secondary containment.

Other leak and spill events occurred on the loading docks and paved truck bay areas of Warehouse III. Such events generally were a result of a leaking container, or in some cases, a leaking PCB transformers, which were delivered to the facility that were either leaking already in the truck or while being offloaded. In the documented cases, the spills were fairly minor and were immediately remediated. One notable incident did occur in April 1997 in which a drum experience a rapid pressure release due to the polymerization of its content, causing damage to the roof. However, no fire or fumes resulted, no significant amount of the drum's contents was spilled, and no other containers were affected by the event. Only a minor amount of air releases were noted, as volatilization of the drum's contents was arrested as the material polymerized.

In summary, all of the documented spill/leak events were minor and occurred where secondary containment was adequate. None of the facility records indicated that a release had occurred to the environment.

4.2 Preliminary Site Reconnaissance

Since facility records were reviewed onsite, an opportunity was taken to make a general reconnaissance of the facility to better understand its features and attempt to identify potential areas of

concern. While this visit was done as part of this RFA effort, it was not considered as the Visual Site Inspection (VSI) which is the next step, if necessary, in the RFA process. The results of this reconnaissance was documented by updating the topographic site map presented in Section V.A of this application. Areas specifically viewed for this PR were:

- the location of two former underground storage tanks used to store diesel fuel;
- drainage patterns and ditches (swales) north and east of Warehouse I;
- containment curbing in areas outside the three warehouse container storage areas; and
- two active, elevated, diesel storage tanks and their respective secondary containments.

No condition were observed at these locations to warrant concern or need for additional evaluation during a VSI. It is the reviewer's understanding that the former underground tanks were removed by a qualified construction services group within Laidlaw Environmental Services, Inc., and that the TCEQ (i.e. TWC) was involved.

From the reconnaissance, it was noted that there is a constructed opening in the curbing in the parking area east of Warehouse I, apparently designed for discharging rainfall run-off which could be a specific point along a surface pathway for migration of pollution. However, the purpose of the curbing at this location is not for waste containment, but rather for parking lot drainage control and safety. The opening location is sufficiently far from those areas where wastes are actively and routinely managed, it would require a spill outside the Warehouse I containment curbs to result in a release through this pathway. Observing no visual or documented evidence of such a previous spill event, it is not believed that this location or downstream pathways warrant further evaluation for releases.

Other areas of drainage were reviewed for the potential for being a pollution pathway, most notably the swale north of the rail siding adjacent to Warehouse I which also is near the location of one of the onsite water wells. Based on this preliminary site reconnaissance, there did not appear to be any evidence of past releases.

4.3 Pollutant Dispersal Pathways

The primary means of pollutant dispersal would be via surface water whereby both water and ditch sediments can be affected. The dispersal pathways generally follow the surface water drainage patterns on the site and are assumed to originate at the Warehouse container storage areas, their dock and staging areas, or the adjacent surrounding paved areas. To a lesser degree of potential, pollutants can be dispersed by spilling directly onto soils, probably as a result of leakage from trucks onto the pavement after which it would either flow or wash onto the adjacent soils or seep through joints or cracks that may be present in the pavement. It is stressed that no releases were observed or documented at the time of this PR to indicate that pollutants had actually dispersed in the directions indicated.

5.0 IDENTIFICATION OF SOLID WASTE MANAGEMENT UNITS

Solid Waste Management Units (SWMUs) were identified as any unit used to manage any type of waste at this RCRA facility, regardless of waste type managed. A Preliminary Review Facility Checklist, presented in Attachment IX-A, was prepared and identifies all the SWMUs and Areas of Concern (AOC) which have been identified based on the PR. Also summarized on the Facility Checklists are the documents reviewed during this PR, a summary of the conditions as they relate to releases to the environment and recommendations, as applicable, for further action in the Corrective Action process.

Preliminary Review Unit Checklists have been prepared for each SWMU and AOC and are presented in Attachment IX.-B. Each checklist includes a description of the unit, a summary of the wastes managed, a discussion of any evidence of release(s) from the unit, a brief evaluation of potential pollutant dispersion pathways, a summary of findings for that unit, and recommendations for action, if needed. All SWMU and AOC locations are shown on Figure IX.2 in Attachment IX-C.

5.1 Hazardous Waste Management Units

Based on review of the permits and associated applications and modification requests, there are three solid waste management units (SWMUs) used to manage hazardous waste at this facility. Each of the three hazardous waste management units are permitted and authorized to store hazardous wastes and are listed on the Facility Checklist as RCRA Regulated Units. The SWMU numbers assigned are in order of their NOR numbers. These units are identified as follows:

- SWMU No. 1 - Warehouse I Container Storage Area, NOR No. 001
- SWMU No. 3 - Warehouse II Container Storage Area, NOR No. 003
- SWMU No. 4 - Warehouse III Container Storage Area, NOR No. 004
- R1 reactor tank- Warehouse III Container Storage Area, NOR No. 026
- R1A reactor tank- Warehouse III Container Storage Area, NOR No. 027
- Cylinder release unit - Warehouse III Cont. Storage Area, NOR No. 028

5.2 Other SWMUs

The other SWMUs identified to have been used for waste management are the two trash dumpsters used for receiving Class 2 wastes. Both locations have been labeled SWMU No. 2. These units are identified on the current NOR (August 25, 1997) as Unit 002 and are presented according to that order in the Unit Checklists. Also used for waste management are NOR No. 029 a Class 1 industrial waste bin, NOR No. 030 a non-hazardous neutralization unit, NOR no. 031 a non-hazardous neutralization unit, NOR No. 034 a mix tub/shredder and NOR No. 035 which is mix tub 2.

5.3 Areas of Concern

Several AOCs were identified during the PR and preliminary site reconnaissance. These are listed on the Facility Checklist as AOC #1 through AOC #7 and are shown on the checklists in Attachments IX-A and IX-B. These AOCs were chosen based on a realistic potential for hazardous constituents to accumulate because of either minor systematic releases, spills or leaks of wastes or waste constituents from one of the container storage areas or loading/unloading areas or the location is along a potential pollutant dispersal pathway. These AOCs were not selected because of historical or visual evidence of release actually being assessed during the PR, but only because of their potential for being affected by a release. The AOCs are as follows:

AOC #1 - Warehouse III Loading Dock and Truck Bays, selected because previous spills and leaks occurred in the trucks and in the truck bay near the loading dock. Also, the secondary containment curb in this area is down at the level of the truck bay, thus it is potentially subject to run-on and flooding which could influence migration through uncoated surfaces and joints of concrete paving;

AOC #2 - Former UST south of Warehouse I, selected solely because it was a previous UST prior to control by the operators of this facility;

AOC #3 - Former UST east of Warehouse I, selected solely because it was a previous UST prior to control by the operators of this facility;

AOC #4 - Firewater Collection Basin, selected because it has the potential to collect waste constituents washed off the paved area north of Warehouse III;

AOC #5 - Stormwater Ditch north of Warehouse I, selected because it is has the potential to accumulate constituents carried in surface water runoff, and it is adjacent to an existing drinking water well. Also, this ditch may accumulate constituents originating with releases from rail cars at the siding;

AOC #6 - Stormwater Ditch east of Warehouse I, selected because it may carry or accumulate constituents transported by surface water runoff from in the vicinity of Warehouse I. Also, there is an outlet in the curbing of the parking area east of Warehouse I which could allow discharge of anything spilled in or transported to this area, including spills from the diesel storage tank (considering that the tank's secondary containment will not hold both tank volume and precipitation volume);

AOC #7 - Area of two former "ponds" northeast of Warehouse I, selected because of the unconfirmed use and closure of the two fluid-filled depressions indicated on the aerial photographs.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on recent visible observations and historical documentation, there does not appear to be any objective evidence of a release to the environment from any of the identified SWMUs or AOCs at this facility. This conclusion was also reached in the prior Part B permit and the 1992 RFA, and there does not appear to have been any changes to the facility's operations to suggest that such changes could have created a greater potential for such releases now than what existing at that time. Accordingly, no further action at this time is warranted to further investigate potential for releases of wastes or hazardous constituents at this facility. These areas should be periodically inspected for evidence of releases.

ATTACHMENT IX-A

PRELIMINARY REVIEW FACILITY CHECKLIST

Preliminary Review Facility Checklist

Facility:	Clean Harbors LaPorte	City	La Porte, Texas
ISW Reg. No:	50225	Date	May 2020
Permit No.	50225	Reviewer:	D Desha
EPA ID No.	TXD-982290140		

A. Waste Management Units:

RCRA Regulated Units:

NOR. No.	Description	Status
001	Warehouse I Container Storage Area	Active
003	Warehouse II Container Storage Area	Active
004	Warehouse III Container Storage Area	Active
026	Hazardous Waste Treatment Tank R-1	Active
027	Hazardous Waste Treatment Tank R-1A	Active
028	Cylinder Release Unit 1	Active
	Remove Last Row	Add Row

Solid Waste Management Units:

NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status

NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
NOR. No.	Description	Status
002	Trash Dumpster	Active Waste Management
AOC#1	Warehouse III Loading Docks and Truck Bays	Active Waste Management
AOC#2	Former UST south of Warehouse I	Removed (1)
AOC#3	Former UST east of Warehouse I	Removed (1)
AOC#4	Firewater Collection Basin	Active, Non-Waste Management
AOC#5	Stormwater Ditch north of Warehouse I	Active, Non-waste Management (2)
AOC#6	Stormwater Ditch east of Warehouse I	Active, Non-waste management (2)
AOC#7	Former Ponds northeast of Warehouse I	Removed
029	Class 1 Industrial Waste Bin	Active
030	Nonhaz Neutralization Unit 1	Active
031	Nonhaz Neutralization Unit 2	Active
034	Mix Tub/Shredder	Active
035	Mix Tub 2	Active
	Remove Last Row	Add Row

B. Reviewed Documents

RCRA:

Part A ☒

Part B ☒

Permit ☐

CERCLA:

Inspection Reports:	RCRA Compliance Inspection Reports dated as follows, plus associated facility responses: • May 23-24, 2012 • April 25-26, 2013 • May 7, 2014 • July 14, 2015 • May 23-24, 2016 • February 7-13, 2017 • December 17-18, 2020
Enforcement Actions	None
Exposure Infomation	None
Other Infomation:	Facility files containing internal reports on spill and leaking container events, near-miss events, injury and OSHA reportable events, reviewing entries for all spill and leaking container events from 1988 through August, 1997. RCRA Facility Assessment, dated June 30, 1992, prepared for the U.S. EPA by PRC Environmental Management, Inc. Annual Site Activity Reports, dated as follows: · 1990 Reporting Year, by T.E.S., dated January 23, 1991 · 1991 Reporting Year, by Laidlaw, dated January 24, 1992 · 1992 Reporting Year, by Laidlaw, dated January 22, 1993 · 1993 Reporting Year, by Laidlaw, dated January 24, 1994 · 1994 Reporting Year, by Laidlaw, dated January 24, 1995 · 1995 Reporting Year, by Laidlaw, dated January 23, 1996 · 1996 Reporting Year, by Laidlaw, dated January 24, 1997 · 2002 – 2020 by CHL

C. Summary:

Facility records and an evaluation of the regulated waste management units indicates that no known or reportable releases have occurred at the facility, nor are there any units for which solid waste is known to have been managed outside of permitted units. However, there is the potential for minor accumulation of waste residuals at certain areas of concern.

D. Recommended Action::

No further action at this time is recommended for RCRA regulated waste management units, SWMUs or Areas of Concern.

ATTACHMENT IX-B

Preliminary Review Unit Checklists

NOR 001 - Warehouse I Container Storage Area
NOR 002 - Trash Dumpsters for Management of Class 2 Plant Refuse
NOR 003 - Warehouse II Container Storage Area
NOR 004 - Warehouse III container Storage Area
NOR 026 – Hazardous Waste Treatment Tank R1
NOR 027 – Hazardous Waste Treatment Tank R1A
NOR 028 - Cylinder Release Unit
NOR 029 – Class 1 Industrial Waste Bin
NOR 030 – Non Haz Neutralization Unit 1
NOR 031 – Non Haz Neutralization Unit 2
Area of Concern No. 1 - Warehouse III Loading Dock and Truck Bays
Area of Concern No. 2 - Former UST South of Warehouse I
Area of Concern No. 3 - Former UST East of Warehouse I
Area of Concern No. 4 - Firewater Collection Basin
Area of Concern No. 5 - Stormwater Ditch North of Warehouse I
Area of Concern No. 6 - Stormwater Ditch East of Warehouse I Rear Parking Area
Area of Concern No. 7 - Former Ponds Northeast of Warehouse I
NOR 034 - Mix Tub / Shredder
NOR 035 - Mix Tub 2

Preliminary Review Facility Checklist

Facility:	Clean Harbors LaPorte	City	La Porte, Texas
ISW Reg. No:	50225	Date	May 2020
Permit No.	50225	Reviewer:	D Desha
EPA ID No.	TXD982290140		

Waste Management Unit(s):

A. NOR No.:	001
B. Description:	Warehouse I Container Storage Area (Process Code S01). Commercial-grade metal building, fully enclosed with epoxy-coated reinforced concrete floor used as a single permitted container storage area. The inside area is subdivided into seven subareas for segregated storage plus a staging area used for temporary holding, transfer, and sampling. The perimeters of the floor systems for all subareas and the staging area have secondary containment features as described in Section V.B. The permitted capacity of Warehouse I container storage area is 403,960 gallons plus an additional 8,800 gallons in containers of temporary holding capacity in the staging area.
C. Dates of Operation:	Since 1988
Wastes Managed:	This unit is permitted to store all EPA-listed RCRA hazardous wastes listed in Table IV.B of this application and Table III-1 of the Part A application and other non-hazardous Class 1 and Class 2 industrial solid wastes. Potential hazardous constituents include all the listed chemical constituents listed in 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX, incorporated herein by reference. According to normal operating practices, wastes typically stored in this unit include caustic materials, PCB's, oxidizers and organic peroxides, some dioxin-related wastes, and miscellaneous materials that are compatible with the other types of wastes stored in the unit. Sampling of all waste containers occurs in the staging area immediately adjacent to this unit.
Evidence of Release:	No visible evidence or documented history of release to environment was observed.
Pollutant Dispersal Pathways:	There is a minor potential for migration by air, soil, groundwater, and surface water. Wastes and pollutants are otherwise contained by 6-inch-high concrete curbing and epoxy-coated concrete floor.

Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system and coating appears in good condition. Only relatively minor spills and leaks have been reported which were cleaned up in an expeditious and thorough manner. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	002
B. Description:	Trash dumpster for management of Class 2 non-hazardous plant refuse.
C. Dates of Operation:	Since 1988
Wastes Managed:	Plant trash and debris generated from routine administration and maintenance operations, not associated with any other industrial waste management activities occurring at the facility. Class 2 industrial solid waste code 05029992 is currently managed. Formerly managed Class 2 non-hazardous waste code 05019032. Based on the NOR, Class 1 non-hazardous trash and debris from sampling activities were indicated. However, based on facility knowledge, this waste (and waste code 05009011) were never managed at this facility, and the listing on the NOR is a clerical error in the TCEQ's computer data base, and the erroneous entry has not been or cannot be deleted.
Evidence of Release:	No visible evidence or documented history of release to environment.
Pollutant Dispersal Pathways:	Minor potential for migration by air, soil, groundwater, and surface water.
Summary:	Wastes are contained temporarily in covered metal dumpsters which are routinely removed for off-site disposal. Nature of wastes, when managed in an approved manner, does not pose a significant potential for release to the environment or related risk to human or ecological receptors.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	003

B. Description:	Warehouse II Container Storage Area (Process Code S01). Commercial-grade metal building, fully enclosed with epoxy-coated reinforced concrete floor used as a single permitted container storage area. The inside area is subdivided into three subareas for segregated storage plus a staging area used for temporary holding, weighing and transfer of containers. The perimeters of the floor system for all subareas and the staging area have secondary containment features as described in Section V.B. The permitted capacity of Warehouse II container storage area is 264,970 gallons plus an additional 8,800 gallons of temporary holding capacity in containers in the staging area.
C. Dates of Operation:	Since 1989
Wastes Managed:	This unit is permitted to store all EPA-listed RCRA hazardous wastes listed in Table IV.B of this application and Table III-1 of the Part A application and other non-hazardous Class 1 and Class 2 industrial solid wastes. Potential hazardous constituents include all the listed chemical constituents listed in 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX, incorporated herein by reference. According to normal operating practices, wastes typically stored in this unit include acids, soils and other media containing toxicity characteristic wastes, mercury containing light bulbs and other used equipment, and some dioxin-related wastes. All wastes are stored in a compatible manner. Also, Class 1 and Class 2 industrial solid wastes, including empty containers and soils and media contaminated with petroleum hydrocarbons, are stored there. This unit is also the primary location used to store Class 2 Non Hazardous Regulated Medical Waste. Wastes previously stored included non-flammable and non-regulated wastes, corrosive acids, certain non-hazardous wastes for day storage, and gas cylinders of vanadium oztrichloride and vanadium tetrachloride.
Evidence of Release:	No visible evidence or documented history of release was observed.
Pollutant Dispersal Pathways:	There is a low potential for migration by air, soil, groundwater, and surface water for most wastes. Wastes and pollutants are otherwise contained by 6-inch-high concrete curbing and epoxy-coated concrete floor.

Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system and coating appear in good condition. Only relatively minor spill and leaks have been reported which were cleaned up in an expeditious and thorough manner. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	004
B. Description:	Warehouse III Container Storage Area (Process Code S01). Commercial-grade metal building, fully enclosed with epoxy-coated, reinforced concrete floor used as a single permitted container storage area. The inside area is subdivided into three subareas for segregated storage plus a staging area used for temporary holding and transfer of containers. The perimeters of floor system for all subareas and staging area have secondary containment features as described in Section V.B. The permitted capacity of Warehouse III container storage area is 395,340 gallons plus an additional 8,800 gallons of temporary holding capacity in containers in the staging area.
C. Dates of Operation:	Since 1990
Wastes Managed:	This unit is permitted to store all EPA-listed RCRA hazardous wastes listed in Table IV.B of this application and Table III-1 of the Part A application and other non-hazardous Class 1 and Class 2 industrial solid wastes. Potential hazardous constituents include all the listed chemical constituents listed in 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX, incorporated herein by reference. For operational purposes, this unit has been designated specifically for storage of ignitable wastes. Wastes typically stored in this unit include flammable solvents, paint wastes, alcohols, reactive materials, miscellaneous hydrocarbon containing wastes, chlorinated solvents, PCB, dioxin-related and corrosive wastes that are ignitable, miscellaneous lab packed wastes and miscellaneous materials that are compatible with ignitable wastes. Incompatible wastes are segregated and stored in separate sub-areas.

Evidence of Release:	No visible evidence or documented history of release to environment was observed. On April 15, 1997, a rapid pressure release from a drum occurred which caused damage to the roof above. However, the event did not result in fuming or a fire, and no reportable quantities were released. No other containers were affected.
Pollutant Dispersal Pathways:	There is a low potential for migration by soil, groundwater, and surface water. Wastes and pollutants are otherwise contained by 6-inch-high concrete curbing and epoxy-coated concrete floor. Storage of flammable and potentially explosive wastes suggests a moderate potential for releases to air.
Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system and coating appears in good condition. Only relatively minor spills and leaks have been reported which were cleaned up in an expeditious and thorough manner. The 1997 drum pressure release did not result in significant release to air or a fire. Unit operations maintains separation of incompatible and reactive wastes in separately-contained subareas. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	026
B. Description:	200 gallon hazardous waste treatment tank R1 located in Warehouse I containment. The perimeters of the floor systems for all subareas and the staging area have secondary containment features as described in Section V.B.
C. Dates of Operation:	Since 2005
Wastes Managed:	This unit is permitted to treat liquid or gas EPA-listed RCRA hazardous wastes listed in Table IV.B of this application and Table III-1 of the Part A application and other non-hazardous Class 1 and Class 2 industrial solid wastes. Potential hazardous constituents include all the listed chemical constituents listed in 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX, incorporated herein by reference. According to normal operating practices, wastes are typically destroyed in this unit. Residues from the reactant solutions are pumped into drums and shipped offsite for final disposal.
Evidence of Release:	No visible evidence or documented history of release to environment was observed.
Pollutant Dispersal Pathways:	There is a minor potential for migration by air, soil, groundwater, and surface water. Wastes and pollutants are otherwise contained by 6-inch-high concrete curbing and epoxy-coated concrete floor.

Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system and coating appears in good condition. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	027
B. Description:	500 gallon hazardous waste treatment tank R1A located in Warehouse I containment. The perimeters of the floor systems for all subareas and the staging area have secondary containment features as described in Section V.B.
C. Dates of Operation:	Since 2005
Wastes Managed:	This unit is permitted to treat liquid or gas EPA-listed RCRA hazardous wastes listed in Table IV.B of this application and Table III-1 of the Part A application and other non-hazardous Class 1 and Class 2 industrial solid wastes. Potential hazardous constituents include all the listed chemical constituents listed in 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX, incorporated herein by reference. According to normal operating practices, wastes are typically destroyed in this unit. Residues from the reactant solutions are pumped into drums and shipped offsite for final disposal.
Evidence of Release:	No visible evidence or documented history of release to environment was observed.
Pollutant Dispersal Pathways:	There is a minor potential for migration by air, soil, groundwater, and surface water. Wastes and pollutants are otherwise contained by 6-inch-high concrete curbing and epoxy-coated concrete floor.
Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system and coating appears in good condition. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	028
B. Description:	A cylinder release unit located in Warehouse I containment. The perimeters of the floor systems for all subareas and the staging area have secondary containment features as described in Section V.B.
C. Dates of Operation:	Since 2005
Wastes Managed:	This unit is permitted to release compressed atmospheric gases.

Evidence of Release:	No visible evidence or documented history of release to environment was observed.
Pollutant Dispersal Pathways:	There is a minor potential for migration by air. Wastes and pollutants are otherwise contained by 6-inch-high concrete curbing and epoxy-coated concrete floor.
Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system and coating appears in good condition. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	029
B. Description:	20 yd^3 rolloff for class 1 industrial waste located on concrete containment behind Warehouse III.
C. Dates of Operation:	Since 2005
Wastes Managed:	non-hazardous Class 1 industrial solid wastes.
Evidence of Release:	No visible evidence or documented history of release to environment was observed.
Pollutant Dispersal Pathways:	There is a minor potential for migration by air, soil, groundwater, and surface water.
Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system appears in good condition. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	030
B. Description:	500 gallon Non hazardous neutralization tank 1 located in Warehouse I containment. The perimeters of the floor systems for all subareas and the staging area have secondary containment features as described in Section V.B.
C. Dates of Operation:	Since 2008
Wastes Managed:	This unit is used to treat non-hazardous Class 1 and Class 2 industrial solid wastes.
Evidence of Release:	No visible evidence or documented history of release to environment was observed.
Pollutant Dispersal Pathways:	There is a minor potential for migration by air, soil, groundwater, and surface water. Wastes and pollutants are otherwise contained by 6-inch-high concrete curbing and epoxy-coated concrete floor.

Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system and coating appears in good condition. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	031
B. Description:	500 gallon Non hazardous neutralization tank 2 located in Warehouse I containment. The perimeters of the floor systems for all subareas and the staging area have secondary containment features as described in Section V.B.
C. Dates of Operation:	Since 2008
Wastes Managed:	This unit is used to treat non-hazardous Class 1 and Class 2 industrial solid wastes.
Evidence of Release:	No visible evidence or documented history of release to environment was observed.
Pollutant Dispersal Pathways:	There is a minor potential for migration by air, soil, groundwater, and surface water. Wastes and pollutants are otherwise contained by 6-inch-high concrete curbing and epoxy-coated concrete floor.
Summary:	The secondary containment curbing is in good condition and has greater than required capacity. The floor system and coating appears in good condition. Currently, there is no visual evidence of environmental release.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	Area of Concern #1
B. Description:	Warehouse III Loading/Receiving Dock and Truck Bays. The area is lined with concrete paving, and concrete curbing is used as secondary for spills coming out of the trucks or off the dock.
C. Dates of Operation:	Since 1990
Wastes Managed:	All wastes normally destined for storage at Warehouses II and III.

Evidence of Release:	No visible evidence of release can currently be seen. The facility documentation indicates several minor events where containers delivered to facility were leaking. Some spill events involved contaminating the undercarriage of the truck which required cleaning. A spill of non-hazardous dye in 1996 resulted in wastes being contained within the loading dock's containment berm which is located at pavement level in the truck bay. On one occasion in 1996, a transformer was received which was leaking dielectric fluid containing PCBs (<500 ppm). No evidence was documented of a release to the environment. Documentation indicates that spills and leaks did not result in releases to the environment.
Pollutant Dispersal Pathways:	There is a minor potential for migration by air, soil, groundwater, and surface water. Wastes and pollutants are otherwise contained between 6-inch-high concrete curbing and the face of the dock. The secondary containment area is susceptible to run-on during major storm events, which increases the potential for surface water migration.
Summary:	Spill and leaks were reportedly cleaned up in an expeditious and thorough manner. Due to the less controlled nature of the truck bays, and since the facility has little control on the leakage of trucks before they back up to the dock, there is an increased general potential for spills outside the curbed containment system and releases to underlying soil or to surface water. However, to date, there has not been a release to the environment.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	Area of Concern #2
B. Description:	Former Underground Storage Tank located south of Warehouse I. Tank was removed in 1993.
C. Dates of Operation:	Prior to 1986
Wastes Managed:	None. Tank was used for automotive fuel storage while the property was owned and operated by Coors Distributing. The fuel tank was not used during ownership and operation by T.E.S. or Laidlaw (TES). The tank was backfilled by T.E.S. with gravel upon taking ownership of facility.

Evidence of Release:	No visible evidence or history of release. The tank was not identified on the list for leaking underground storage tanks. The tank was removed voluntarily by Laidlaw (TES) using a qualified remedial contractor, and the TCEQ was present during part of the removal action. Samples were obtained and analyzed for BTEX and TPH and found to be at insignificant levels in the excavation. Consequently, there is no reason to suspect a release from this area.
Pollutant Dispersal Pathways:	There is a potential pathway to groundwater beneath site, which could affect the shallow groundwater aquifer. However, the lack of significant residual fuel constituents after removal results in the potential being very small. Furthermore, the surface at the former tank location is continuously covered by concrete paving which would effectively mitigate and reduce migration of constituents due to infiltration.
Summary:	The tank was removed by Laidlaw Environmental Services, Field Services Division, which is a separate entity within Laidlaw. The tank does not show up on the list of reported leaking underground storage tanks. The tank was not excessively old, having been used by only the Coors Distributing company, occupying the property prior to T.E.S.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	Area of Concern #3
B. Description:	Former Underground Storage Tank located east of Warehouse I. Tank was removed in 1993.
C. Dates of Operation:	Prior to 1986
Wastes Managed:	None. The tank was used for automotive fuel storage while property was owned and operated by Coors Distributing. The fuel tank was not used during ownership and operation by T.E.S. or Laidlaw (TES). The tank was backfilled with gravel by T.E.S. upon their taking ownership of facility.
Evidence of Release:	No visible evidence or history of release. The tank was not identified on the list for leaking underground storage tanks. The tank was removed voluntarily by Laidlaw using a qualified remedial contractor, and the TCEQ was present during part of the removal action. Samples were obtained and analyzed for BTEX and TPH and found to be at insignificant levels in the excavation. Consequently, there is no reason to suspect a release from this area.

Pollutant Dispersal Pathways:	There is a potential pathway to groundwater beneath site, which could affect shallow the groundwater aquifer. However, the lack of significant residual fuel constituents after removal results in the potential being very small. Furthermore, the surface at the former tank location is continuously covered by concrete paving which would effectively mitigate and reduce migration of constituents due to infiltration.
Summary:	The tank was removed by Laidlaw Environmental Services, Field Services Division, which is a separate entity within Laidlaw. The tank does not show up on the list of reported leaking underground storage tanks. The tank was not excessively old, having been used by only the Coors Distributing company, occupying the property prior to T.E.S.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	Area of Concern #4
B. Description:	Firewater Collection Basin
C. Dates of Operation:	1993 to present
Wastes Managed:	None. The unit is used to collect spent firewater which may overflow out of Warehouse III in the event that firewater volume exceeds secondary containment volume of the container storage area.
Evidence of Release:	No visible evidence or history of release or accumulation. There is a potential point of accumulation and potential release, if basin overflows or if the contents are pumped directly to the ground.
Pollutant Dispersal Pathways:	Pollutants may be carried by overland flow after spilling out of Warehouse III onto the concrete pavement on the north side of Warehouse III. Water and constituents flow into concrete-lined collection basin. Pollutants may be released by spilling out of basin if basin overflows due to excessive collection. Pollutants would flow as surface water, generally west or north, into large drainage swale, then subsequently to the drainage ditch on east side of Battleground Road. Pollutants would then flow northward toward Buffalo Bayou (Houston Ship Channel). The potential for release to soil, air, or groundwater is low.
Summary:	The firewater collection basin has yet to date been used to collected excess firewater as it is intended for use, as no such fires have occurred. Predominant collection that has occurred to date is rainwater collected within the paved vehicle parking area north of Warehouse III.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	Area of Concern #5

B. Description:	Stormwater ditch north of Warehouse I along north side of rail spur. The ditch extends toward the front of the property and discharges to drainage ditch outside facility fence.
C. Dates of Operation:	N/A
Wastes Managed:	None. This is a potential point of sediment and constituent accumulations or pathway of pollutants.
Evidence of Release:	There is no visible evidence or documented history of release to or from this location. Ground surface within the ditch flow line has minor discoloration due to sediment, and vegetation is sparse.
Pollutant Dispersal Pathways:	Pollutants could spill from rail cars along rail siding to the North of Warehouse I, carried by surface water in subject ditch, flowing toward the front of the facility and discharging into drainage ditch on east side of Battleground Road. The subject ditch also flows within 20 feet of onsite drinking water well.
Summary:	To date, there is no documented evidence of spills or releases which could have impacted this area of concern. The area is of concern primarily because of the potential for accumulation of waste residuals from operations at Warehouse I or related to rail cars left at the siding or as evidence of other potential upstream releases.
Recommended Action:	No further action recommended at this time
A. NOR No.:	Area of Concern #6
B. Description:	Stormwater Ditch East of rear parking (concrete area) behind Warehouse I.
C. Dates of Operation:	N/A
Wastes Managed:	None. This location is point of potential accumulation or pathway of pollutants.
Evidence of Release:	There is no visible evidence or documented history of a release to or from this location. This is a potential point of release or pollutant pathway. No evidence of impacts to ground or vegetation are visible. This location is at point where runoff from surface areas adjacent to Warehouse I is allowed to discharge through opening in the containment curbing. This opening is approximately140 feet from the nearest point of Warehouse I, and a spill would likely require transport by rainfall run-off to result in a release to the environment.

Pollutant Dispersal Pathways:	Surface water is the major pathway with lesser potential to the soil. Minor potential to air groundwater. Releases to this area could occur if a spill were to occur somewhere east of Warehouse I during movement of containers and if rainwater run-off were to carry these pollutants to the break in the curb. It is noted that the curbing is not part of the facility's secondary containment system nor is required to contain wastes, but it is primarily for stormwater drainage control and parking area safety.
Summary:	To date, there is no documented evidence of spills or releases which could have impacted this area of concern. The area is of concern primarily because of the potential for accumulation of waste residuals from operations at Warehouse I or related to rail cars left at the adjacent siding. Furthermore, there is a outlet in the containment curb near this location which would be a likely point of release to the ground should wastes or waste residuals be washed off the pavement due to precipitation.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	Area of Concern #7
B. Description:	Two Former Ponds Northeast of Warehouse I, located between split in rail siding and the parking area east of Warehouse I.
C. Dates of Operation:	Exact dates of construction and removal are unknown. The southernmost of the two ponds was in existence sometime prior to 1979, apparently contemporaneously with the original construction of Warehouse I by Coors Distributing, but it was removed prior to 1986. The northernmost pond are appears in an the 1886 aerial photograph and may have replaced the use of the southernmost pond after construction of the paved area east of Warehouse I. Neither pond shows up on aerial photos prior to 1979 or after 1986. The next closest dates of aerial photographs are 1962 and 1992.
Wastes Managed:	None identified.
Evidence of Release:	No visible evidence or history of release.
Pollutant Dispersal Pathways:	Surface water is the major pathway. There is potential for collection in the pond area and release to drainage ditch, with subsequent drainage away from the east side of facility. Minor potential to air, soil and groundwater.

Summary:	Apparent ponds were visible on aerial photograph taken in 1979 and 1986. The purpose of these ponds is not known, but they may have been used for firewater storage or were simple drainage basins. The area is of concern because associated depressions could have potentially accumulated wastes or waste residuals due to non-waste management activities at Warehouse I prior to 1988 or from waste management activities since the facility was used for that purpose. Facility records, however, do not indicate that the ponds were in use while Warehouse I was used for waste management activities, nor do they indicate that the younger pond even existed after the time the facility was converted to this purpose (permitted 4/6/88). There are no records or visible evidence to suggest that wastes residuals would be found in either pond within this area. However, the location still appears to be a low spot which tends to hold surface water and could accumulate residuals from upstream releases.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	034
B. Description:	Commercial material shredder performs size reduction and shredding of containers with nonhazardous waste only into Mix Tub 1 where liquids are solidified using an appropriate solidification media prior to wastes being shipped offsite for landfilling.
C. Dates of Operation:	2015 to present
Wastes Managed:	Non-hazardous liquid and solid waste
Evidence of Release:	No visible evidence or history of release.
Pollutant Dispersal Pathways:	Surface water is the major pathway with lesser potential to the soil. Minor potential to air and groundwater. Releases to this area could occur if a spill were to occur and if rainwater run-off were to carry these pollutants to the break in the curb. It is noted that the curbing is not part of the facility's secondary containment system nor is required to contain wastes, but it is primarily for stormwater drainage control and parking area safety.
Summary:	Container used to solidified nonhazardous wastes only using an appropriate solidification media prior to wastes being shipped offsite for landfilling.
Recommended Action:	No further action recommended at this time.
A. NOR No.:	035

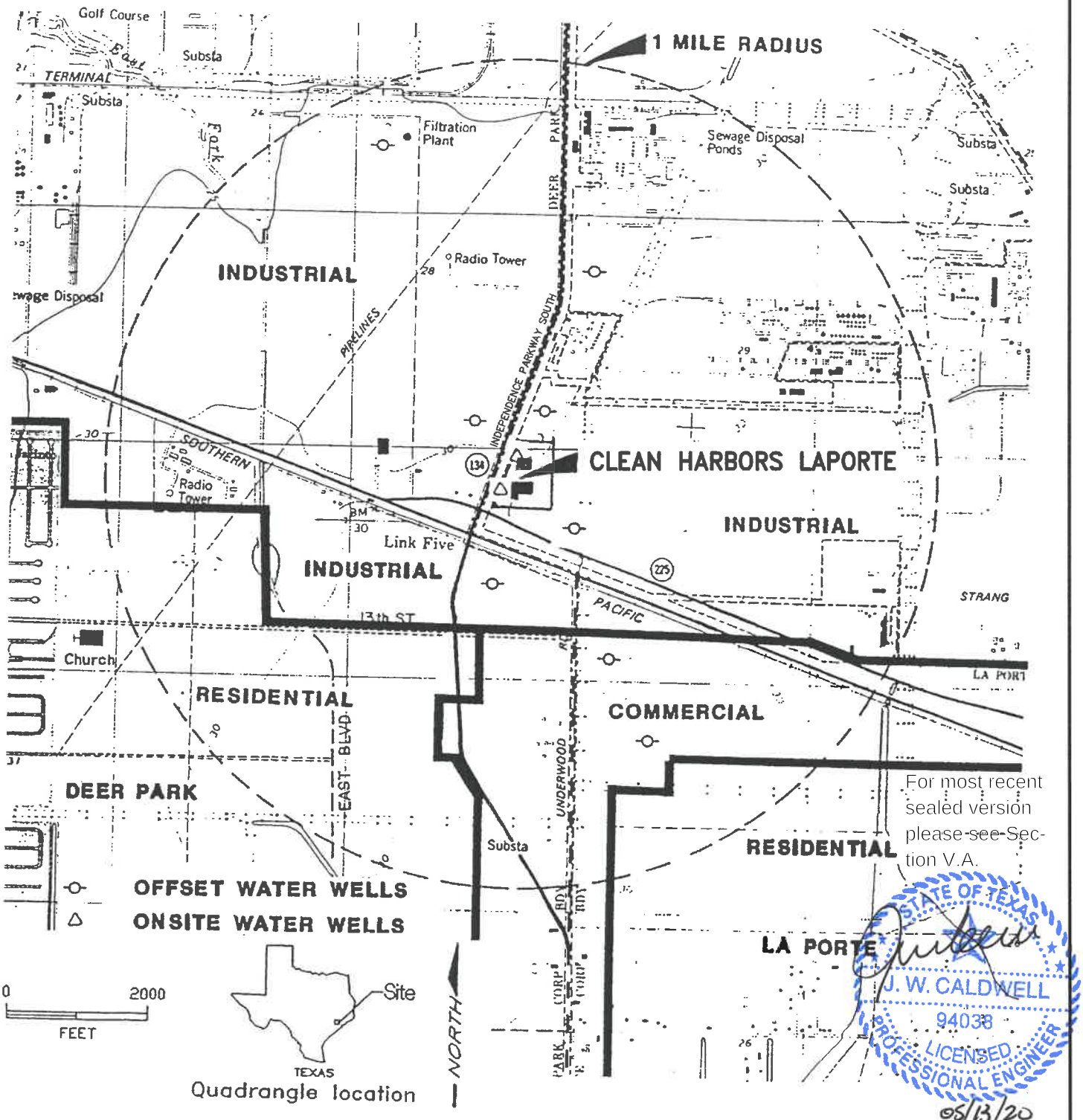
B. Description:	Container used to solidified nonhazardous wastes only using an appropriate solidification media prior to wastes being shipped offsite for landfilling.
C. Dates of Operation:	2015 to present
Wastes Managed:	Non-hazardous liquid and solid waste
Evidence of Release:	No visible evidence or history of release.
Pollutant Dispersal Pathways:	Surface water is the major pathway with lesser potential to the soil. Minor potential to air and groundwater. Releases to this area could occur if a spill were to occur and if rainwater run-off were to carry these pollutants to the break in the curb. It is noted that the curbing is not part of the facility's secondary containment system nor is required to contain wastes, but it is primarily for stormwater drainage control and parking area safety.
Summary:	Container used to solidified nonhazardous wastes only using an appropriate solidification media prior to wastes being shipped offsite for landfilling.
Recommended Action:	No further action recommended at this time.

ATTACHMENT IX-C

Facility and SWMU Location Maps

Figure IX.1 - Regional Facility Map

Figure IX.2 - SWMU Location Map



For most recent sealed version please see Section V.A.

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED
PROFESSIONAL ENGINEER
05/13/20

Modified from USGS La Porte, Texas 7.5 Min. Quadrangle

REV.	DESCRIPTION	DRAWN BY	DATE	APPR. BY
B	PERMIT RENEWAL 2020	KMC	5/7/20	DAD

CleanHarbors®

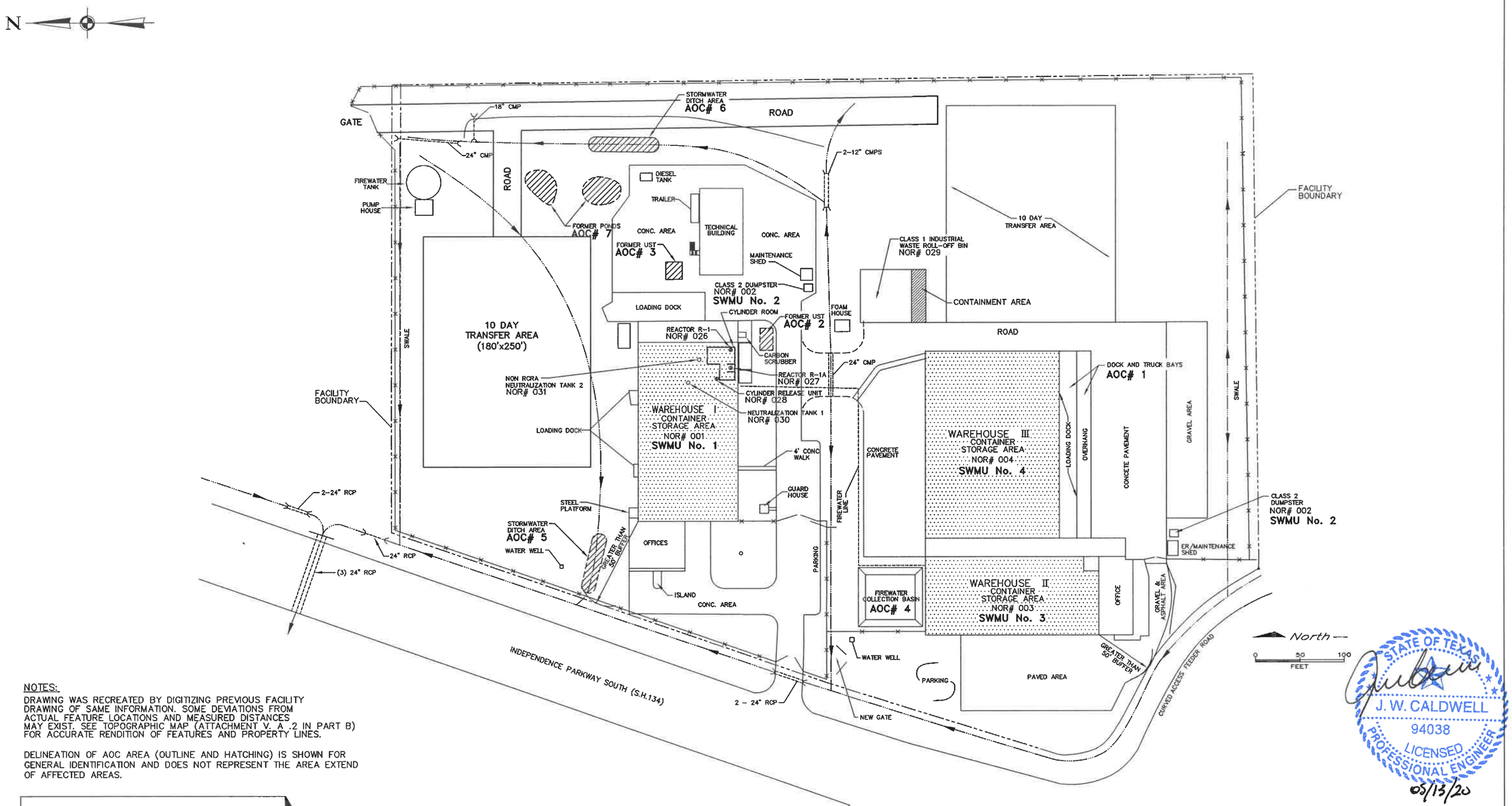
TITLE

CLEAN HARBORS LAPORTE REGIONAL FACILITY MAP

DRAWN	CHECKED	SCALE	DATE
K.M.C.	M.A.R.	AS NOTED	07/30/09

DRAWING NO. 67LT-1000-003

REV. B



NOTES:

DRAWING WAS RECREATED BY DIGITIZING PREVIOUS FACILITY DRAWING OF SAME INFORMATION. SOME DEVIATIONS FROM ACTUAL FEATURE LOCATIONS AND MEASURED DISTANCES MAY EXIST. SEE TOPOGRAPHIC MAP (ATTACHMENT V. A .2 IN PART B) FOR ACCURATE RENDITION OF FEATURES AND PROPERTY LINES.

DELINEATION OF AOC AREA (OUTLINE AND HATCHING) IS SHOWN FOR GENERAL IDENTIFICATION AND DOES NOT REPRESENT THE AREA EXTEND OF AFFECTED AREAS.

LEGEND

- FACILITY PROPERTY BOUNDARY
- CHAIN LINK FENCE
- BOUNDARY OF EXISTING CONTAINER STORAGE AREAS
- DRAINAGE CHANNEL FLOWLINE AND FLOW DIRECTION

STATE OF TEXAS
J. W. CALDWELL
94038
LICENSED PROFESSIONAL ENGINEER
05/13/20

REFERENCE DRAWINGS

TITLE	DRAWING NO.

REV.	DESCRIPTION OF ISSUE	DWN.	CHECKED	CONSULTED	APPROVED	DATE	EST. NO.
C	PERMIT RENEWAL 2020	KMC				DAD 5/7/20	
B	ADDED NOR# 029, NOR# 030, NOR# 031 & AOC# 4	KMC				MC 12/29/09	
A	FOR PERMIT RENEWAL	KMC				MAR 7/30/09	

CleanHarbors
LAPORTE
500 Independence Parkway South
LaPorte, Texas 77571
Phone: (281) 727-7600

TITLE:

FACILITY SWMU LOCATIONS

FILE: 67LT-1000-004

APPROVED:	SCALE:	DWG. NO.:	REV.
	1 = 50	67LT-1000-004	C

ATTACHMENT IX-D

(Reserved for Pertinent Waste Information, as needed)

APPENDIX X – AIR EMISSIONS STANDARDS

GENERAL INFORMATION

As part of the Part B permit application, all new applicants, permit renewals, and modifications must take into account the effect of their existing or proposed facility operations on air quality within the area the facility is located. This is done by demonstrating compliance with RCRA air emissions requirements (specifically 40 CFR Part 264, Subparts AA, BB and CC), as well as any applicable state or federal air emissions standards. Permit renewal applicants have the option of either including air emissions standards as part of their RCRA operating permits or applying for a separate air permit through the TCEQ Office of Air Quality ("OAQ").

As a permit renewal applicant, Clean Harbors LaPorte, has opted to continue inclusion of air emissions provisions within its RCRA operating permit. This document is intended to meet all of the conditions given in the Part B application that apply to this option.

This document is divided into three main sections, X.A, X.B and X.C as dictated by TCEQ's Part B application. Sections X.A, X.B and X.C provides all of the required information needed to document the facility's compliance with the respective Subpart AA, BB and CC air emissions standards.

X.A. Compliance with Air Emissions Standards for Process Vents

None of the processes regulated under Subpart AA are carried out at the facility and none of these processes are included in the proposed units in this permit renewal application. Therefore, Subpart AA regulations are not applicable to the operations described in this permit renewal application and thus Table X.A. is not applicable. Additionally, the certifications associated with process vents are not required.

X.B. Compliance with Air Emissions Standards for Equipment Leaks

There is no equipment in operation at the facility that is subject to Subpart BB requirements since the only type of equipment in >10% organic concentrations is operated for <300 hours annually, therefore is exempt pursuant to 40 CFR 264.1050(f):

> Equipment that contains or contacts hazardous waste with an organic concentration of at least 10 percent by weight for less than 300 hours per calendar year is excluded from the requirements of §§264.1052 through 264.1060 of this subpart if it is identified, as required in §264.1064(g)(6) of this subpart.

Thus, Subpart BB regulations are not applicable to the operations described in this permit renewal application as well as Table X.B. Additionally, certifications associated with equipment leaks are not required.

X.C. Compliance with Air Emissions Standards for Tanks, Surface Impoundments, and Containers

Per 40 CFR Part 264, Subpart CC, facility owners and operators must control organic air emissions from tanks, surface impoundments or containers used to manage hazardous wastes having an average volatile organic concentration of 500 ppm at the point of origin. Specifically exempted from this standard are waste management units holding waste prior to October 6, 1996 that are no longer active, containers with a capacity of less than 0.1 m3, tanks or surface impoundments that are under closure, waste management units managing wastes resulting from a RCRA or CERCLA corrective action, waste management units used solely to manage radioactive mixed wastes, and waste management units already in compliance with applicable Clean Air Act regulations (40 CFR Parts 60, 61 or 63).

The facility does not have floating roof covers.

The facility does not operate any surface impoundments.

The facility is not required to operate control devices covered under 40 CFR 264.1089 (e)(1) because the tanks are not in applicable VOC service, and applicable containers are DOT compliant Level 1 or 2 and kept closed at all times except to add or remove wastes.

Based on the above considerations, discussion will be limited here to tanks and containers. Below is detailed facility compliance with Subpart CC for applicable wastes it manages in covered hazardous waste management units.

Table X.C is attached to the Part B permit application.

A container certification is included as the final page of this appendix.

Compliance with Container Standards

Subpart CC regulations stipulate that containers that meet the applicable DOT packaging requirements and are kept closed and sealed shall be considered vapor-tight and in compliance with the standard. Also, containers are required to be inspected within 24 hours of receipt and every twelve months to ensure compliance with the standard.

Under current operations at the facility, all containers accepted for storage in the container storage areas must meet the applicable DOT packaging requirements and thus, are subject to Level 1 controls as specified in 40 CFR 264.1086(c). Containers that are accepted for storage are checked upon arrival to ensure that they are closed and sealed and meet the applicable DOT packaging requirements. Those that do not meet the applicable packaging requirements are either rejected, immediately transferred to an approved container or, if the material cannot be transferred, overpacked into an approved container. Under the Inspection Schedule, given in Section III of this application, containers (and container storage areas) are inspected daily and thus, there is no need for a separate annual inspection for Subpart CC compliance. Also, as indicated by the Inspection Schedule, any damaged, leaking or otherwise unacceptable containers are remediated within 24 hours of their discovery.

Roll-off containers accepted and managed at the site will not be in light material service (i.e., not contain >10% by weight of volatile organics) and thus, will be subject to Level 1 controls as specified in 40 CFR 264.1086(c). Upon acceptance, roll-off containers are visually inspected to ensure they are equipped with a cover and closure device that forms a continuous barrier over any openings or have an organic-suppressing barrier in place. Roll-offs that are not properly covered are either rejected or remediated prior to acceptance. Roll-off containers used for solids processing will be kept covered except when it is necessary to add or remove waste from them. Tanker trucks and rail tankers will be operated in light material service and thus, subject to the Level 2 controls specified in 40 CFR 264.1086(d). Only those tankers that meet the applicable DOT packaging requirements or have been demonstrated to be vapor-tight using 40 CFR Part 60, Appendix A, Method 27 will be managed at the site. Transfer of materials between tankers will be accomplished using a vapor balancing system.

Compliance with Tank Standards

Permitted operations at the facility include three container storage areas and two treatment tanks (R-1 and R-1A). An additional neutralization tank is proposed in this permit renewal. None of the existing or proposed tanks manage hazardous wastes having an average volatile organic concentration of 500 ppm and are therefore exempt from Subpart CC requirements.

Container Sampling

Container sampling is conducted to characterize incoming materials, as required by the facility's Waste Analysis Plan (WAP) – see Section IV. The enclosed staging area east of Warehouse I and the covered staging/loading area along the south side of Warehouse III are the designated container sampling areas for the facility. Both of these areas are within concrete berm containment and are adequately ventilated to prevent any significant buildup of vapors.

The facility has been providing and will continue to comply with 40 CFR Part 264, Subpart CC as required. Additional emission controls for container sampling, such as vapor treatment, are not required by Subpart CC and are not planned at this time.

Clean Harbors La Porte, LLC, La Porte, TX
EPA ID#: TXD982290140
Permit #: 50225

Certification

I, James Childress, certify that the requirements of 40 CFR Part §264, Subpart CC, are met for all containers subject to control.

Signature [signature] Date 5/21/2020

Table X.A Process Vents

None of the processes regulated under Subpart AA are carried out at the facility and none of these processes are included in the proposed units in this permit renewal application. Therefore, Subpart AA regulations are not applicable to the operations described in this permit renewal application and thus Table X.A. is not applicable.

Table X.B Equipment Leaks

There is no equipment in operation at the facility that is subject to Subpart BB requirements since the only type of equipment in >10% organic concentrations is operated for <300 hours annually, therefore is exempt pursuant to 40 CFR 264.1050(f):

Equipment that contains or contacts hazardous waste with an organic concentration of at least 10 percent by weight for less than 300 hours per calendar year is excluded from the requirements of §§264.1052 through 264.1060 of this subpart if it is identified, as required in §264.1064(g)(6) of this subpart.

Thus, Subpart BB regulations are not applicable to the operations described in this permit renewal application as well as Table X.B.

Permittee: Clean Harbors La Porte, LLC

Table X.C. - Tanks, Surface Impoundments, and Containers Subject to Air Emission Controls
List all units covered by this application

Permit Unit No.	Tanks	Design Capacity (Cubic Meters)	Hazardous Waste Maximum Organic Vapor Pressure[1] (Kilopascals)	Tank Used in Waste Stabilization Process (Y, N)	Tank Level Control (1, 2)[2]	Identify Tank Level 2 Control Tank Type and Control Device Type[3]
N/A						
N/A						
N/A						

Permit Unit No.	Surface Impoundments	Control Type (Floating Membrane/ Cover Vented through Closed Vent System to Control Device)[3]
N/A		
N/A		
N/A		
N/A		

Permit Unit No.	Container Storage Areas	Container Design Capacity (Cubic Meters)	In Light Material Service? (Y/N)	Container Level Standard[2](1,2,3)	Container Level Standard 3 Control Types (Closed-Vent System/ Enclosure, Control Device Type)[3]
001	Warehouse I	0.1 m3 and less than or equal to 0.46 m3 & >0.46 m3	Y	1, 2	N/A
002	Warehouse II	0.1 m3 and less than or equal to 0.46 m3 & >0.46 m3	Y	1, 2	N/A
003	Warehouse III	0.1 m3 and less than or equal to 0.46 m3 & >0.46 m3	Y	1, 2	N/A
033	Bulk Container Storage Area	>0.46 m3	N	1	N/A

Appendix

X.D

RESERVED

Appendix

XI

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Table XII.A. - Hazardous Waste Units (For Application Fee Calculations)

Verbal Description of Unit	Rated Capacity	Surface Acreage[1]	# of Unit Types[2]	Identical Unit Justification[3]
Warehouse I	403,960 Gallons	0.51	1	N/A
Warehouse II	264,970	0.33	1	N/A
Warehouse III	395,340	0.68	1	N/A
Bulk Container Storage Area (Permitted/Not Constructed)	181,777	0.38	1	N/A
Tank R-1	200 Gallons	0.01	1	N/A
Tank R-1A	500 Gallons Existing 1500 Gallon Proposed	0.01	1	N/A
Tank R2	500 Gallons Proposed	0.01	1	N/A
Cylinder Release Unit 1	N/A	0.01	1	N/A
Cylinder Release Unit 2 (Permitted/ Not Constructed)	N/A	0.01	N/A	Identical to Cylinder Release Unit 1. Proposed unit will be: (1) Made of the same material and same design; (2) The same size/ capacity within + 10%; (3) Manage the same waste (as identified by USEPA hazardous waste numbers; and (4) Have the same management characteristics.
		Total[4] 2	Total[4] 8	

Table XII.B. - Hazardous Waste Permit Application Fee Worksheet

Name of Facility: Clean Harbors La Porte, LLC

Solid Waste Registration Number: 50225

1. Process Analysis - $1,000	$	1,000
2. Facility Management Analysis - $500	$	500
3. Unit Analysis - 8 units @ $500 per unit	$	4,000
4. Site Evaluation - 2 acres @ $100 per acre	$	200
(Maximum of 300 acres)		
5. Minor amendment, Class 1, or Class 1 modification - $100	$	100
6. Cost of Providing Notice - $50 (+ $15 for a renewal)	$	65

Pay This Amount **Total** $5,865

Make Checks Payable To:

Texas Commission on Environmental Quality - Fund 549 *(your canceled check will be your receipt)*

Complete And Return With Payment To:

Texas Commission on Environmental
Quality Financial Administration Division -
MC 214 P.O. BOX 13088
Austin, Texas 78711-3088

The applicant's fees are subject to evaluation by the technical staff of the Texas Commission on Environmental Quality (TCEQ). However, the TCEQ reserves the right to assess further fees as may be necessitated.

Please do not submit a photocopy of the check (or equivalent transaction submittal) with your application packet but provide only the following account information:

Check No.	Date of Check	Check Amount
1985127	May 28, 2020	$5,865

Appendix

XIII

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