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, 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.

[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.

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: **Houston Refining**

(Individual, Corporation, or Other Legal Entity Name)

TCEQ Solid Waste Registration No: **30092** EPA I.D. No.: **TXD082688979**

Street Address (If Available): **12000 Lawndale Street**

City: **Houston** State: **Texas** Zip Code: **77017**

County: **Harris**

Telephone Number: **(713) 321-5741** Charter Number: **0011608011**

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.

Caryn J. Brooks
Principal Environmental Engineer
Houston Refining, LP
12000 Lawndale Street
Houston, Texas 77017
(713) 321-4710

Roel A. Muñoz
Manager, Environmental & DOT Pipelines
Houston Refining LP
12000 Lawndale Street
Houston, TX 77017
(713) 321-4094

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.

The Corporation Trust Company
1999 Bryan Street, Suite 900
Dallas, Texas 75201-3136

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

Operator Name: (Same as applicant)

Address: _____

City: _____, State: _____ Zip Code: _____

Telephone Number: _____ Charter Number: _____

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: _____

Address: _____

City: _____, State: _____ Zip Code: _____

Telephone Number: _____

[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].

Owner Name: _____

Address: _____

City: _____, State: _____ Zip Code: _____

Telephone Number: _____

E. Type of Application Submittal:

Initial ____ or Revision ____x___

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	None	None
2.	Wastewater disposal under the Texas Water Code	WQ0000392000	TCEQ
3.	Underground injection under the Texas Water Code	None	None
4.	Texas Clean Air Act Attachment F	NSR Permit 2167	Various** others as
5.	Texas Uranium Surface Mining & Reclamation Act	None	None
6.	Texas Surface Coal Mining & Reclamation Act	None	None
7.	Hazardous Waste Management program under the Resource Conservation and Recovery Act	50106	TCEQ
8.	UIC program under the Safe Drinking Water Act	None	None
9.	TPDES program under the Clean Water Act	WQ0000392000	TCEQ
10.	PSD program under the Clean Air Act	PSD TX-985	TCEQ
11.	Nonattainment program under the Clean Air Act	None	None

12. National Emission Standards for Hazardous Pollutants (NESHAP) Pre-construction approval under the Clean Air Act	None	None
13. Ocean dumping permits under the Marine Protection Research and Sanctuaries Act	None	None
14. Dredge or fill permits under section 404 of the Clean Water Act	None	None
15. Other relevant environmental permits	See Below	TCEQ

Public Water Supply (Reg.) #1011570

Wastewater Affluent Permit 401/601

Pipeline Crossing Permit

*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

**For a complete list of active air permits and registrations, refer to Attachment F of the Part A.

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

Petroleum refining and petrochemical (aromatic) feedstock production.

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.

RN 100218130, CN601313083.

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: _____ Date: 11/18/2020

Name and Official Title (type or print): ***Greg Nevermann, Site Manager Houston Refining***

Operator Signature: _____ Date: _____

Name and Official Title (type or print): _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print): _____

Owner Signature: _____ Date: _____

Name and Official Title (type or print): _____

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 GREG NEVERMANN on this 18 day of NOVEMBER, 2020.

My commission expires of the 8 day of August, 2021

Karen L Lyerly
Notary Public in and for HARRIS County, Texas

KAREN L. LYERLY
Notary Public, State of Texas
Comm. Expires 08-08-2021
Notary ID 5166580

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 Refinery is located on approximately 700 acres bound approximately as follows: West – an extension of Goodyear Drive; East – Light Company Road; North – Houston Ship Channel; South – U.S. Highway 225.

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

   Exit U.S. Hwy 225 to Allen Genoa Road, go north on Allen Genoa Road to intersection with Lawndale Avenue.

3. Enter the geographical coordinates of the facility:

   Latitude: 29 deg 42 min 34 sec

   Longitude: 95 deg 14 min 07 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.

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
2911	**Petroleum refining (LPG, Gasoline, Kerosene/Jet Fuel, Lubricants, Petrochemicals (Aromatics), Coke).**

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.

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.

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.).

   <u>These requirements are addressed in several drawings. A topographic map showing facility boundaries and one mile beyond the facility is provided in Attachment C-1. This map also shows surface water bodies. Attachment C-2 shows the location and boundary of each hazardous waste management unit. The status and areal size of each unit are indicated in the table below. There</u>

are no on-site injection wells. Attachment C-3 (labeled as Figure 4-1) shows recovery system wells which are currently in use. Note that HRW-109 on this figure has been replaced with HRW-109B. Attachment C-4 (labeled as Figure 5-1) shows corrective action monitoring wells which are in use. Attachment C-5 (labeled as Figure D-2) shows some of these wells and other wells that are present on site. Attachment C-5 also shows the location of known boreholes and all discharge structures. There are no springs in or around the facility. The water well map, Attachment C-6, shows all known wells within one mile of the facility.

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.

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.

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
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	
I.F.4	Active air permits and registrations	F	X	

Table III-1 – Hazardous Wastes and Management Activities

Verbal Description of Waste	TCEQ Waste for Code and Classification Code	EPA Hazardous Waste Number	Storage[1] of Wastes Received from Off-Site	Processing[2] of Wastes Received from Off-Site	Disposal of Wastes Received from Off-Site	Storage[1] of Wastes Generated On-Site	Processing[2] of Wastes Generated On-Site	Disposal[2] of Wastes Generated On-Site	Annual Quantity Generated and/or Received
Primary Sludge	0014695H	F037						X	Historical
API Separator Sludge	0018695H	D018, K051						X	Historical
Exchanger Bundle Cleaning Sludge	0019695H	K050						X	Historical
Tank Bottoms with Lead	0045602H	K052						X	Historical

[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.

Table III-2 – Hazardous Waste Management Unit Checklist

Waste Management Unit	TCEQ N.O.R. Unit #	Status[1]	Design Capacity[2]	Number of Years Utilized	Date in Service
Southwest Landfarm Plots 612/614	001	Closed	4.96 acres	38	1960
Southwest Landfarm Plot 613	003	Closed	3.27 acres	38	1960
Southwest Landfarm Plot 615	004	Closed	1.9 acres	38	1960
Southwest Landfarm Plot 616	005	Closed	2.1 acres	38	1960
Southwest Landfarm Plot 617	006	Closed	1.6 acres	38	1960
Northeast Landfarm Plot 2	007	Closed	1.48 acres	48	1950
Northeast Landfarm Plot 4	022	Closed	1.74 acres	48	1950
East Guard Basin	032	Inactive (delay of closure)	6 million gallons	25[3]	1969
East Impoundment Basin	034	Inactive (delay of closure)	20 million gallons	20[3]	1974

[1] Indicate only one of the following: Active, Inactive, Closed, or Proposed
[2] Cubic yards, gallons, pounds, gallons/minute, pounds/hour, BTUs/hour, etc.
[3] Reflects number of years in hazardous waste service

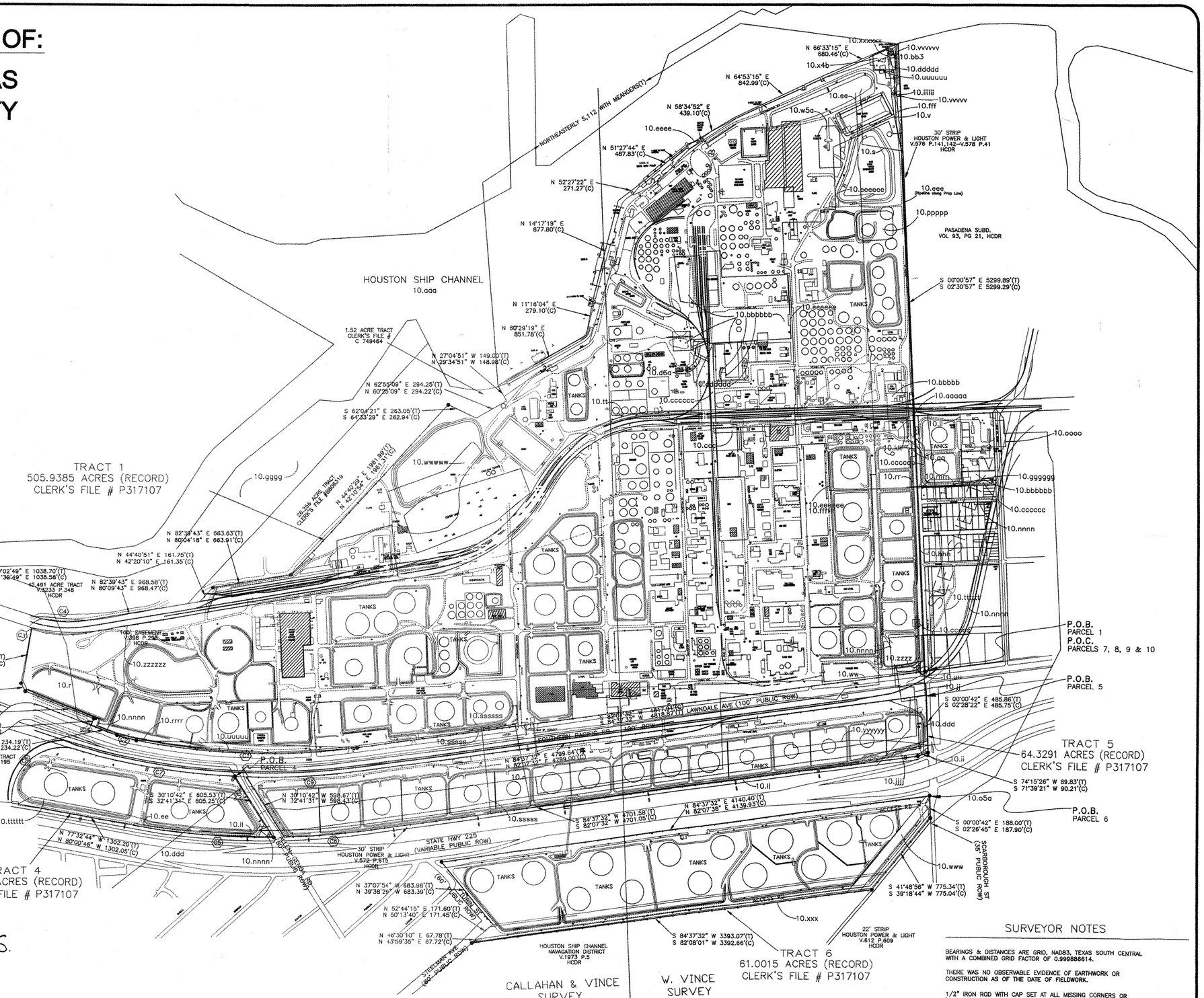
ATTACHMENT B

SITE LEGAL DESCRIPTION

ALTA/ACSM LAND TITLE SURVEY OF:

TRACTS 1, 4, 5, 6, 7, 8, 9, & 10 AS DESCRIBED IN HARRIS COUNTY CLERK'S FILE NO. P317107, HARRIS COUNTY, TEXAS

CURVE	RADIUS	ARC LENGTH	DELTA ANGLE	CHORD BEARING	CHORD LENGTH
C1 (T)	5579.65'	1869.02'	19°11'33"	N 85°46'42" W	1860.30'
C1 (C)	5579.02'	1869.20'	19°11'47"	N 88°16'36" W	1860.47'
C2 (T)	1369.49'	168.33'	07°02'33"	N 72°39'39" W	168.23'
C2 (C)	1369.33'	168.24'	07°02'22"	N 75°08'35" W	168.13'
C3 (T)	1005.37'	11.10'	00°37'57"	N 69°21'48" W	11.10'
C3 (C)	1005.26'	11.10'	00°37'57"	N 71°51'48" W	11.10'
C4 (T)	905.37'	447.05'	28°17'28"	S 83°11'33" E	442.52'
C4 (C)	905.27'	447.00'	28°17'28"	N 85°41'33" W	442.47'
C5 (T)	6279.55'	928.88'	08°28'31"	N 84°12'53" W	928.04'
C5 (C)	6279.02'	928.78'	08°28'30"	N 86°40'55" W	927.93'
C6 (T)	433.60'	764.83'	101°03'51"	N 47°52'44" E	669.46'
C6 (C)	433.55'	762.95	100°49'37"	N 45°27'35" E	668.24'
C7 (T)	5779.65'	1429.45'	14°10'15"	S 77°51'24" E	1425.81'
C7 (C)	5779.02'	1429.29'	14°10'14"	S 80°21'17" E	1425.65'
C8 (T)	6279.55'	665.04'	06°04'05"	S 87°39'34" W	664.73'
C8 (C)	6279.02'	664.37'	06°03'44"	S 85°11'41" W	664.06'
C9 (T)	5779.65'	955.00'	09°28'02"	N 89°21'33" E	953.91'
C9 (C)	5779.02'	955.11'	09°28'10"	S 86°51'35" W	954.03'



SCALE: 1" = 400'

FOR INQUIRIES, QUESTIONS OR CONCERNS ABOUT THIS SURVEY CONTACT BWEIGHTMAN@USSURVEYOR.COM or call 1-800-867-5783 Ext. 221

U.S. SURVEYOR®
EVANSVILLE, INDIANA 47715
1-800- TO SURVEY

PREPARED FOR: TX6 - (HRO)
Skadden
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP & Affiliates

PROJECT LOCATION: HARRIS COUNTY, STATE OF TEXAS

PROJECT ADDRESS: 12000 LAWNDALE ST HOUSTON, TX 77017

PROJECT TYPE: ALTA/ACSM LAND TITLE SURVEY

JOB NUMBER: TX6

SHEET 1 OF 7

TX 6.

(T) = BEARINGS AND DISTANCES PER TITLE DESCRIPTION

(C) = BEARINGS & DISTANCES ARE GRID, NAD83, TEXAS SOUTH CENTRAL WITH A COMBINED GRID FACTOR OF 0.999886614

SURVEYOR NOTES

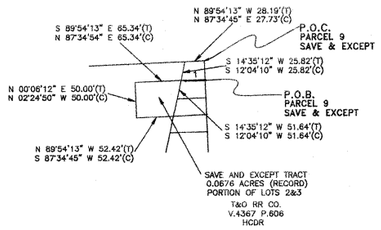
BEARINGS & DISTANCES ARE GRID, NAD83, TEXAS SOUTH CENTRAL WITH A COMBINED GRID FACTOR OF 0.999886614.

THERE WAS NO OBSERVABLE EVIDENCE OF EARTHWORK OR CONSTRUCTION AS OF THE DATE OF FIELDWORK.

1/2" IRON ROD WITH CAP SET AT ALL MISSING CORNERS OR "POINTS" CALLED FOR IN THE SURVEYOR'S LEGAL, WHERE POSSIBLE.

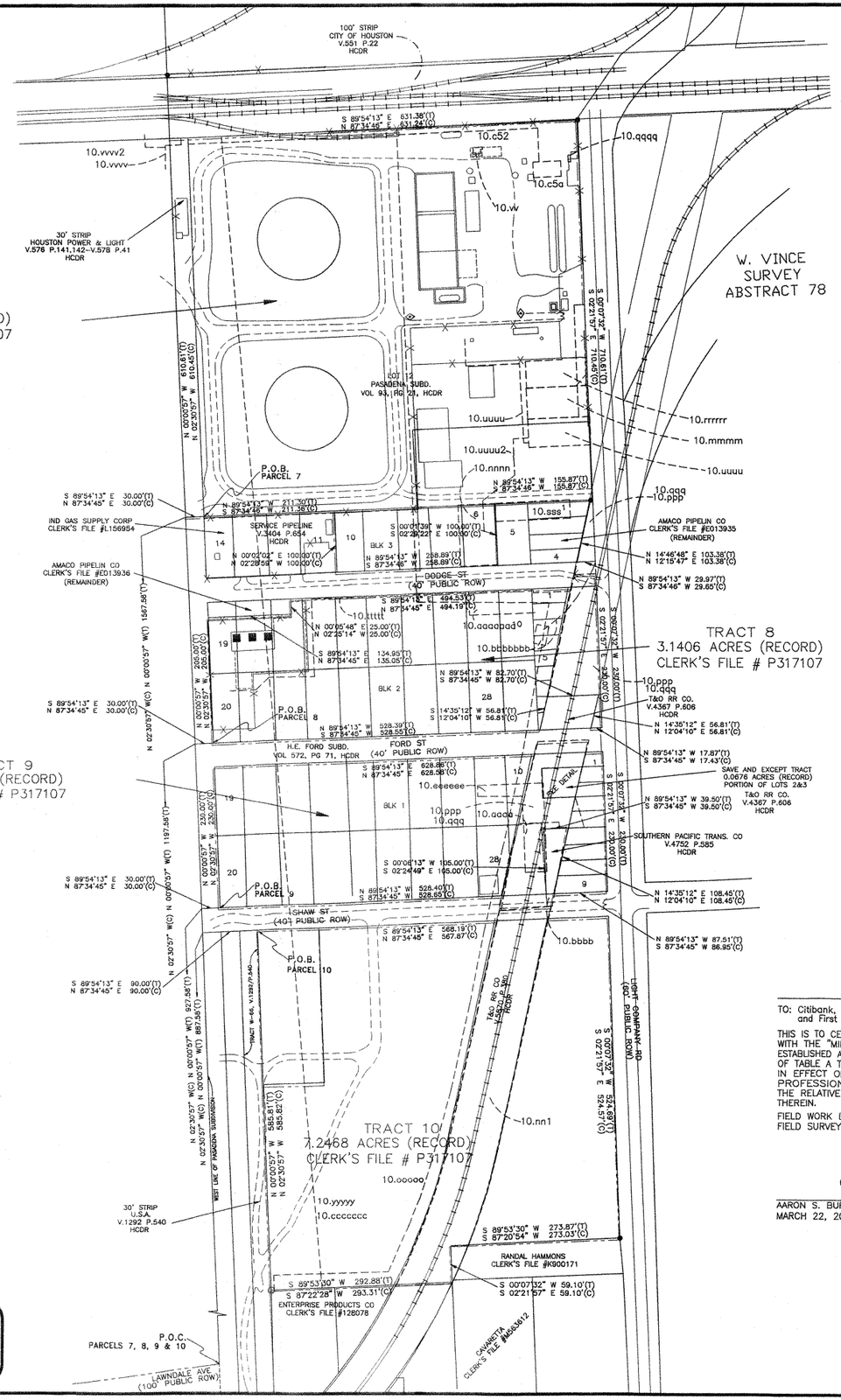
DATE OF ORIGINAL: MARCH 12, 2008
REVISION: _____ DATE: _____, 2008
REVISION: _____ DATE: _____, 2008
REVISION: _____ DATE: _____, 2008

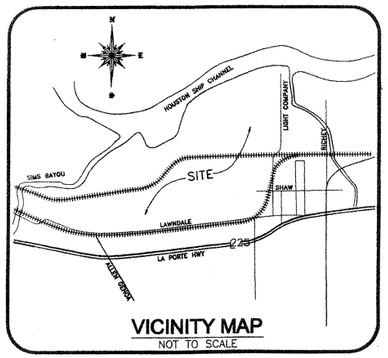
DETAIL



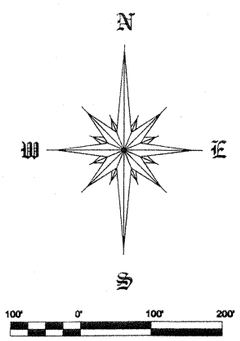
(T) = BEARINGS AND DISTANCES PER TITLE DESCRIPTION

(C) = BEARINGS & DISTANCES ARE GRID, NAD83, TEXAS SOUTH CENTRAL WITH A COMBINED GRID FACTOR OF 0.999886614





VICINITY MAP
NOT TO SCALE



SCALE: 1" = 100'

FLOOD DATA This property is in Zones X & AE of the Flood Insurance Rate Map,Community Panel No.'s 48201C0905L & 48201C0885L which has an effective date of 6-18-07 and Portions Are in a Special Flood Hazard Area. Field surveying was not performed to determine this zone. An elevation certificate may be needed to verify this determination or apply for an amendment from the Federal Emergency Management Agency.

SURVEYOR'S CERTIFICATION

TO: Citibank, N.A., as Collateral Agent under the Credit Agreement and Bridge Loan Agreement and First American Title Insurance Company.

THIS IS TO CERTIFY THAT THIS PLAT AND THE SURVEY ON WHICH IT IS BASED, WERE MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS," JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS IN 2005, AND INCLUDES ITEMS 2-4,6,8-10 & 11(a), 13,16 OF TABLE A THEREOF. PURSUANT TO THE ACCURACY STANDARDS AS ADOPTED BY ALTA AND NSPS AND IN EFFECT ON THE DATE OF THIS CERTIFICATION, UNDERSIGNED FURTHER CERTIFIES THAT IN MY PROFESSIONAL OPINION, AS A LAND SURVEYOR REGISTERED IN THE STATE OF TEXAS THE RELATIVE POSITIONAL ACCURACY OF THIS SURVEY DOES NOT EXCEED THAT WHICH IS SPECIFIED THEREIN.

FIELD WORK DATE: FEBRUARY 2008
FIELD SURVEY: A.S.B.

AARON S. BURRELL, RPLS #5689
MARCH 22, 2008

STATE OF TEXAS
REGISTERED
AARON SCOTT BURRELL
5689
PROFESSIONAL
LAND SURVEYOR

CERTIFICATION IS ONLY TO THE PARTIES HEREIN NAMED.
THIS SURVEY IS NOT VALID FOR ANY FUTURE TRANSACTIONS OF THIS PROPERTY.

DATE OF ORIGINAL: MARCH 12, 2007
REVISION: _____ DATE: _____, 2007
REVISION: _____ DATE: _____, 2007
REVISION: _____ DATE: _____, 2007

U.S. SURVEYOR®
4929 RIVERWIND POINTE DRIVE
EVANSVILLE, INDIANA 47715
1-800- TO SURV

PREPARED FOR: TX6 - (HRO)
Skadden
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP & Affiliates

PROJECT LOCATION: HARRIS COUNTY, STATE OF TEXAS

PROJECT ADDRESS: 12000 LAWNDALE ST HOUSTON, TX 77017

PROJECT TYPE: ALTA/ACSM LAND TITLE SURVEY

JOB NUMBER: TX6

SHEET 2 OF 7

tx-6_final.dwg 3/24/2008 10:38 AM

LEGAL DESCRIPTION AS PROVIDED IN TITLE COMMITMENT

PARCEL 1:

BEING A 506 ACRE TRACT OF LAND, MORE OR LESS, IN THE WILLIAM VINCE SURVEY, ABSTRACT NO. 78, HARRIS COUNTY, TEXAS, AND THE CALLAHAN & VINCE SURVEY, ABSTRACT NO. 9, SAID SURVEYS BEING IN HOUSTON, HARRIS COUNTY, TEXAS AND BEING ALL OF THAT TRACT OF LAND SOLD TO LYONDELL-CITGO REFINING COMPANY, LTD., AS DESCRIBED AS PARCEL 1 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER P317107, AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO REFINING PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5; SAID BEARING SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27 AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108:

BEGINNING AT A 5/8-INCH IRON ROD FOUND MARKING THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF LAWNDALE AVENUE, 100.00 FEET WIDE, WITH THE WEST LINE OF PASADENA, A SUBDIVISION AS PER PLAT RECORDED IN VOLUME 93, PAGE 21 OF THE HARRIS COUNTY DEED RECORDS AND BEING THE SOUTHEAST CORNER OF THE HEREIN DESCRIBED TRACT AND THE NORTHEAST CORNER OF THAT CALLED 6.24 ACRE TRACT OF LAND SOLD TO HARRIS COUNTY AS DESCRIBED IN DEED RECORDED IN VOLUME 723, PAGE 115, OF THE HARRIS COUNTY DEED RECORDS, SAID POINT OF BEGINNING HAVING TEXAS STATE PLANE COORDINATES OF NORTH 701,541.23 AND EAST 3,197,163.24 AND HAVING LYONDELL-CITGO PLANT COORDINATES OF NORTH A+40.88 AND EAST 0+00.58;

THENCE SOUTH 84° 37' 32" WEST, ALONG THE NORTH LINE OF SAID LAWNDALE AVENUE AS DEFINED BY SAID 6.24 ACRE TRACT, A DISTANCE OF 4818.87 FEET TO A 3/4" INCH MAGNETIZED ALUMINUM ROD FOUND MARKING THE POINT OF CURVATURE OF A CURVE TO THE RIGHT

THENCE NORTHWESTERLY, A DISTANCE OF 1869.02 FEET, CONTINUING ALONG THE NORTH LINE OF SAID LAWNDALE AVENUE AND ALONG THE ARC OF SAID CURVE TO THE RIGHT HAVING A CENTRAL ANGLE OF 19° 11' 33", A RADIUS OF 5579.65 FEET, AND WHOSE CHORD BEAR NORTH 85° 46' 42" WEST, A DISTANCE OF 1860.30 FEET TO A 3/4" INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING A POINT OF COMPOUND CURVATURE OF A CURVE TO THE RIGHT;

THENCE NORTHWESTERLY, A DISTANCE OF 168.33 FEET, CONTINUING ALONG THE NORTH LINE OF SAID LAWNDALE AVENUE AND ALONG THE ARC OF SAID COMPOUND CURVE TO THE RIGHT HAVING A CENTRAL ANGLE OF 07° 02' 33", A RADIUS OF 1369.49 FEET, AND WHOSE CHORD BEARS NORTH 72° 39' 39" WEST, A DISTANCE OF 168.23 FEET TO A 3/4" INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER FOUND MARKING THE END OF SAID COMPOUND CURVE TO THE RIGHT;

THENCE NORTH 66° 12' 42" WEST, ALONG THE NORTH LINE OF SAID LAWNDALE AVENUE, A DISTANCE OF 234.19 FEET TO A 3/4" INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHEAST CORNER OF A CALLED 9.177 ACRE TRACT OF LAND SOLD BY SINCLAIR GULF REFINING COMPANY TO THE HARRIS-COUNTY SHIP CHANNEL NAVIGATION DISTRICT AND DESCRIBED AS PARCEL, 1 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER C 222732, SAME BEING THE MOST SOUTHERLY SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE, NORTH 24° 05' 38" EAST, LEAVING THE NORTH LINE OF SAID LAWNDALE, ALONG THE EAST LINE OF SAID 9.177 ACRE TRACT, AT 0.86 FEET PASS A CHAIN LINK FENCE CORNER POST, CONTINUING ALONG SAID COURSE AND GENERALLY ALONG A CHAIN LINK FENCE, A TOTAL DISTANCE OF 60.90 FEET TO A CHAIN LINK FENCE CORNER POST FOUND MARKING THE MOST EASTERLY NORTHEAST CORNER OF SAID 9.177 ACRE TRACT AND AN INTERIOR CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 66° 09' 44" WEST, ALONG A NORTH LINE OF SAID 9.177 ACRE TRACT AND GENERALLY ALONG A CHAIN LINK FENCE, A DISTANCE OF 624.02 FEET TO A CHAIN LINK FENCE POST FOUND FOR AN ANGLE POINT IN SAID NORTH LINE AND AN ANGLE POINT IN A SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 26° 37' 07" WEST, ALONG A NORTHEAST LINE OF SAID 9.177 ACRE TRACT AND GENERALLY ALONG A CHAIN LINK FENCE, A TOTAL DISTANCE OF 76.03 FEET TO A CHAIN LINK FENCE POST FOUND FOR AN ANGLE POINT IN SAID NORTHEAST LINE AND AN ANGLE POINT IN A SOUTHWEST LINE OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 13° 11' 18" EAST, ALONG AN EAST LINE OF SAID 9.177 ACRE TRACT AND GENERALLY ALONG A CHAIN LINK FENCE, A TOTAL DISTANCE OF 478.51 FEET TO A 5/8 INCH IRON ROD WITH "CLR" PLASTIC CAP SET IN THE SOUTH RIGHT-OF-WAY LINE OF A 100.00 FEET WIDE EASEMENT GRANTED BY SINCLAIR GULF REFINING COMPANY TO THE CITY OF HOUSTON SAID EASEMENT CURRENTLY OCCUPIED BY THE PORT TERMINAL RAILROAD AND DESCRIBED IN A DEED RECORDED IN VOLUME 398, PAGE 295, OF THE HARRIS COUNTY DEED RECORDS, SAID 5/8-INCH IRON ROD WITH CAP MARKING THE MOST NORTHERLY NORTHEAST CORNER OF SAID 9.177 ACRE TRACT AND BEING AN INTERIOR CORNER OF THE HEREIN DESCRIBED TRACT AND BEING IN A CURVE CONCAVE TO THE NORTH WHOSE CENTER BEARS NORTH 20° 19' 14" EAST, A DISTANCE OF 1005.37 FEET;

THENCE NORTHWESTERLY, A DISTANCE OF 11.10 FEET ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID 100.00 FOOT EASEMENT, THE NORTH LINE OF SAID 9.177 ACRE TRACT, AND ALONG THE ARC OF SAID CURVE CONCAVE TO THE NORTH HAVING A CENTRAL ANGLE OF 00° 37' 57" A RADIUS OF 1005.37 FEET, AND WHOSE CHORD BEARS NORTH 69° 21' 48 " WEST, A DISTANCE OF 11.10 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET FOR THE POINT OF TANGENCY OF SAID CURVE CONCAVE TO THE NORTH;

THENCE NORTH 69° 02' 49" WEST, ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID 100.00 FOOT EASEMENT, SAME BEING PARTLY THE NORTH LINE OF SAID 9.177 ACRE TRACT, PARTLY THE NORTH LINE OF A 0.755 ACRE TRACT OF LAND SOLD BY SINCLAIR REFINING CO. TO THE HARRIS COUNTY HOUSTON SHIP CHANNEL NAVIGATION DISTRICT AND DESCRIBED AS TRACT 3 IN DEED RECORDED IN VOLUME 3233, PAGE 348, OF THE HARRIS COUNTY DEED RECORDS, AND PARTLY THE NORTH LINE OF PARCELS 2 AND 3 AS DESCRIBED IN SAID DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER C 222732, A TOTAL DISTANCE OF 1039.91 FEET TO A 3/4" INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE HIGH BANK ON THE EAST SIDE OF SIMS BAYOU MARKING THE NORTHWEST CORNER OF SAID PARCEL 3 AND THE MOST WESTERLY SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 21° 38' 39" EAST, ALONG THE EAST- HIGH BANK OF 97 SIMS BAYOU, A TOTAL DISTANCE OF 100.01 FEET TO A 3/4" INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE NORTH LINE OF SAID 100.00 FOOT EASEMENT MARKING THE MOST WESTERLY CORNER OF A CALLED 42.491 ACRE TRACT , OF LAND DESCRIBED AS TRACT 1 IN SAID DEED RECORDED IN VOLUME 3233, PAGE 348, OF THE HARRIS COUNTY DEED RECORDS AND THE NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT)

THENCE SOUTH 69° 02' 49" EAST, ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID 100.00 FOOT EASEMENT AND THE SOUTH LINE OF SAID 42.491 ACRE TRACTS A TOTAL DISTANCE 1038.70 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE POINT OF CURVATURE OF A CURVE TO THE LEFT;

THENCE SOUTHEASTERLY, A DISTANCE OF 447.05 FEET ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID 100.00 FOOT EASEMENT, THE SOUTH LINE OF SAID 42.491 ACRE TRACT, AND ALONG THE ARC OF SAID CURVE TO THE LEFT HAVING A CENTRAL ANGLE OF 28° 17' 28", A RADIUS OF 905.37 FEET, AND WHOSE CHORD BEARS SOUTH 83° 11' 33" EAST, A DISTANCE OF 442.52 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE POINT OF TANGENCY OF SAID CURVE AND THE BEGINNING OF THE REALIGNMENT OF SAID 100.00 FOOT EASEMENT AS DESCRIBED IN A DEED RECORDED IN VOLUME 744, PAGE 158, OF THE HARRIS COUNTY DEED RECORDS;

THENCE NORTH 82° 39' 43" EAST, ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID REALIGNED 100.00 FOOT EASEMENT AND THE SOUTH LINE OF SAID 42.491 ACRE TRACT, AT 864.27 FEET PASS THE SOUTHEAST CORNER OF SAID 42.491 ACRE TRACT AND THE SOUTHWEST CORNER OF A 26.256 ACRE TRACT OF LAND SOLD BY SINCLAIR GULF REFINING COMPANY TO THE HARRIS COUNTY HOUSTON SHIP CHANNEL NAVIGATION DISTRICT AND DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER B 806319, CONTINUING ALONG SAID COURSE AND ALONG THE SOUTH LINE OF SAID 26.256 ACRE-TRACT, A TOTAL DISTANCE OF 968.58 FEET TO 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET FOR AN ANGLE POINT IN THE NORTHWEST LINE OF THE HEREIN DESCRIBED TRACT, FROM WHICH A FOUND 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" BEARS SOUTH 44 41' WEST, A DISTANCE OF 0.9 FEET;

THENCE LEAVING THE NORTH RIGHT-OF-WAY LINE OF SAID 100.00 FOOT EASEMENT AND CONTINUING ALONG THE SOUTHEASTERLY LINES OF SAID 26.256 ACRE TRACT AND GENERALLY ALONG A CHAIN LINK FENCE AS FOLLOWS:

NORTH 44° 40' 51" EAST, A DISTANCE OF 161.75 FEET TO A CHAIN LINK FENCE CORNER POST FOUND MARKING AN ANGLE POINT IN THE NORTHWEST LINE OF THE HEREIN DESCRIBED TRACT;

NORTH 82° 39' 43" EAST, A DISTANCE OF 663.63 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET FOR AN ANGLE POINT IN THE NORTHWEST LINE OF THE HEREIN DESCRIBED TRACT;

NORTH 44° 40' 29" EAST, A DISTANCE OF 1961.99 FEET TO A CHAIN LINK FENCE CORNER POST FOUND MARKING THE MOST WESTERLY CORNER OF A CALLED 1.52 ACRE TRACT OF LAND SOLD BY SINCLAIR GULF REFINING COMPANY TO THE HARRIS COUNTY HOUSTON SHIP CHANNEL NAVIGATION DISTRICT AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER C 749464 AND AN ANGLE POINT IN THE NORTHWEST LINE OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 62° 04' 21" EAST, ALONG THE SOUTHWEST LINE OF SAID 1.52 ACRE TRACT, A DISTANCE OF 263.05 FEET TO A PK NAIL WITH SHINER SET FOR THE MOST SOUTHERLY CORNER OF SAID 1.52 ACRE TRACT AND AN ANGLE POINT IN THE NORTHWEST LINE OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 62° 55' 09" EAST, ALONG THE SOUTHEAST LINE OF SAID 1.52 ACRE TRACT, A DISTANCE OF 294.25 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE EASTERLY CORNER OF SAID 1.52 ACRE TRACT AND AN ANGLE POINT IN THE NORTHWEST LINE OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 27° 04' 51" WEST, ALONG THE EAST LINE OF SAID 1.52 ACRE TRACT, AT 69.51 FEET PASS A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND FOR A REFERENCE CORNER IN THE HIGH BANK OF THE HOUSTON SHIP CHANNEL AND CONTINUING ALONG SAID COURSE, A TOTAL DISTANCE OF 149.00 FEET TO POINT ON THE WATER'S EDGE OF SAID HOUSTON SHIP CHANNEL;

THENCE IN A NORTHEASTERLY DIRECTION, DOWNSTREAM AND GENERALLY ALONG THE WATER'S EDGE OF SAID HOUSTON SHIP CHANNEL WITH ITS MEANDERS, A TOTAL DISTANCE OF APPROXIMATELY 5,112 FEET TO A POINT IN THE FACE OF A CONCRETE BULKHEAD FOR THE NORTHEAST CORNER OF THE HEREIN DESCRIBED TRACT OF LAND;

THENCE SOUTH 00° 00' 57" EAST, ALONG THE EAST LINE OF THAT TRACT OF LAND DESCRIBED AS PARCEL 1 IN SAID LYONDELL-CITGO REFINING COMPANY DEED, THE WEST LINE OF SAID PASADENA SUBDIVISION AND THE WEST LINE OF A STRIP OF LAND ORIGINALLY CALLED VINCE STREET SOLD TO HOUSTON LIGHTING AND POWER COMPANY AS DESCRIBED IN DEEDS RECORDED IN VOLUME 576, PAGE 142, VOLUME 576 PAGE 141 AND VOLUME 578, PAGE 41, OF THE HARRIS COUNTY DEED RECORDS, AT 100.00 FEET PASS A 5/8 INCH IRON ROD SET ON LINE FOR REFERENCE, AT 432.24 FEET PASS A BRASS DISC IN CONCRETE MARKED "HL&P", AT 3021.70 FEET PASS A POINT IN THE NORTH RIGHT-OF-WAY LINE OF SAID 100.00 FOOT CITY OF HOUSTON EASEMENT, AT 3022.84 FEET PASS A CHAIN LINK FENCE CORNER POST, AT 3121.70 FEET PASS THE SOUTH RIGHT-OF-WAY LINE OF SAID 100.00 FOOT CITY OF HOUSTON EASEMENT, AND CONTINUING ALONG SAID COURSE A TOTAL DISTANCE OF 5299.89 FEET TO THE POINT OF BEGINNING AND CONTAINING 506 ACRES OF LAND, MORE OR LESS.

PARCEL 4:

BEING A 23.3530 ACRE TRACT OF LAND IN THE CALLAHAN AND VINCE SURVEY, ABSTRACT NO. 9, HARRIS COUNTY, TEXAS AND BEING ALL OF THAT TRACT OF LAND SOLD TO LYONDELL-CITGO REFINING COMPANY, LTD., AS DESCRIBED AS PARCEL 4 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER P 317107 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO REFINING PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5, SAID SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27, AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108;

BEGINNING AT A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SOUTHERN PACIFIC RAILROAD (100 FEET WIDE) WITH THE SOUTHWEST RIGHT-OF-WAY LINE OF ALLEN GENOA ROAD (80 FEET WIDE) AND THE NORTHEAST CORNER OF THE HEREIN DESCRIBED TRACT AND HAVING LYONDELL-CITGO REFINING PLANT COORDINATES OF NORTH -T+87.49 AND WEST 58+29.29;

THENCE SOUTH 30° 10' 42" EAST, ALONG THE SOUTHWEST RIGHT-OF-WAY LINE OF SAID ALLEN GENOA ROAD, A DISTANCE OF 605.53 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE INTERSECTION OF THE SOUTHWEST RIGHT-OF-WAY LINE OF SAID ALLEN GENOA ROAD AND THE NORTH RIGHT-OF-WAY LINE OF STATE HIGHWAY NO. 225 AND THE SOUTHEAST CORNER OF THE HEREIN DESCRIBED TRACT, SAID POINT BEING IN A CURVE CONCAVE TO THE NORTH WHOSE CENTER BEARS NORTH 01° 32' 52" EAST, A DISTANCE OF 6279.55 FEET;

THENCE NORTHWESTERLY, A DISTANCE OF 928.88 FEET ALONG THE ARC OF SAID CURVE CONCAVE TO THE NORTH, HAVING A CENTRAL ANGLE OF 08° 28' 31", A RADIUS OF 6279.55 FEET, AND WHOSE CHORD BEARS NORTH 84° 12' 53" WEST, A DISTANCE OF 928.04 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET IN THE NORTH LINE OF A 30.00-FOOT WIDE STRIP OF LAND SOLD BY ROSA C. ALLEN TO HOUSTON LIGHTING & POWER COMPANY AND DESCRIBED IN A DEED RECORDED IN VOLUME 572, PAGE 615, OF THE HARRIS COUNTY DEED RECORDS MARKING THE POINT OF TANGENCY OF SAID CURVE TO THE RIGHT;

THENCE NORTH 77° 32' 44" WEST, ALONG THE NORTH LINE OF SAID 30.00-FOOT WIDE HOUSTON LIGHTING & POWER COMPANY STRIP, A DISTANCE OF 1302.20 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHEAST CORNER OF A CALLED 4.00 ACRE TRACT OF LAND SOLD BY SINCLAIR REFINING COMPANY TO THE TEXAS AND NEW ORLEANS RAILROAD COMPANY AND DESCRIBED IN A DEED RECORDED IN VOLUME 1280, PAGE 195, OF THE HARRIS COUNTY DEED RECORDS AND THE SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT, SAID POINT BEING IN A CURVE TO THE RIGHT WHOSE CENTER BEARS NORTH 89° 20' 49" EAST, FOR A DISTANCE OF 433.60 FEET;

THENCE NORTHEASTERLY, A DISTANCE OF 764.83 FEET ALONG THE EAST LINE OF SAID 4.00 ACRE TRACT, 25.00 FEET SOUTHEASTERLY OF AND CONCENTRIC TO THE CENTERLINE OF A RAILROAD, AND ALONG THE ARC OF SAID CURVE TO THE RIGHT HAVING A CENTRAL ANGLE OF 101° 03' 51", A RADIUS OF 433.60 FEET, AND WHOSE CHORD BEARS NORTH 47° 52' 44" EAST, A DISTANCE OF 669.46 FEET TO A 3/4- INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE SOUTH RIGHT-OF-WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD MARKING THE NORTHEAST CORNER OF SAID 4.00 ACRE TRACT AND THE NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT, SAID CORNER BEING IN A CURVE TO THE LEFT WHOSE CENTER BEARS NORTH 19° 13' 43" EAST, FOR A DISTANCE OF 5779.65 FEET;

THENCE SOUTHEASTERLY, A DISTANCE OF 1429.45 FEET ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD AND ALONG THE ARC OF SAID CURVE TO THE LEFT HAVING A CENTRAL ANGLE OF 14° 10' 15", A RADIUS OF 5779.65 FEET, AND WHOSE CHORD BEARS SOUTH 77° 51' 24" EAST, A DISTANCE OF 1425.81 FEET TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 23.3530 ACRES OF LAND.

PARCEL 5:

BEING A 64.3291 ACRE TRACT OF LAND IN THE WILLIAM VINCE SURVEY, ABSTRACT NO. 78 AND THE CALLAHAN AND VINCE SURVEY, ABSTRACT NO. 9, HARRIS COUNTY, TEXAS AND BEING ALL OF THAT TRACT OF LAND SOLD TO LYONDELL-CITGO REFINING COMPANY, LTD., AS DESCRIBED AS PARCEL 5 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER P 317107 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO REFINING PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5, SAID SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27, AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108;

BEGINNING AT A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET AT THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SOUTHERN PACIFIC RAILROAD RIGHT-OF-WAY WITH THE WEST RIGHT-OF-WAY LINE OF SCARBOROUGH STREET MARKING THE NORTHEAST CORNER OF THE HEREIN DESCRIBED TRACT, SAID POINT HAVING LYONDELL-CITGO REFINING PLANT COORDINATES OF NORTH -Y+39.95 AND EAST 0+00.17;

THENCE SOUTH 00° 00' 42" EAST, ALONG THE WEST RIGHT-OF-WAY LINE OF SAID SCARBOROUGH STREET, A DISTANCE OF 485.86 FEET TO A TEXAS HIGHWAY DEPARTMENT CONCRETE MONUMENT WITH BRASS DISC FOUND MARKING THE INTERSECTION OF THE WEST RIGHT-OF-WAY LINE OF SAID SCARBOROUGH STREET WITH THE NORTH RIGHT-OF-WAY LINE OF STATE HIGHWAY NO. 225, VARIABLE WIDTH, THE NORTHEAST CORNER OF A 0.016 ACRE TRACT OF LAND SOLD BY SINCLAIR GULF REFINING COMPANY TO THE STATE OF TEXAS AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER B 745364, AND THE SOUTHEAST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 74° 15' 26" WEST, ALONG THE NORTH LINE OF SAID 0.016 ACRE TRACT AND SAID STATE HIGHWAY NO. 225, A DISTANCE OF 89.83 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET FOR AN ANGLE POINT IN THE NORTH RIGHT-OF-WAY LINE OF SAID STATE HIGHWAY NO. 225, THE WEST CORNER OF SAID 0.016 ACRE TRACT AND BEING THE INTERSECTION OF SAID NORTH RIGHT-OF-WAY LINE WITH THE NORTH LINE OF A 30.00 FOOT WIDE STRIP OF LAND SOLD BY ROSA C. ALLEN TO HOUSTON LIGHTING & POWER COMPANY AS DESCRIBED IN DEED RECORDED IN VOLUME 572, PAGE 615, OF THE HARRIS COUNTY DEED RECORDS, FROM WHICH POINT A TEXAS HIGHWAY DEPARTMENT CONCRETE MONUMENT WITH BRASS DISC BEARS SOUTH 43° 13' WEST, A DISTANCE OF 0.5 FEET;

THENCE SOUTH 84° 37' 32" WEST, ALONG THE NORTH LINE OF SAID 30.00 FOOT WIDE HOUSTON LIGHTING & POWER COMPANY STRIP, A DISTANCE OF 4701.58 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE POINT OF CURVATURE OF A CURVE TO THE RIGHT;

THENCE SOUTHWESTERLY, A DISTANCE OF 665.04 FEET, LEAVING THE NORTH LINE OF SAID 30.00 FOOT WIDE HOUSTON LIGHTING & POWER COMPANY STRIP AND ALONG THE ARC OF SAID CURVE TO THE RIGHT HAVING A CENTRAL ANGLE OF 06° 04' 05", A RADIUS OF 6279.55 FEET, AND WHOSE CHORD BEARS SOUTH 87° 39' 34" WEST, A DISTANCE OF 664.73 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND ON THE NORTHEAST RIGHT-OF-WAY LINE OF ALLEN-GENOA ROAD, 80.00 FEET WIDE MARKING THE SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 30° 10' 42" WEST, ALONG THE NORTHEAST RIGHT-OF-WAY LINE OF SAID ALLEN-GENOA ROAD, A DISTANCE OF 598.67 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE INTERSECTION OF THE NORTHEAST RIGHT-OF-WAY LINE OF SAID ALLEN-GENOA ROAD WITH THE SOUTH RIGHT-OF-WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD AND THE NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT, SAID CORNER BEING IN A CURVE CONCAVE TO THE NORTH WHOSE CENTER BEARS NORTH 04° 05' 34" EAST, FOR A DISTANCE OF 5779.65 FEET;

THENCE NORTHEASTERLY, A DISTANCE OF 955.00 FEET ALONG THE SOUTH RIGHT-OF WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD AND ALONG THE ARC OF SAID CURVE CONCAVE TO THE NORTH HAVING A CENTRAL ANGLE OF 09° 28' 02", A RADIUS OF 5779.65 FEET, AND WHOSE CHORD BEARS NORTH 89° 21' 33" EAST, A DISTANCE OF 953.91 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE POINT OF TANGENCY OF SAID CURVE;

THENCE NORTH 84° 37' 32" EAST, CONTINUING ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD, A DISTANCE OF 4799.64 FEET TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 64.3291 ACRES OF LAND.

PARCEL 6:

BEING A 61.0015 ACRE TRACT OF LAND IN THE WILLIAM VINCE SURVEY, ABSTRACT NO. 78 AND THE CALLAHAN AND VINCE SURVEY, ABSTRACT NO. 9, HARRIS COUNTY, TEXAS AND BEING ALL OF THAT TRACT OF LAND SOLD TO LYONDELL-CITGO REFINING COMPANY, LTD. AS DESCRIBED AS PARCEL 6 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER P 317107 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5, SAID SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27, AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108;

BEGINNING BEGINNING AT A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF HIGHWAY 225 WITH THE WEST RIGHT-OF-WAY LINE OF SCARBOROUGH STREET, 35.00 FEET WIDE AT THIS POINT AND THE NORTHEAST CORNER OF THE HEREIN DESCRIBED TRACT, SAID POINT HAVING LYONDELL-CITGO REFINING PLANT COORDINATES OF NORTH -P+91.34 AND EAST 0+00.34, FROM SAID POINT OF BEGINNING A FOUND 5/8-INCH IRON ROD BEARS SOUTH 32° 39' WEST, A DISTANCE OF 0.2 FEET;

THENCE SOUTH 00° 00' 42" EAST, ALONG THE WESTERLY RIGHT-OF-WAY LINE OF SAID SCARBOROUGH STREET, A DISTANCE OF 188.00 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE NORTHEAST CORNER OF A 22.00-FOOT WIDE STRIP OF LAND SOLD BY ROSA C. ALLEN TO HOUSTON LIGHTING & POWER COMPANY AS DESCRIBED IN DEED RECORDED IN VOLUME 612, PAGE 609, OF THE HARRIS COUNTY DEED RECORDS AND AN ANGLE POINT IN THE EAST LINE OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 41° 48' 56" WEST, ALONG THE NORTHWEST LINE OF SAID 22.00-FOOT WIDE HOUSTON LIGHTING & POWER COMPANY STRIP, A DISTANCE OF 775.34 FEET TO A3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE NORTHEAST CORNER OF THAT TRACT OF LAND SOLD TO HARRIS COUNTY HOUSTON SHIP CHANNEL NAVIGATION DISTRICT AS DESCRIBED IN DEED RECORDED IN VOLUME 1973, PAGE 5, OF THE HARRIS COUNTY DEED RECORDS AND THE SOUTHEAST CORNER OF THE HEREIN DESCRIBED TRACT, FROM WHICH POINT A 3/4-INCH IRON PIPE BEARS SOUTH 41° 49' WEST, A DISTANCE OF 1.2 FEET;

THENCE SOUTH 84° 37' 32" WEST, ALONG THE NORTH LINE OF SAID HARRIS COUNTY HOUSTON SHIP CHANNEL NAVIGATION DISTRICT TRACT, A DISTANCE OF 3393.07 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN A BARBED WIRE FENCE ON THE SOUTHEAST RIGHT-OF-WAY LINE OF STEELMAN AVENUE, 80.00 FEET WIDE, AS PER ALLENDALE TOWNSITE SECTION A SUBDIVISION PLAT RECORDED IN VOLUME 8, PAGE 15, OF THE HARRIS COUNTY DEED RECORDS, MARKING THE NORTHWEST CORNER OF SAID HARRIS COUNTY HOUSTON SHIP CHANNEL NAVIGATION DISTRICT TRACT AND THE SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 46° 30' 10" EAST, ALONG THE OCCUPIED SOUTHEAST RIGHT-OF-WAY LINE OF SAID STEELMAN AVENUE AND ALONG SAID BARB-WIRE FENCE, AT 1.63 FEET PASS A CHAIN LINK FENCE CORNER POST AT THE NORTHEASTERLY END OF SAID BARB-WIRE FENCE, AND CONTINUING A TOTAL DISTANCE OF 67.78 FEET TO A3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING AN ANGLE POINT IN A NORTHWEST LINE OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 52° 44' 15" EAST, ALONG THE OCCUPIED SOUTHEAST RIGHT-OF-WAY LINE OF SAID STEELMAN AVENUE AND ALONG A CHAIN LINK FENCE, A DISTANCE OF 171.60 FEET TO A CHAIN LINK FENCE CORNER POST FOUND MARKING THE INTERSECTION OF THE OCCUPIED SOUTHEAST RIGHT-OF-WAY LINE OF SAID STEELMAN AVENUE WITH THE OCCUPIED NORTHEAST RIGHT-OF-WAY LINE OF TURIN STREET, 60.00 FEET WIDE, AS PER SAID ALLENDALE TOWNSITE SECTION A PLAT, AND AN INTERIOR CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 37° 07' 54" WEST, ALONG THE OCCUPIED NORTHEAST RIGHT-OF-WAY LINE OF SAID TURIN STREET AND ALONG A CHAIN LINK FENCE, AT 682.31 FEET PASS A CHAIN LINK FENCE CORNER POST, AND CONTINUING IN ALL A TOTAL DISTANCE OF 683.98 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE INTERSECTION OF THE OCCUPIED NORTHEAST RIGHT-OF-WAY LINE OF SAID TURIN STREET, WITH THE SOUTH RIGHT-OF-WAY LINE OF SAID HIGHWAY 225 AND THE NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT, FROM WHICH POINT A TEXAS HIGHWAY DEPARTMENT CONCRETE MONUMENT WITH A BRASS DISC FOUND AT THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SAID HIGHWAY 225 WITH THE SOUTHWEST RIGHT-OF-WAY LINE OF FOREMAN AVENUE, 60.00 FEET WIDE, BEARS SOUTH 84° 37' 32" WEST, FOR A DISTANCE OF 119.92 FEET;

* THENCE NORTH 84° 37' 32" EAST, ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID HIGHWAY 225, A DISTANCE OF 4140.40 FEET TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 61.0015 ACRES OF LAND.

*THE WORD "NORTH" WAS OMITTED FROM THE TITLE COMMITMENT DESCRIPTION.

PARCEL 7:

BEING A 9.4730 ACRE TRACT OF LAND IN THE WILLIAM VINCE SURVEY, ABSTRACT NO. 78, IN HOUSTON, HARRIS COUNTY, TEXAS, AND BEING ALL OF LOT 12 OF BLOCK 35 OF PASADENA, A SUBDIVISION AS PER PLAT RECORDED IN VOLUME 93, PAGE 21, OF THE HARRIS COUNTY DEED RECORDS, ALL OF LOTS 7, 8, 9, AND 10 OF BLOCK 3 OF THE H.E. FORD SUBDIVISION AS PER PLAT RECORDED IN VOLUME 572, PAGE 71, OF THE HARRIS COUNTY DEED RECORDS, AND A PORTION OF LOT 6 OF BLOCK 3 OF SAID H.E. FORD SUBDIVISION, AND BEING ALL OF THAT TRACT OF LAND SOLD TO LYONDELL-CITGO REFINING COMPANY, LTD. AS DESCRIBED AS PARCEL 7 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER P 317107 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO REFINING COMPANY PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5, SAID SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27, AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108:

COMMENCING AT A 5/8-INCH IRON ROD FOUND FOR THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF LAWNDALE AVENUE, 100.00 FEET WIDE, WITH THE WEST LINE OF SAID PASADENA, AND BEING THE SOUTHEAST CORNER OF THAT TRACT OF LAND DESCRIBED AS PARCEL 1 IN SAID LYONDELL-CITGO REFINING COMPANY DEED AND THE NORTHEAST CORNER OF THAT TRACT OF LAND SOLD TO HARRIS COUNTY AS DESCRIBED IN DEED RECORDED IN VOLUME 723, PAGE 115, OF THE HARRIS COUNTY DEED RECORDS, AND SAID POINT HAS TEXAS STATE PLANE COORDINATES OF NORTH 701,541.23 AND EAST 3,197,163.24 AND LYONDELL-CITGO REFINING COMPANY PLANT COORDINATES OF NORTH A+40.88 AND EAST 0+00.58;

THENCE NORTH 00° 00' 57" WEST, A DISTANCE OF 1567.58 FEET ALONG THE COMMON LINE OF SAID PARCEL 1 AND OF SAID PASADENA TO THE INTERSECTION OF SAID LINE WITH THE PROJECTION OF THE NORTH LINE OF SAID H.E. FORD SUBDIVISION;

THENCE SOUTH 89° 54' 13" EAST, A DISTANCE OF 30.00 FEET ALONG THE PROJECTION OF THE NORTH LINE OF SAID H.E. FORD SUBDIVISION TO A FENCE CORNER FOUND MARKING THE NORTHWEST CORNER OF SAID H.E. FORD SUBDIVISION, THE SOUTHWEST CORNER OF LOT 12 OF BLOCK 35 OF SAID PASADENA, THE NORTHWEST CORNER OF THAT TRACT OF LAND SOLD TO INDUSTRIAL GAS SUPPLY CORPORATION AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER L 156954, A POINT IN THE EAST LINE OF THAT STRIP OF LAND ORIGINALLY CALLED VINCE STREET SOLD TO HOUSTON LIGHTING AND POWER COMPANY AS DESCRIBED IN DEEDS RECORDED IN VOLUME 576, PAGE 141 - 142, AND VOLUME 578, PAGE 41, OF THE HARRIS COUNTY DEED RECORDS, AND THE MOST WESTERLY SOUTHWEST CORNER AND POINT OF BEGINNING OF THE HEREIN DESCRIBED TRACT, SAID POINT HAVING LYONDELL CITGO REFINING COMPANY PLANT COORDINATES OF NORTH Q+08.41 AND EAST 0+30.15;

THENCE NORTH 00° 00' 57" WEST, A DISTANCE OF 610.61 FEET ALONG THE EAST LINE OF SAID HOUSTON LIGHTING AND POWER COMPANY FEE STRIP AND THE WEST LINE OF SAID LOT 12 TO A3/4- INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHWEST CORNER OF THAT TRACT OF LAND SOLD TO THE CITY OF HOUSTON AS DESCRIBED IN DEED RECORDED IN VOLUME 551, PAGE 22, OF THE HARRIS COUNTY DEED RECORDS AND THE NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 89° 54' 13" EAST, A DISTANCE OF 631.38 FEET ALONG THE SOUTH LINE OF SAID CITY OF HOUSTON TRACT AND THE NORTH LINE OF SAID LOT 12 TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE WEST RIGHT-OF-WAY LINE OF LIGHT COMPANY ROAD (60.00 FEET WIDE) MARKING THE NORTHEAST CORNER OF THE HEREIN DESCRIBED TRACT;

* THENCE SOUTH 00° 07' 32" WEST, ALONG THE WEST RIGHT-OF-WAY LINE OF SAID LIGHT COMPANY ROAD, AT 475.8 FEET PASS A 1/2-INCH IRON ROD AND CONTINUE IN ALL A TOTAL DISTANCE OF 710.61 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE INTERSECTION OF THE WEST RIGHT-OF-WAY LINE OF SAID LIGHT COMPANY ROAD WITH THE NORTH RIGHT-OF-WAY LINE OF DODGE STREET (40.00 FEET WIDE) AND THE SOUTHEAST CORNER OF LOT 4 OF BLOCK 3 OF SAID H.E. FORD SUBDIVISION AND OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 29.97 FEET ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID DODGE STREET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHEAST CORNER OF THE RESIDUE OF THAT TRACT OF LAND SOLD TO AMOCO PIPELINE COMPANY AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER E 013935 AND AN ANGLE POINT IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT, FROM WHICH POINT A 5/8 INCH PINCHED IRON PIPE BEARS SOUTH 1.4 FEET AND WEST 1.2 FEET;

THENCE ALONG THE PERIMETER OF SAID AMOCO PIPELINE COMPANY RESIDUE TRACT AS FOLLOWS:

NORTH 14° 46' 48" EAST, A DISTANCE OF 103.38 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE NORTH LINE OF SAID H.E. FORD SUBDIVISION MARKING AN ANGLE POINT IN A SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

NORTH 89° 54' 13" WEST, A DISTANCE OF 155.87 FEET ALONG THE NORTH LINE OF SAID H.E. FORD SUBDIVISION TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING AN "ELL" CORNER IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

SOUTH 00° 01' 39" WEST, A DISTANCE OF 100.00 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE NORTH RIGHT-OF-WAY LINE OF SAID DODGE STREET MARKING AN "ELL" CORNER IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 258.89 FEET ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID DODGE STREET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHEAST CORNER OF LOT 11 OF BLOCK 3 OF SAID H.E. FORD SUBDIVISION, THE SOUTHEAST CORNER OF THAT TRACT OF LAND SOLD TO SERVICE PIPELINE COMPANY AS DESCRIBED IN DEED RECORDED IN VOLUME 3404, PAGE 654, OF THE HARRIS COUNTY DEED RECORDS AND THE MOST SOUTHERLY SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT, FROM WHICH POINT A 5/8 INCH IRON ROD BEARS SOUTH 0.4 FEET AND WEST 1.6 FEET;

*THE WORD "FEET" WAS OMITTED FROM THE TITLE COMMITMENT DESCRIPTION.

NOTE:
SEVERAL SCRIVENER'S SPELLING AND PUNCTUATION ERRORS WERE CORRECTED ON THIS DESCRIPTION, AND WERE NOT NOTED.

DATE OF ORIGINAL: MARCH 12, 2008
REVISION: ____ DATE: ____, 2008
REVISION: ____ DATE: ____, 2008
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PREPARED FOR: TX6 - (HRO)
Skadden
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP & Affiliates

PROJECT LOCATION:
HARRIS COUNTY, STATE OF TEXAS

PROJECT ADDRESS:
12000 LAWNDALE ST
HOUSTON, TX 77017

PROJECT TYPE:
ALTA/ACSM LAND TITLE SURVEY

JOB NUMBER:
TX6

SHEET 3 OF 7

THENCE NORTH 00° 02' 02" EAST, A DISTANCE OF 100.00 FEET ALONG THE EAST LINE OF SAID SERVICE PIPELINE COMPANY TRACT TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE NORTH LINE OF SAID H.E. FORD SUBDIVISION MARKING THE NORTHEAST CORNER OF SAID SERVICE PIPELINE COMPANY TRACT AND AN "ELL" CORNER OF THE HEREIN DESCRIBED TRACT, FROM WHICH POINT A 1/2-INCH IRON ROD BEARS SOUTH 0.5 FEET AND WEST 0.9 FEET;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 211.30 FEET ALONG THE NORTH LINES OF SAID H.E. FORD SUBDIVISION, OF SAID SERVICE PIPELINE COMPANY TRACT AND OF SAID INDUSTRIAL GAS SUPPLY CORPORATION TRACT TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 9.4750 ACRES OF LAND.

PARCEL 8:

BEING A 3.1406 ACRE TRACT OF LAND IN THE WILLIAM VINCE SURVEY, ABSTRACT NO. 78, IN HOUSTON, HARRIS COUNTY, TEXAS, AND BEING ALL OF LOTS 1 THROUGH 7 INCLUSIVE, LOTS 10 THROUGH 16 INCLUSIVE, AND LOTS 20 THROUGH 29 INCLUSIVE OF BLOCK 2 OF THE H.E. FORD SUBDIVISION AS PER PLAT RECORDED IN VOLUME 572, PAGE 71, OF THE HARRIS COUNTY DEED RECORDS, AND PORTIONS OF LOTS 8, 9, 17, 18, AND 19 OF BLOCK 2 OF SAID H.E. FORD SUBDIVISION, AND BEING ALL OF THAT TRACT OF LAND SOLD TO LYONDELL-CITGO REFINING COMPANY, LTD. AS DESCRIBED AS PARCEL 8 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER P 317107 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO REFINING COMPANY PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5, SAID SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27, AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108:

COMMENCING AT 5/8-INCH IRON ROD FOUND MARKING THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF LAWNDALE AVENUE, 100.00 FEET WIDE, WITH THE WEST LINE OF PASADENA, A SUBDIVISION AS PER PLAT RECORDED IN VOLUME 93, PAGE 21, OF THE HARRIS COUNTY DEED RECORDS AND THE BEING THE SOUTHEAST CORNER OF THAT TRACT OF LAND DESCRIBED AS PARCEL 1 IN SAID LYONDELL-CITGO REFINING COMPANY DEED AND THE NORTHEAST CORNER OF THAT TRACT OF LAND SOLD TO HARRIS COUNTY AS DESCRIBED IN DEED RECORDED IN VOLUME 723, PAGE 115, OF THE HARRIS COUNTY DEED RECORDS, AND SAID POINT HAS TEXAS STATE PLANE COORDINATES OF NORTH 701,541.23 AND EAST 3,197,163.24 AND LYONDELL-CITGO REFINING COMPANY PLANT COORDINATES OF NORTH A+40.88 AND EAST 0+00.58;

* THENCE NORTH 00° 00' 57" WEST, A DISTANCE OF 1197.58 FEET ALONG THE COMMON LINE OF SAID PARCEL 1 AND OF SAID PASADENA TO THE INTERSECTION OF SAID LINE WITH THE PROJECTION OF THE NORTH RIGHT-OF-WAY LINE OF FORD STREET, 40.00 FEET WIDE;

THENCE SOUTH 89° 54' 13" EAST, A DISTANCE OF 30.00 FEET ALONG THE PROJECTION OF THE NORTH RIGHT-OF-WAY LINE OF SAID FORD STREET TO A 5/8 INCH IRON ROD FOUND MARKING THE SOUTHWEST CORNER OF BLOCK 2 OF SAID H.E. FORD SUBDIVISION, THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF SAID FORD STREET WITH THE EAST LINE OF THAT STRIP OF LAND ORIGINALLY CALLED VINCE STREET SOLD TO HOUSTON LIGHTING AND POWER COMPANY AS DESCRIBED IN DEEDS RECORDED IN VOLUME 576, PAGE 141 - 142, AND VOLUME 578, PAGE 41, OF THE HARRIS COUNTY DEED RECORDS, AND THE SOUTHWEST CORNER AND POINT OF BEGINNING OF THE HEREIN DESCRIBED TRACT, SAID POINT HAVING LYONDELL-CITGO REFINING COMPANY PLANT COORDINATES OF NORTH H+38.41 AND EAST 0+30.32;

THENCE NORTH 00° 00' 57" WEST, A DISTANCE OF 205.00 FEET ALONG THE EAST LINE OF SAID HOUSTON LIGHTING AND POWER COMPANY FEE STRIP AND THE WEST LINE OF SAID BLOCK 2 TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHWEST CORNER OF THAT TRACT OF LAND RETAINED BY AMOCO PIPELINE COMPANY AS DESCRIBED IN SAID DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER E 013936 AND THE MOST WESTERLY NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 89° 54' 13" EAST, A DISTANCE OF 134.95 FEET ALONG THE SOUTH LINE OF SAID AMOCO PIPELINE COMPANY TRACT TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHEAST CORNER OF SAID AMOCO PIPELINE COMPANY TRACT AND AN "ELL" CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 00° 05' 48" EAST, A DISTANCE OF 25.00 FEET ALONG THE EAST LINE OF SAID AMOCO PIPELINE COMPANY TRACT TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE SOUTH RIGHT-OF-WAY LINE OF DODGE STREET, 40.00 FEET WIDE, AND THE NORTH LINE OF SAID BLOCK 2 MARKING THE NORTHEAST CORNER OF SAID AMOCO PIPELINE COMPANY TRACT AND THE MOST NORTHERLY NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 89° 54' 13" EAST, A DISTANCE OF 494.53 FEET ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID DODGE STREET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET FOR THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SAID DODGE STREET WITH THE WEST RIGHT-OF-WAY LINE OF LIGHT COMPANY ROAD, 60.00 FEET WIDE AND THE NORTHEAST CORNER OF SAID BLOCK 2 AND OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 00° 07' 32" WEST, A DISTANCE OF 230.00 FEET ALONG THE WEST RIGHT-OF-WAY LINE OF SAID LIGHT COMPANY ROAD TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF SAID FORD STREET WITH THE WEST RIGHT-OF-WAY LINE OF SAID LIGHT COMPANY ROAD AND THE SOUTHEAST CORNER OF SAID BLOCK 2 AND OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 17.87 FEET ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID FORD STREET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHEAST CORNER OF THAT TRACT OF LAND SOLD TO THE T. & N.O. RAILROAD COMPANY AS DESCRIBED IN DEED RECORDED IN VOLUME 4367, PAGE 606, OF THE HARRIS COUNTY DEED RECORDS AND AN ANGLE POINT IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

THENCE ALONG THE PERIMETER OF SAID T. & N.O. RAILROAD COMPANY TRACT AS FOLLOWS:

*THE WORD "NORTH" WAS OMITTED FROM THE TITLE COMMITMENT DESCRIPTION.

NORTH 14° 35' 13" EAST, A DISTANCE OF 56.81 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING AN ANGLE POINT IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

NORTH 89° 54' 13" WEST, A DISTANCE OF 82.70 FEET TO A 5/8 INCH IRON ROD FOUND MARKING AN ANGLE POINT IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

SOUTH 14° 35' 12" WEST, A DISTANCE OF 56.81 FEET TO A 5/8 INCH IRON ROD FOUND ON THE NORTH RIGHT-OF-WAY LINE OF SAID FORD STREET MARKING THE SOUTHWEST CORNER OF SAID T. & N.O. RAILROAD COMPANY TRACT AND AN ANGLE POINT IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 528.39 FEET ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID FORD STREET TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 3.1406 ACRES OF LAND.

PARCEL 9:

BEING A 3.1898 ACRE TRACT OF LAND IN THE WILLIAM VINCE SURVEY, ABSTRACT NO. 78, IN HOUSTON, HARRIS COUNTY, TEXAS, AND BEING ALL OF LOTS 1, 4, 5, AND 10 THROUGH 29 INCLUSIVE OF BLOCK 1 OF THE H.E. FORD SUBDIVISION AS PER PLAT RECORDED IN VOLUME 572, PAGE 71, OF THE HARRIS COUNTY DEED RECORDS, AND PORTIONS OF LOTS 2, 3, 6, 7, 8, AND 9 OF BLOCK 1 OF SAID H.E. FORD SUBDIVISION, AND BEING ALL OF THAT TRACT OF LAND SOLD TO LYONDELL-CITGO REFINING COMPANY, LTD. AS DESCRIBED AS PARCEL 9 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER P 317107 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO REFINING COMPANY PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5, SAID SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27, AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108:

COMMENCING AT A 5/8-INCH IRON ROD FOUND MARKING THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF LAWNDALE AVENUE, 100.00 FEET WIDE, WITH THE WEST LINE OF PASADENA, A SUBDIVISION AS PER PLAT RECORDED IN VOLUME 93, PAGE 21, OF THE HARRIS COUNTY DEED RECORDS AND THE BEING THE SOUTHEAST CORNER OF THAT TRACT OF LAND DESCRIBED AS PARCEL 1 IN SAID LYONDELL-CITGO REFINING COMPANY DEED AND THE NORTHEAST CORNER OF THAT TRACT OF LAND SOLD TO HARRIS COUNTY AS DESCRIBED IN DEED RECORDED IN VOLUME 723, PAGE 115, OF THE HARRIS COUNTY DEED RECORDS, SAID POINT HAS TEXAS STATE PLANE COORDINATES OF NORTH 701,541.23 AND EAST 3,197,163.24 AND LYONDELL-CITGO REFINING PLANT COORDINATES OF NORTH A+40.88 AND EAST 0+00.58;

THENCE NORTH 00° 00' 57" WEST, A DISTANCE OF 927.58 FEET ALONG THE COMMON LINE OF SAID PARCEL 1 OF SAID PASADENA TO FENCE CORNER MARKING THE INTERSECTION OF SAID LINE WITH THE PROJECTION OF THE NORTH RIGHT-OF-WAY LINE OF SHAW STREET, 40.00 FEET WIDE;

THENCE SOUTH 89° 54' 13" EAST, A DISTANCE OF 30.00 FEET ALONG THE PROJECTION OF THE NORTH RIGHT-OF-WAY LINE OF SAID SHAW STREET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHWEST CORNER OF BLOCK 1 OF SAID H.E. FORD SUBDIVISION, THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF SAID SHAW STREET WITH THE EAST LINE OF THAT STRIP OF LAND ORIGINALLY CALLED VINCE STREET SOLD TO HOUSTON LIGHTING AND POWER COMPANY AS DESCRIBED IN DEEDS RECORDED IN VOLUME 576, PAGE 141 - 142, AND VOLUME 578, PAGE 41, OF THE HARRIS COUNTY DEED RECORDS, AND THE SOUTHWEST CORNER AND POINT OF BEGINNING OF THE HEREIN DESCRIBED TRACT, SAID POINT HAVING LYONDELL-CITGO REFINING COMPANY PLANT COORDINATES OF NORTH J+68.41 AND EAST 0+30.32;

THENCE NORTH 00° 00' 57" WEST, A DISTANCE OF 230.00 FEET ALONG THE EAST LINE OF SAID HOUSTON LIGHTING AND POWER COMPANY FEE STRIP AND THE WEST LINE OF SAID BLOCK 1 TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE INTERSECTION OF THE EAST LINE OF SAID HOUSTON LIGHTING AND POWER COMPANY FEE STRIP WITH THE SOUTH RIGHT-OF-WAY LINE OF FORD STREET, 40.00 FEET WIDE, AND THE NORTHWEST CORNER OF SAID BLOCK 1 AND OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 89° 54' 13" EAST, ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID FORD STREET, AT 600.4 FEET PASS A 1/2-INCH IRON ROD 0.9 FEET SOUTH OF LINE, AND CONTINUE IN ALL A TOTAL DISTANCE OF 628.86 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SAID FORD STREET WITH THE WEST RIGHT-OF-WAY LINE OF LIGHT COMPANY ROAD, 60.00 FEET WIDE, AND THE NORTHEAST CORNER OF SAID BLOCK 1 AND OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 00° 07' 32" WEST, ALONG THE WEST RIGHT-OF-WAY LINE OF SAID LIGHT COMPANY ROAD, AT 125.9 FEET PASS A 5/8 INCH IRON ROD 0.8 FEET WEST OF LINE, AND CONTINUE IN ALL A TOTAL DISTANCE OF 230.00 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE INTERSECTION OF THE WEST RIGHT-OF-WAY LINE OF SAID LIGHT COMPANY ROAD WITH THE NORTH RIGHT-OF-WAY LINE OF SAID SHAW STREET AND THE SOUTHEAST CORNER OF SAID BLOCK 1 AND OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 87.31 FEET ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID SHAW STREET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE SOUTHEAST CORNER OF THAT RIGHT-OF-WAY AND EASEMENT GRANTED TO SOUTHERN PACIFIC TRANSPORTATION COMPANY AS DESCRIBED IN INSTRUMENT RECORDED IN VOLUME 4752, PAGE 585, OF THE HARRIS COUNTY DEED RECORDS-AND AN ANGLE POINT IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 14° 35' 12" EAST, A DISTANCE OF 108.45 FEET ALONG THE EAST LINE OF SAID RIGHT-OF-WAY AND EASEMENT TO A 5/8 INCH IRON ROD FOUND ON THE COMMON LINE OF LOTS 5 AND 6 OF THE BLOCK 1 MARKING AN ANGLE POINT IN THE SOUTH LINE OF THE HEREIN DESCRIBED TRACT, FROM WHICH POINT A 1/2-INCH IRON ROD BEARS SOUTH 0.8 FEET AND WEST 0.3 FEET;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 39.50 FEET ALONG THE NORTH LINE OF SAID RIGHT-OF-WAY AND EASEMENT TO A PK NAIL FOUND ON THE EAST LINE OF LOT 29 OF SAID BLOCK 1 MARKING THE COMMON WEST CORNER OF SAID LOTS 5 AND 6, THE NORTHWEST CORNER OF SAID RIGHT-OF-WAY AND EASEMENT, AND AN "ELL" CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 00° 06' 13" WEST, A DISTANCE OF 105.00 FEET ALONG THE COMMON LINE OF SAID LOT 29 AND OF SAID RIGHT-OF-WAY AND EASEMENT TO A DRILL HOLE IN CONCRETE CULVERT FOUND IN THE NORTH RIGHT-OF-WAY LINE OF SAID SHAW STREET MARKING THE SOUTHWEST CORNER OF SAID RIGHT-OF-WAY AND EASEMENT AND AN "ELL" CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 528.40 FEET ALONG THE NORTH RIGHT-OF-WAY LINE OF SAID SHAW STREET TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED GROSS AREA OF 3.2564 ACRES OF LAND,

SAVE AND EXCEPT A TRACT OF LAND DESCRIBED AS FOLLOWS:

BEING A 0.0676 ACRE TRACT OF LAND IN THE WILLIAM VINCE SURVEY, ABSTRACT NO. 78, IN HOUSTON, HARRIS COUNTY, TEXAS, AND BEING A PORTION OF LOTS 2 AND 3 OF BLOCK 1 OF H.E. FORD SUBDIVISION AS PER PLAT RECORDED IN VOLUME 572, PAGE 71, OF THE HARRIS COUNTY DEED RECORDS AND BEING ALL OF THAT TRACT OF LAND SOLD TO T. & N.O. RAILROAD COMPANY AS DESCRIBED IN DEED RECORDED IN VOLUME 4367, PAGE 606, OF THE HARRIS COUNTY DEED RECORDS AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO REFINING COMPANY PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5, SAID SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27, AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108:

COMMENCING AT A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF FORD STREET, 40.00 FEET WIDE, WITH THE WEST LINE OF LIGHT COMPANY ROAD, 60.00 FEET WIDE, AND THE NORTHEAST CORNER OF BLOCK 1 OF SAID H.E. FORD SUBDIVISION;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 28.19 FEET ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID FORD STREET TO A POINT IN THE EAST LINE OF THAT RIGHT-OF-WAY AND EASEMENT GRANTED TO T. & N.O. RAILROAD COMPANY AS DESCRIBED IN DEED RECORDED IN VOLUME 4621, PAGE 176, OF THE HARRIS COUNTY DEED RECORDS;

THENCE SOUTH 14° 35' 12" WEST, A DISTANCE OF 25.82 FEET ALONG THE EAST LINE OF SAID RIGHT-OF-WAY AND EASEMENT TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE COMMON LINE OF LOTS 1 AND 2 OF SAID BLOCK 1 MARKING THE POINT OF BEGINNING AND NORTHEAST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 14° 35' 12" WEST, A DISTANCE OF 51.64 FEET TO A 5/8 INCH IRON ROD FOUND ON THE COMMON LINE OF LOTS 3 AND 4 OF SAID BLOCK 1 MARKING THE SOUTHEAST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 89° 54' 13" WEST, A DISTANCE OF 52.42 FEET ALONG THE COMMON LINE OF SAID LOTS 3 AND 4 TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE EAST LINE OF LOT 10 OF SAID BLOCK 1 MARKING THE COMMON WEST CORNER OF SAID LOTS 3 AND 4 AND THE SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 00° 06' 12" EAST, A DISTANCE OF 50.00 FEET ALONG THE EAST LINE OF SAID LOT 10 TO A 5/8 INCH IRON ROD FOUND MARKING THE COMMON WEST CORNER OF SAID LOTS 1 AND 2 AND THE NORTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 89° 54' 13" EAST, A DISTANCE OF 65.34 FEET ALONG THE COMMON LINE OF SAID LOTS 1 AND 2 TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 0.0676 ACRES OF LAND, AND ENCLOSING WITHIN THIS DESCRIPTION A NET ACREAGE OF 3.1898 ACRES OF LAND.

PARCEL 10:

BEING A 7.2468 ACRE TRACT OF LAND IN THE WILLIAM VINCE SURVEY, ABSTRACT NO. 78, IN HOUSTON, HARRIS, COUNTY, TEXAS, AND BEING A PORTION OF LOT 1 OF BLOCK 34 OF PASADENA A SUBDIVISION AS PER PLAT RECORDED IN VOLUME 93, PAGE 21, OF THE HARRIS COUNTY DEED RECORDS AND BEING ALL OF THAT TRACT OF LAND SOLD TO LYONDELL-CITGO REFINING COMPANY, LTD. AS DESCRIBED AS PARCEL 10 IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER P 317107 AND BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS WITH ALL BEARINGS BEING BASED ON THE LYONDELL-CITGO REFINING COMPANY PLANT COORDINATE SYSTEM MONUMENTS 2 AND 5, SAID SYSTEM BEING ROTATED 02° 29' 43" COUNTERCLOCKWISE FROM THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 27, AS BASED ON CITY OF HOUSTON MONUMENTS 5755/0910 AND 5755/0108:

COMMENCING AT A 5/8-INCH IRON ROD FOUND MARKING THE INTERSECTION OF THE NORTH RIGHT-OF-WAY LINE OF LAWNDALE AVENUE, 100.00 FEET WIDE, WITH THE WEST LINE OF SAID PASADENA, AND BEING THE SOUTHEAST CORNER OF THAT TRACT OF LAND DESCRIBED AS PARCEL 1 IN SAID LYONDELL-CITGO REFINING COMPANY, LTD. DEED AND THE NORTHEAST CORNER OF THAT TRACT OF LAND SOLD TO HARRIS COUNTY AS DESCRIBED IN DEED RECORDED IN VOLUME 723, PAGE 115, OF THE HARRIS COUNTY DEED RECORDS, AND HAS TEXAS STATE PLANE COORDINATES OF NORTH 701,541.23 AND EAST 3,197,163.24 AND LYONDELL-CITGO REFINING COMPANY PLANT COORDINATES OF NORTH A+40.88 AND EAST 0+00.58;

THENCE NORTH 00° 00' 57" WEST, A DISTANCE OF 887.58 FEET ALONG THE COMMON LINE OF SAID PARCEL 1 AND OF SAID PASADENA TO THE INTERSECTION OF SAID LINE WITH THE PROJECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SHAW STREET, 40.00 FEET WIDE;

THENCE SOUTH 89° 54' 13" EAST, A DISTANCE OF 90.00 FEET ALONG THE PROJECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SAID SHAW STREET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING THE NORTHEAST CORNER OF THAT 30.00 FOOT STRIP OF LAND GRANTED TO THE UNITED STATES OF AMERICA AND DESCRIBED AS "TRACT W-66" IN INSTRUMENT RECORDED IN VOLUME 1292, PAGE 540, OF THE HARRIS COUNTY DEED RECORDS AND THE NORTHWEST CORNER AND POINT OF BEGINNING OF THE HEREIN DESCRIBED TRACT, SAID POINT HAVING LYONDELL-CITGO REFINING COMPANY PLANT COORDINATES OF NORTH J+28.31 AND EAST 0+90.33 AND FROM WHICH POINT A 3/4-INCH IRON PIPE BEARS NORTH 1.3 FEET AND WEST 0.4 FEET;

THENCE SOUTH 89° 54' 13" EAST, ALONG THE SOUTH RIGHT-OF-WAY LINE OF SAID SHAW STREET, AT 99.6 FEET PASS A 3/4-INCH IRON PIPE 1.4 FEET NORTH OF LINE, AT 470.2 FEET PASS A 5/8 INCH IRON ROD 0.8 FEET SOUTH OF LINE, AND CONTINUE IN ALL A TOTAL DISTANCE OF 568.19 FEET TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET AT THE INTERSECTION OF THE SOUTH RIGHT-OF-WAY LINE OF SAID SHAW STREET WITH THE WEST RIGHT-OF-WAY LINE OF LIGHT COMPANY ROAD, 60.00 FEET WIDE AND THE NORTHEAST CORNER OF LOT 1 OF BLOCK 34 OF SAID PASADENA;

THENCE SOUTH 00° 07' 32" WEST, A DISTANCE OF 524.69 FEET ALONG THE WEST RIGHT-OF-WAY LINE OF SAID LIGHT COMPANY ROAD TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE NORTHEAST CORNER OF THAT TRACT OF LAND SOLD TO RANDAL L. HAMMONS AND WIFE MARGARET HAMMONS AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER K 900171 AND THE MOST EASTERLY SOUTHEAST CORNER OF THE HEREIN DESCRIBED TRACT, FROM WHICH POINT A 5/8 INCH IRON ROD BEARS NORTH 0.3 FEET AND WEST 0.6 FEET;

THENCE SOUTH 89° 53' 30" WEST, ALONG THE NORTH LINE OF SAID HAMMONS TRACT, AT 244.7 FEET PASS A 1/2-INCH IRON ROD, AND CONTINUE IN ALL A TOTAL DISTANCE OF 273.87 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND MARKING AN "ELL" CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 00° 07' 32" WEST, A DISTANCE OF 59.10 FEET PARALLEL WITH THE WEST RIGHT-OF-WAY LINE OF SAID LIGHT COMPANY ROAD TO A 5/8-INCH IRON ROD WITH "CLR" PLASTIC CAP SET MARKING THE NORTHEAST CORNER OF THAT RIGHT-OF-WAY AND EASEMENT GRANTED TO T. & N.O. RAILROAD COMPANY AS DESCRIBED AS "FIRST TRACT" IN INSTRUMENT RECORDED IN VOLUME 5070, PAGE 380, OF THE HARRIS COUNTY DEED RECORDS, THE SOUTHWEST CORNER OF SAID HAMMONS TRACT, THE NORTHWEST CORNER OF THAT TRACT OF LAND SOLD TO ISADORE CAVARRETTA AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER M 563612, AND THE MOST SOUTHERLY SOUTHEAST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE SOUTH 89° 53' 30" WEST, AT 91.0 FEET PASS A 5/8 INCH IRON ROD FOUND MARKING THE NORTHWEST CORNER OF SAID RIGHT-OF-WAY AND EASEMENT AND CONTINUE ALONG THE NORTH LINE OF THAT TRACT OF LAND SOLD TO ENTERPRISE PRODUCTS COMPANY AS DESCRIBED IN DEED RECORDED UNDER HARRIS COUNTY CLERK'S FILE NUMBER N 128078 IN ALL A TOTAL DISTANCE OF 292.88 FEET TO A 3/4-INCH MAGNETIZED ALUMINUM ROD WITH AN ALUMINUM CAP STAMPED "ATLANTIC RICHFIELD PROPERTY CORNER" FOUND IN THE EAST LINE OF SAID "TRACT W-66" MARKING THE SOUTHWEST CORNER OF THE HEREIN DESCRIBED TRACT;

THENCE NORTH 00° 00' 57" WEST, ALONG THE EAST LINE OF SAID "TRACT W-66", AT 335.3 FEET PASS A 1/2-INCH IRON ROD 0.7 FEET WEST OF LINE, AND CONTINUE IN ALL A TOTAL DISTANCE OF 585.81 FEET TO THE POINT OF BEGINNING AND CONTAINING A COMPUTED AREA OF 7.2468 ACRES OF LAND.

NOTE:
SEVERAL SCRIVENER'S SPELLING AND PUNCTUATION ERRORS WERE CORRECTED ON THIS DESCRIPTION, AND WERE NOT NOTED.

FOR INQUIRIES, QUESTIONS OR CONCERNS ABOUT THIS SURVEY CONTACT BWEIGHTMAN@USSURVEYOR.COM or call 1-800-867-6701 Ext. 221

U.S. SURVEYOR®
4929 RIVERWIND POINTE DRIVE
EVANSVILLE, INDIANA 47715
1-800- TO SURV

PREPARED FOR: TX6 - (HRO)
Skadden
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP & Affiliates

PROJECT LOCATION: HARRIS COUNTY, STATE OF TEXAS

PROJECT ADDRESS: 12000 LAWNDALE ST HOUSTON, TX 77017

PROJECT TYPE: ALTA/ACSM LAND TITLE SURVEY

JOB NUMBER: TX6

SHEET 4 OF 7

DATE OF ORIGINAL: MARCH 12, 2008
REVISION: DATE: . 2008
REVISION: DATE: . 2008
REVISION: DATE: . 2008

P-00043-TX6.dwg

SURVEYOR'S LEGAL DESCRIPTION

TRACT 1
LEGAL DESCRIPTION OF A 508.12 ACRE TRACT OF LAND (505.9385 ACRES – RECORD) IN THE CALLAHAN AND VINCE SURVEY, ABSTRACT 9 AND THE WILLIAM VINCE SURVEY, ABSTRACT 78, IN THE CITY OF HOUSTON, HARRIS CO. TEXAS. BEING TRACT 1 AS RECORDED IN HARRIS CO. CLERK'S FILE NO. P317107.

BOUNDARY BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING AT A 5/8" IRON ROD FOUND IN THE NORTH LINE OF LAWNDALE AVENUE AT THE SOUTHEAST CORNER OF A 30 FOOT STRIP TO HOUSTON POWER AND LIGHT RECORDED IN VOLUME 576, PAGES 141 AND 142 AND VOLUME 578, PAGE 41 OF THE HARRIS COUNTY DEED RECORDS, BEING THE SOUTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 82°07'32" WEST WITH THE NORTH RIGHT OF WAY LINE OF SAID LAWNDALE AVENUE, AT DISTANCE OF 4817.91 FEET TO A 5/8" IRON ROD FOUND AT A POINT OF CURVATURE IN THE NORTH ROGHT OF WAY LINE OF SAID LAWNDALE AVENUE, BEING A POINT OF CURVATURE IN THE SOUTH LINE OF THIS TRACT;

THENCE ALONG AN ARC TO THE RIGHT IN A NORHTWESTERLY DIRECTION WITH THE NORTH RIGHT OF WAY LINE OF SAID LAWNDALE AVENUE, SAID ARC HAVING A RADIUS LENGTH OF 5579.02 FEET, A CENTRAL ANGLE OF 19°11'47", AN ARC LENGTH OF 1869.20 FEET AND A CHORD LENGTH OF 1860.47 FEET BEARING NORTH 88°16'36" WEST TO A 5/8" IRON ROD WITH ALUMINUM CAP MARKED ATLANTIC RICHFIELD FOUND FOR A POINT OF COMPOUND CURVATURE IN THE NORTH LINE OF SAID LAWNDALE AVENUE, BEING A POINT OF COMPOUND CURVATURE IN THE SOUTH LINE OF THIS TRACT;

THENCE ALONG AN ARC TO THE RIGHT IN A NORHTWESTERLY DIRECTION WITH THE NORTH RIGHT OF WAY LINE OF SAID LAWNDALE AVENUE, SAID ARC HAVING A RADIUS LENGTH OF 1369.33 FEET, A CENTRAL ANGLE OF 07°02'22", AN ARC LENGTH OF 168.24 FEET AND A CHORD LENGTH OF 168.13 FEET BEARING NORTH 75°08'35" WEST TO A 5/8" IRON ROD WITH ALUMINUM CAP MARKED ATLANTIC RICHFIELD FOUND AT A POINT OF TANGENCY IN THE NORTH RIGHT OF WAY LINE OF SAID LAWNDALE AVENUE, BEING A POINT OF TANGENCY IN THE SOUTH LINE OF THIS TRACT;

THENCE NORTH 68°45'22" WEST WITH THE NORTH RIGHT OF WAY LINE OF SAID LAWNDALE AVENUE, A DISTANCE OF 234.22 FEET TO A POINT AT THE SOUTHEAST CORNER OF A 9.117 ACRE TRACT DESCRIBED AS PARCEL ONE IN HARRIS COUNTY CLERK'S FILE NO. C222732, BEING A POINT OF DEFELCTION IN THE SOUTH LINE OF THIS TRACT, WHENCE A STEEL FENCE POST BEARS NORTH 37°58'13" EAST 1.09 FEET;

THENCE NORTH 21°28'04" EAST WITH THE EAST LINE OF SAID 9.117 ACRE TRACT, A DISTANCE OF 61.35 FEET TO A STEEL FENCE POST FOUND AT A POINT OF DEFLECTION IN THE EAST LINE OF SAID 9.117 ACRE TRACT, AND BEING A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE NORTH 68°41'16" WEST WITH THE EAST LINE OF SAID 9.117 ACRE TRACT, A DISTANCE OF 623.61 FEET TO A STEEL FENCE POST FOUND FOR A POINT OF DEFLECTION IN THE EAST LINE OF SAID 9.117 ACRE TRACT, AND BEING A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE NORTH 28°42'32" WEST WITH THE EAST LINE OF SAID 9.117 ACRE TRACT, A DISTANCE OF 76.32 FEET TO A STEEL FENCE CORNER FOUND FOR A POINT OF DEFLECTION IN THE EAST LINE OF SAID 9.117 ACRE TRACT, AND BEING A POINT OF DEFLECTION OF THE SOUTH LINE IN THIS TRACT;

THENCE NORTH 10°37'57" EAST WITH THE EAST LINE OF SAID 9.117 ACRE TRACT, A DISTANCE OF 477.74 FEET TO A POINT IN THE SOUTH LINE OF A 100 FOOT WIDE EASEMENT TO THE CITY OF HOUSTON RECORDED IN VOLUME 398, PAGE 295 OF THE HARRIS COUNTY DEED RECORDS, AND AT THE NORTHEAST CORNER OF SAID 9.117 ACRE TRACT, BEING A POINT OF CURVATURE IN THE SOUTH LINE OF THIS TRACT;

THENCE ALONG AN ARC TO THE RIGHT IN A NORHTWESTERLY DIRECTION WITH THE NORTH LINE OF SAID 9.117 ACRE TRACT AND THE SOUTH LINE OF SAID 100 FOOT WIDE EASEMENT, SAID ARC HAVING A RADIUS LENGTH OF 1005.26 FEET, A CENTRAL ANGLE OF 00°37'57", AN ARC LENGTH OF 11.10 FEET AND A CHORD LENGTH OF 11.10 FEET BEARING NORTH 71°51'48" WEST TO A POINT OF TANGENCY IN THE NORTH LINE OF SAID 9.117 ACRE TRACT IN THE SOUTH LINE OF SAID 100 FOOT WIDE EASEMENT, BEING A POINT OF TANGENCY OF THE SOUTH LINE OF THIS TRACT;

THENCE NORTH 71°32'49" WEST WITH THE NORTH LINE OF SAID 9.117 ACRE TRACT, PASSING ITS NORTHWEST CORNER AND THE NORTHEAST CORNER OF A 0.755 ACRE TRACT DESCRIBED AS TRACT 3 IN VOLUME 3233, PAGE 348 OF THE HARRIS COUNTY DEED RECORDS, THEN PASSING ITS NORTHWEST CORNER AND THE NORTHEAST CORNER OF A TRACT OF LAND DESCRIBED AS PARCEL 2 IN HARRIS COUNTY CLERK'S FILE NO. C222732, THEN PASSING ITS NORTWEST CORNER AND THE NORTHEAST CORNER OF A TRACT OF LAND DESCRIBED AS PARCEL 3 IN HARRIS COUNTY CLERK'S FILE NO. C222732, CONTINUING FOR A TOTAL DISTANCE OF 1039.79 FEET TO A POINT IN THE HIGH BANK OF SIMS BAYOU AT THE NORHTWEST CORNER OF SAID PARCEL 3, BEING THE SOUTHWEST CORNER OF THIS TRACT;

THENCE NORTH 19°08'39" EAST WITH THE EAST HIGH BANK OF SAID SIMS BAYOU, A DISTANCE OF 100 FEET TO A POINT IN THE NORTH LINE OF SAID 100 FOOT WIDE EASTMENT AND AT THE SOUTHWEST CORNER OF A 42.491 ACRE TRACT AS DESCRIBED IN VOLUME 3233, PAGE 348 OF THE HARRIS COUNTY DEED RECORDS, AND BEING THE NORTHWEST CORNER OF THIS TRACT;

THENCE SOUTH 71°32'49" EAST WITH THE NORTH LINE OF SAID 100 FOOT WIDE EASEMENT AND THE SOUTH LINE OF SAID 42.491 ACRE TRACT, A DISTANCE OF 1038.58 FEET TO A POINT OF CURVATURE IN THE NORTH LINE OF SAID 100 FOOT WIDE EASEMENT AND THE SOUTH LINE OF SAID 42.491 ACRE TRACT, BEING A POINT OF CURVATURE IN THE NORTH LINE OF THIS TRACT;

THENCE ALONG AN ARC TO THE LEFT IN A SOUTHEASTERLY DIRECTION WITH THE NORTH LINE OF SAID 100 FOOT WIDE EASEMENT AND THE SOUTH LINE OF SAID 42.491 ACRE TRACT, SAID CURVE HAVING A RADIUS LENGTH OF 905.27 FEET, A CENTRAL ANGLE OF 28°17'28", AN ARC LENGTH OF 447.00 FEET AND A CHORD LENGTH OF 442.47 FEET BEARING SOUTH 85°41'33" EAST TO A POINT OF TANGENCY IN THE NORTH LINE OF SAID 100 FOOT WIDE EASEMENT AND THE SOUTH LINE OF SAID 42.491 ACRE TRACT, BEING A POINT OF TANGENCY IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 80°09'43" EAST WITH THE NORTH LINE OF SAID 100 FOOT WIDE EASEMENT AND THE SOUTH LINE OF SAID 42.491 ACRE TRACT, PASSING ITS SOUTHEAST CORNER AND THE SOUTHWEST CORNER OF A 26.256 ACRE TRACT RECORDED IN HARRIS COUNTY CLERK'S FILE NO. B806319, CONTINUING FOR A TOTAL DISTANCE OF 968.47 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF SAID 26.256 ACRE TRACT, AND BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 42°20'10" EAST WITH THE SOUTH LINE OF SAID 26.256 ACRE TRACT, A DISTANCE OF 161.35 FEET TO A STEEL FENCE POST FOUND FOR A POINT OF DEFLECTION IN THE SOUTH LINE OF SAID 26.256 ACRE TRACT, AND BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 80°04'18" EAST WITH THE SOUTH LINE OF SAID 26.256 ACRE TRACT, A DISTANCE OF 663.91 FEET TO A STEEL FENCE POST FOUND FOR THE SOUTHEAST CORNER OF SAID 26.256 ACRE TRACT, AND BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 42°10'54" EAST WITH THE EAST LINE OF SAID 26.256 ACRE TRACT, A DISTANCE OF 1961.31 FEET TO A STEEL FENCE POST FOUND AT THE NORTHEAST CORNER OF SAID 26.256 ACRE TRACT AND THE NORTHWEST CORNER OF A 1.52 ACRE TRACT DESCRIBED IN HARRIS COUNTY CLERK'S FILE NO. C749464, AND BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE SOUTH 64°33'29" EAST WITH THE WEST LINE OF SAID 1.52 ACRE TRACT, A DISTANCE OF 262.94 FEET TO A POINT FOR THE SOUTHWEST CORNER OF SAID 1.52 ACRE TRACT, AND BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 60°25'09" EAST WITH THE SOUTH LINE OF SAID 1.52 ACRE TRACT, A DISTANCE OF 294.22 FEET TO A POINT FOR THE SOUTHEAST CORNER OF SAID 1.52 ACRE TRACT, AND BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 29°37'51" WEST WITH THE EAST LINE OF SAID 1.52 ACRE TRACT, A DISTANCE OF 148.98 FEET TO A POINT ON THE HOUSTON SHIP CHANNEL AT THE NORTH EAST CORNER OF SAID 1.52 ACRE TRACT, BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE WITH THE HOUSTON SHIP CHANNEL THE FOLLOWING 8 COURSES AND DISTANCES:

1. NORTH 60°29'19" EAST, A DISTANCE OF 851.78 FEET
2. NORTH 11°16'04" EAST , A DISTANCE OF 279.10 FEET
3. NORTH 14°17'19" EAST, A DISTANCE OF 877.80 FEET
4. NORTH 52°27'22" EAST, A DISTANCE OF 271.27 FEET
5. NORTH 51°27'44" EAST, A DISTANCE OF 487.83 FEET
6. NORTH 58°34'52" EAST, A DISTANCE OF 439.10 FEET
7. NORTH 64°54'15" EAST, A DISTANCE OF 842.99 FEET
8. NORTH 66°33'15" EAST, A DISTANCE OF 680.46 FEET TO A POINT FOR THE NORTHWEST CORNER OF SAID 30 FOOT STRIP TO HOUSTON POWER AND LIGHT, BEING THE NORTHEAST CORNER THIS TRACT, WHENCE A STEEL FENCE POST BEARS SOUTH 59°42'28" WEST, A DISTANCE OF 7.76 FEET;

THENCE SOUTH 02°30'57" EAST WITH THE WEST LINE OF SAID 30 FOOT STRIP, A DISTANCE OF 5299.29 FEET TO THE POINT OF BEGINNING. CONTAINING 508.12 ACRES OF LAND, MORE OR LESS.

TRACT 4
LEGAL DESCRIPTION OF A 23.31 ACRE TRACT OF LAND (23.3530 ACRES – RECORD) IN THE CALLAHAN AND VINCE SURVEY, ABSTRACT 9, IN THE CITY OF HOUSTON, HARRIS CO. TEXAS. BEING TRACT 4 AS RECORDED IN HARRIS CO. CLERK'S FILE NO. P317107.

BOUNDARY BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING AT A 5/8" IRON ROD WITH CAP MARKED "ATLANTIC RICHFIELD" FOUND IN THE SOUTH RIGHT OF WAY LINE OF SOUTHERN PACIFIC RAILROAD AND THE SOUTHWEST RIGHT OF WAY LINE OF ALLEN–GENOA ROAD FOR THE NORTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 32°41'31" EAST WITH THE SOUTHWEST RIGHT OF WAY LINE OF SAID ALLEN–GENOA ROAD, A DISTANCE OF 605.25 FEET TO A 5/8" IRON ROD WITH CAP MARKED "ATLANTIC RICHFIELD" FOUND IN THE NORTH LINE OF A 30 FOOT STRIP RECORDED IN VOLUME 572, PAGE 615 OF THE HARRIS COUNTY DEED RECORDS, BEING THE SOUTHEAST CORNER OF THIS TRACT;

THENCE ALONG AN ARC TO THE RIGHT IN A NORTHWESTERLY DIRECTION WITH THE NORTH OF SAID 30 FOOT STRIP, SAID CURVE HAVING A RADIUS LENGTH OF 6279.02 FEET, A CENTRAL ANGLE OF 08°28'30", AN ARC LENGTH OF 928.78 FEET AND A CHORD LENGTH OF 927.93 FEET BEARING NORTH 86°40'55" WEST TO A POINT OF TANGENCY IN THE SOUTH LINE OF THIS TRACT;

THENCE NORTH 80°00'46" WEST WITH THE NORTH LINE OF SAID 30 FOOT STRIP, A DISTANCE OF 1302.05 FEET TO A POINT FO THE SOUTHEAST CORNER OF A 4.00 ACRE TRACT RECORDED IN VOLUME 1280, PAGE 195 OF THE HARRIS COUNTY DEED RECORDS, BEING THE SOUTHWEST CORNER OF THIS TRACT;

THENCE ALONG AN ARC TO THE RIGHT IN A NORTHEASTERLY DIRECTION WITH THE EAST LINE OF SAID 4.00 ACRE TRACT, SAID CURVE HAVING A RADIUS LENGTH OF 433.55 FEET, A CENTRAL ANGLE OF 100°49'37", AN ARC LENGTH OF 762.95 FEET AND A CHORD LENGTH OF 668.24 FEET BEARING NORTH 45°27'35" EAST TO A POINT IN THE SOUTH RIGHT OF WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD, BEING THE NORTHWEST CORNER OF THIS TRACT;

THENCE ALONG AN ARC TO THE LEFT IN A SOUTHEASTERLY DIRECTION WITH THE SOUTH RIGHT OF WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD, SAID CURVE HAVING A RADIUS LENGTH OF 5779.02 FEET, A CENTRAL ANGLE OF 14°10'14", AN ARC LENGTH OF 1429.29, AND A CHORD LENGTH OF 1425.65 FEET BEARING SOUTH 80°21'17" EAST TO THE POINT OF BEGINNING. CONTAINING 23.31 ACRES OF LAND, MORE OR LESS.

TRACT 5
LEGAL DESCRIPTION OF A 64.34 ACRE TRACT OF LAND (64.3291 ACRES – RECORD) IN THE CALLAHAN AND VINCE SURVEY, ABSTRACT 9 AND THE WILLIAM VINCE SURVEY, ABSTRACT 78, IN THE CITY OF HOUSTON, HARRIS CO. TEXAS. BEING TRACT 5 AS RECORDED IN HARRIS CO. CLERK'S FILE NO. P317107.

BOUNDARY BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING AT A TXDOT HIGHWAY MONUMENT FOUND IN THE NORTH RIGHT OF WAY LINE OF STATE HIGHWAY 255 AND THE WEST RIGHT OF WAY LINE OF SCARBOROUGH STREET FOR THE SOUTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 71°39'21" WEST WITH THE NORTH RIGHT OF WAY LINE OF SAID STATE HIGHWAY 255, A DISTANCE OF 90.21 FEET TO A 5/8" IRON ROD WITH CAP MARKED "ATLANTIC RICHFIELD" FOUND IN THE NORTH LINE OF A 30 FOOT STRIP RECORDED IN VOLUME 572, PAGE 615 OF THE HARRIS COUNTY DEED RECORDS, BEING A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 82°07'32" WEST WITH THE NORTH LINE OF SAID 30 FOOT STRIP, A DISTANCE OF 4701.05 FEET TO A POINT OF CURVATURE IN THE SOUTH LINE OF THIS TRACT;

THENCE ALONG AN ARC TO THE RIGHT IN A SOUTHWESTERLY DIRECTION WITH THE NORTH LINE OF SAID 30 FOOT STRIP, SAID CURVE HAVING A RADIUS LENGTH OF 6279.02 FEET, A CENTRAL ANGLE OF 06°03'44", AN ARC LENGTH OF 664.37 FEET AND A CHORD LENGTH OF 664.06 FEET BEARING SOUTH 85°11'41" WEST TO A POINT IN THE NORTHEAST RIGHT OF WAY LINE OF ALLEN–GENOA ROAD, BEING THE SOUTHWEST CORNER OF THIS TRACT;

THENCE NORTH 32°41'31" WEST WITH THE NORTHEAST RIGHT OF WAY LINE OF SAID ALLEN–GENOA ROAD, A DISTANCE OF 598.43 FEET TO A POINT IN THE SOUTH RIGHT OF WAY LINE OF THE SOUTHERN PACIFIC RAILROAD FOR THE NORTHWEST CORNER OF THIS TRACT;

THENCE ALONG AN ARC TO THE LEFT IN A NORTHEASTERLY DIRECTION WITH THE SOUTH RIGHT OF WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD, SAID CURVE HAVING A RADIUS LENGTH OF 5779.02 FEET, A CENTRAL ANGLE OF 09°28'10", AN ARC LENGTH OF 955.11 AND A CHORD LENGTH OF 954.03 FEET BEARING NORTH 86°51'35" EAST TO A POINT OF TANGENCY IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 82°07'32" EAST WITH THE SOUTH RIGHT OF WAY LINE OF SAID SOUTHERN PACIFIC RAILROAD, A DISTANCE OF 4799.00 FEET TO A POINT IN THE WEST RIGHT OF WAY LINE OF SAID SCARBOROUGH STREET FOR THE NORTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 02°28'22" EAST WITH THE WEST RIGHT OF WAY LINE OF SAID SCARBOROUGH STREET, A DISTANCE OF 485.75 FEET TO THE POINT OF BEGINNING. CONTAINING 64.34 ACRES OF LAND, MORE OR LESS.

TRACT 6
LEGAL DESCRIPTION OF A 60.97 ACRE TRACT OF LAND (61.0015 ACRES – RECORD) IN THE CALLAHAN AND VINCE SURVEY, ABSTRACT 9 AND THE WILLIAM VINCE SURVEY, ABSTRACT 78, IN THE CITY OF HOUSTON, HARRIS CO. TEXAS. BEING TRACT 6 AS RECORDED IN HARRIS CO. CLERK'S FILE NO. P317107.

BOUNDARY BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING AT A ½" IRON ROD FOUND IN THE SOUTH RIGHT LINE OF WAY LINE OF STATE HIGHWAY 225 AND THE WEST LINE OF SCARBOROUGH STREET FOR THE NORTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 02°26'45" EAST WITH THE WEST RIGHT OF WAY LINE OF SAID SCARBOROUGH STREET, A DISTANCE OF 187.90 FEET TO A 5/8" IRON ROD WITH CAP MARKED "ATLANTIC RICHFIELD" FOUND AT A POINT IN THE NORTHWEST LINE OF A 22 FOOT STRIP RECORDED IN VOLUME 612, PAGE 609 OF THE HARRIS COUNTY DEED RECORDS, BEING THE MOST EASTERLY SOUTHEAST CORNER OF THIS TRACT;
THENCE SOUTH 39°18'44" WEST WITH THE NORTHWEST LINE OF SAID 22 FOOT STRIP, A DISTANCE OF 775.04 FEET TO AN IRON ROD FOUND AT THE NORTHEAST CORNER OF A TRACT OF LAND DEEDED TO THE HOUSTIN SHIP CHANNEL NAVAGATION DISTRICT IN VOLUME 1973, PAGE 5 OF THE HARRIS COUNTY DEED RECORDS, BEING THE MOST SOUTHERLY SOUTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 82°08'01" WEST WITH THE NORTH LINE OF SAID HOUSTON SHIP CHANNEL NAVAGATION DISTRICT TRACT, A DISTANCE OF 3392.66 FEET TO A 5/8" IRON ROD WITH CAP MARKED "ATLANTIC RICHFIELD" FOUND IN THE SOUTHEAST RIGHT OF WAY LINE OF STEELMAN AVENUE AT THE NORTHWEST CORNER OF SAID HOUSTON SHIP CHANNEL NAVAGATION DISTRICT TRACT, BEING THE SOUTHWEST CORNER OF THIS TRACT;

THENCE NORTH 43°59'35" EAST WITH THE SOUTHEAST RIGHT OF WAY LINE OF SAID STEELMAN AVENUE, A DISTANCE OF 67.72 FEET TO A POINT OF DEFLECTION IN THE WEST LINE OF THIS TRACT;

THENCE NORTH 50°13'40" EAST WITH THE SOUTHEAST RIGHT OF WAY LINE OF SAID STEELMAN AVENUE, A DISTANCE OF 171.45 FEET TO A POINT FOR THE END OF THE SOUTHEAST RIGHT OF WAY OF SAID STEELMAN AVENUE AND THE BEGINNING OF THE NORTHEAST RIGHT OF WAY OF TURIN STREET, BEING A POINT OF DEFLECTION IN THE WEST LINE OF THIS TRACT;

THENCE NORTH 39°38'29" WEST WITH THE NORTHEAST RIGHT OF WAY LINE OF SAID TURIN STREET, A DISTANCE OF 683.39 FEET TO A 5/8" IRON ROD WITH CAP MARKED "ATLANTIC RICHFIELD" FOUND IN THE SOUTH RIGHT OF WAY LINE OF SAID STATE HIGHWAY 225 FOR THE NORTHWEST CORNER OF THIS TRACT;

THENCE NORTH 82°07'38" EAST WITH THE SOUTH RIGHT OF WAY LINE OF SAID STATE HIGHWAY 225, A DISTANCE OF 4139.93 FEET TO THE POINT OF BEGINNING. CONTAINING 60.97 ACRES OF LAND, MORE OR LESS.

TRACT 7
LEGAL DESCRIPTION OF A 9.47 ACRE TRACT OF LAND (9.4730 ACRES – RECORD) IN THE WILLIAM VINCE SURVEY, ABSTRACT 78, IN THE CITY OF HOUSTON, HARRIS CO. TEXAS. BEING TRACT 7 AS RECORDED IN HARRIS CO. CLERK'S FILE NO. P317107.

BOUNDARY BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING AT A 5/8" IRON ROD WITH CAP MARKED "ATLANTIC RICHFIELD" IN THE SOUTH LINE OF A 100 FOOT STRIP, BEING THE CITY OF HOUSTON'S RAILROAD TRACT, RECORDED IN VOLUME 551, PAGE 22 OF THE HARRIS COUNTY DEED RECORDS AND IN THE WEST RIGHT OF WAY LINE OF LIGHT COMPANY ROAD FOR THE NORTHEAST CORNER OF LOT 12, PASADENA SUBDIVISION RECORDED IN VOLUME 93, PAGE 21 OF THE HARRIS COUNTY DEED RECORDS, BEING THE NORTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 02°21'57" EAST WITH THE WEST RIGHT OF WAY LINE OF SAID LIGHT COMPANY ROAD, A DISTANCE OF 710.45 FEET TO A POINT IN THE NORTH RIGHT OF WAY LINE OF DODGE STREET FOR THE SOUTHEAST CORNER OF BLOCK 3, H.E. FORD SUBDIVISION RECORDED IN VOLUME 572, PAGE 71 OF THE HARRIS COUNTY DEED RECORDS, AND BEING THE SOUTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 87°34'46" WEST WITH THE NORTH RIGHT OF WAY LINE OF DODGE STREET, A DISTANCE OF 29.65 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE 12°15'47" EAST, A DISTANCE OF 103.38 FEET TO A 5/8" IRON ROD WITH CAP MARKED "ATLANTIC RICHFIELD" FOUND IN THE NORTH LINE OF SAID BLOCK 3 FOR A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 87°34'46" WEST WITH THE NORTH LINE OF SAID BLOCK 3, A DISTANCE OF 155.87 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THANCE SOUTH 02°29'22" EAST, A DISTANCE OF 100 FEET TO A FENCE CORNER FOUND IN THE NORTH RIGHT OF WAY LINE OF SAID DODGE STREET, BEING A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 87°34'46" WEST WITH THE NORTH RIGHT OF WAY LINE OF SAID DODGE STREET, A DISTANCE OF 258.89 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE NORTH 02°28'59" WEST, A DISTANCE OF 100.00 FEET TO A POINT IN THE NORTH LINE OF SAID BLOCK 3, BEING A POINT OF DELFECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 87°34'46" WEST WITH THE NORTH LINE OF SAID BLOCK 3, A DISTANCE OF 211.36 FEET TO A POINT FOR THE NORTHWEST CORNER OF SAID BLOCK 3 IN THE EAST LINE OF A 30 FOOT STRIP RECORDED IN VOLUME 576, PAGES 141 AND 142 AND VOLUME 578, PAGE 41 OF THE HARRIS COUNTY DEED RECORDS, BEING THE SOUTHWEST CORNER OF THIS TRACT;

THENCE NORTH 02°30'57" WEST WITH THE EAST LINE OF SAID 30 FOOT STRIP, A DISTANCE OF 610.45 FEET TO A POINT IN THE SOUTH LINE OF SAID 100 FOOT STRIP FOR THE NORTHWEST CORNER OF THIS TRACT;

THENCE NORTH 87°34'46" EAST WITH THE SOUTH LINE OF SAID 100 FOOT STRIP, A DISTANCE OF 631.24 FEET TO THE POINT OF BEGINNING. CONTAINING 9.47 ACRES OF LAND, MORE OR LESS.

TRACT 8
LEGAL DESCRIPTION OF A 3.14 ACRE TRACT OF LAND (3.1406 ACRES – RECORD) IN THE WILLIAM VINCE SURVEY, ABSTRACT 78, IN THE CITY OF HOUSTON, HARRIS CO. TEXAS. BEING TRACT 8 AS RECORDED IN HARRIS CO. CLERK'S FILE NO. P317107.

BOUNDARY BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING AT A POINT IN THE SOUTH RIGHT OF WAY LINE OF DODGE STREET IN THE WEST RIGHT OF WAY LINE OF LIGHT COMPANY ROAD FOR THE NORTHEAST CORNER OF BLOCK 2, H.E. FORD SUBDIVISION RECORDED IN VOLUME 572, PAGE 71 OF THE HARRIS COUNTY DEED RECORDS, BEING THE NORTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 02°21'57" EAST WITH THE WEST RIGHT OF WAY LINE OF SAID LIGHT COMPANY ROAD, A DISTANCE OF 230.00 FEET TO A POINT IN THE NORTH RIGHT OF WAY LINE OF FORD STREET FOR THE SOUTHEAST CORNER OF SAID BLOCK 2, BEING THE SOUTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 87°34'45" WEST WITH THE NORTH RIGHT OF WAY LINE OF SAID FORD STREET, A DISTANCE OF 17.43 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE NORTH 12°04'10" EAST, A DISTANCE OF 56.81 FEET TO A POINT OF DELFECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 87°34'45" WEST, A DISTANCE OF 82.70 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 12°04'10" WEST, A DISTANCE OF 56.81 FEET TO A POINT IN THE NORTH RIGHT OF WAY LINE OF SAID FORD STREET, BEING A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 87°34'45" WEST WITH THE NORTH LINE OF SAID FORD STREE, A DISTANCE OF 528.55 TO A POINT FOR THE SOUTHWEST CORNER OF SAID BLOCK 2 IN THE EAST LINE OF A 30 FOOT STRIP RECORDED IN VOLUME 576, PAGES 141 AND 142 AND VOLUME 578, PAGE 41 OF THE HARRIS COUNTY DEED RECORDS, BEING THE SOUTHWEST CORNER OF THIS TRACT;

THENCE NORTH 02°30'57" WEST WITH THE EAST LINE OF SAID 30 FOOT STRIP, A DISTANCE OF 205.00 FEET TO A POINT FOR THE SOUTHWEST CORNER OF A REMIANDER OF A TRACT OF LAND RECORDED IN HARRIS COUNTY CLERK'S FILE NO. E013936, BEING THE NORTHWEST CORNER OF THIS TRACT;

THENCE NORTH 87°34'45" EAST WITH THE SOUTH LINE OF SAID REMAINDER TRACT, A DISTANCE OF 135.05 FEET TO THE SOUTHEAST CORNER OF SAID REMAINDER TRACT, BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 02°25'14" WEST WITH THE EAST LINE OF SAID REMAINDER TRACT, A DISTANCE OF 25 FEET TO A POINT IN THE SOUTH RIGHT OF WAY LINE OF SAID DODGE STREET FOR THE NORTHEAST CORNER OF SAID REMAINDER TRACT, BEING A POINT OF DEFLECTION IN THE NORTH LINE OF THIS TRACT;

THENCE NORTH 87°34'45" EAST WITH THE SOUTH RIGHT OF WAY LINE OF SAID DODGE STREET, A DISTANCE OF 494.19 FEET TO THE POINT OF BEGINNING. CONTAINING 3.14 ACRES OF LAND MORE OR LESS.

TRACT 9
LEGAL DESCRIPTION OF A 3.26 ACRE TRACT OF LAND (3.1888 ACRES – RECORD) IN THE WILLIAM VINCE SURVEY, ABSTRACT 78, IN THE CITY OF HOUSTON, HARRIS CO. TEXAS. BEING TRACT 9 AS RECORDED IN HARRIS CO. CLERK'S FILE NO. P317107.

BOUNDARY BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING AT A POINT IN THE SOUTH RIGHT OF WAY LINE OF FORD STREET AND THE WEST RIGHT OF WAY LINE OF LIGHT COMPANY ROAD FOR THE NORTHEAST CORNER OF BLOCK 1, H.E. FORD SUBDIVISION, RECORDED IN VOLUME 572, PAGE 71 OF THE HARRIS COUNTY DEED RECORDS, BEING THE NORTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 02°21'57" EAST WITH THE WEST RIGHT OF WAY LINE OF SAID LIGHT COMPANY ROAD, A DISTANCE OF 230.00 FEET TO A POINT IN THE NORHT RIGHT OF WAY LINE OF SHAW STREET FOR THE SOUTHEAST CORNER OF SAID BLOCK 1, BEING THE SOUTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 87°34'45" WEST WITH THE NORTH RIGHT OF WAY LINE OF SAID SHAW STREET, A DISTANCE OF 86.95 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE NORTH 12°04'10" EAST, A DISTANCE OF 108.45 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 87°34'45" WEST, A DISTANCE OF 39.50 FEET TO A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT ;

THENCE SOUTH 02°24'49" EAST, A DISTANCE OF 105.00 FEET TO A POINT IN THE NORTH RIGHT OF WAY LINE OF SAID SHAW STREET FOR A POINT OF DELFECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 87°24'45" WEST WITH THE NORTH RIGHT OF WAY LINE OF SAID SHAW STREE, A DISTANCE OF 528.65 FEET TO A POINT FOR THE SOUTHWEST CORNER OF SAID BLOCK 1 IN THE EAST LINE OF A 30 FOOT STRIP, RECORDED IN VOLUME 576, PAGES 141 AND 142 AND VOLUME 578, PAGE 41 OF THE HARRIS COUNTY DEED RECORDS, BEING THE SOUTHWEST CORNER OF THIS TRACT;

THENCE NORTH 02°30'57" WEST WITH THE EAST LINE OF SAID 30 FOOT STRIP, A DISTANCE OF 230.00 FEET TO A POINT IN THE SOUTH RIGHT OF WAY LINE OF SAID FORD STREET FOR THE NORTWEST CORNER OF SAID BLOCK 1, BEING THE NORTHWEST CORNER OF THIS TRACT;

THENCE NORTH 87°34'45" EAST WITH THE SOUTH RIGHT OF WAY LINE OF SAID FORD STREET, A DISTANCE OF 628.58 FEET TO THE POINT OF BEGINNING. CONTAINING 3.26 ACRES OF LAND, MORE OR LESS.

SAVE AND EXCEPT A 0.07 ACRE TRACT (0.0676 ACRES – RECORD) OF LAND IN SAID 3.26 ACRE TRACT OF LAND DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT FOR THE NORTHEAST CORNER OF THIS TRACT, WHENCE THE NORTHEAST CORNER OF SAID 3.26 ACRE TRACT BEARS NORTH 12°04'10" EAST, A DISTANCE OF 25.82 FEET AND NORTH 87°34'45" EAST A DISTANCE OF 27.73 FEET;

THENCE SOUTH 12°04'10" WEST, A DISTANCE OF 51.64 FEET TO A POINT FOR THE SOUTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 87°34'45" WEST, A DISTANCE OF 52.42 FEET TO A POINT FOR THE SOUTHWEST CORNER OF THIS TRACT;

THENCE NORTH 02°24'50" WEST, A DISTANCE OF 50.00 FEET TO A POINT FOR THE NORTHWEST CORNER OF THIS TRACT;

THENCE NORTH 87°34'54" EAST, A DISTANCE OF 65.34 FEET TO THE POINT OF BEGINNING. CONTAINING 0.07 ACRES OF LAND, MORE OR LESS.

LEAVING A NET ACREAGE OF 3.19 ACRES OF LAND, MORE OR LESS.

TRACT 10
LEGAL DESCRIPTION OF A 7.24 ACRE TRACT OF LAND (7.2468 ACRES – RECORD) IN THE WILLIAM VINCE SURVEY, ABSTRACT 78, IN THE CITY OF HOUSTON, HARRIS CO. TEXAS. BEING TRACT 10 AS RECORDED IN HARRIS CO. CLERK'S FILE NO. P317107.

BOUNDARY BEING MORE FULLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

BEGINNING AT A POINT IN THE SOUTH RIGHT OF WAY LINE OF SHAW STREET AND THE WEST RIGHT OF WAY LINE OF LIGHT COMPANY ROAD FOR THE NORTHEAST CORNER OF LOT 1, BLOCK 34, PASADENA SUBDIVISION RECORDED IN VOLUME 93, PAGE 21 OF THE HARRIS COUNTY DEED RECORDS, BEING THE NORTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 02°21'57" EAST WITH THE WEST RIGHT OF WAY LINE OF SAID LIGHT COMPANY ROAD, A DISTANCE OF 524.57 FEET TO A 5/8" IRON ROD FOUND AT THE NORTHEAST CORNER OF A TRACT OF LAND DEEDED TO HAMMONS DESCRIBED IN HARRIS COUNTY CLERK'S FILE NO. K900171, BEING THE SOUTHEAST CORNER OF THIS TRACT;

THENCE SOUTH 87°20'54" WEST WITH THE NORTH LINE OF SAID HAMMONS TRACT, A DISTANCE OF 273.03 FEET TO A POINT FOR THE NORHTWEST CORNER OF SAID HAMMONS TRACT, BEING A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 02°21'57"EAST WITH THE WEST LINE OF SAID HAMMONS TRACT, A DISTANCE OF 59.10 TO A POINT FOR THE SOUTHWEST CORNER OF SAID HAMMONS TRACT AND THE NORTHEAST CORNER OF A TRACT OF LAND DEEDED TO ENTERPRISE PRODUCTS COMPANY RECORDED IN HARRIS COUNTY CLERK'S FILE NO. N128078, BEING A POINT OF DEFLECTION IN THE SOUTH LINE OF THIS TRACT;

THENCE SOUTH 87°22'28" WEST WITH THE NORTH LINE OF SAID ENTERPRISE PRODUCTS COMPANY TRACT, A DISTANCE OF 293.31 FEET TO A POINT IN THE EAST LINE OF A 30 FOOT STRIP DEEDED TO THE UNITED STATES OF AMERICA IN VOLUME 1292 PAGE 540 OF THE HARRIS COUNTY DEED RECORDS, BEING THE SOUTHWEST CORNER OF THIS TRACT;

THENCE NORTH 02°30'57" WEST WITH THE EAST LINE OF SAID 30 FOOT STRIP, A DISTANCE OF 585.82 FEET TO A POINT IN THE SOUTH RIGHT OF WAY LINE OF SAID SHAW STREET FOR THE NORTHWEST CORNER OF THIS TRACT;

THENCE NORTH 87°34'45" EAST WITH THE SOUTH RIGHT OF WAY LINE OF SAID SHAW STREET A DISTANCE OF 567.87 FEET TO THE POINT OF BEGINNING, CONTAINING 7.24 ACRES OF, MORE OR LESS.

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PREPARED FOR: TX6 - (HRO)
Skadden
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP & Affiliates

PROJECT LOCATION:
HARRIS COUNTY, STATE OF TEXAS

PROJECT ADDRESS:
12000 LAWNDALE ST
HOUSTON, TX 77017

PROJECT TYPE:
ALTA/ACSM LAND TITLE SURVEY

JOB NUMBER:
TX6

SHEET 5 OF 7

DATE OF ORIGINAL: MARCH 12, 2008
REVISION: ______ DATE: ______, 2008
REVISION: ______ DATE: ______, 2008
REVISION: ______ DATE: ______, 2008

P-00043-TX6.dwg

NOTES CORRESPONDING TO SCHEDULE B

AS PER COMMITMENT NO. 332507TX6 DATED JANUARY 15, 2008

10.

a. Right of way and pipeline easement from Sinclair Gulf Refining Company to Texas Pipe Line Company dated December 11, 1910 recorded under Volume 434, Page 357 in the Deed Records of Harris County, Texas. (Affects Parcels 1, 5 and 6)

f. Right of way and pipeline easement from Sinclair Gulf Refining Company to Texas Pipe Line Company dated February 10, 1920 recorded under Volume 444, Page 152 of the Deed Records of Harris County, Texas. (Affects Parcels 1, 5 and 6)

g. Right of way and pipeline easement from Sinclair Refining Company to Sinclair Cudahy Pipe Line Company dated May 6, 1920, filed for record under Harris County Clerk's File No(s). 36116 (Volume 453, Page 176 of the Deed Records). (Affects Parcels 1, 4, 5 and 6)

h. Right of way and pipeline easement from Mrs. O. L. Allen to S. M. Briscoe dated November 13, 1921, filed for record under Harris County Clerk's File No(s). 46820 (Volume 463, Page 476 of the Deed Records). (Affects Parcels 4, 5 and 6)

i. Right of way and pipeline easement from Sinclair Refining Company to Houston Natural Gas Company dated January 11, 1926 recorded in Volume 654, Page 596 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

j. Right of way and pipeline easement from Sinclair Refining Company to Stanolind Pipe Line Company dated January 17, 1934 recorded in Volume 856, Page 572 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

k. Right of way and pipeline easement from Sinclair Refining Company to Defense Plant Corporation dated April 21, 1944 filed for record under Harris County Clerk's File No(s). 200543 (Volume 1325, Page 377 of the Deed Records). (Affects Parcel 1)

l. Right of way and pipeline easement from Sinclair Refining Company to United States of America dated September 16, 1944 filed for record under Harris County Clerk's File No(s). 206288 (Volume 1350, Page 138 of the Deed Records). (Affects Parcel 1)

m. Right of way and pipeline easement from Sinclair Refining Company to Houston Industrial Pipe Line Company dated July 21, 1947 recorded in Volume 1638 Page 323 of the Deed Records of Harris County, Texas. (Affects Parcel 7)

n. Right of way and pipeline easement from Sinclair Gulf Refining Company to Pan American Pipe Line Company dated August 18, 1948 recorded in Volume 1762 Page 640 of the Deed Records of Harris County, Texas. (Affects Parcel 7)

o. Right of way and pipeline easement from Sinclair Refining Company to Houston Pipe Line Company dated February 8, 1951 recorded in Volume 2272 Page 638 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

p. Right of way and pipeline easement from Sinclair Refining Company to Houston Natural Gas Corporation Company dated February 8, 1951 filed for record under Harris County Clerk's File No(s). 885521 (Volume 2288, Page 524 of the Deed Records). (Affects Parcel 1)

q. Right of way and pipeline easement from Sinclair Refining Company to Reconstruction Finance Corporation dated April 21, 1952 filed for record under Harris County Clerk's File No(s). 1032118 (Volume 2446, Page 494 of the Deed Records). (Affects Parcel 1)

r. Right of way and pipeline easement from Sinclair Gulf Refining Company to Shell Pipe Line Company dated May 19, 1953 filed for record under Harris County Clerk's File No(s). 1126918 (Volume 2613, Page 712 of the Deed Records). (Affects Parcels 1, 4, 5 and 6)

s. Right of way and pipeline easement from Sinclair Refining Company to Pan American Pipe Line Company dated August 26, 1954 filed for record under Harris County Clerk's File No(s). 1322793 (Volume 2835, Page 522 of the Deed Records). (Affects parcel 1)

t. Right of way and pipeline easement from Sinclair Refining Company to Federal Facilities Corporation dated March 25, 1955 filed for record under Harris County Clerk's File No(s). 1415236 (Volume 2906, Page 66 of the Deed Records). (Affects Parcel 1)

u. Right of way and pipeline easement from Sinclair Refining Company to Federal Facilities Corporation dated March 25, 1955 filed for record under Harris County Clerk's File No(s). 1415237 (Volume 2945, Page 1 of the Deed Records). (Affects Parcels 1, 4 and 5)

v. Right of way and pipeline easement from Sinclair Gulf Refining Company to Texas Pipe Line Company dated June 8, 1956 filed for record under Harris County Clerk's File No(s). 1475583 (Volume 3013, Page 366 of the Deed Records). Said pipeline purchased by Enterprise Gas, Inc. as described in Pipe Line Easement and Right of way from Atlantic Richfield Company to Enterprise Gas, Inc., dated December 27, 1971, filed for record under Harris County Clerk's File No. D487904. (Affects Parcel 1)

w. Right of way and pipeline easement from Sinclair Refining Company to Industrial Gas Supply Corporation dated December 27, 1956 filed for record under Harris County Clerk's File No(s). 1548752 (Volume 3095, Page 227 of the Deed Records). (Affects Parcels 1 and 4)

x. Right of way and pipeline easement from Sinclair Refining Company to Phillips Pipe Line Company dated September 27, 1956 recorded in Volume 3240 Page 323 of the Deed Records of Harris County, Texas. (Affects Parcels 1, 6 and 7)

y. Right of way and pipeline easement from Sinclair Refining Company to Sinclair Koppers Chemical Company dated May 3, 1961 recorded in Volume 4365 Page 330 of the Deed Records of Harris County, Texas. (Affects Parcels 1, 5 and 6)

z. Right of way and pipeline easement from Sinclair Refining Company to Texas New Mexico Pipe Line Company dated May 3, 1962 recorded in Volume 4791 Page 372 of the Deed Records of Harris County, Texas, as amended by Agreement dated June 15, 1962, recorded in Volume 4791, Page 382 of the Deed Records of Harris County, Texas. (Affects Parcels 4 and 5)

aa. Right of way and pipeline easement from Sinclair Refining Company to United Gas Pipe Line Company dated February 14, 1963 recorded in Volume 5037 Page 270 of the Deed Records of Harris County, Texas, being an amendment to the easement recorded in Volume 1163, Page 449 of the Deed Records of Harris County, Texas. (Affects Parcels 4, 5 and 6)

bb. Right of way and pipeline easement from Sinclair Refining Company to Sinclair Petrochemicals, Inc., dated December 9, 1963, filed for record under Harris County Clerk's File No(s). 8814643 (Volume 5570, Page 606 of the Deed Records). (Affects Parcels 1, 4, 5 and 6)

Right of way and pipeline easement from Sinclair Refining Company to Sinclair Petrochemicals, Inc., dated February 11, 1965 recorded in Volume 5431 Page 254 of the Deed Records of Harris County, Texas, which amends the pipeline easement recorded in Volume 5570, Page 606 of the Deed Records of Harris County, Texas. (Affects Parcels 1, 4, 5 and 6)

Amendment to Pipe Line Easement executed December 7, 1998 by and between Lyondell-Citgo Refining Company Ltd. and Equistar Chemicals, LP as described by instrument filed for record under Harris County Clerk's File No. T504272. (Affects Parcel 1)

cc. Right of way and pipeline easement from Sinclair Refining Company to Industrial Gas Supply Corporation dated October 22, 1964 recorded in Volume 5725 Page 68 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

dd. Right of way and pipeline easement from Sinclair Oil Company to the Goodyear Tire & Rubber Company dated September 30, 1966 recorded in Volume 7521, Page 228 of the Deed Records of Harris County, Texas. (Affects Parcels 1, 4 and 6)

ee. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated February 26, 1971 recorded in Volume 9407 Page 72 of the Deed Records of Harris County, Texas. (Affects Parcels 1, 4 and 5)

ff. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated February 26, 1971 recorded in Volume 9407 Page 102 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

gg. Right of way and pipeline easement from Atlantic Richfield Company to AMOCO Pipe Line Company dated January 1, 1973 filed for record under Harris County Clerk's File No(s). E013837. (Affects Parcel 9)

hh. Right of way and pipeline easement from Atlantic Richfield Company to Charter International Oil Company dated March 21, 1973 filed for record under Harris County Clerk's File No(s). D858543. (Affects Parcels 1, 4 and 5)

ii. Right of way and pipeline easement from Atlantic Richfield Company to Exxon Pipeline Company dated October 14, 1976 filed for record under Harris County Clerk's File No(s). E945549. (Affects Parcel 5)

jj. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated August 26, 1963 filed for record under Harris County Clerk's File No(s). J107580. (Affects Parcels 1, 4 and 6)

kk. Right of way and pipeline easement from Atlantic Richfield Company to Enterprise Products Company dated April 13, 1964 filed for record under Harris County Clerk's File No(s). J458877. (Affects Parcel 1)

ll. Right of way and pipeline easement from Atlantic Richfield Company to the Goodyear Tire & Rubber Company dated July 29, 1966 filed for record under Harris County Clerk's File No(s). H364444. (Affects Parcels 1, 4 and 6)

mm. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971 filed for record under Harris County Clerk's File No(s). D317493. (Affects Parcel 1)

nn. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971 filed for record under Harris County Clerk's File No(s). D317495. (Affects Parcel 1)

oo. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971 filed for record under Harris County Clerk's File No(s). D317496. (Affects Parcel 1)

pp. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971 filed for record under Harris County Clerk's File No(s). D317497. (Affects Parcel 1)

qq. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971 filed for record under Harris County Clerk's File No(s). D317498. (Affects Parcel 1)

rr. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971 filed for record under Harris County Clerk's File No(s). D317499. (Affects Parcel 1)

ss. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 9, 1966 filed for record under Harris County Clerk's File No(s). K013237. (Affects Parcels 1 and 6)

tt. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated April 3, 1967 filed for record under Harris County Clerk's File No(s). L054045. (Affects Parcel 1)

uu. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971 filed for record under Harris County Clerk's File No(s). D317492. (Affects Parcel 1)

vv. Right of way and pipeline easement from Atlantic Richfield Company to Goodyear Tire & Rubber Company dated February 5, 1968, filed for record under Harris County Clerk's File No(s). L534149. (Affects Parcel 7)

ww. Right of way and pipeline easement from Atlantic Richfield Company to Union Carbide Corporation dated December 7, 1963, filed for record under Harris County Clerk's File No(s). J268085. (Affects Parcels 7, 8, 9 and 10)

Consent, Assignment and Release dated January 1, 1989 by and between Union Carbide Corporation as Assignor, Union Carbide Industrial Gases, Inc. as Assignee and Lyondell petrochemical Company as Grantor as described by instrument filed for record under Harris County Clerk's File No. M572671.

xx. Right of way and pipeline easement from Sinclair Gulf Refining Company to Defense Plant Corporation dated December 11, 1944 filed for record under Harris County Clerk's File No(s). 249998 (Volume 1374 Page 419 of the Deed Records). (Affects Parcel 1)

yy. Right of way and pipeline easement from Sinclair Refining Company to Houston Gulf Gas Company dated November 16, 1943 filed for record under Harris County Clerk's File No(s). 197757 (Volume 1163, Page 449 of the Deed Records). (Affects Parcel 1)

zz. Right of way and pipeline easement from Sinclair Refining Company to Defense Plant Corporation dated July 27, 1943 filed for record under Harris County Clerk's File No(s). 183528 (Volume 1163, Page 417 of the Deed Records). (Affects Parcels 1 and 7)

aaa. Right of way and channel navigation easement from Sinclair Refining Company to the United States of America dated June 28, 1938, filed for record under Harris County Clerk's File No(s). 236425 (Volume 998, Page 618 of the Deed Records). (Affects Parcel 1)

bbb. Right of way and pipeline easement from Sinclair Refining Company to Houston Gulf Gas Company dated March 10, 1933 filed for record under Harris County Clerk's File No(s). 072143 (Volume 605, Page 417 of the Deed Records). (Affects Parcel 1)

ccc. Right of way and pipeline easement from Atlantic Richfield Company to ARCO Pipe Line Company dated February 26, 1971 filed for record under Harris County Clerk's File No(s). D317492. (Affects Parcel 6)

Assignment of Pump Station Easement filed March 2, 1992, under Harris County Clerk's File No. N026876, executed by ARCO Transportation Alaska, Inc. to ARCO Pipe Line Company, a Delaware Corporation conveying the interest described by instrument filed for record under Harris County Clerk's File No(s). D317492. Said easement clarified by Addendum to Easement dated January 17, 1994, filed for record under Harris County Clerk's File No(s). P674255 and R077992.

ddd. Right of way and pipeline easement from Sinclair Refining Company to Lo-Vaca Gathering Company dated September 13, 1966 filed for record under Harris County Clerk's File No(s). C158303. (Affects Parcels 5 and 6)

eee. Right of way and pipeline easement from Sinclair Refining Company to Houston Industrial Pipe Line Company, recorded October 6, 1964 under Harris County Clerk's File No(s). S969277. (Affects Parcel 1)

fff. Right of way and pipeline easement from Sinclair Gulf Refining Company to Warren Petroleum Corporation dated June 11, 1951, recorded in Volume 3532, Page 659 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

ggg. Right of way and pipeline easement from the City of Houston to the Deffense Plant Corporation, dated June 26, 1944, recorded in Volume 1325, Page 382 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

hhh. Right of way and pipeline easement from Houston Lighting & Power to Wanda Petroleum Company dated December 21, 1964, filed for record under Harris County Clerk's File No(s). C033747. (Affects Parcels 7, 8, 9 and 10)

iii. Right of way and pipeline easement from Houston Lighting & Power to Service Pipe Line Company dated April 20, 1965, filed for record under Harris County Clerk's File No(s). C076017. (Affects Parcels 7, 8, 9 and 10)

jjj. Right of way and pipeline easement from Virgil Benner to Humble Pipe Line Company dated January 29, 1969, filed for record under Harris County Clerk's File No(s). C554006. (Affects Parcel 9)

kkk. Right of way and pipeline easement from T. F. Hudgins to Humble Pipe Line Company dated February 5, 1968, filed for record under Harris County Clerk's File No(s). C866337. (Affects Parcels 7, 8, 9 and 10)

lll. Right of way and pipeline easement from Gulf-Coast Drive-Ins, Inc. to Humble Pipe Line Company dated February 19, 1969, filed for record under Harris County Clerk's File No(s). C987305. (Affects Parcels 7, 8, 9 and 10)

mmm. Right of way and pipeline easement from Virgil Benner to Petro-Tex Chemical Corp. dated April 10, 1969, filed for record under Harris County Clerk's File No(s). C899635. (Affects Parcel 9)

nnn. Right of way and pipeline easement from T. F. Hudgins to Petro-Tex Chemical Corp. dated April 17, 1969, filed for record under Harris County Clerk's File No(s). C904520, as supplemented and amended by instrument filed for record under Harris County Clerk's File No. D697902. (Affects Parcel 10)

ooo. Right of way and pipeline easement from Lloyd Fadrigue to Petro-Tex Chemical Corp. dated April 9, 1969, filed for record under Harris County Clerk's File No(s). C904521. (Affects Parcels 7, 8 and 9)

ppp. Right of way and pipeline easement from Bank of Texas to Humble Pipe Line Company, et al dated March 30, 1972, filed for record under Harris County Clerk's File No(s). D579913. (Affects Parcels 7, 8 and 9)

qqq. Right of way and pipeline easement from Bank of Texas to Petro-Tex Chemical Corp. dated March 30, 1972, filed for record under Harris County Clerk's File No(s). D697903. (Affects Parcels 7, 8 and 9)

rrr. Right of way and pipeline easement from Atlantic Richfield Company to Amoco Pipeline Company dated January 1, 1973, filed for record under Harris County Clerk's File No(s). E013837. (Affects Parcel 7)

sss. Right of way and pipeline easement reserved to Amoco Pipeline Company in Warranty Deed to Atlantic Richfield Company dated May 2, 1963, filed for record under Harris County Clerk's File No(s). H979362. (Affects Parcel 7)

ttt. Right of way and pipeline easement from Bank of Texas to Humble Pipe Line Company dated March 30, 1972, filed for record under Harris County Clerk's File No(s). K462916. (Affects Parcels 7, 8 and 9)

Right of way, materials and pipeline easement granted to Cowboy Pipeline Company as described by instrument recorded under Harris County Clerk's File No. P238012. Said easement being more fully described by Amendment to Right of Way and Easement Dated July 29, 1993 and filed for record under Harris County Clerk's File No(s). P408406. (Affects Parcels 7, 8, 9 and 10)

uuu. A Municipal Belt and Terminal Railway easement from Sinclair Gulf Refining Company to City of Houston dated February 28, 1918, recorded in Volume 396, Page 296 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

vvv. A Municipal Belt and Terminal Railway easement from Sinclair Refining Company to City of Houston dated March 2, 1938 recorded in Volume 744, Page 188 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

www. Right of way and water pipeline easement from Atlantic Richfield Company to Coastal Industrial Water Authority dated October 13, 1976, filed for record under Harris County Clerk's File No(s). E979915. (Affects Parcel 6)

xxx. Right of way and water pipeline easement from Sinclair Refining Company to City of Houston dated September 20, 1967 recorded in Volume 6944, Page 128 of the Deed Records of Harris County, Texas. (Affects Parcel 6)

yyy. Right of way and railroad easement from Lloyd Fadrigue to Texas & New Orleans Railroad Company dated September 9, 1961, filed for record under Harris County Clerk's File No(s). B452015. (Affects Parcels 7, 8 and 9)

zzz. Right of way and railroad easement from T. F. Hudgins to Texas & New Orleans Railroad Company dated March 29, 1962, filed for record under Harris County Clerk's File No(s). B486227. (Affects Parcel 10)

aaaa. Right of way and railroad easement from Virgil Benner to Texas & New Orleans Railroad Company dated March 7, 1962, filed for record under Harris County Clerk's File No(s). B607792. (Affects Parcel 9)

bbbb. Right of way and railroad easement from Elmer Richardson to Texas & New Orleans Railroad Company dated March 12, 1962, filed for record under Harris County Clerk's File No(s). B613219. (Affects Parcel 9)

cccc. Right of way and easement for the Houston Ship Channel from Sinclair Refining Company to United States of America dated June 28, 1938, recorded in Volume 998, Page 618 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

dddd. Right of way and dredge easement from Sinclair Refining Company to Harris County Houston Ship Navigation District dated April 30, 1956, filed for record under Harris County Clerk's File No(s). 1045652 (Volume 3206, Page 401 of the Deed Records). (Affects Parcel 1)

eeee. Right of way and navigation easement from Sinclair Refining Company to United States of American dated May 17, 1956, filed for record under Harris County Clerk's File No(s). 1039898 (Volume 3179, Page 680 of the Deed Records). (Affects parcel 1)

ffff. Right of way and dredge easement from Sinclair Refining Company to Harris County Houston Ship Navigation District dated November 13, 1956 recorded in Volume 3277, Page 212 of the Deed Records of Harris County, Texas, modified under Harris County Clerk's File No. C023797. (Affects Parcel 1)

gggg. Agreement by and between Sinclair Refining Company and Harris County Houston Ship Navigation District dated June 7, 1956, recorded in Volume 3233, Page 348 of the Deed Records of Harris County, Texas, which modifies previous grant recorded in Volume 754, Page 593 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

hhhh. Right of way and electric distribution easement from Sinclair Refining Company to Houston Lighting & Power Company dated April 22, 1938, filed for record under Harris County Clerk's File No(s). 236484 (Volume 998, Page 63, Deed Records). (Affects Parcel 1)

iiii. Right of way and electric distribution easement from Sinclair Refining Company to Houston Lighting & Power Company dated September 21, 1948, recorded in Volume 1936, Page 15 of the Deed Records of Harris County, Texas. (Affects Parcel 1)

jjjj. Right of way and electric distribution easement from Sinclair Refining Company to Houston Lighting & Power Company dated, recorded in Volume 5898, Page 513 of the Deed Records of Harris County, Texas. (Affects Parcel 6)

kkkk. Right of way and electric distribution easement from Atlantic Richfield Company to Houston Lighting & Power Company dated March 24, 1971, filed for record under Harris County Clerk's File No(s). D291298. (Affects Parcel 1)

llll. Amendment to right of way and electric distribution easement from Atlantic Richfield Company to Houston Lighting & Power Company dated August 12, 1971, filed for record under Harris County Clerk's File No(s). D391144. (Affects Parcel 1)

mmmm.Pipeline and Meter Site Easement filed July 13, 1999, under Harris County Clerk's File No. M234172, executed by Lyondell Petrochemical Company to Exxon Gas System, Inc. (Affects Parcel 7).

nnnn. Right of way and pipeline easement filed September 12, 1990, under Harris County Clerk's File No. M315795, executed by Lyondell petrochemical Company to Hill Petroleum Company (Affects Parcels 1, 7, 8, 9 and 10).

oooo. Right of way and pipeline easement filed June 24, 1991, under Harris County Clerk's File No. N194619, executed by Lyondell petrochemical Company to San Jacinto Gas Transmission Company (Affects Parcel 7).

pppp. Right of Way and Pipeline Easement filed December 13, 1990, under Harris County Clerk's File No. M941088, executed by Lyondell Petrochemical Company to Houston Pipe Line Company (Affects Parcel 7).

qqqq. Pipeline and Meter Site Easement filed November 19, 1991, under Harris County Clerk's File No. N417947, executed by Lyondell petrochemical Company to Enterprise Products Company (Affects Parcel 7).

rrrr. Right of Way and Pipeline Easement filed May 15, 1991, under Harris County Clerk's File No. N137874, executed by Lyondell petrochemical Company to Mobay Corporation (Affects Parcel 1).

ssss. Amendment to Easement filed October 29, 1991, under Harris County Clerk's File No. N388146, executed by Lyondell petrochemical Company to Mobay Corporation (Affects Parcel 1).

tttt. Right of Way and Pipeline Easement filed December 17, 1990, under Harris County Clerk's File No. M945582 and M945583, executed by Lyondell petrochemical Company to Amoco Gas Company (Affects Parcel 7).

uuuu. Right of Way and Pipeline Easement and Meter Site Easement filed February 13, 1989, under County Clerk's File No. M041476, filed March 13, 1990, under County Clerk's File No. M549011 and filed January 23, 1992, under Harris County Clerk's File No. N503938, executed by Lyondell petrochemical Company to United Texas Transmission Company (Affects Parcel 7).

vvvv. Right of Way and Easement filed June 6, 1990, under Harris County Clerk's File No. M668181, M668182 and M668183, executed by Lyondell petrochemical Company to TE Products Pipeline Company (Affects Parcels 1 and 7).

wwww. Partial Assignment filed June 10, 1991, under Harris County Clerk's File No. N172523, executed by TE Products Pipeline Company to Arco Pipeline Company conveying the interest described by instrument filed for record under Harris County Clerk's File No(s). D418179 (Affects Parcel 7).

xxxx. Communications cable, company power, meter and pump site, pipeline easements granted by Lyondell petrochemical Company to ARCO Pipe Line Company, as recorded under Harris County Clerk's File No(s). M499056, M499055, M499057, M499058, M477132, M477133, M477134, M477135, M477136, M477137, M477138, M477139, M477140, M477141, M477142, M477143, M477145, M667203 and M667204. (Affects Parcels 1, 4, 5 and 7)

yyyy. Assignment of Right of Way Easements filed August 21, 1992, under Harris County Clerk's File No. N524148, executed by Arco Transportation Alaska, Inc. to ARCO Pipe Line Company, a Delaware Corporation (Affects Parcels 1, 4, 5 and 7).

zzzz. Valve Site Easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971, filed for record under Harris County Clerk's File No(s). D317491. (Affects Parcel 6)

aaaaa. Valve Site Easement from Atlantic Richfield Company to ARCO Pipe Line Company dated February 26, 1971, filed for record under Harris County Clerk's File No(s). D317479 and D317480. (Affects Parcel 7)

bbbbb. Surge tank easement from Atlantic Richfield Company to ARCO Pipe Line Company dated May 3, 1971, filed for record under Harris County Clerk's File No(s). D317476. (Affects Parcel 1)

ccccc. Meter prover site easement and pipeline right of way easement from Atlantic Richfield Company to ARCO Pipe Line Company dated February 26, 1971, filed for record under Harris County Clerk's File No(s). D317478, D317477 and D317480. (Affects Parcels 6 and 7)

ddddd. Tunnel and meter site easement from Atlantic Richfield Company to ARCO Pipe Line Company dated February 26, 1971, filed for record under Harris County (Clerk's File No(s). D317478. (Affects Parcel 1)

eeeee. Industrial solid waste sites from Atlantic Richfield Company to Texas Water Quality Board Industrial Solid Waste Management dated filed January 23, 1986, under Harris County Clerk's File No(s). J032043. (Affects Parcels 1 and 4)

fffff. Building lines for State Highway 225 as described in Ordinance by the County of Harris filed in Volume 3284, Page 943 of the Deed Records of Harris County, Texas. (Affects Parcels 4, 5 and 6)

ggggg. Map of Right of Way for Houston Municipal Railway as shown on Map Reference recorded in Volume 9, Page 20 and Allendale Townsite Section "A" as shown on the plat recorded in Volume 5, Page 15 of the Map Records of Harris County, Texas. (Affects Parcels 1, 4, 5 and 6)

FOR INQUIRIES, QUESTIONS OR CONCERNS ABOUT THIS SURVEY CONTACT SWEIGHTMAN@USSURVEYOR.COM or call 1-800-867-6783 Ext. 221

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HARRIS COUNTY, STATE OF TEXAS

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HOUSTON, TX 77017

PROJECT TYPE:
ALTA/ACSM LAND TITLE SURVEY

JOB NUMBER: TX6

SHEET 6 OF 7

DATE OF ORIGINAL: MARCH 12, 2008
REVISION: _____ DATE: _____, 2008
REVISION: _____ DATE: _____, 2008
REVISION: _____ DATE: _____, 2008

P-00043-TX6.dwg

hhhhh. Reservations contained in Deed from E.C. Scurlock to Sinclair Refining Company dated May 6, 1952 recorded in Volume 2437, Page 400 of the Deed Records of Harris County, Texas. (Affects Parcel 4)

iii. Access to and from State Highway 225 as contained in Deed from Sinclair Refining Company to the State of Texas dated May 24, 1963 filed in Volume 5232, Page 585 of the Deed Records of Harris County, Texas. (Affects Parcels 4, 5 and 6)

jjj. Plat of the lands of the Deepwater, Land and Town Co. as shown on Map recorded in Volume 93, Page 21 and the plat or map of H.E. Ford subdivision of Block 11 - Outlot 30 Pasadena Townsite as recorded in Volume 372, Page 71 of the Deed Records of Harris County, Texas. (Affects Parcels 7, 8, 9 and 10)

kkkkk. All Oil, Gas and Associates Hydrocarbons were reserved in Deed dated December 19, 1988, filed for record on December 19, 1988 under Harris County Clerk's File No. L977279. (Affects all Parcels)

(Surface rights waived therein)

lll. This Company shall have no liability for, nor responsibility to defend any part of the property described herein against any right, title, interest or claim (valid or invalid) of any character, had or asserted by the State of Texas, or by any other government or governmental authority or by the public generally (1) in and to portions of the above described property which may be within the bed, shore or banks of a perennial stream, or of a stream or lake navigable in fact or in law; or within the bed or shores of the beach adjacent thereto of a body of water affected by the ebb and flow of the tide; and (2) in and to the portions of the above described property which may be between the water's edge and the line of vegetation on the upland or for any claim or right for ingress thereto or egress therefrom.

mmmmm. Right of way, pipeline easements and meter sites granted to Lyondell petrochemical Company as described by instrument dated July 1, 1993, executed by Lyondell-Citgo Refining Company, Ltd., and filed for record under Harris County Clerk's File No(s). P337115. (Affects Parcels 1 and 5)

nnnnn. Right of way and pipeline easement granted to Mobil Chemical Company as described by instrument dated June 23, 1993, executed by Lyondell Petrochemical Company and filed for record under Harris County Clerk's File No(s). P311153. (Affects Parcel 4) (Rev. 1-1-93).

ooooo. Right of way and pipeline easement granted to Arkoma Hess Corporation as described by instrument dated July 20, 1993, executed by Arco Pipe Line Company and Lyondell-Citgo Refining Company, Ltd., and filed for record under Harris County Clerk's File No(s). P363951. Said easement being amended by Amendment to Easement dated July 21, 1993 filed for record under Harris County Clerk's File No(s). P466686 and refiled under P517411. (Affects Parcels 7, 8, 9 and 10)

ppppp. Industrial Solid Waste Certification of Remediation dated January 31, 1994, executed by Lyondell-Citgo Refining Company, Ltd., as filed for record under Harris County Clerk's File No(s). P681126. (Affects Parcel 1)

qqqqq. Assignment of right of way easements dated effective March 1, 1995 executed by ARCO Transportation Alaska, Inc., to ARCO Pipe Line Company filed for record under Harris County Clerk's File No(s). P806975, P857368, R105422, R125462, R138602, R138609 and R138615. (Affects all Parcels)

rrrrr. Assignment of Permits dated effective March 1, 1995, executed by ARCO Transportation Alaska, Inc., to ARCO Pipe Line Company as filed for record under Harris County Clerk's File No(s). P857368. (Affects Parcel 1)

sssss. Right of way and pipeline easement granted to Houston Fuel Oil Terminal Company together with a surface site as described by right of way and easement filed for record under Harris County Clerk's File No(s). R593891. (Affects Parcels 1 and 5)

ttttt. Right of way and pipeline easement granted to Air Products, Incorporated together with above ground meter site as described by right of way and easement filed for record under Harris County Clerk's File No(s). N47208 and S363084, being a replacement for a pipeline described by instrument filed for record under Harris County Clerk's File No. R567431. (Affects Parcel 1)

uuuuu. Right of way and pipeline easement granted to Shell Oil Pipeline Company as described by right of way and easement filed for record under Harris County Clerk's File No(s). D592128. (Affects Parcels 1 and 5)

vvvvv. Right of way and pipeline easement granted to Industrial Gas Supply Corporation together with a surface site as described by right of way and easement filed for record under Harris County Clerk's File No(s). S524382. (Affects Parcel 1)

wwwww. Industrial Solid Waste Certification of Remediation dated February 7, 1996 and dated March 27, 1996, executed by Lyondell-Citgo Refining Company, Ltd., as filed for record under Harris County Clerk's File No(s). R776063 and R847004. (Affects Parcel 1)

xxxxx. Right of Way and pipeline easement filed March 17, 1997, under Harris County Clerk's File No. S363084, executed by Lyondell-Citgo Refining Company Ltd. to Air Products, Incorporated (Affects Parcel 1).

yyyyy. Right of Way and pipeline easement filed June 29, 1999, under Harris County Clerk's File No. T814551, executed by Lyondell-Citgo Refining Company Ltd. to Mobil Vanderbilt Corporation (Affects Parcels 5, 7, 8, 9 and 10).

zzzzz. Right of Way and pipeline easement filed June 29, 1999, under Harris County Clerk's File No. T814552, executed by Lyondell-Citgo Refining Company Ltd. to Mobil Chemical Company, an incorporated division of Mobil Oil Corporation (Affects Parcels 5, 7, 8, 9 and 10).

aaaaaa. Financing Statement for information as to the fact that equipment is leased as filed April 20, 2001, under Harris County Clerk's File No. U990472, executed by Lyondell-Citgo Refining LP, as Lessee to Channel Energy Center, LP, as Lessor (Affects Parcel 1).

bbbbbb. Memorandum of Amended and Restated Ground Lease and Easement Agreement filed April 23, 2001, under Harris County Clerk's File No. V001692, executed by Lyondell-Citgo Refining LP, as Lessor, to Channel Energy Center, L.P. as Lessee (Affects Parcels 1, 7, 8 and 9).

cccccc. Grant of Easement For Access filed March 30, 2001, under Harris County Clerk's File No. V001893, executed by Lyondell-Citgo Refining Company LP to Channel Energy Center, L.P. (Affects Parcels 1, 7, 8 and 9).

dddddd. Grant of Easement For Electrical Interconnection Facilities filed March 30, 2001, under Harris County Clerk's File No. V001894, Amended and Restated Grant of Easements for electrical Interconnection Facilities filed for record under Harris County Clerk's File No. V746990 and correction thereto filed for record under Harris County Clerk's File No. V974765, executed by Lyondell-Citgo Refining Company LP to Channel Energy Center, L.P. (Affects Parcel 1).

eeeeee. Grant of Easement For Natural Gas Pipelines filed March 30, 2001, under Harris County Clerk's File No. V001895, executed by Lyondell-Citgo Refining Company LP to Channel Energy Center, L.P. (Affects Parcels 1 and 7).

ffff. Grant of Easement For Water Product Pipelines filed March 30, 2001, under Harris County Clerk's File No. V001896, executed by Lyondell-Citgo Refining Company LP to Channel Energy Center, L.P. (Affects Parcel 1).

gggggg. Grant of Easement For Communications Facilities filed March 30, 2001, under Harris County Clerk's File No. V001897, executed by Lyondell-Citgo Refining Company LP to Channel Energy Center, L.P. (Affects Parcels 1 and 7).

hhhhhh. Amended and Restated Grant of Easements For Electrical Transmission Facilities filed October 4, 2001, under Harris County Clerk's File No. V341306, executed by Lyondell-Citgo Refining Company LP to Reliant Energy H L &P, a division of Reliant Energy, Incorporated (Affects Parcels 1 and 7).

iii. Right of way and Pipeline easement to Cowboy Pipeline Service Company, dated October 1, 2001, executed by Lyondell-Citgo Refining LP, recorded under File Number V368703 (Affects Parcel 1) in the Official Public Records of Harris County, Texas.

jjjj. Right of way and Pipeline easement to HSC Pipeline Partnership, L.P., dated August 30, 2000, executed by Lyondell-Citgo Refining LP, recorded under File Number V368704 (No Exhibit A attached) in the Official Public Records of Harris County, Texas.

kkkkkk. Grant of Stand-Alone Easement for Fire Water dated October 26, 2001, executed by Lyondell-Citgo Refining LP to Channel Energy Center, L.P. as described by instrument filed for record on November 20, 2001 under Harris County Clerk's File No. V432321. (Affects Parcel 1)

llll. Grant of Stand-Alone Easement for Potable Water dated October 26, 2001, executed by Lyondell-Citgo Refining LP to Channel Energy Center, L.P. as described by instrument filed for record on November 20, 2001 under Harris County Clerk's File No. V432322 and correction filed for record on July 31, 2002 under Harris County Clerk's File No. V974766. (Affects Parcel 1)

mmmmmmm. Grant of Stand-Alone Easement for Process/City Water Discharge dated October 26, 2001, executed by Lyondell-Citgo Refining LP to Channel Energy Center, L.P. as described by instrument filed for record on November 20, 2001 under Harris County Clerk's File No. V432323 and Amended and Restated Grant of Stand-Alone Easement for Process/City Water Discharge filed for record on February 20, 2002 under Harris County Clerk's File No. V811939. (Affects Parcel 1)

nnnnnn. Grant of Stand-Alone Easement for Raw Water dated October 26, 2001, executed by Lyondell-Citgo Refining LP to Channel Energy Center, L.P. as described by instrument filed for record on November 20, 2001 under Harris County Clerk's File No. V432324 and Amended and Restated Grant of Stand-Alone Easement for Raw Water filed for record on February 20, 2002 under Harris County Clerk's File No. V811940. (Affects Parcels 1, 7 and 9)

oooooo. Grant of Stand-Alone Easement for Sanitary Sewer Discharge dated October 26, 2001, executed by Lyondell-Citgo Refining LP to Channel Energy Center, L.P. as described by instrument filed for record on November 20, 2001 under Harris County Clerk's File No. V432325 and Amended and Restated Grant of Stand-Alone Easement for Sanitary Sewer Discharge filed for record on February 20, 2002 under Harris County Clerk's File No. V811941. (Affects Parcel 1)

pppppp. Grant of Stand-Alone Easement for Storm Water Discharge dated October 26, 2001, executed by Lyondell-Citgo Refining LP to Channel Energy Center, L.P. as described by instrument filed for record on November 20, 2001 under Harris County Clerk's File No. V432326 and Amended and Restated Grant of Stand-Alone Easement for Storm Water Discharge filed for record on February 20, 2002 under Harris County Clerk's File No. V811942. (Affects Parcel 1)

qqqqqq. Grant of Stand-Alone Easement for Water Clarifier (Amber) Sludge Discharge dated October 26, 2001, executed by Lyondell-Citgo Refining LP to Channel Energy Center, L.P. as described by instrument filed for record on November 20, 2001 under Harris County Clerk's File No. V432327. (Affects Parcel 7)

rrrrr. Right of way and surface easement to Tejas Ship Channel, LLC, dated November 29, 2001, executed by Lyondell-Citgo Refining LP, recorded under File Number V460752 (Affects Parcel 7) in the Official Public Records of Harris County, Texas.

ssssss. Right of way and surface easement to Oil Tanking Houston, L.P., dated August 1, 2002, executed by Lyondell-Citgo Refining LP, recorded under File Number W027980 (Affects Parcel 1) in the Official Public Records of Harris County, Texas.

ttttt. Right of way and pipeline easement to Kinder Morgan Texas Pipelines, L.P., a Delaware limited partnership, dated June 6, 2001, executed by Lyondell-Citgo Refining L.P., a Delaware limited partnership, recorded under File Number V368702 (Affects Parcels 4, 6, 7, 8, 9 and 10) in the Official Public Records of Harris County, Texas.

uuuuuu. A non-exclusive easement for two (2) surface sites and a pipeline being six inches (6"), executed by Lyondell-Citgo Refining LP to Equistar Chemicals, LP as described by Easement Agreement filed for record on May 12, 2003 and recorded under Harris County Clerk's File No. W656091. (Affects Parcel 1)

vvvvvv. Amendment to and Restatement of Right of Way Easement executed effective May 8, 2003 by and between Lyondell-Citgo Refining L.P. and Shell Pipeline Company LP as described by instrument filed for record on June 11, 2003 and recorded under Harris County Clerk's File No. W741062. (Affects Parcel 1)

wwwwww. Notice of Land Use Restrictions Relating to Hazardous Waste Disposal Units acknowledged March 31, 2004, but effective as of October 29, 2003, executed by Lyondell-Citgo Refining LP, restricting the disturbance of the Restricted Units as described in the instrument filed for record on April 1, 2004 and recorded under Harris County Clerk's No. X802225. (Affects Parcel 1)

xxxxxx. Terms, conditions and stipulations contained in Agreement:

Recorded: November 08, 2004 under County Clerk's File No. Y045975, Official Records, Harris County, Texas.
Type: Easement Agreement (Affects Parcel 1)

yyyyyy. Easement:

To: Pasair, Inc.
Recorded: In Y782219, of the Official Records, of Harris County, Texas.

Purpose: Pipeline easement (Affects Parcel 6)

zzzzzz. Easement:

To: CenterPoint Energy Intrastate Pipelines, Inc.
Recorded: February 21, 2006 in County Clerk's File No. Z104462, of the Official Records, of Harris County, Texas.
Purpose: Right-of-way Easement (Affects Parcel 1)

aaaaaaa. Terms, conditions and stipulations contained in Agreement:

Recorded: March 07, 2006 under County Clerk's File No. Z137075, Official Records, Harris County, Texas.
Type: Standard Easement Agreement (Affects Parcel 6)

bbbbbbb. Easement:

To: Pasdar, Inc., a Delaware Corporation
Recorded: March 14, 2006 in County Clerk's File No. Z154130, of the Official Records, of Harris County, Texas.
Purpose: Pipeline Right-of-way Easement (Affects Parcels 7 and 8)

ccccccc. Easement:

To:
Recorded: June 16, 2007 in County Clerk's File No. 20070370330, of the Official Records, of Harris County, Texas.
Purpose: Standard Easement Agreement (Affects Parcels 7, 8, 9 and 10)

ddddddd. Terms, conditions and stipulations contained in Agreement:

Recorded: March 19, 2002 under County Clerk's File No. 20070198345, Official Records, Harris County, Texas.
Type: Standard Easement Agreement

FOR INQUIRIES, QUESTIONS OR CONCERNS ABOUT THIS SURVEY CONTACT SWEIGHTMAN@USSURVEYOR.COM or call 1-800-867-6783 Ext. 221

U.S. SURVEYOR®
4929 RIVERWIND POINTE DRIVE
EVANSVILLE, INDIANA 47715
1-800- TO SURV

PREPARED FOR: TX6 - (HRO)
Skadden
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP & Affiliates

PROJECT LOCATION:
HARRIS COUNTY, STATE OF TEXAS

PROJECT ADDRESS:
12000 LAWNDALE ST
HOUSTON, TX 77017

PROJECT TYPE:
ALTA/ACSM LAND TITLE SURVEY

JOB NUMBER: TX6

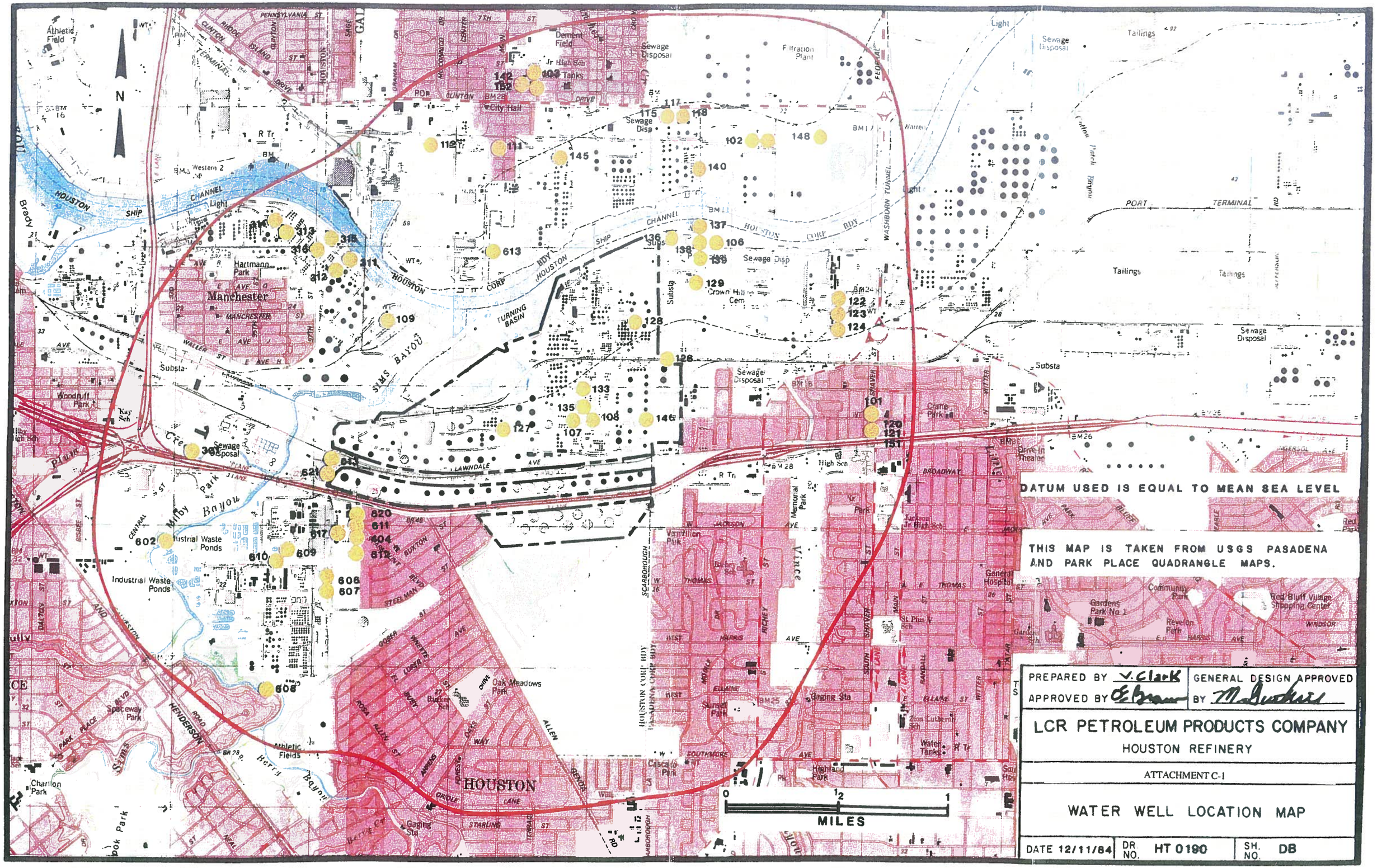
SHEET 7 OF 7

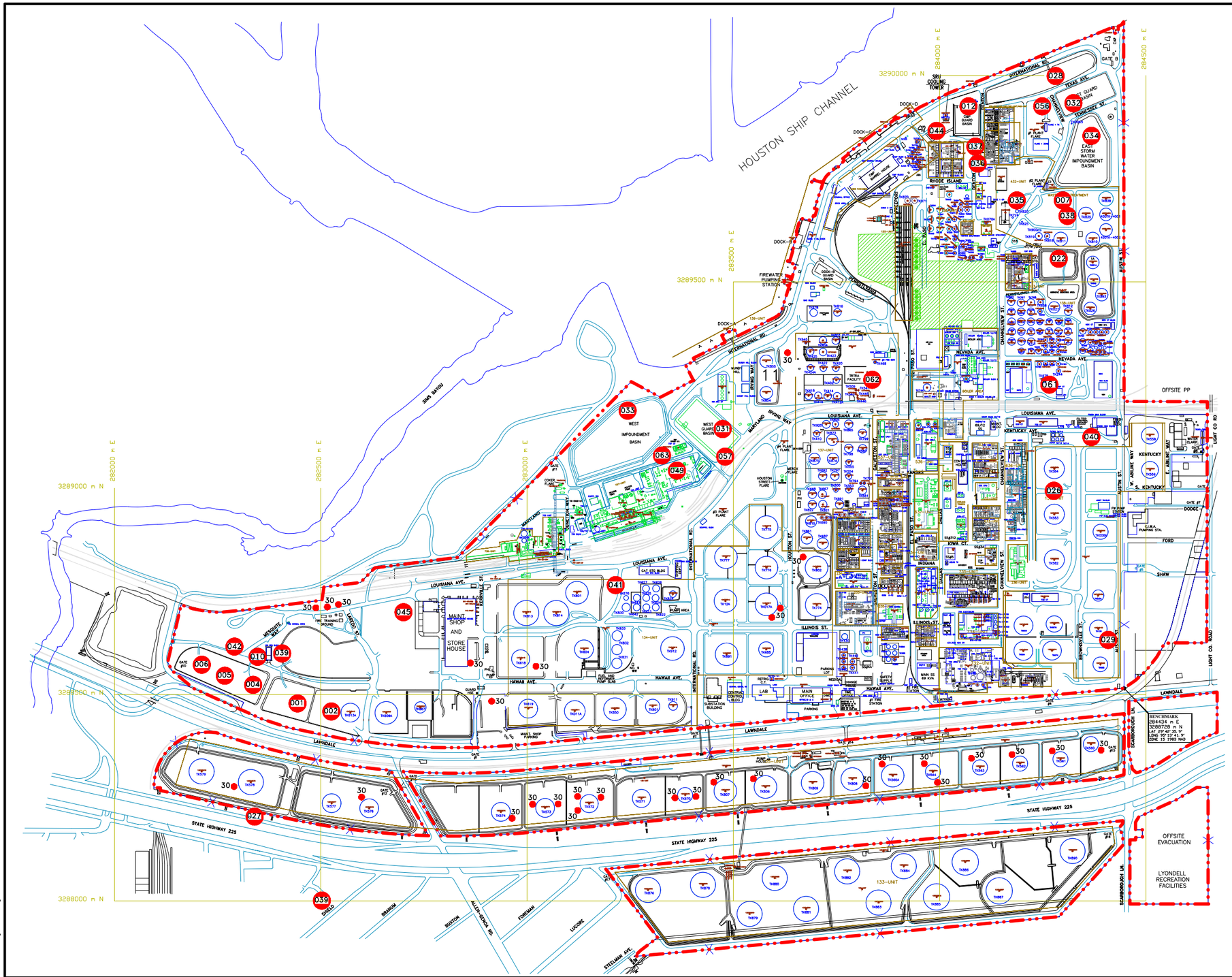
DATE OF ORIGINAL: MARCH 12, 2008
REVISION: _____ DATE: _____, 2008
REVISION: _____ DATE: _____, 2008
REVISION: _____ DATE: _____, 2008

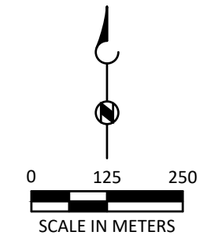
P-00043-TX8.dwg

ATTACHMENT C

FACILITY BOUNDARIES AND ADJACENT WATERS MAP


N
Manchester
HOUSTON
Industrial Waste Ponds
Sewage Disposal
Filtration Plant
Tailings
Crown Hill Cem
Oak Meadows Park
Athletic Fields
Gaging Sta
Substa
Water Tanks
Crane Park
Drive In Theater
High Sch
Memorial Park
General Hospital
Community Park
Red Bluff Village Shopping Center
Gardens Park No 1
Revelon Park
Highland Park
Cascade Park
Charlton Park
Spateway Park
Woodruff Park
Hartmann Park
Vanvillon Park
Tucker Jr High Sch
St Pius V Sch
Zion Lutheran Sch
Kay Sch
Western 2
City Hall
Jr High Sch
Cement Field
Athletic Field
Tanks
HOUSTON SHIP CHANNEL
TURNING BASIN
HOUSTON CORP BDY
WASHBURN TUNNEL
PORT TERMINAL RD
SIMS BAYOU
Milby Bayou
Hunting Bayou
Cotton Patch Bayou
DATUM USED IS EQUAL TO MEAN SEA LEVEL
THIS MAP IS TAKEN FROM USGS PASADENA AND PARK PLACE QUADRANGLE MAPS.
0 1/2 1
MILES
PREPARED BY V. Clark
APPROVED BY E. Brown
GENERAL DESIGN APPROVED BY M. Duchesne
LCR PETROLEUM PRODUCTS COMPANY
HOUSTON REFINERY
ATTACHMENT C-1
WATER WELL LOCATION MAP
DATE 12/11/84
DR. NO. HT 0190
SH. NO. DB





EXPLANATION

- AFFECTED FILL OUTLINE (#27)
- HAZARDOUS WASTE MANAGEMENT UNITS
- 30 LEADED TANK BOTTOMS PIT (#30)

WASTE UNIT CROSS REFERENCE

NOR #	Unit ID	Description
1	1	Southwest Landfarm 612/614
3	2	Southwest Landfarm 613
4	3	Southwest Landfarm 615
5	4	Southwest Landfarm 616
6	5	Southwest Landfarm 617
7	6	Northeast Landfarm 2
8	7	Lead Sludge Weathering Tank
10	8	Asbestos/Lead (West of Facility 039)
12	9	Equalization Basin
22	10	Northeast Landfarm 4
32	11	East Guard Basin
34	12	East Impoundment Basin
37	13	Biological Oxidation Basin
38	14	Oily Water Retention Basin
39	15	West Staging Building
40	16	East Staging Building
41	17	Catalyst Staging Area
42	18	West of NOR No. 039
44	19	C&P Slab (West of C&P Guard Basin)
45	20	Bundle Cleaning Slab (West of Paint Shop)
56	21	Roll–off Storage (West of East Guard Basin)
57	22	Roll–off Storage (South of West Guard Basin)
62	23	Roll–off storage at SSPU
63	24	Temporary Roll–off Storage (North of 737 Coker Cooling Tower)
25	25	Southwest Landfill
26	26	Land treatment Units 584, 583, and 582
27	27	Land Treatment Units 578/579
28	28	Northeast Landfill
29	29	Landfill 100
30	30	Leaded Tank Bottoms Pits
31	31	West Guard Basin
33	32	West Impoundment Basin (Northern Portion)
35	33	API Separator
36	34	Acid Retention Basin
49	35	West Impoundment Basin (Southern Portion of NOR No. 33)
50	36	Processing Cooling Tower Sludge
XX	37	Affected Fill AOC

Brown AND Caldwell

SCALE: 1" = 250'

JOB #: 140978

DATE: 10/13/2020

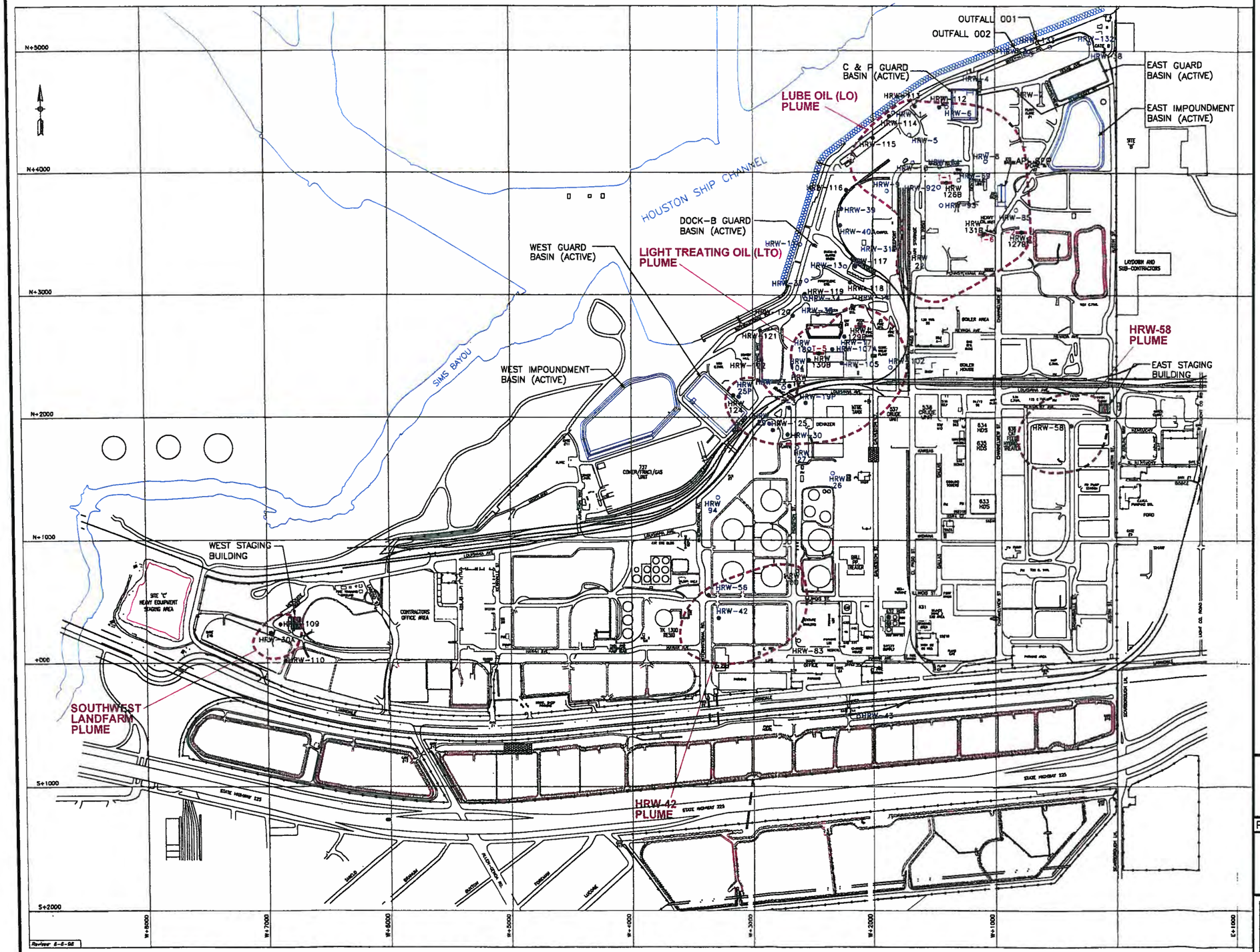
HOUSTON REFINING LP
WASTE MANAGEMENT UNITS

HOUSTON, TEXAS

ATTACHMENT

A.C-2

Path: \\BCHOUFP01\Projects\Lyondell\140978 - LBI HRO 2011\GIS\RCRA Renewal File: BASEPLOT2 Date: October 14, 2020 10:47 AM User: Eric Stiles



N

0 800
SCALE IN FEET

STATE OF TEXAS
SCOTT T. CROUCH
Geology
428
LICENSED
PROFESSIONAL GEOSCIENTIST

LEGEND

- ACTIVE AUTOMATED HYDROCARBON RECOVERY WELL
- ACTIVE MANUAL HYDROCARBON RECOVERY WELL
- INACTIVE MANUAL HYDROCARBON RECOVERY WELL
- TRENCH
- SHEET PILING
- ESTIMATED EXTENT OF LNAPL (NOV 2004)

ATTACHMENT C-3

NOTE:

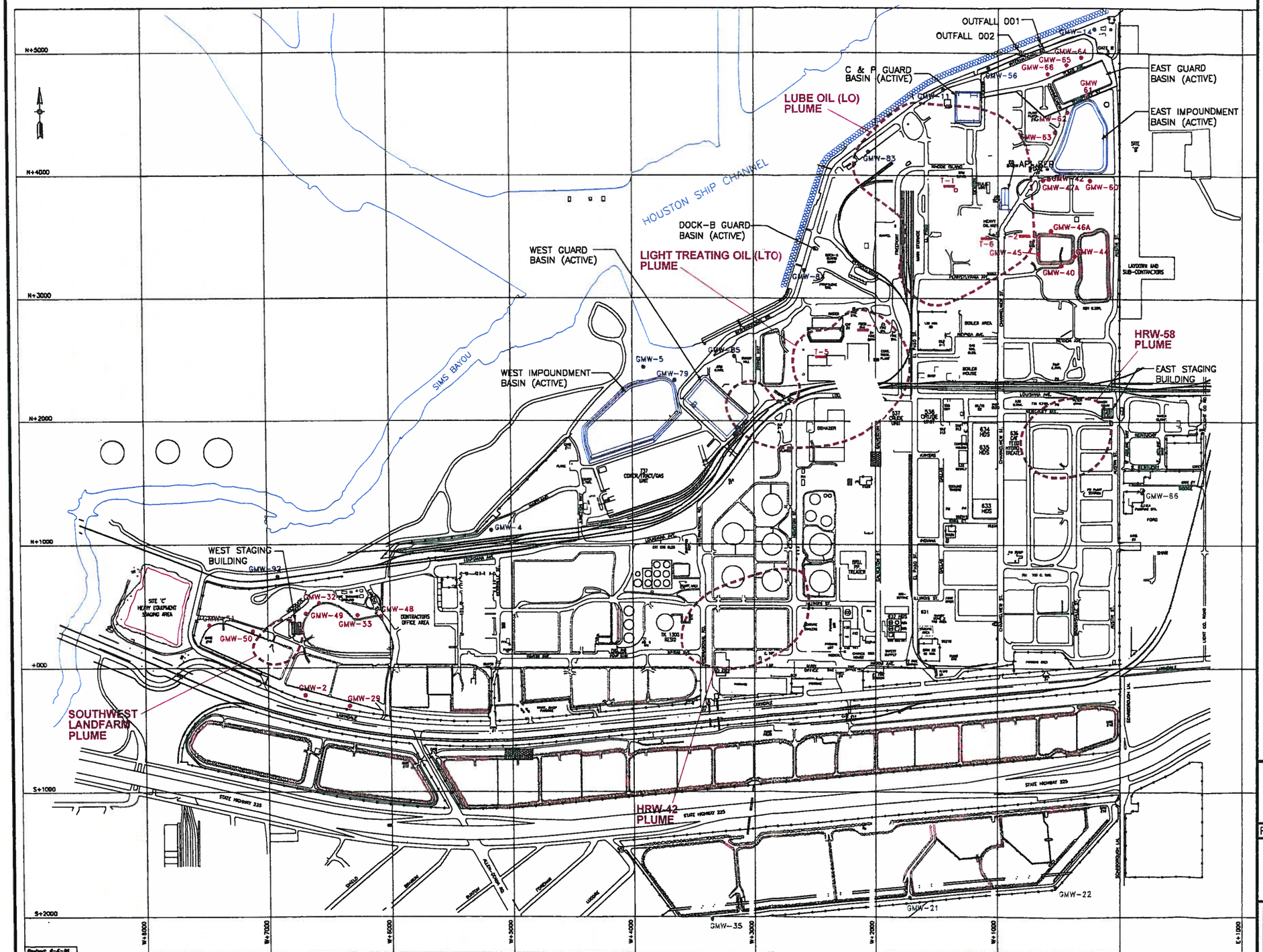
EACH RECOVERY TRENCH CONSISTS OF TWO OBSERVATION WELLS AT THE ENDS OF THE TRENCH AND A CENTRAL RECOVERY PORT. THE OUTER OBSERVATION WELLS ARE DESIGNATED A AND C, eg. HRW-126A, HRW-126C. THE CENTRAL RECOVERY WELL IS DESIGNATED B, eg. HRW-126B. THE A AND C WELLS HAVE BEEN OMITTED FOR CLARITY, ONLY THE B WELL IS SHOWN.

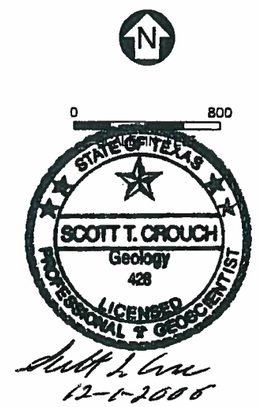
LYONDELL-CITGO Refining LP
HOUSTON, TEXAS

PROJ. NO.: Citgo Lyondell | DATE: 7/19/05 | FILE: CitgoLD-B40

FIGURE 4-1
CURRENT RECOVERY SYSTEM COMPONENTS

JDC
JD Consulting, L.P.
404 Camp Craft Road
Austin, Texas 78746





LEGEND

- BACKGROUND WELL LOCATION
- POINT OF EXPOSURE WELL LOCATION
- RCRA WELL LOCATION
- TRENCH
- ESTIMATED EXTENT OF LNAPL (NOV 2004)
- SHEET PILING

ATTACHMENT C-4

NOTE:

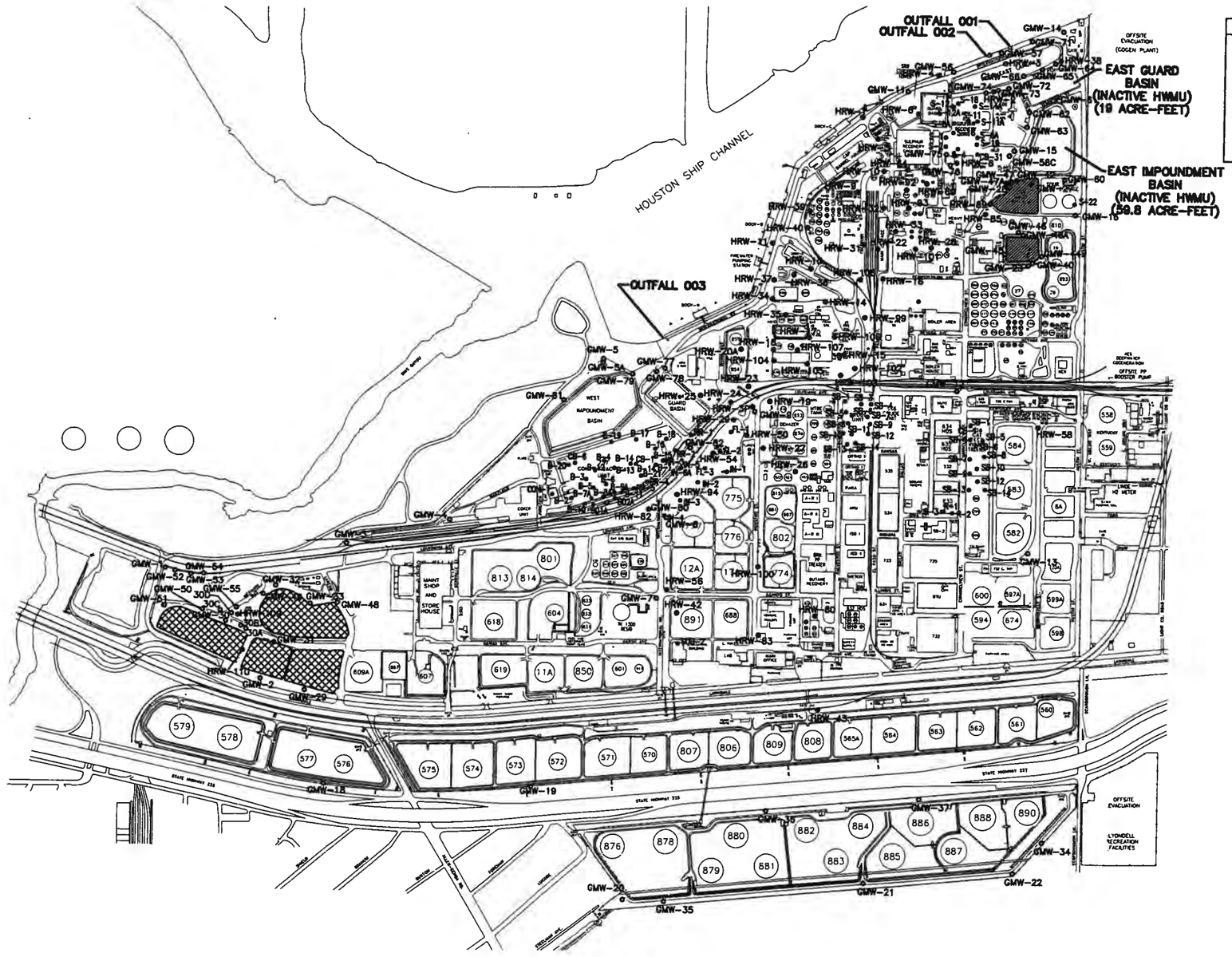
EACH RECOVERY TRENCH CONSISTS OF TWO OBSERVATION WELLS AT THE ENDS OF THE TRENCH AND A CENTRAL RECOVERY PORT. THE OUTER OBSERVATION WELLS ARE DESIGNATED A AND C, eg. HRW-126A, HRW-126C. THE CENTRAL RECOVERY WELL IS DESIGNATED B, eg. HRW-126B. THE A AND C WELLS HAVE BEEN OMITTED FOR CLARITY, ONLY THE B WELL IS SHOWN.

LYONDELL-CITGO Refining LP
HOUSTON, TEXAS

PROJ. NO.: Citgo Lyondell	DATE: 7/19/05	FILE: CitgoLD-B43

FIGURE 5-1
LOCATION OF RCRA AND CORRECTIVE ACTION MONITORING WELLS

JDC
JD Consulting, L.P.
404 Camp Craft Road
Austin, Texas 78746



LEGEND

- Groundwater Monitoring Wells
- Hydrocarbon Recovery Wells
- Bore Holes
- Northeast Landfarm (Inactive) (3.22 acres)
- Southwest Landfarm (Inactive) (13.83 acres)

NOTE: Outfalls 001, 002 and 003 are for stormwater discharge. Normally, no flow occurs through these outfalls.

ATTACHMENT C-5

1000 500 0 1000
(SCALE IN FEET)

MAP SOURCE: GERAGHTY & MILLER, INC.
HAZARDOUS WASTE MANAGEMENT UNITS
SEPTEMBER 4, 1997

REV.	DATE	DESCRIPTION	DR BY	APP BY

COOK-JOYCE INC.
ENGINEERING AND CONSULTING
812 WEST ELEVENTH 512-474-9097
AUSTIN, TEXAS 78701

PROJECT:
LYONDELL-CITGO
RCRA PERMIT RENEWAL

SHEET TITLE:
LOCATIONS OF ALL KNOWN MONITOR WELLS AND BOREHOLES

DES BY			SCALE: SEE BAR SCALE
DR BY	SDB	SDB	PROJECT NO. 99023
CHK BY	CKK		CJI NO. 99023007
APP BY	KLM		SHEET 1 OF 1 SHEETS
DATE ISSUED: 30 JULY 1999			FIGURE NO.
PURPOSE: TNRCC SUBMITTAL			D-2

Current Imagery Overlay Map - 1 Mile Buffer

BANKS ENVIRONMENTAL DATA
A DIVISION OF THE BANKS GROUP

12000 Lawndale Street

Well

Well Cluster

Target Property

Search Buffer

1 : 31,500
1 inch = 0.497 miles
1 inch = 2625 feet
1 centimeter = 0.315 kilometers
1 centimeter = 315 meters

N

Lambert Conformal Conic Projection
1983 North American Datum
First Standard Parallel: 33 0' 00" North
Second Standard Parallel: 45 0' 00" North
Central Meridian: 96 0' 00" West
Latitude of Origin: 39 0' 00" North

Attachment C-6

Banks Environmental Data, Inc. - 1601 Rio Grande, Ste. 331 - Austin, TX 78701 - 800.531.5255 P - 512.478.1433 F
www.banksenvdata.com

ATTACHMENT D

PHOTOGRAPHS

Southwest Landfill 612-614
View toward the west/northwest; SWLF 612 located in the foreground

Southwest Landfill 612-614
View toward east/northeast; SWLF 614 located in the foreground

Southwest Landfill 613
View toward the southwest

Southwest Landfill 613
View toward the northwest

East Impoundment Basin

East Guard Basin
View toward the west

ATTACHMENT E

PROCESS FLOW DIAGRAM/DESCRIPTION

ATTACHMENT E
PROCESS FLOW DESCRIPTION

No hazardous wastes generated at the Houston Refining LP facility are processed or disposed on-site. All hazardous wastes are containerized at the point of generation, staged on-site at one of two less than 90-day accumulation areas, and ultimately disposed at an authorized off-site facility. Industrial wastewater is routed through the site's wastewater handling system and pumped to an authorized off-site facility. Hazardous wastes listed in this application were managed in the waste management units prior to 1999 and are no longer actively managed in these units.

ATTACHMENT F

ACTIVE AIR PERMITS AND REGISTRATIONS

Active Air Permits and Registrations

#	Program	ID Type	ID Number	ID Status
1	AIR EMISSIONS INVENTORY	ACCOUNT NUMBER	HG0048L	ACTIVE
2	AIR NEW SOURCE PERMITS	ACCOUNT NUMBER	HG0048L	ACTIVE
3	AIR NEW SOURCE PERMITS	AFS NUM	4820100040	ACTIVE
4	AIR NEW SOURCE PERMITS	EPA PERMIT	PSDTX985	ACTIVE
5	AIR NEW SOURCE PERMITS	PERMIT	2167	ACTIVE
6	AIR NEW SOURCE PERMITS	PERMIT	AMOC51	ACTIVE
7	AIR NEW SOURCE PERMITS	REGISTRATION	101633	ACTIVE
8	AIR NEW SOURCE PERMITS	REGISTRATION	101897	ACTIVE
9	AIR NEW SOURCE PERMITS	REGISTRATION	102445	ACTIVE
10	AIR NEW SOURCE PERMITS	REGISTRATION	102446	ACTIVE
11	AIR NEW SOURCE PERMITS	REGISTRATION	102448	ACTIVE
12	AIR NEW SOURCE PERMITS	REGISTRATION	102500	ACTIVE
13	AIR NEW SOURCE PERMITS	REGISTRATION	102511	ACTIVE
14	AIR NEW SOURCE PERMITS	REGISTRATION	102512	ACTIVE
15	AIR NEW SOURCE PERMITS	REGISTRATION	102521	ACTIVE
16	AIR NEW SOURCE PERMITS	REGISTRATION	102522	ACTIVE
17	AIR NEW SOURCE PERMITS	REGISTRATION	102523	ACTIVE
18	AIR NEW SOURCE PERMITS	REGISTRATION	102524	ACTIVE
19	AIR NEW SOURCE PERMITS	REGISTRATION	102525	ACTIVE
20	AIR NEW SOURCE PERMITS	REGISTRATION	102526	ACTIVE
21	AIR NEW SOURCE PERMITS	REGISTRATION	102528	ACTIVE
22	AIR NEW SOURCE PERMITS	REGISTRATION	102531	ACTIVE
23	AIR NEW SOURCE PERMITS	REGISTRATION	102533	ACTIVE
24	AIR NEW SOURCE PERMITS	REGISTRATION	102537	ACTIVE
25	AIR NEW SOURCE PERMITS	REGISTRATION	102538	ACTIVE
26	AIR NEW SOURCE PERMITS	REGISTRATION	102539	ACTIVE
27	AIR NEW SOURCE PERMITS	REGISTRATION	102540	ACTIVE
28	AIR NEW SOURCE PERMITS	REGISTRATION	109351	ACTIVE
29	AIR NEW SOURCE PERMITS	REGISTRATION	112762	ACTIVE
30	AIR NEW SOURCE PERMITS	REGISTRATION	113654	ACTIVE
31	AIR NEW SOURCE PERMITS	REGISTRATION	118761	ACTIVE
32	AIR NEW SOURCE PERMITS	REGISTRATION	123232	ACTIVE
33	AIR NEW SOURCE PERMITS	REGISTRATION	131635	ACTIVE
34	AIR NEW SOURCE PERMITS	REGISTRATION	136228	ACTIVE
35	AIR NEW SOURCE PERMITS	REGISTRATION	139906	ACTIVE
36	AIR NEW SOURCE PERMITS	REGISTRATION	141096	ACTIVE
37	AIR NEW SOURCE PERMITS	REGISTRATION	142711	ACTIVE
38	AIR NEW SOURCE PERMITS	REGISTRATION	146126	ACTIVE
39	AIR NEW SOURCE PERMITS	REGISTRATION	151230	ACTIVE
40	AIR NEW SOURCE PERMITS	REGISTRATION	154665	ACTIVE
41	AIR NEW SOURCE PERMITS	REGISTRATION	156246	ACTIVE
42	AIR NEW SOURCE PERMITS	REGISTRATION	156839	ACTIVE
43	AIR NEW SOURCE PERMITS	REGISTRATION	160669	ACTIVE
44	AIR NEW SOURCE PERMITS	REGISTRATION	43445	ACTIVE
45	AIR NEW SOURCE PERMITS	REGISTRATION	46595	ACTIVE
46	AIR NEW SOURCE PERMITS	REGISTRATION	55719	ACTIVE

Active Air Permits and Registrations

#	Program	ID Type	ID Number	ID Status
47	AIR NEW SOURCE PERMITS	REGISTRATION	86815	ACTIVE
48	AIR NEW SOURCE PERMITS	REGISTRATION	87937	ACTIVE
49	AIR NEW SOURCE PERMITS	REGISTRATION	92373	ACTIVE
50	AIR NEW SOURCE PERMITS	REGISTRATION	95583	ACTIVE
51	AIR OPERATING PERMITS	ACCOUNT NUMBER	HG0048L	ACTIVE
52	AIR OPERATING PERMITS	PERMIT	1372	ACTIVE

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)		3. Regulated Entity Reference Number (if issued)
CN 601313083	Follow this link to search for CN or RN numbers in **Central Registry****	RN 100218130

SECTION II: Customer Information

4. General Customer Information | 5. Effective Date for Customer Information Updates (mm/dd/yyyy): 11/17/2020

☐ 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: e.g.: Doe, John): Houston Refining LP

If new Customer, enter previous Customer below:

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number (if applicable)
11608011	17603953039	760395303	806322210

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: 12000 Lawndale

City	Houston	State	TX	ZIP	77017	ZIP + 4	

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)
(713) 321 - 4211		(713) 321 - 6820

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.)

Houston Refining

23. Street Address of the Regulated Entity: (No PO Boxes)	12000 Lawndale						
	City	Houston	State	TX	ZIP	77017	ZIP + 4
24. County							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	2 miles east of the Loop 610/Hwy 225 intersection				
26. Nearest City			State		Nearest ZIP Code
Houston			TX		77017
27. Latitude (N) In Decimal:	29.709444		28. Longitude (W) In Decimal:		95.235278
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
29	42	34	95	14	07

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)
2911			

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

Petroleum Refining

34. Mailing Address:	12000 Lawndale						
	City	Houston	State	TX	ZIP	77017	ZIP + 4
35. E-Mail Address:	roel.munoz@lyondellbasell.com						

36. Telephone Number	37. Extension or Code	38. Fax Number (if applicable)
(713) 321 - 4211		(713) 321 - 6820

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
☐ Municipal Solid Waste	☒ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☒ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☒ Waste Water	☐ Wastewater Agriculture	☒ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name: Joe R. Cantu			41. Title: Environmental Team Lead
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(713) 321 - 4258		(713) 321 - 6820	joe.cantu@lyondellbasell.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 I, Field 6 and/or as required for the updates to the ID numbers identified in field 39

Company:	Houston Refining LP	Job Title:	Environmental & DOT Pipelines Manager
Name(*In Print*):	Roel A. Muñoz	Phone:	(713) 321-4094
Signature:		Date:	09.12.2016

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

Part B

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: http://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 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 formatted in MS Word. Files may be compressed using PKZIP Ver. 2 or a 100% compatible program. For Renewal, Amendment, and Modification applications, the MS Word 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.I. through XI.E.III., and CP Tables I, II, V, VI through VIII, are required; and CP Tables III, IIIA, IV, and IVA as applicable; 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 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 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 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);
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 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 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 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]:

The TCEQ encourages applicants to conduct an applicant held public meeting prior to submittal of an application to allow the applicant and the public to identify potential issues. A pre-application public meeting is required prior to submittal of an application for an initial permit for hazardous waste management units, an application for hazardous waste part B applications for renewal of permits which propose a significant change in facility operations that would classify as a Class 3 Modification and an application for a major amendment. The pre-application public meeting requirements are described under 40 CFR Part 124.31(b)-(d).

Applicants are 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 a permit application.

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.

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 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)

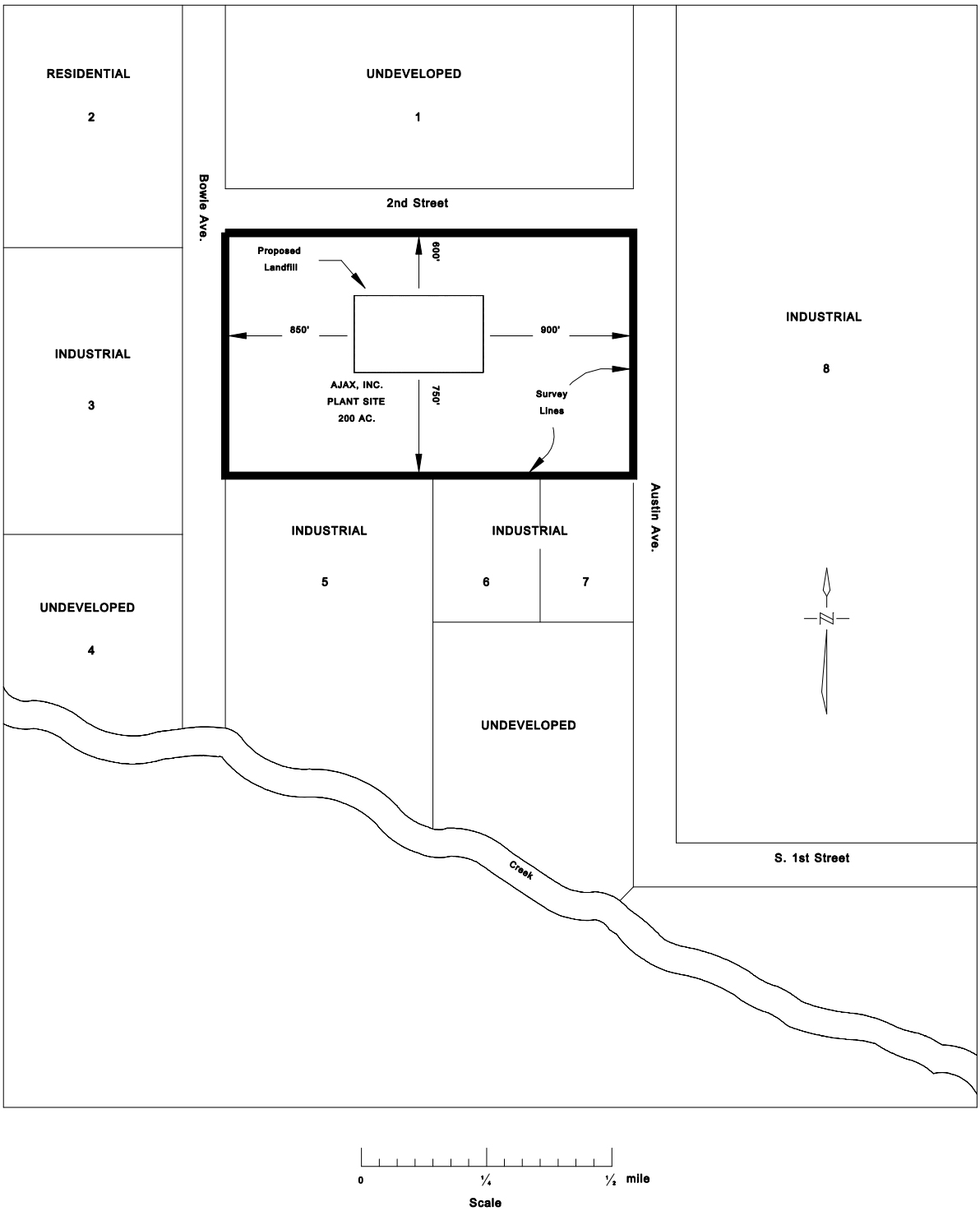
If a bilingual education program(s) is provided by either the elementary school or the middle school nearest to the facility, which language(s) is required by the bilingual program?

<u>Spanish</u>

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

In accordance with 30 TAC 39.5(b), please also submit this list electronically, for mailing labels, in MS Word. The electronic mailing list must contain only the name, mailing address, city, state, and zip code with no reference to the lot number or lot location. The list should contain 30 names, addresses, etc. (3 columns with 10 per column) per page (MS WORD Avery Standard 5160 – ADDRESS template).

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

Table of Contents

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

I. General Information

A. Applicant Name: [Facility Operator (or Facility Owner & Operator, if same)]

Houston Refining LP

(Individual, Corporation, or Other Legal Entity Name – must match the Secretary of State's database records for the Facility)

Previous or former names of the facility, if applicable: Lyondell Petrochemical Company (LPC), Lyondell-Citgo Refining LP (LCR), Atlantic Richfield Company

Address: 12000 Lawndale

City: Houston State: Texas Zip Code: 77017

Telephone Number: (713) 321-5741

TCEQ Solid Waste Registration No.: 30092 EPA I.D. No.: TXD082688979

Permit No.: 50106 County: Harris

Regulated Entity Name: Houston Refining

Regulated Entity Reference Number: RN100218130

Customer Name: Houston Refining LP

Customer Reference Number: CN601313083

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.

0011608011
(Charter Number)

B. Facility Owner: Identify the Facility Owner if different than the Facility Operator

(Same as applicant above)

Address: _____

City: _____, Texas, Zip Code: _____

Telephone Number: _____

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 Part A of this application [Section 361.087, Texas Health and Safety Code].

C. Facility Contact

1. List those persons or firms, including a complete mailing address and telephone number, who will act as primary contact for the applicant during the processing of the permit application.

   Contact: Caryn J. Brooks Title: Principal Environmental Engineer

   Address: Houston Refining LP, 12000 Lawndale Street

   City: Houston State: Texas Zip Code: 77017

   Telephone Number(s): Office (713) 321 4710 Other (832) 215 7986

   E-mail: Caryn.Brooks@lyondellbasell.com FAX (713) 321 6820

   Contact: Roel A. Muñoz Title: Manager, Environmental & DOT Pipelines

   Address: Houston Refining LP, 12000 Lawndale Street

   City: Houston State: Texas Zip Code: 77017

   Telephone Number(s): Office (713) 321 4094 Other _____

   E-mail: Roel.Munoz@lyondellbasell.com FAX (713) 321 6820

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.

   Contact: The Corporation Trust Company Title: _____

   Address: 1999 Bryan Street, Ste 900

   City: Dallas State: Texas Zip Code: 75201-3136

   Telephone Number(s): Office _____ Other _____

   E-mail: _____FAX _____

3. List the individual who will be responsible for causing notice to be published in the newspaper and his/her mailing address, telephone number and fax number. If e-mail is available please provide an e-mail address.

   Contact: Caryn J. Brooks Title: Principal Environmental Engineer

   Address: Houston Refining LP, 12000 Lawndale Street

   City: Houston State: Texas Zip Code: 77017

   Telephone Number(s): Office (713) 321 4710 Other (832) 215 7986

   E-mail: Caryn.Brooks@lyondellbasell.com FAX (713) 321 6820

4. For applications for new permits, renewals, major amendments and Class 3 modifications a copy of the administratively complete application must be made available at a public place in the county where the facility is, or will be, located for review and copying by the public. Identify the public place in the county (e.g., public library, county court house, city hall), including the address, where the application will be made available for review and copying by the public.

Contact: Pasadena Public Library Title: TBD

Address: 1201 Jeff Ginn Memorial Drive

City: Pasadena State: Texas Zip Code: 77506

Telephone Number(s): Office (713) 477 0276 Other _____

E-mail: _____ FAX _____

5. 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).

Contact: N/A Title: N/A

Address: N/A

City: N/A State: N/A Zip Code: N/A

Telephone Number(s): Office N/A Other _____

E-mail: N/A FAX N/A

D. Application Type and Facility Status

1.

☒permit	☒amendment	☐modification
☐new	☐major	☐Class 3
☐ interim status	☒minor	☐Class 2
☒renewal		☐Class 1[1]
☐RD&D		☐Class 1
☒Compliance Plan		

2. Is this submittal part of a Consolidated Permit Processing request, in accordance with 30 TAC Chapter 33?
☐Yes ☒No

If Yes, state the other TCEQ program authorizations requested.

3. Does the application contain confidential material? ☐ Yes ☒ No

If Yes, cross-reference the confidential material throughout the application to Section XIII: Confidential Material, and submit as a separate Section XIII document or binder conspicuously marked "CONFIDENTIAL".

4. In either column, check all that apply.

☐Proposed hazardous waste management facility	☒Existing hazardous waste management facility
☐On-site	☒On-site
☐Off-site	☒Off-site
☐Commercial	☐Commercial
☐Recycle	☐Recycle
☐Land Disposal	☒Land Disposal
	☐Areal or capacity expansion
	☒Compliance plan

5. Is the facility within the Coastal Management Program boundary (for Class 3 Modifications, Permit Renewals, and New Permit applications only)?

   ☒ Yes ☐ No

6. Provide a brief description of the portion of the facility covered by this application in the table below, including the changes for which an amendment or modification is requested: [Note: *List all changes requested in the table below. Unlisted requests risk remaining unaddressed or possibly denied if brought to the permit application reviewer's attention at a later time.]*

Permit/Compliance Plan Application Section	Brief Description of Proposed Change	Modification or Amendment Type	Supporting Regulatory Citation
All		Renewal	
Section 1	Updated Plant Contact and Elected Officials		
Section 1	Current wetlands map shows wetlands on site. This has been addressed; no changes required		
Section III, Contingency Plan	Revised Contingency Plan to update to current procedures	Renewal	
Section V	Added plant sewer system figures to the addendum	Class 1 Modification	30 TAC 305.69(k)(A)(1)

Permit/Compliance Plan Application Section	Brief Description of Proposed Change	Modification or Amendment Type	Supporting Regulatory Citation
Section VII, Table VII.B	Removed closure costs for the portions of the Southwest Landfarm and Northeast Landfarm which were previously closed under Class 1[1] Permit Modification issued on March 22, 2016	Class 1 Modification	30 TAC 305.69(k)(A)(1)
Section VII, Tables	Updated cost for inflation	Class 1 Modification	30 TAC 305.69(k)(A)(1)
Section VIII, Financial Assurance	Provided updated financial assurance mechanisms	Class 1 Modification	30 TAC 305.69(k)(A)(1)
Section XI, Compliance Plan	Updated ecological PCLs for Houston Ship Channel POEs	Class 1 Modification	30 TAC 305.69(k)(A)(4)
	Updated GWPS for current PCLS	Class 1 Modification	30 TAC 305.69(k)(A)(4)
	Revised Costs for Inflation	Class 1 Modification	30 TAC 305.69(k)(A)(4)

7. Total acreage of the facility being permitted: Approximately 700 acres

8. Identify the name of the drainage basin and segment where the facility is located: Segment 1007 Houston Ship Channel/Buffalo Bayou Tidal in the San Jacinto River Basin

E. Facility Siting Summary

Is the facility located or proposed to be located:

1. within a 100-year floodplain?
   ☐Yes ☒ No

2. in wetlands?
   ☒Yes ☐No

   Although the current wetlands map shows that there are wetlands located on site, these are hazardous waste units, the East Guard Basin

and the East Impoundment Basin, that are used for wastewater management or closed hazardous waste units consisting of the Northeast LTU 02 and 04, the West Guard Basin, the West Impoundment Basin, the Southwest Landfarm, Southwest LTUs, and tank secondary containment. These areas are not wetlands.

3. in the critical habitat of an endangered species of plant or animal?
   ☐Yes ☒No

4. on the recharge zone of a sole-source aquifer?
   ☐Yes ☒ No

5. in an area overlying a regional aquifer?
   ☒Yes ☐ No

6. 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? (Use only for a new commercial hazardous waste management facility or areal expansion of an existing commercial hazardous waste management facility or unit of that facility as defined in 30 TAC 335.202)
   ☐Yes ☐No ☒Not Applicable

If Yes: the TCEQ shall not issue a permit for this facility.

7. 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?
   ☐Yes ☒No

If Yes: provide a copy of the ordinance or order.

F. Wastewater and Stormwater Disposition

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

2. Will any point source discharge of effluent or rainfall runoff occur as a result of the proposed activities?
   ☐ Yes ☒No

3. If Yes, is this discharge regulated by a TPDES or TCEQ permit?
   ☐ Yes Permit No._____(TCEQ)
   Permit No._WQ0000392000_(TPDES)

4. ☐No Date TCEQ discharge permit application filed: _____
   Date TPDES discharge permit application filed:_____

G. Information Required to Provide Notice

State Officials List

Provide the name and mailing address for the State Senator and State Representative in the district in which the facility is or will be located. Either local district addresses or capitol addresses are acceptable. This list should not be included in the Adjacent Landowners List required below. [30 TAC 39.103(b)]

State Senator:
Senator Carol Alvarado
Senate District 6
4450 Harrisburg
Suite 400
Houston, Texas 77011

State Representative:
Representative Mary Ann Perez
House District 144
101 South Richey Street
Suite F
Pasadena, Texas 77506

Local Officials List

Provide the name and mailing address of the mayor and health authority of the municipality in whose territorial limits or extraterritorial jurisdiction the facility is or will be located. In addition, please provide the county judge and health authority of the county in which the facility is located. This list should not be included in the Adjacent Landowners List required below. [30 TAC 39.103(c)]

Mayor:
Mayor Sylvester Turner
City of Houston
P.O. Box 1562
Houston, Texas 77251

City Health Authority:
Stephen L. Williams
Houston Health Department
8000 North Stadium Drive
Houston, TX 77054

County Judge:
Harris County Judge Lina Hidalgo
1001 Preston Street
Suite 911
Houston, Texas 77002

County Health Authority:
Executive Director Umair A. Shah, MD, MPH
Harris County Public Health
2223 West Loop South
Houston, TX 77027

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:

Industrial Hazardous Waste Permit No. 50000, Texas Chemical Plant

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.

See Attachment I-1

Based on the questions in the Bilingual Notice Instructions for this form, are you required to make alternate (Bilingual) notice for this application?

☒Yes ☐No

Bilingual Language(s): Spanish

H. TCEQ Core Data Form

The TCEQ requires that a Core Data Form CDF (Form 10400) be submitted on all incoming applications. Please ensure that the submitted CDF does not show a change for any information that will remain the same as previously submitted. For more information regarding the Core Data Form, call (512) 239 1575 or go to the TCEQ Web site at http://www.tceq.texas.gov/permitting/central_registry/guidance.html

Submitted in Part A.

I. 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.

Signature Page

I, Greg Nevermann, Site Manager Houston Refining,
(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: 11/18/2020

- -

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 GREG NEVERMANN

On this 18 day of NOVEMBER, 2020

My commission expires on the 8 day of August, 2021

Notary Public in and for HARRIS County, Texas
*[**Note**: Application Must Bear Signature & Seal of Notary Public]*

KAREN L. LYERLY
Notary Public, State of Texas
Comm. Expires 08-08-2021
Notary ID 5166580

Karen L Lyerly

Interim Status Land Disposal Unit(s) Certification

For all land disposal units managing wastes which are newly listed or identified as hazardous wastes, the following certification must be executed by or on the date 12 months after the effective date of the rule identifying or listing the waste as hazardous. If the operator fails to certify compliance with these requirements, the operator shall lose authority to operate under interim status. [40 CFR 270.73(d)]

I,_____, _____

(operator) *(title)*

certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete.

I further certify that in accordance with Section 3005(e)(3) of the Resource Conservation and Recovery Act, as amended, the subject land disposal unit(s) are in compliance with all applicable groundwater monitoring and financial responsibility requirements of 30 TAC Sections 335.112, 335.116, and 335.117. I am aware there are significant penalties for submitting false information, including the possibility of civil penalty, criminal fines, and imprisonment.

Signature:_____ Date: _____

II. Facility Siting Criteria

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 Sections II.A. through II.G. below 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 Sections II.A through II.G below, 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 Sections II.A through II.G, as applicable. Please note however, that additional technical information may be requested to address any facility siting characteristics noted in Section I.E.

> 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.

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)]

   ☒ Yes ☐ No

Provide the source of information.

<u>Based on the National Wetlands Inventory (NWI) Mapper, there are portions of the facility located in wetlands. See Attachment II-1a and II-1b. However, review of the wetlands map indicates that the areas marked as wetlands are current wastewater storage areas, closed hazardous waste units, or tank secondary containment. There are no wetlands on site.</u>

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).

2. in the critical habitat of an endangered species of plant or animal? [as applicable: 30 TAC 335.204(a)(8), (b)(10), (c)(9), (d)(9), and/or (e)(11)]

☐Yes ☐No ☐ Not Applicable

Provide the source of information.

If Yes: submit in Section V information demonstrating that design, construction, and operational features will prevent adverse effects on such critical habitat.

Houston Refining conducted a Baseline Risk Assessment in 2002, which included a Texas Risk Reduction Program (TRRP) Tier 1 Exclusion Criteria Checklist in accordance with 30 TAC 350.77(b) to determine if additional ecological risk assessment was necessary for Houston Refining. The Tier 1 document indicated that additional ecological risk assessment was not necessary for the refinery; therefore, it is unlikely that endangered species are located at Houston Refining. This document was approved by the TCEQ in a letter dated June 4, 2004. See Attachment II-2.

3. on the recharge zone of a sole-source aquifer? [30 TAC 335.204(a)(3), (b)(3), (c)(3), (d)(3), and/or (e)(3)]

☐ Yes ☒ No

Provide the source of the information.

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.

Note: Land treatment facilities, waste piles, storage surface impoundments, and landfills may not be located on the recharge zone of a sole-source aquifer.

According to the United States Environmental Protection Agency (EPA) Interactive map of sole-source aquifers, the Houston area is not located within a region overlying a sole-source aquifer; therefore, Houston Refining is not located on the recharge zone of a sole-source aquifer. See Attachment II-3.

4. 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)]

☒ Yes ☐ No

Provide the source of information.

If Yes: submit site-specific information in Section V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1).

According to Attachment VI-1: 1999 Geology Report, the facility is in an area overlying the Chicot and Evangeline regional aquifers. As noted in Section XI.A.4.f, an aquifer demonstration was previously presented in the 2002 Risk Assessment Report, which was approved by the TCEQ on June 4, 2004

as shown in Attachment II-2. The demonstration focused on the clay aquitard between the upper and lower aquifer. The results of the demonstration were summarized in a March 13, 2003 letter to the TCEQ. The aquitard is laterally extensive across the site and has very low native hydraulic conductivity (<1.12 x 10-7 cm/sec). Additionally, secondary containment is provided to preclude migration to groundwater from spills, leaks, or discharges.

5. 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)]

☐ Yes ☒ No

Provide information to verify the above.

If Yes: provide additional information in Sections V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1)

Houston Refining is underlain by a clay layer with a hydraulic conductivity of <1.12 x 10-7 cm/sec; this assessment has been previously approved by the TCEQ in 2004. See Attachment II-2.

6. 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? [as applicable: 30 TAC 335.204 (a)(6), (b)(7), (c)(6), and/or (e)(8)].

☐ Yes ☒ No ☐ Not Applicable

Provide information to verify the above.

If Yes: provide information in Section V demonstrating compliance with 30 TAC 335.205(a)(1).

Houston Refining is not located within one-mile of Lake Houston, which is the primary lake used to supply public drinking water in the Houston, Texas area. See Attachment II-4.

7. 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? [as applicable: 30 TAC 335.204(a)(7), (b)(8) ,(c)(7), (d)(7), and/or (e)(9)]

☐ Yes ☒ No ☐ Not Applicable

Provide the source of the information.

If Yes: specify in Section V the design, construction, and operational features of the facility that will prevent adverse effects resulting from the geologic processes.

The Houston area is located in a subsidence zone; however, according to Attachment VI-1: 1999 Geology Report, the permitted units were in existence prior to the effective date of RCRA. The possible existence of

faulting has no bearing on the siting of these units. In addition, pursuant to 40 CFR 270.14(b)(11)(i) and 40 CFR 264.18(a), Houston Refining is not located in an area subject to seismic location standards for new facilities. In regards to subsidence, borehole extensometers have been placed in the Houston area to measure compaction (Figure VI-6). The nearest extensometer to Houston Refining indicates compaction and subsidence have slowed and these trends are expected to continue; therefore, potential for submergence beneath Gulf waters is very unlikely. For more details, please see Attachment VI-1.

8. 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? [as applicable: 30 TAC 335.204(a)(9), (b)(12) ,(c)(11), (d)(11), and/or (e)(13)]

☐ Yes ☒ No ☐ Not Applicable

Provide the source of information.

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.

According to Attachment VI-1: 1999 Geology Report, no faults have been identified within 3,000 feet of Houston Refining that have had movement during the Holocene. For additional information refer to Attachment VI-1: 1999 Geology Report.

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

Is the land treatment facility located or proposed to be located:

1. 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?

☐ Yes ☒ No

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).

2. either

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?

☐ Yes ☒ No

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.

b. within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.

☐ Yes ☒ No

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.

3. on a barrier island or peninsula?

☐ Yes ☒ No ☐ Not Applicable

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).

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

Is the waste pile located or proposed to be located:

1. either

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?

☐ Yes ☐ No

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.

b. within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.

☐ Yes ☐ No

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.

2. on a barrier island or peninsula?

☐ Yes ☐ No ☐ Not Applicable

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).

<u>Waste piles are not applicable to this facility.</u>

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

Is the storage surface impoundment located or proposed to be located:

1. either

a. within 1000 feet of an area of active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?

☐ Yes ☒ No

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.

b. within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula?

☐ Yes ☒ No

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.

2. on a barrier island or peninsula?

☐ Yes ☒ No ☐ Not Applicable

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).

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

Is the landfill located or proposed to the located:

1. 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?

☐ Yes ☐ No

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).

2. (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?

☐ Yes ☐ No

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).

3. either:

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?

☐ Yes ☐ No

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.

b. within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barriers island or peninsula.

☐ Yes ☐ No

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.

4. on a barrier island or peninsula?

☐ Yes ☐ No ☐ Not Applicable

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).

Landfills are not applicable to this facility.

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, do not complete Sections II.F.2. through II.F.4. below. 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.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 48201C0905N, effective 05/02/2019, the northeastern and eastern portions of the facility has a 0.2% annual chance flood hazard; however, it is not located within a 100-year flood plain. See Attachment II-5a and II-5b.

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.

Not applicable (N/A).

2. 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)]

N/A.

3. 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.

N/A.

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)]

N/A.

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.

   N/A.

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.

   N/A.

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)]

   N/A.

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)]

   N/A.

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.

   Three addenda to the deed records, dated October 24, 1983, September 27, 1984, and January 23, 1985, were submitted with the permit renewal application (Registration No. 30092) dated September 15, 1997. A copy of the BIOX (NOR 037) deed recordation dated 3/27/96 was submitted on April 2, 1996, the oily water retention basin (NOR 038) deed recordation was submitted in 1994 , and the West Impoundment Basin (NOR 033) dated 2/7/96 is provided in Section VII Attachment VII-1 Attachment B.

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.

   N/A.

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)]

   N/A.

III. Facility Management

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).

   None except the subject facility.

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).

   N/A.

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.

Not required for post-closure.

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.

See Attachment III-1.

D. Inspection Schedule

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).

See Attachment III-2.

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.

   See Attachment III-3.

F. Emergency Response Plan

For a new commercial hazardous waste management facility, the application shall contain evidence sufficient to demonstrate that emergency response capabilities are available or will be available before the facility first receives waste. An emergency response plan must be provided which satisfies the requirements of 30 TAC 305.50(a)(12)(C) and (D). This plan must show that the proposed facility has sufficient emergency response capabilities for managing a reasonable worst-case emergency condition associated with the operation of the facility. (For financial assurance requirements associated with the emergency response activities, please see Section VIII.C.3.)

1. Practice Drills

   In addition to the contingency plan required under 40 Code of Federal Regulations Part 270.14(b)(7), provisions specifying procedures and timing of practice facility evacuation drills are required. Provide a description and a frequency for facility evacuation drills.

2. If a private corporation, municipality or county group will provide emergency response actions at the proposed facility, include a copy of the contract for this type of agreement with this application or state that documentation will be submitted before the facility accepts wastes.

3. Historical weather data for the area should be documented and submitted. Information regarding how emergency response operations may be affected by weather conditions should be included. (Local rainfall extremes, average rainfall amounts, average wind speeds and directions, potential for major weather events such as hurricanes, tornados, icy conditions, flash flooding etc., should be addressed.)

4. A definition of a worst-case emergency for the proposed facility should be described in the application. This worst-case emergency should take into account the possible complications involved with a facility emergency compounded by adverse weather conditions. It should also detail spills, fires, explosions, etc. This worst case scenario should be developed with the help of local governmental entities where possible. Emergency planning should include both unexpected emergencies and emergencies occurring as a result of a predictable event such as a flood or hurricane. For areas which are prone to hurricanes and flash flooding, the worst case which allows for a realistic situation should be used. For example, response teams should be well versed in reacting to events such as a 100-year flood.

5. A training program for personnel who will respond to these types of emergencies must be provided and must include the requirements described in OSHA Federal Register 1910 and EPA Federal Register 311, the Texas Hazard Communication Act, SARA Title III 302, 304, 311, 312, and 313. If emergency response actions are contracted out, the contracted employees must be properly trained and documentation of this training must be maintained on-site. All responders to emergencies at the proposed facility must be involved in training and drills at the facility in order to be thoroughly familiar with the facility and its operations.

6. The application must include a description and identification of first-responders (i.e. all pertinent facility personnel, local responders, and contractors). The duties of the facility employee who is to be the on-scene coordinator (OSC) must

be described. Additional information must be provided detailing the OSC's role in the emergency response activities. This person must have the authority to commit the resources needed to carry out the Emergency Response Plan. His duties must be thoroughly described so that it is clear whether he will remain in control once the emergency response team arrives or whether he will relinquish control to another incident commander upon that person's arrival on the scene. Additionally, there must be a qualified OSC on-site or on call 24 hours a day. The name, address and phone numbers (home and work) of the OSC(s) must be listed in the Emergency Response Plan. Where more than one person is listed, one must be named as the primary OSC and others must be listed in the order in which they will assume responsibility as alternates.

7. Local or regional emergency medical services or hospitals which have experience in hazardous materials training must be identified in the application. The names, addresses and phone numbers of the hospitals or medical centers should be listed here and updated as necessary. Additionally, maps showing the quickest routes to the medical services must be provided. A description of decontamination procedures for injured personnel prior to transport to medical services must also be provided. The decontamination and transport of injured people to appropriate medical centers must be included in the emergency evacuation training and drills.

8. A pre-disaster plan which includes training drills must be included in the application. This plan should include a schedule for staging evacuations of the facility and for emergency response training drills. At least two evacuations and two emergency response drills should occur annually. The plan should also include additional drills for responding to "predictable" emergencies such as floods and hurricanes. The plan must include the following (or must reference applicable sections of the Contingency Plan): a description of arrangements already in place with local authorities; emergency phone numbers; internal communication or alarm systems and proper alarm codes; a list of all types of emergency equipment at the facility, including a physical description and the capabilities of each item on the list, and the location of each item (a map would be useful here); a description of decontamination equipment; an evacuation plan including signals, evacuation routes and alternate evacuation routes; listing of pertinent first responder emergency phone numbers, and codes for other types of communication devices; and a description of actions that will be performed in the event that a "predictable" emergency occurs.

9. Describe the mechanism which will be used to notify first responders and appropriate local governmental entities that an emergency has occurred. Also describe the mechanism which will be used to notify all applicable governmental agencies when an incident occurs (i.e., TCEQ, Texas Parks and Wildlife, General Land Office, TCEQ Office of Air Quality, Texas Department of Health, and the Texas Railroad Commission).

10. Evidence must be provided that shows coordination with the Local Emergency Planning Committee (LEPC) and any local comprehensive emergency management plan. The applicants should be able to show compliance with SARA Title III.

11. Any medical response capabilities proposed for the facility property must be detailed in the application.

N/A – this facility is not a new commercial hazardous waste facility.

Table III.D. – Inspection Schedule

Facility Unit(s) and Basic Elements	*Possible Error, Malfunction, or Deterioration*	*Frequency of Inspection*
LAND TREATMENT UNITS		
1) Monitoring System - Groundwater Wells	Check for damage to pipe Check well covers: closed & locked	Weekly
2) Inspect vegetative cover (during post-closure care)	Check for erosion, settling, or subsidence Check for ponding, check for proper drainage of stormwater	Semi-annually and after significant rainfall event
SURFACE IMPOUNDMENT UNITS		
1) Warning Signs	Check for presence, damage	Monthly
2) Monitoring System - Groundwater Wells	Check for damage to pipe Check well covers: closed & locked	Weekly
3) Inspect vegetative cover (during post-closure care for contingent closure)	Check for erosion, settling, or subsidence	Semi-annually and after significant rainfall event
4) Stormwater Run-on/Run-off (during post-closure care for contingent closure	Check dikes for erosion, seepage breaches, leaks, discoloration	Weekly and after storms
5) Bench marks (during post-closure care for contingent closure)	Check for cover system settlement	Annually
SECURITY SYSTEM		
1) Video Monitoring Cameras	Malfunction	Monthly
2) Security Fencing	Evidence of Unauthorized Entry Breach or Visible Damage	Monthly
3) Remote Control Security Gates	Malfunction Vehicle Damage	Monthly
4) Warning Signs	Missing Illegible	Monthly

As applicable, all closed units subject to post-closure care with cover will be sloped to ensure proper drainage and conveyance of stormwater.

Table III.E.1 – Arrangements with Local Authorities

Police: Houston Police Department
Address: Dispatch Office
Person Contacted: Phone: 911
Agreed Arrangements: Respond upon notification
Fire: Houston Fire Department
Address: Dispatch Office
Person Contacted: Phone: 911
Agreed Arrangements: Respond upon notification
Hospital: Hermann Life Flight
Address: 6411 Fannin Street, Houston, TX 77030
Person Contacted: Phone: (713) 704 4014
Agreed Arrangements: Respond upon notification
Other: Pasadena Fire Department
Address: Dispatch Office
Person Contacted: Phone: 911
Agreed Arrangements: Respond upon notification
Other: Pasadena LEPC
Address: Dispatch Office
Person Contacted: Phone: 713-473-2273
Agreed Arrangements: Respond upon notification

Table III.E.2. – Emergency Coordinators

Name	Home Address	Office Phone(s) and/or Pager	Home Phone(s)
Primary:			
Eugene E. Martin	2321 Westside Dr. Deer Park, TX 77536	(713) 321-4223	(281) 415-7382
Richard L. Armstrong	12000 Lawndale, Houston, TX 77017	713-321-4223	713-321-4211
John W. Pffanberger	12000 Lawndale, Houston, TX 77017	713-321-4223	713-321-4211
Chris A. Tomlinson	12000 Lawndale, Houston, TX 77017	713-321-4223	713-321-4211
John D. Cerrone	12000 Lawndale, Houston, TX 77017	713-321-4223	713-321-4211
Ted Bulfin	12000 Lawndale, Houston, TX 77017	713-321-4223	713-321-4211
Jimmy Melcher	12000 Lawndale, Houston, TX 77017	713-321-4223	713-321-4211
Alternates:			
<<One of the individuals listed above will be on-site in the role of the Plant Shift Superintendent at all times. Since the Plant Shift Superintendent serves as the Emergency Coordinator, no alternate coordinators are required.>>			

Table III.E.3. – Emergency Equipment

Equipment	Location	Physical Description	Capabilities
Ambulance	Station 1	BLS Ambulance; ALS equipped	Texas Fire Commission ALS equipped
Spill Boats	Spill Station	Flat-bottom boats (2)	Spill tow boat with boom anchor systems
Breathing Air/Light Unit	Station 1	Air cascade unit with generator and light tower	50+ SCBA units with spare 30- and 60-minute SCBA cylinders, 9-bank 100 30-minute capacity air cascade system and filling station. SAR equipped
Field Command Post	Medical	Mobile field command post	Mobile command post, fully equipped with communications and information systems
Foam Aerial	Site D Station	Foam Aerial 110' ladder with 3,000 gpm pump	Servo-Command Foam System, 1000 gal foam tank, 1,000' 6" hose and 500' 5" hose
Foam Engine	Station 3	Foam Engine, 3,000 gpm, fully enclosed pump panel	High volume 6,000 gpm deck gun, Husky foam system, 1,000 gal foam tank, 500 gal. water tank, 1,500' + of 6" hose and 500' 5"hose
Foam Engine	Station 1	Foam Engine, 3,000 gpm, top mounted pump panel	High volume 6,000 gpm deck gun, Husky foam system, 1,000 gal foam tank, 2,000' + of 6" hose and 500' 5"hose

Equipment	Location	Physical Description	Capabilities
Foam Engine	Station 1	Foam Engine, 1,500 gpm, side pump panel	2,000 gpm deck gun, Servo-Command Foam System, 1000. Gal foam tank, 1,000' 6" hose, 500' 5" hose
Foam Monitor Tender	Station 4	Mobile 1,500 gpm self-educting mobile foam monitor with 500 gal storage tank	Self-educting foam nozzle, Blitz fire portable monitor and 500 gal of 3 x 6 firefighting foam
HAZMAT	Station 4	2 Fully self-contained HAZMAT trailers	Truck and Self-Contained HAZMAT Trailer with full CPC, SCBAs, plugging and patching equipment, off-loading fittings and assorted tools
Hose Tender	Station 4	Hose tender reel	Powered hose reel with 4-lays of 7 1/4" hose totaling 3600
Hose Tender	Station 4	Hose tender flatbed trailer	Flat-bed trailer with 1000 of 7 ¼: hose. Assorted fire water appliances
Quick Attack	Station 1	Quick attack unit with 2-fixed monitors	Fixed monitors: 1-1250 gpm water and 1-1250 gpm foam self-educting. 250' of 5" hose. 175 gal 1% X3 firefighting foam
Quick Attack	Station 3	Quick attack unit with 2-fixed monitors	Fixed monitors: 1-1250 gpm water and 1-1250 gpm foam self-educting. 250' of 5" hose. 175 gal 1% X3 firefighting foam

Equipment	Location	Physical Description	Capabilities
Large Delivery Device	Station 4	Trailer mounted 2,000-8,000 gpm monitor	2,000 – 8,000 trailer mounted large diameter water/foam monitor
Portable Pump	Station 4	4,000 gpm portable pump	4,000 gpm self-contained pump trailer unit
Rescue Unit	Station 2	Walk-in Heavy Rescue Unit with generator and light tower	4-bank air cascade system and filling station, SAR equipped, high angle and confined space rescue equipment, hydraulic rescue tools, forcible entry tools and equipment
Spill Boom	Spill station	Spill reel trailer	750' spill boom on powered reel
Spill Boom	Gate 23	Spill reel trailer	1,000' spill boom on powered reel
Spill Boom	D Dock	Spill reel trailer	1,000' spill boom on powered reel
Spill Boom	B dock	Spill reel trailer	500' Flat-bed spill boom trailer
Fire-water pumps	A-Dock	4,000 gpm fire-water pump	Brackish water from Ship Channel 4,000 gpm diesel fire-water pump
Fire-water pumps	B-Dock	4,000 gpm fire-water pump	Brackish water from Ship Channel 4,000 gpm diesel fire-water pump
Fire-water pumps	C-Dock	2,500 gpm fire-water pump	Brackish water from Ship Channel 2,500 gpm diesel fire-water pump

Equipment	Location	Physical Description	Capabilities
Fire-water pumps	D-Dock	4,000 gpm fire-water pump	Brackish water from Ship Channel 4,000, diesel fire-water pump
Fire-water pumps	E-Dock	4,000 gpm fire-water pump	Brackish water from Ship Channel 4,000 gpm diesel fire-water pump
Fire-water pumps	East Tank Farm, CWA	1,500 gpm fire-water pump	1,500 gpm Electric Fire-water pump
Fire-water pumps	East Tank Farm, CWA	3,000 gpm fire-water pump	3,000 gpm Diesel Fire-water pump
Fire-water pumps	East of 735 Unit, CWA	2,500 gpm fire-water pump	2,500 gpm Electric Fire-water pump
Fire-water pumps	East of 735 Unit, CWA	2,500 gpm fire-water pump	2,500 gpm Steam Turbine Fire-water pump
Oil boom	Spill station	1500’ 18” conventional oil containment boom	1500’ 18” conventional oil containment boom
Oil boom	Boom Box between B and C Dock	250’ Oil Boom	250’ Oil Boom
Oil boom	Boom Box between C and D Dock	250’ Oil Boom	250’ Oil Boom
Absorbents – Spill Textiles	East Staging Building, Waste Crew Truck, 7 HAZMAT Trailer	Assorted Sorbent Booms and Pads	Assorted Sorbent Booms and Pads
Absorbents	East Staging Building, Waste Crew Truck, 7 HAZMAT Trailer	Sorbent Granules	Sorbent Granules

Equipment	Location	Physical Description	Capabilities
900 MHZ Motorola Radios, MTS 2000 Smartnet Trunked Portable Radio, Model HOIQZ/207H	HSE Communications Equipment Cabinet	Plant Radio Communication	Plant Radio Communication
Leased from Veolia			
Vacuum Truck	Various	3 x 70 barrel capacity vacuum truck	Vacuum Truck
Vacuum Truck	Various	Liquid Ring Ace	Vacuum Truck

IV. Wastes and Waste Analysis

(Sections IV.A, IV.C, and IV.D do not apply to post closure applications.)

A. Waste Management Information – N/A.

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.

Table IV.B has been completed.

C. Sampling and Analytical Methods – N/A.

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 – N/A.

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.

Table IV.A. – Waste Management Information – N/A

Waste Type(s)	Source	Volume (tons/year)

Table IV.B. – Wastes Managed In Permitted Units

No. (NOR No.)	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
EGB, EIB			
8 (032)	Non-hazardous stormwater	N/A	1021, 1022
9 (034)			
SWLF 612/614, 613, 616			
1 (001)	Sludges, wastewater treatment sludge, tank bottoms, perlite waste, tank bottoms with lead	Ko52	3191, 5042, 602H, 6021, 6951
6 (003)			
7 (005)			

Table IV.C. – Sampling and Analytical Methods – N/A

Waste No.[1]	Sampling Location	Sampling Method[2]	Frequency	Parameter	Test Method[2]	Desired Accuracy Level[3]

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.

V. Engineering Reports

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.

Engineering Report for Combustion Units

For hazardous waste combustion unit which are subject to regulation by 40 CFR Part 63, Subpart EEE, the requirements 30 TAC Chapter 305 and Subchapters I and Q do not apply

when the unit becomes subject to Resource Conservation and Recovery Act (RCRA) permit requirements after October 12, 2005 (i.e., new unit), or no longer apply when an owner or operator of an existing hazardous waste management unit demonstrates compliance with the air emission standards and limitations in 40 Code of Federal Regulations (CFR) Part 63, Subpart EEE, except for the following:

1. Those provisions the Executive Director determines are necessary to comply with 40 CFR §264.345(a) and 40 CFR §264.345(c) for Phase I sources or 40 CFR §266.102(e)(1) and (2)(iii) for Phase II sources if the permittee or applicant elects to comply with any of the options listed in 40 CFR §270.235(a) to minimize emissions of toxic compounds from startup, shutdown, and malfunction events;
2. Those standards and associated requirements for particulate matter, hydrogen chloride and chlorine gas, and non-mercury metals that a Phase II area source elects to comply with in 40 CFR §§266.105, 266.106, and 266.107;
3. Those standards for particulate matter in 40 CFR 264.343(c) remain in effect for a Phase I source incinerator that elects to comply with the alternative to the particulate matter standard under 40 CFR 63.1206(b)(14) and 63.1219(e); and
4. Those provisions that the Executive Director may apply in 30 TAC Chapter 305, Subchapters I and Q, on a case-by-case basis. The Executive Director may require a permittee or an applicant to submit information in order to establish permit conditions under §305.50(a)(15) or (16) and §305.127(1)(B)(iii) or (4)(A) (i.e., risk-based permit conditions).

For hazardous waste combustion units subject to regulation by 40 CFR Part 63, Subpart EEE, some of the information requested in Sections V.H and V.I. will not be applicable for new units or existing units which have submitted a Notification of Compliance in accordance with 40 CFR 63.1207(j) and 63.1210(d), received a Finding of Compliance pursuant to 40 CFR 63.1206(b)(3), and have the associated RCRA permit conditions removed from the permit. Information which is not applicable or no longer applicable should not be included in the Part B application. *[Please note that the TCEQ will require a Finding of Compliance be made prior to modifying the permit by deleting redundant operating parameter limits and standards for the combustion units. Until such time as the permit is modified to delete the redundant RCRA-based operating parameter limits and standards in the permit or the permit is terminated or revoked, the permittee must comply with the RCRA-based conditions specified in the permit. More stringent risk-based permit conditions will remain in the RCRA permit.]*

For the exceptions listed in Items 1.-4., the owner and operator must provide the applicable information requested in the Part B permit application and any additional information required by the Executive Director to establish permit conditions.

<u>An Engineering Report addressing applicable requirements in Subsections A, D, and F is provided as Attachment V-1. This report is submitted largely unchanged from the previously submitted version in 1999 and 2009 with the exception of minor updates to reflect administrative changes. This information includes record copies of engineering work performed in the past. As noted previously, the RCRA permitted units at the facility no longer accept any hazardous waste and are either closed or are operating as non-hazardous waste management areas under the delay of closure requirements of 40 CFR 264.113 (d). As a result, detailed plans and specifications for these units are no longer necessary. Pertinent engineering information for each of these units is included in the Engineering Report and in Tables V.D.1, V.F.1, and V.F.2. Sewer drawings, drawn in 2000, have been added as</u>

Attachment V.A-B, Sewer Drawings

A. General Engineering Reports

1. General Information – Refer to Engineering Report and Table V.A

   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.

   See Figures V.A-A through V.A-F.

2. Features to Mitigate Unsuitable Site Characteristics – N/A.

   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 – N/A.

   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. – N/A.

B. Container Storage Areas – N/A.

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 – N/A.

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. If a tank will manage ignitable or reactive waste, as indicated on Table V.C, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.198 and provide drawings demonstrating compliance with any applicable buffer zone requirements and 40 CFR 264.17.

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 – Refer to Engineering Report and Table V.D.1.

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(6), 335.168, 335.169, and 40 CFR 264.19, 264.220, 264.221, 264.222, 264.223, 264.226(a) and (c), 264.227, 264.229-264.231, and 270.17.

For storage surface impoundments at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(d). For any surface impoundment to be closed as a landfill (where wastes will remain after closure of the impoundment) at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(e).

For all impoundments, include in the report the following information.

1. Complete Table V.D.1 - Surface Impoundments and list the surface impoundments, covered by this application, to be permitted. List the waste(s) managed in each unit and the rated capacity or size of each unit.

2. If a surface impoundment will manage ignitable or reactive waste, as indicated on Table V.D.1., describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.229.

3. If a surface impoundment will manage incompatible waste, as indicated on Table V.D.1., describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.230.

4. If a surface impoundment will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.D.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.231.

5. Describe the surface impoundment. Detailed plan view and cross-sectional drawings of the surface impoundment should be included with the engineering report.

6. Freeboard

   Specify the minimum freeboard to be maintained and the basis of the design to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error. Show that adequate freeboard will be available to prevent overtopping from a 100-year, 24-hour storm. [40 CFR 264.221(g)]

   If the impoundment is inflow sensitive, it should be equipped with a high-level alarm based on a different level sensor than that used for automatic control.

7. Waste Flow

Describe the means that will be used to immediately shut off the flow of waste to the impoundment to prevent overtopping or in the event of liner failure, and include appropriate detailed drawings.

If the surface impoundment is a flow-through facility describe the flow of waste, including a hydraulic profile.

8. Dike Construction

a. If dikes are used, include the following certification as part of the engineering report:

"I,____*(qualified licensed Professional Engineer)*__, Texas P.E. License Number_ _____, of Registered Firm__*(Name)*_____ Registered Firm No._*(Registration Number)*_____ certify under penalty of law that I have personally examined and am familiar with the design and construction of the dikes that are a portion of _____*(surface impoundment unit name)*__.

I further certify that I have evaluated the dike design and materials of construction using accepted engineering procedures, and have determined that the dike, including the portion of the dike providing freeboard, has structural integrity, and

(1) will withstand the stress of the pressure exerted by the types and amounts of wastes to be placed in the impoundment; and
(2) will not fail due to scouring or piping, without dependence on any liner system included in the impoundment construction.

Date: _____"

"(Signature)"

"(Seal)"

b. The structural integrity of the dike system must be certified by a qualified Professional Engineer before a permit is issued. If the impoundment is not being used, the dike licensed system must be certified before it can be put into use. 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.

c. A report shall accompany the dike certification which summarizes the activities, calculations, and laboratory and field analyses performed in support of the dike certification. Describe the design basis used in construction of the dikes. Provide the following analyses as attachments to the engineering report (A Quality Assurance Project Plan <QAPP> should be included in the report to ensure that each analysis is performed appropriately):

(1) Slope Stability Analysis
(2) Hydrostatic and Hydrodynamic Analysis
(3) Storm Loading
(4) Rapid Drawdown

d. Earthen dikes should have a protective cover to minimize wind and water erosion and to preserve the structural integrity of the dike. Describe the protective cover used and describe its installation and maintenance.

9. Containment System

We suggest that the applicant use available recognized guidance documents, such as EPA publication 530-SW-85-014, which provide design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities, or an equivalent method, such as those found in ASTM publications, and approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

a. Complete Table V.D. 6. - Surface Impoundment Liner System for each surface impoundment to be permitted.

b. In the engineering report, describe the design, installation and operation of liner and leak detection components. The description must demonstrate that the liner and leak detection system will prevent discharge to the land, and ground and surface water. Include the following analyses as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

For artificial liners:

(1) Seaming method
(2) Seaming method
(3) Surface preparation method
(4) Tensile Strength
(5) Impact Resistance
(6) Compatibility Demonstration
(7) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(8) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated waste constituents
(9) Atterberg Limits, % passing a #200 sieve, and Permeability
(10) Moisture Content
(11) Standard Proctor Density, Compaction Data

For leachate collection systems:

(12) Pipe Material and Strength
(13) Pipe Network Spacing and Grading
(14) Collection Sump(s) Material and Strength
(15) Drainage Media Specifications and Performance
(16) Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.
(17) Compatibility Demonstration
(18) Capacity of System
    (a) rate of leachate removal
    (b) capacity of sumps
    (c) thickness of mounding and maximum hydraulic head

c. Specify the liner system installation date and expected lifetime of liner system (years).

d. Specify whether the liner is chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.

e. Submit a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.

f. Submit a Response Action Plan that proposes actions to be taken if the Action Leakage Rate for the surface impoundment exceeds. At a minimum the Response Action Plan must include the requirements of 40 CFR 264.223.

10. Surface impoundments that receive waste on or after May 8, 1985 (or for newly-regulated units, the effective date of the new RCRA regulation) into new units and/or lateral expansions or replacements of existing units must meet the minimum technological requirements of the Hazardous and Solid Waste Amendments of 1984, unless an appropriate waiver is granted by the Commission. The owner or operator of each new surface impoundment unit for which the construction commences after January 29, 1992, or each lateral expansion of an existing surface impoundment unit where construction commences after July 29, 1992, or replacement of an existing surface impoundment unit that commence reuse after July 29, 1992 must install two or more liners and leachate collection and removal system unless commission approves alternate design or operating practices. Plans and specifications for both new and existing surface impoundments must demonstrate conformity with 30 TAC 335.168 and 40 CFR 264.221

11. Run-on Diversion

Describe in detail how the surface impoundment system will manage stormwater run-on away from the surface impoundment. Stormwater run-on must be diverted away from a surface impoundment. Use at least a 100-year, 24-hour rainfall event in the design and analysis of diversion structures. Where dikes are used to divert run-on, they must be protected from erosion. Include all analyses used to calculate run-on volumes.

12. The Commission may approve an alternate design or operating practice for a surface impoundment if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.221(d)]:

a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system required by 40 CFR 264.221; and

b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

13. Exemption from Double-Liner Requirements for Monofills [264.221(e)]

Owners or operators of hazardous waste surface impoundment monofills will be exempted from the double-liner requirements if the Commission finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics are at least as effective as a double liner in preventing migration of hazardous constituents to the groundwater or surface water. If an exemption is sought, submit detailed plans and engineering and hydrogeologic reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the groundwater or surface water at any future time.

E. Waste Piles – N/A.

This section applies to owners or operators of industrial solid waste facilities that store or process hazardous waste in piles. A hazardous waste pile that will be closed with wastes left in place must be managed as a landfill. Existing portions of waste piles are those areas that were listed on the original Part A and on which wastes have been lawfully placed.

Provide an engineering report which includes all of the information specified in 30 TAC 335.170 and 40 CFR 264.19, 264.250, 264.251, 264.252-264.253, 264.254(a) and (c), 264.256, 264.257, 264.259, and 270.18.

For waste piles at a new hazardous waste management facility or which are part of any areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(c).

For all waste piles, include in the report the following information.

1. For inclusion into a permit, complete Table V.E.1 - Waste Piles and list the waste piles covered by this application. List the waste managed in each unit and the rated capacity or size of the unit.
2. If a waste pile will manage ignitable or reactive waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.256.
3. If a waste pile will manage incompatible waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.257.
4. If a waste pile will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.259.
5. Describe the waste pile, including any structure surrounding or enclosing the waste pile.
6. Containment System

   We suggest that the applicant use available recognized guidance documents, such as EPA publication 530-SW-85-014, which provide design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities, or an equivalent method, such as those found in ASTM publications, and approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

   a. For inclusion into a permit, complete Table V.E. 3 - Waste Pile Liner System and specify the type of containment/liner system.
   b. In the engineering report, describe the design, installation, construction, and operation of the liner and leachate collection system. The description must demonstrate that containment systems will prevent discharge to the land, surface water, or groundwater. Include the following analyses as attachments to the engineering report, when applicable to the containment system being

described (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

For artificial liners:

(1) Seaming method
(2) Surface preparation method
(3) Tensile Strength
(4) Impact Resistance
(5) Compatibility Demonstration
(6) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(7) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated constituents.
(8) Atterberg Limits, % passing a #200 sieve, and Permeability
(9) Moisture Content
(10) Standard Proctor Density, Compaction Data

For leachate detection, collection, and removal system:

(11) Capacity of system
    (a) rate of leachate removal
    (b) capacity of sumps
    (c) thickness of mounding and maximum hydraulic head
(12) Pipe Material and Strength
(13) Pipe Network Spacing and Grading
(14) Collection Sump(s) Material and Strength
(15) Drainage Media Specifications and Performance
(16) Analysis showing that pipe and perforation size will prevent clogging and allow free liquid access to the pipe.
(17) Compatibility Demonstration

c. Containment/liner system installation date and expected lifetime of liner system (years).

d. Specify whether the containment/liner system is chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.

e. Submit a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.

f. Submit a Response Action Plan that proposes actions to be taken if the Action Leakage Rate for the waste pile exceeds. At a minimum the Response Action Plan must include the requirements of 40 CFR 264.253.

7. Wind Dispersal [30 TAC 335.170(j)]

Waste piles containing hazardous waste which could be subject to dispersal by wind must be covered or otherwise managed so that wind dispersal is minimized. Describe practices to control wind dispersal (e.g., cover or frequent wetting) of the hazardous waste.

8. Run-on Diversion [30 TAC 335.170(g)]

Describe in detail the measures used to control and divert run-on from the unit. The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the pile during peak discharge from at least a 100-year, 24-hour storm.

Include all analyses used to calculate: flow rates; run-on volume and depth; and back-water calculations for the ditches on plant property.

Any tanks or basins associated with the run-on control systems must be emptied or otherwise managed expeditiously after a storm to maintain the design capacity of the system. [30 TAC 335.170(i)]

9. Run-off Control [30 TAC 335.170(h)]

Describe in detail the measures used to control run-off from the unit. Include all analyses used to calculate the run-off volumes.

The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control at least the water volume resulting from a 100-year, 24-hour storm.

Collection and holding facilities (e.g., tanks or basins) associated with the run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system. [30 TAC 335.170(i)]

10. Give a description of design and operating procedures to properly manage and/or dispose of any residuals (e.g., leachate) that may be generated during waste management. Describe the management process and any equipment used.

11. Provide a description and list of all equipment and procedures used to place the waste in or on the waste pile, and how the liner surface will be exposed for inspection, if necessary. A containment system must be protected from plant growth which could puncture any component of the system.

12. Exemption from Liner and Leachate Collection Requirements

The Commission may approve an alternate design or operating practice for a waste pile if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.251(d)]:

a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system; and
b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

13. Exemption from Groundwater Monitoring under 40 CFR 264.250(c)

A waste pile may be exempt from groundwater monitoring if the following standards are met:

a. The waste pile (including its underlying liners) must be located entirely above the seasonal high water table; and
b. The waste pile is inside or under a structure that provides protection from precipitation so that neither run-off nor leachate is generated, provided that:
    (1) Liquids or materials containing free liquids are not placed in the pile;

(2) The waste pile is protected from surface water run-on by the structure or in some other manner;

(3) The waste pile is designed and operated to control dispersal of the waste by wind, where necessary, by means other than wetting; and

(4) The waste pile will not generate leachate through decomposition or other reactions; or

c. The waste pile must have a leachate collection and removal system above the top liner; and

d. Underlayment:

(1) either:

(a) The waste pile must be underlain by two liners, which are designed and constructed in a manner that prevents the migration of liquids into or out of the space between the liners and a leak detection system which must be designed, constructed, maintained, and operated between the liners to detect any migration of liquids into the space between the liners; and

(b) A demonstration must be made that there is a low potential for migration of liquid from the waste pile to the uppermost aquifer during the life of the waste pile (including the closure period). The owner or operator must base any predictions made on assumptions that maximize the rate of liquid migration;

(2) or:

(a) The waste pile must be underlain by a liner (base) that is designed, constructed, and installed in a manner that prevents the migration of liquids or waste beyond the liner; and

(b) The wastes in the waste pile must be removed periodically, and the liner must be inspected for deterioration, cracks, or other conditions that may result in leaks. The frequency of inspection will be specified in the inspection plan and 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).

The liner(s) used to satisfy V.D.13.d. must be of sufficient strength and thickness to prevent failure due to puncture, cracking, tearing, or other physical damage from equipment used to place waste in or on the pile or to clean and expose the liner surface for inspection.

F. Land Treatment Units – Refer to Engineering Report and Tables V.F.1 and V.F.2.

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(6), 335.171, 335.172, 40 CFR 264.270-264.272, 264.273, 264.276, 264.278, 264.279, 264.281-264.283, and 270.20 for each land treatment unit.

For land treatment units at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in

the engineering report design, construction, and operational information specified in 30 TAC 335.204(b).

For all land treatment units, include in the report the following information.

1. Complete Tables V.F.1 - Land Treatment Units and V.F.2 - Land Treatment Unit Capacity and list the land treatment units covered by this application. List the waste(s) managed in each unit and the rated capacity or size of the unit. If different wastes are placed on separate portions of the land treatment area, each portion is considered a land treatment unit, and requires a separate summary form and engineering report.

   The treatment zone is defined as the soil area of the unsaturated zone of a land treatment unit within which hazardous constituents are degraded, transformed, or immobilized. In this section, specify the depth of the treatment zone. The maximum depth of the treatment zone for new land treatment units must be [40 CFR 264.271(c)]:

   a. No more than 1.5 meters (5 feet) from the surface; and
   b. More than 1 meter (3 feet) above the seasonal high water table.

2. If a land treatment unit will manage ignitable or reactive waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.281.

3. If a land treatment unit will manage incompatible waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.282.

4. If a land treatment unit will manage F020, F021, F022, F023, F026 and F027 waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.283.

5. Describe the land treatment unit. The report shall include all the information requested in this section including drawings. At a minimum, a plan view and cross-section of the unit should be included with the engineering report.

6. Complete Table V.F.3. - Land Treatment Principal Hazardous Constituents and list the wastes for which the treatment demonstration will be made and the principal hazardous constituents in each waste. Specify in the report the data sources to be used to make the demonstration such as laboratory data, field data, operating data, literature, or other.

7. Run-on Diversion

   Describe in detail the measures used to control run-on and divert run-on from the unit. Include all the analyses used to calculate the run-on volumes.

   The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the land treatment unit during peak discharge from a 100-year, 24-hour storm. [30 TAC 335.171(3)]

   Collection holding facilities (e.g., tanks or basins) associated with the run-on control system must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system. [30 TAC 335.171(5)]

8. Run-off Control

Describe in detail the measures used to control the run-off from the unit, and minimize hazardous constituents in the run-off, include all the analyses used to calculate the run-off volumes.

The owner or operator must design, construct, operate and maintain a run-off management system to collect and control at least the water volume resulting from a 100-year, 24-hour storm. [30 TAC 335.171(4)]

Collection and holding facilities (e.g., tanks or basins) associated with run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system. [30 TAC 335.171(5)]

9. Wind Dispersal

The owner or operator of a land treatment unit containing hazardous waste which could be subject to dispersal by wind must cover or otherwise manage the land treatment unit so that wind dispersal is minimized. Describe practices to control wind dispersal (e.g., cover or frequent wetting) of the hazardous waste. [30 TAC 335.171(6)]

10. Treatment Demonstration

A description of the treatment demonstration required under 40 CFR 264.272 and 270.20(a) shall be included with the engineering report. If the owner or operator intends to conduct field tests or laboratory analyses in order to make the demonstration, he must obtain a treatment or disposal permit.

11. The owner or operator must establish an unsaturated zone monitoring program in accordance with 40 CFR 264.278 and a detailed monitoring program must be included in the application.

12. Food Chain Crops [40 CFR 264.276]

Several conditions must be satisfied if food-chain crops are to be grown in or on the treatment zone. A demonstration must be prepared similar to the one described in the Treatment Demonstration and submitted at least 90 days prior to the planting of crops. The demonstration need not be submitted with this application. However, a description of the demonstration must be included as part of the engineering report. This demonstration may be combined with the Treatment Demonstration description, as some of the information required is identical.

G. Landfills – N/A.

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(5), (6), (9), (10), and (12), 335.173, 40 CFR 264.19, 264.300, 264.301, 264.302, 264.303(a), 264.304, 264.309, 264.312, 264.313, 264.315-264.317, and applicable requirements of 270.21. The text of the report should be written to supplement engineering plans, specifications, and test results necessary to provide a detailed description of how the landfill will comply with these standards.

For landfills at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(e).

For all landfills, include in the report the following information.

1. Complete Table V.G.1 - Landfills and list the landfills (and number of cells, if applicable) covered by this application. List the waste(s) managed in each unit and the rated capacity or size of the unit. If wastes are segregated in some manner, list the cell number in which wastes are placed next to each waste type.

2. If a landfill will manage ignitable or reactive waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.312.

3. If a landfill will manage incompatible waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.313.

4. If a landfill will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.317.

5. Describe the landfill. A plan view and cross-section of the landfill should be included with the engineering report. As appropriate, detailed plan, elevation, cross-section of landfill containment facilities shall be included with the report.

6. Containment System

   We suggest that the applicant use available recognized guidance documents, such as EPA publication 530-SW-85-014, which provide design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities, or an equivalent method, such as those found in ASTM publications, and approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

   a. Complete Table V.G.3. - Landfill Liner System and specify the type of liner used for the landfill.

   b. In the engineering report, describe the design, installation, construction, and operation of the liner and leachate collection system. The description must demonstrate that the liner system will prevent discharge to the land, groundwater, and surface water. The following analyses should be included as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

   For artificial liners:

   (1) Seaming method
   (2) Surface preparation method
   (3) Tensile Strength
   (4) Impact Resistance
   (5) Compatibility Demonstration
   (6) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(7) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated waste constituents
(8) Atterberg Limits, % passing a #200 sieve, and Permeability
(9) Moisture Content
(10) Standard Proctor Density, Compaction Data

For Leachate Collection System

For incorporation into the permit, complete Table V.G.4. - Landfill Leachate Collection System used for the landfill.

(11) Capacity of the system:
  (a) rate of leachate removal
  (b) capacity of sumps
  (c) thickness of mounding and maximum hydraulic head
(12) Pipe Material and Strength
(13) Pipe Network Spacing and Grading
(14) Collection Sump(s) Material and Strength
(15) Drainage Media Specifications and Performance
(16) Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.
(17) Compatibility Demonstration

c. State whether the liner system components are chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.
d. Provide a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.
e. Whether the leachate collection components are chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.
f. Provide a Response Action Plan that proposes actions to be taken in the case of exceedance of the landfill Action Leakage Rate. At a minimum the Response Action Plan must include the requirements of 40 CFR 264.304.

7. For Dikes:
   a. Slope Stability Analysis;
   b. Hydrostatic and Hydrodynamic Analyses
   c. Ability to withstand scouring from leaking liner.

8. Landfills that receive waste on or after May 8, 1985 (or for newly-regulated units, the effective date of the new RCRA regulation) into new units and/or lateral expansions or replacements of existing units must meet the minimum technological requirements of the Hazardous and Solid Waste Amendments of 1984, unless an appropriate waiver is granted by the Commission. The owner or operator of each new landfill unit for which the construction commences after January 29, 1992, or each lateral expansion of an existing landfill unit where construction commences after July 29, 1992, or replacement of an existing landfill unit that commence reuse after July 29, 1992 must install two or more liners and leachate collection and removal system unless commission approves

alternate design or operating practices. Plans and specifications for both new and existing landfills must demonstrate conformity with 30 TAC 335.173 and 40 CFR 264.301(c).

9. Site Development Plan

Describe the methods used to deposit waste in the landfill. This description should include rate of waste deposition, waste segregation, average lift size, maximum lift, average cell or trench size, maximum cell or trench size, and other information necessary to depict how the landfill will be developed. Do not include liner or leachate collection system information, closure information, or handling of special wastes. This will be included elsewhere in the report.

10. Run-on Control [30 TAC 335.173(g)]

The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during peak discharge from at least a 100-year, 24-hour storm.

In the engineering report, include the following analyses:

a. Run-on volume and depth calculations from the peak discharge of the 100-year, 24-hour storm; and
b. For ditches on the plant property, back-water calculations.

Collection and holding facilities (e.g., tanks or basins) associated with the run-on control system must be emptied or otherwise managed expeditiously. [30 TAC 335.173(i)]

11. Run-off Control [30 TAC 335.173(h)]

The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control the water volume resulting from a 100-year, 24-hour storm.

Include all analyses used to calculate run-off volumes.

Collection and holding facilities (e.g., tanks or basins) associated with run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system. [30 TAC 335.173(i)]

12. Wind Dispersal [30 TAC 335.173(j)]

If the landfill contains any particulate matter which may be subject to wind dispersal, the owner or operator must cover or otherwise manage the landfill to minimize wind dispersal. Based upon the characteristics of the material to be landfilled describe the likelihood of wind dispersal occurring. Describe in detail any method and/or control mechanism used to prevent wind dispersal.

13. Liquid Waste

If liquid waste or waste containing free liquids is to be stabilized and then placed in the landfill, the procedures used to stabilize the waste must be described in the engineering report. The waste must be treated prior to landfilling using a treatment technology that does not solely involve the use of a material that functions primarily as a sorbent. Provide supporting documentation to verify that an appropriate stabilization procedure is used to comply with 30 TAC 335.175.

14. The Commission may approve an alternate design or operating practice for a landfill if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.301(d)]:
    a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system; and
    b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

15. Exemption from Double-Liner Requirements for Monofills [264.301(e)]

    Owners or operators of hazardous waste monofills will be exempted from the double-liner requirements if the Commission finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics are at least as effective as a double liner in preventing migration of hazardous constituents to the groundwater or surface water. If an exemption is sought, submit detailed plans and engineering and hydrogeologic reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the groundwater or surface water at any future time.

16. Above-grade Benefits

    The engineering report must evaluate the benefits, if any, associated with the construction of the landfill above existing grade at the proposed site, the costs associated with the above-grade construction, and the potential adverse effects, if any, which would be associated with the above-grade construction. [TX. Health and Safety Code 361.108]

H. Incinerators – N/A.

As applicable, provide an engineering report which includes all of the information specified in 30 TAC 305.171-305.176, 40 CFR 264.340, 264.342-264.346, 264.347(a), and 270.19. In addition, the Executive Director may require additional information to address the requirements in 30 TAC 305.50(a)(15).

Note: Please review the information provided in the section above entitled "Engineering Report for Combustion Units" and 40 CFR 270.19(e) to determine applicability of standards and associated requirements in 40 CFR Part 264, Subpart O. If the permit contains risk-based permit conditions, please ensure that all applicable supporting information is included in the engineering report.

1. Complete Table V.H.1 - Incinerators and list the incinerators covered by this application and list the waste managed in each unit.
2. Complete Table V.H.2 - Incinerator Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems for each Incinerator.
3. Complete Table V.H.3 - Maximum Constituents Feed Rate for each Incinerator.
4. Complete Table V.H.4 - Maximum Allowable Emission Rates for each Incinerator.

5. For use during the shakedown period, the trial burn period and the period after completion of the initial trial burn, complete Table V.H.5 - Incinerator Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff-Short-Term Operation for each new or modified Incinerator.

6. If an incinerator will manage reactive or incompatible waste, as indicated on Table V.H.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17.

7. If an incinerator will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.H.1, the DRE requirement is 99.9999%.

8. If a trial burn for a modified unit and Comprehensive Performance Test under 40 CFR Part 63, Subpart EEE (HWC MACT) (for all new and modified units) will be performed, designate one or more of the 40 CFR 261 Appendix VIII organic compounds present in the wastes to be incinerated as Principal Organic Hazardous Constituents (POHCs). Selection will be based upon the degree of difficulty of incineration of these compounds and upon their concentration or mass in the waste feed. These POHCs will be used to determine the destruction and removal efficiency (DRE) specified in the performance standards of 40 CFR 264.343 and HWC MACT. In addition, complete Table V.H.8 - Principal Organic Hazardous Constituents.

9. Submit a Quality Control/Quality Assurance Plan for all sampling, analysis, and monitoring activities which will occur in conjunction with the trial burn.

10. As applicable, facilities with existing permits may request that the Executive Director to address permit conditions that minimize emissions from startup, shutdown, and malfunction events in accordance with the options under 40 CFR 270.235 when requesting the removal of permit conditions that are no longer applicable according to 30 TAC 305.175. Please provide the relevant information needed to process the requested option to minimize emissions identified in 40 CFR 270.235(1)(a)(i)-(iii). (30 TAC 305.176)

I. Boilers and Industrial Furnaces – N/A.

As applicable, provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(13), 305.571-573, 40 CFR 266.100 and 266.102 (as incorporated by reference in 30 TAC 335.221 through 335.225), 266.104-266.112, and 270.22. In addition, the Executive Director may require additional information to address the requirements in 30 TAC 305.50(a)(15).

Note: Please review the information provided in the section above entitled "Engineering Report for Combustion Units" and 40 CFR 270.22 to determine applicability of standards and associated requirements in 40 CFR Part 266, Subpart H. Area sources that elect to comply with the standards and associated requirements of 40 CFR 266.105, 266.106, and 266.107 should address those elected standards and requirements in the engineering report. If the permit contains risk-based permit conditions, please ensure that all applicable supporting information is included in the engineering report.

1. Complete Table V.I.1 - Boilers and Industrial Furnaces and list the boilers and/or industrial furnaces covered by this application to be permitted and list the waste managed in each unit.

2. Complete Table V.I.2 - Boiler and Industrial Furnace Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems for each unit.

3. Complete Table V.I.3 - Maximum Constituent Feed Rate for each unit.

4. Complete Table V.I.4 - Maximum Allowable Emission Rates for each unit.

5. For use during the shakedown period, trial burn period and the period after completion of the initial trial burn, complete Table V.I.5 - Boiler and Industrial Furnace Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems-Short-Term Operation for each new or modified unit.

6. If a boiler or industrial furnace will manage reactive or incompatible waste, as indicated on Table V.I.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17.

7. If a boiler and industrial furnace will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.I.1, the DRE requirement is 99.9999%.

8. If a trial burn for modified units and Comprehensive Performance Test under 40 CFR Part 63, Subpart EEE (HWC MACT) (for all new and modified units) will be performed, designate one or more of the 40 CFR 261 Appendix VIII organic compounds present in the wastes to be incinerated as Principal Organic Hazardous Constituents (POHCs). Selection will be based upon the degree of difficulty of incineration of these compounds and upon their concentration or mass in the waste feed. These POHCs will be used to determine the destruction and removal efficiency (DRE) specified in the performance standards of 40 CFR 266.104 and HWC MACT. In addition, complete Table V.I.8 - Principal Organic Hazardous Constituents.

9. Submit a Quality Control/Quality Assurance Plan for all sampling, analysis, and monitoring activities.

10. As applicable, facilities with existing permits may request that the Executive Director to address permit conditions that minimize emissions from startup, shutdown, and malfunction events in accordance with the options under 40 CFR 270.235 when requesting the removal of permit conditions that are no longer applicable according to 30 TAC 305.571(b). Please provide the relevant information needed to process the requested option to minimize emissions identified in 40 CFR 270.235(1)(a)(i)-(iii). [30 TAC 305.572(a)(6)]

J. Drip Pads – N/A.

Provide an engineering report which includes all of the information specified in 40 CFR 264.570-573 and 270.26.

1. Complete Table V.J.1. - Drip Pads and list the drip pads, covered by this application, to be permitted. List the N.O.R. unit number, the waste managed in each unit, the rated capacity of each unit, and the overall dimensions of the unit (including perimeter curb or berm height) that will be in contact with the waste.

2. For either new drip pads[1] or existing drip pads for which the owner/operator elects to comply with the synthetic liner requirement of 40 CFR 264.573(b), please complete Table V.J.2. - Drip Pad Synthetic Liner System.

3. In the engineering report, describe the design, installation, construction, and operation of the liner and leakage collection system. The description must demonstrate that the liner system will prevent discharge to the land, groundwater, and surface water. The following analyses should be included as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

For artificial liners:

a. Seaming method
b. Surface preparation method
c. Tensile Strength
d. Impact Resistance
e. Compatibility Demonstration
f. Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For Leakage Collection System

g. Capacity of the system:
   (1) rate of leachate removal
   (2) capacity of sumps
   (3) thickness of mounding and maximum hydraulic head
h. Pipe Material and Strength
i. Pipe Network Spacing and Grading
j. Collection Sump(s) Material and Strength
k. Drainage Media Specifications and Performance
l. Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.
m. Compatibility Demonstration

K. Miscellaneous Units – N/A.

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.

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1 New drip pads are those drip pads constructed after 12/06/90 and which had no binding contract for construction. If electing to comply with 40 CFR 264.573(b), the requirement to install a leakage collection system of 40 CFR 264.573(b)(3) applies only to those drip pads constructed after 12/24/92 and which had no binding contract for construction.

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 – N/A.

Provide an engineering report which includes all of the information specified in 40 CFR 264.1100-1101(c)(3), and 264.1101(d)-(e).

Complete Table V.L. - Containment Buildings and list the containment buildings 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 or debris managed in each unit, the rated capacity of each unit, and the overall dimensions of the unit (including containment wall height) that will be in contact with the waste or debris.

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	Southwest Landfarm Plots 612/614	001	Land Treatment Unit	4.96 Acres	Post-Closure Care
2	Northeast LTU 02	007	Land Treatment Unit	1.74 Acres	Closed
3	Southwest Landfarm Plot 615	004	Land Treatment Unit	350' x 250'	Post-Closure Care
4	Northeast LTU 04	022	Land Treatment Unit	200' x 200'	Closed
5	Southwest LTU 617	006	Land Treatment Unit	325' x 225'	Closed
6	Southwest Landfarm Plot 613	003	Land Treatment Unit	3.27 Acres	Closed
7	Southwest Landfarm Plot 616	005	Land Treatment Unit	2.1 Acres	Closed
8	East Guard Basin	032	Surface Impoundment	19 Acres	Inactive (Delay of Closure)
9	East Impoundment Basin	034	Surface Impoundment	59.8 Acres	Inactive (Delay of Closure)

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.

Table V.B. – Container Storage Area – N/A

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)

1 Containers managing ignitable or reactive waste must be located at least 15 meters (50 feet) from the facility's property line.
2 Incompatible waste must be separated from other waste or materials stored nearby in other containers, piles, open tanks, or surface impoundments by means of a dike, berm, wall, or other device.
3 Container Storage Areas need to include in capacity calculations any nonhazardous wastes and universal wastes managed in the unit in addition to hazardous wastes.
4 from Table IV.B, first column

Table V.C. – Tanks and Tank System – N/A

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)

1 from Table IV.B, first column

Table V.D.1. – Surface Impoundments

Permit Unit No.	Surface Impoundment	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions[2]	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)[3]
8	East Guard Basin[3]	032	1021, 1022	6 million gallons	Top: 450' x 215' Bottom: 350' x 115' Depth: 18' Surface Area: 19 Acres Dimensions Approximate	0-5'	Not Required	No
9	East Impoundment Basin[3]	034	1021, 1022	20 million gallons	Top: 560' x 440' Bottom: 470' x 350' Depth: 20' Surface Area: 59.8 Acres Dimensions Approximate	5-8'	Not Required	No

[1]from Table IV.B, first column
[2]Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.
[3]The units are subject to delay of closure and managing only non-hazardous waste.

Table V.D.6. – Surface Impoundment Liner System

Surface Impoundment	Primary Liner			Secondary Liner			Clay Liner		
	Material	Permeability (cm/sec)	Thickness (ft)	Material	Permeability (cm/sec)	Thickness (ft)	Material	Permeability (cm/sec)	Thickness (ft)
East Guard Basin	Native soil	Unknown	Unknown	N/A	N/A	N/A	Clay	3.8 x 10-9	>2
East Impoundment Basin	Unknown	Unknown	Unknown	N/A	N/A	N/A	Clay	Unknown	Unknown

Table V.E.1. – Waste Piles – N/A

Permit Unit No.	Waste Pile	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions[2]	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)

1from Table IV.B, first column
2Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.

Table V.E.3. – Waste Pile Liner System – N/A

Waste Pile	Primary Liner			Secondary Liner			Clay Liner		
	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness

Table V.F.1. – Land Treatment Units

List the land treatment units covered by this application. List the waste managed in each unit and the rated capacity or size of the unit.

Permit Unit No.	Land Treatment Unit	N.O.R. No.	Waste Nos.[1,2]	Dimensions[3]	Distance from lowest liner to groundwater	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)
1	Southwest Plot 612/614 (Closed)[4]	001	3191, 5042, 602H, 6021, 6951	500' x 300' Surface area: 4.96 Acres	26'	No
6	Southwest Plot 613 (Closed) [4]	003	3191, 5042, 602H, 6021, 6951	400' x 300' Surface area: 3.27 Acres	26'	No
7	Southwest Plot 616 (Closed) [4]	005	3191, 5042, 602H, 6021, 6951	325' x 225' Surface area: 2.1 Acres	26'	No

[1]from Table IV.B, first column
[2]If cadmium is present in the waste, state the concentration in the report.
[3]Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.
[4]All permitted Land Treatment Units (LTUs) are closed and no longer accept any wastes.

Table V.F.2. – Land Treatment Unit Capacity

For the land treatment units listed in Table V.F.1, specify the waste treatment capacity.

Permit Unit No.*	Land Treatment Unit	N.O.R. No.	Rated Capacity				Treatment Zone Depth
			Monthly Hydraulic Loading	Monthly Organic Loading	Monthly Inorganic Loading	Cumulative Lifetime Loading	
1	Southwest Plot 612/614[1]	001	N/A	N/A	N/A	N/A	8.4-10
6	Southwest Plot 613[1]	003	N/A	N/A	N/A	N/A	8.5-8.6
7	Southwest Plot 616[1]	005	N/A	N/A	N/A	N/A	7.5-9.0

* This number should match the Permit Unit No. given on Table V.F.1.

1All permitted Land Treatment Units (LTUs) are closed and no longer accept any wastes.

Table V.F.3. – Land Treatment Principal Hazardous Constituents – N/A

List the wastes for which the demonstration will be made and the principal hazardous constituents in each waste. Indicate by an (*) asterisk which constituents will be treated and rendered nonhazardous.

Waste	Hazardous Constituents

Table V.G.1. – Landfills – N/A

Permit Unit No.	Landfill	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions[2]	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)

1from Table IV.B, first column
2Dimensions should be provided as average length, width and depth, also include the surface acreage for the unit.

Table V.G.3. – Landfill Liner System – N/A

Permit Unit No.*	Landfill	Primary Liner			Secondary Liner			Clay Liner		
		Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness

* This number should match the Permit Unit No. given on Table V.G.1.

Table V.G.4. – Landfill Leachate Collection System – N/A

Landfill	Primary Leachate Collection System					Secondary Leachate Collection System				
	Drainage Media	Collection Pipes (including risers)	Filter Fabric	Geofabric	Sump Material	Drainage Media	Collection Pipes (including risers)	Filter Fabric	Geofabric	Sump Material

Table V.H.1. – Incinerators – N/A

List the incinerators covered by this application to be permitted. List the waste managed in each unit and the rated capacity or size of each unit.

Permit Unit No.*	Incinerators	N.O.R. No.	Waste Nos.[1]	Waste Physical Form (Pumpable or Non-pumpable	Reactive, Incompatible, or F020, F021, F022, F023, F026, or F027 Waste

1From the first column of Table IV.B.

* 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.

Table V.H.2. – Incinerator Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems – N/A

[Use a table for each unit and fill in all columns with the appropriate information]

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	Primary Combustion Chamber AWFCO Y/N2	Secondary Combustion Chamber AWFCO Y/N[2]
Operating Parameters						
Maximum Total Hazardous Waste Feed Rate *[Additional hazardous waste feed limits shall be added as determined necessary based upon feed mechanism and/or waste-specific needs]*		*[Volumetric Flow Meter[3] or Mass Flow Meter as applicable to the feed mechanism]*	Feed System	lb/hr	Y	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate *[Not applicable for Tier I or Tier I adjusted metals control limits]*		Volumetric Flow Meter[3] or Mass Flow Meter	Feed System	lb/hr		
Minimum Primary Combustion Chamber Temperature		Thermocouple *[or other device]*	Primary Chamber Exit	lb/hr		
Minimum Secondary Combustion Chamber Temperature		Thermocouple *[or other device]*	Secondary Chamber Exit	°F	Y	Y
Maximum Secondary and/or Primary Combustion Chamber Temperature [Include if using Tier II, III metals controls only]		Thermocouple *[or other device]*	Secondary Chamber Exit	°F	Y	Y
Maximum Flue Gas Temperature at PM Control Device Inlet [Tier II and Tier III Metals only as applicable]		Thermocouple *[or other device]*	At entrance to PM Control	°F	Y	Y
Maximum Combustion Gas Velocity Indicator *[If condition is something other than "maximum combustion gas velocity", write specific name of condition]*					Y	Y
Atomization parameters *[as necessary]*						[as appropriate]
Feed Rates: (Metals, Total Chlorine, and Ash)			Volumetric Flow Meter[3]			

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	Primary Combustion Chamber AWFCO Y/N2	Secondary Combustion Chamber AWFCO Y/N[2]
or Mass Flow Meter	Feed Systems	Limits Specified in Table _____ *[Maximum Constituent Feed Rates]*	N	N		
Secondary Combustion Zone Pressure *[or other method for fugitives monitoring]*				e.g., in. H2O	*[Yes, if neg. pressure is used to control fugitives.]*	*[Yes, if neg. pressure is used to control fugitives.]*
Primary Combustion Zone Pressure *[or other method for fugitives monitoring]*				e.g., in. H2O	*[Yes, if neg. pressure is used to control fugitives.]*	*[Yes, if neg. pressure is used to control fugitives.]*
CEMS Monitoring Parameters						
Stack Oxygen	Continuous	CEMS	Stack	No Limit (for correction to 7% O2)	N	N
Stack CO	Continuous HRA	CEMS	Stack	100 ppmv HRA, 7% O2, dry basis	Y	Y
Stack THC *[If specified in the permit]*	Continuous HRA	CEMS	Stack	20 ppmv HRA, 7% O2, dry basis	Y	Y
APCD Parameters						
Pressure drop across Baghouse *[or fabric filter]*				_____ in. W.C.		
[Wet Scrubbers:]						
Ionizing Wet Scrubber minimum voltage				_____ kilovolts (kV)		
Minimum liquid to flue gas ratio (L/G)				_____ gallons/1000 actual		

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	Primary Combustion Chamber AWFCO Y/N2	Secondary Combustion Chamber AWFCO Y/N[2]
				cubic feet (acf)		
Minimum scrubber blowdown				_____ gallons/min		
Minimum scrubber water pH				_____		
[Venturi Scrubbers:]						
Venturi scrubber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet minute (acfm)		
Minimum differential gas pressure across venturi scrubber				____ in. W.C.		
[Dry Scrubbers:]						
Minimum alkaline reagent *[insert name of reagent here, such as lime]* flow to the dry scrubber				_____ pounds per minute		
Maximum flue gas flow rate				_____acfm		
[Absorbers:]						
Absorber minimum pH of incoming liquid				_____		
Absorber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)		
Other Air Pollution Control Devices permit conditions as necessary						

1Instantaneous as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
Continuous monitor is one which continuously samples or measures the regulated parameter without interruption and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
Hourly Rolling Average (HRA) as defined in 40 CFR 266.102(e)(6)(i)(B).
- For carcinogenic metals and lead feed rates: Instantaneous as defined above or, rolling average as defined in 40 CFR 266.102(e)(6)(ii).
2AWFCO: Automatic Waste Feed Cutoff. For AWFCOs indicated by "Y", the Permit Limit in the table triggers an AWFCO.
3The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.H.3. – Maximum Constituent Feed Rates – N/A

[Multi-chamber Incinerators (e.g., rotary kilns) may need feed rate limits to each combustion chamber.] The total feed rate of constituents to the incinerator(s) shall not exceed the following limitations in grams per hour (g/hr) or tons per year (T/yr), as noted. The metals limitations have been evaluated through the risk assessment. The ash and chlorine limits are based upon testing or regulatory limits.

Constituent	Maximum Allowable Feed Rate In All Feedstreams Hourly Basis (g/hr)	Maximum Allowable Feed Rate In All Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Pumpable Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Feedstreams Annual Basis (T/yr)
Arsenic				
Beryllium				
Cadmium				
Total Chromium				
Antimony				
Barium				
Lead				
Mercury				
Silver				
Thallium				
(Others as Necessary)				
Total Chlorine		Not applicable	Not applicable	Not applicable
Ash to Secondary Combustion Chamber or Other Primary Chamber if Only Pumpable Waste is Fed		Not applicable	Not applicable	Not applicable

1Not applicable for Tier I or Tier I adjusted metals feed rate screening limits.

[Hourly feed rate limits must comply with the requirements of 40 CFR 266.106 for carcinogenic metals and non-carcinogenic metals. As applicable, the feed rate limit for chromium may be specified as hexavalent and total chromium limits.]

Table V.H.4. – Maximum Allowable Emission Rates – N/A

[Use a table for each operating mode as applicable]

Carcinogenic Constituent (Compliance Tier)	Maximum Allowable Emission Rate[1]	Units[2]
Arsenic (Tier___)		g/hr
Beryllium (Tier___)		g/hr
Cadmium (Tier___)		g/hr
Chromium, Total (Tier___)		g/hr
Non-Carcinogenic Constituent(Compliance Tier)	Maximum Allowable Emission Rate1	Units2
Antimony (Tier___)		g/hr
Barium (Tier___)		g/hr
Lead (Tier___)		g/hr
Mercury (Tier___)		g/hr
Silver (Tier___)		g/hr
Thallium (Tier___)		g/hr
Hydrogen Chloride (Tier___)		g/hr
Free Chlorine (Tier___)		g/hr
Particulate Matter	0.08	Grains/dscf

1 Not applicable for Tier I or Tier I adjusted feed rate screening limits.

2g/hr denotes grams per hour. Grains/dscf denotes grains per dry standard cubic foot (standard conditions: 760 mm Hg, 68 °F) after correction to a stack gas concentration of 7% oxygen.

Note: Site-specific dispersion modeling factor x.xxx *[insert dispersion factor for Tier III as applicable]* micrograms per cubic meter per grams per second emission rate.

Table V.H.5. - Incinerator Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems - Short-Term Operation – N/A

[Use this table for each new or modified Incinerator unit and fill in all columns with the appropriate information]

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Operating Parameters								
Maximum Total Hazardous Waste Feed Rate *[Additional hazardous waste feed limits shall be added as determined necessary based upon feed mechanism and/or waste-specific needs]*		*[Volumetric Flow Meter[3] or Mass Flow Meter as applicable to the feed mechanism]*	Feed System	lb/hr			Y	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate *[Not applicable for Tier I or Tier I adjusted metals screening limits]*		Volumetric Flow Meter[3] or Mass Flow Meter	Feed System	lb/hr				
Minimum Primary Combustion Chamber Temperature		Thermocouple *[or other device]*	Primary Chamber Exit	°F			Y	N
Minimum Secondary Combustion Chamber Temperature		Thermocouple *[or other device]*	Secondary Chamber Exit	°F			Y	Y
Maximum Secondary and/or Primary Combustion Chamber Temperature *[Include if using Tier II/ III metals controls.]*		Thermocouple *[or other device]*	Secondary Chamber Exit	°F			Y	Y
Maximum Flue Gas Temperature at PM Control Device Inlet *[Tier II/III metals controls as applicable.]*		Thermocouple *[or other device]*	At entrance to PM Control Device	°F			Y	Y
Maximum Combustion Gas Velocity Indicator *[If condition is something other than "maximum combustion gas velocity", write specific name of condition]*							Y	Y

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Atomization parameters *[as necessary]*								*[as appropriate]*
Feed Rates: (Metals, Total Chlorine, and Ash)		Volumetric Flow Meter[3] or Mass Flow Meter	Feed Systems	Limits Specified in Table ____			N	N
Secondary Combustion Zone Pressure *[or other method for fugitives monitoring]*				e.g., in. H2O			*[Yes, if neg. pressure is used to control fugitives.]*	*[Yes, if neg. pressure is used to control fugitives.]*
Primary Combustion Zone Pressure *[or other method for fugitives monitoring]*				e.g., in. H2O			*[Yes, if neg. pressure is used to control fugitives.]*	N
CEMS Monitoring Parameters								
Stack Oxygen	C	CEMS	Stack	No Limit (for correction to 7% O2)			N	N
Stack CO	C, HRA	CEMS	Stack	100 ppmv HRA, 7% O2, dry basis			Y	Y
Stack THC *[If specified in the permit]*	C, HRA	CEMS		20 ppmv HRA, 7% O2, dry basis			Y	Y
APCD Parameters								
Pressure drop across Baghouse *[or fabric filter]*				_____ in. W.C.				
[Wet Scrubbers:]								

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Ionizing Wet				_____ kilovolts (kV)				
Scrubber minimum voltage								
Minimum liquid to flue gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)				
Minimum scrubber blowdown				_____ gallons/min				
Minimum scrubber water pH				_____				
[Venturi Scrubbers:]								
Venturi scrubber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet minute (acfm)				
Minimum differential gas pressure across venturi scrubber				____ in. W.C.				
[Dry Scrubbers:]								
Minimum alkaline reagent [insert name of reagent here, such as lime] flow to the dry scrubber				_____ pounds per minute				
Maximum flue gas flow rate				_____acfm				
[Absorbers:]								
Absorber minimum pH of incoming liquid				_____				

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Absorber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)				
Other Air Pollution Control Devices permit conditions as necessary								

1 (I) *Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
(C) *Continuous monitor* is one which continuously samples or measures the regulated parameter without interruption, and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
(HRA) *Hourly Rolling Average* as defined in 40 CFR 266.102(e)(6)(ii).
For carcinogenic metals and lead feed rates: *Instantaneous* as defined above or, *Rolling average* as defined in 40 CFR 266.102(e)(6)(ii)
2AWFCO: *Automatic Waste Feed Cutoff*. For AWFCOs indicated by "Y", the Permit Limit in the table triggers an AWFCO.
3The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.H.8 - Principal Organic Hazardous Constituents – N/A

List the wastes for which the trial burn demonstration will be made and the principal organic hazardous constituents (POHCs) in each waste.

Waste	Principal Organic Hazardous Constituents

Table V.I.1. - Boilers/Industrial Furnaces – N/A

Permit Unit No.	Boilers/Industrial Furnaces	N.O.R. No.	Waste Nos.[1]	Waste Physical Form (Pumpable or Non-pumpable)	Reactive, Incompatible, or F020, F021, F022, F023, F026, or F027 Waste

1From the first column of Table IV.B.

* 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.

Table V.I.2. - Boiler/Industrial Furnace Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems – N/A

[Use a table for each unit and fill in all columns with the appropriate information]

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
Operating Parameters					
Maximum Total Hazardous Waste Feed Rate *[Additional hazardous waste feed limits shall be added as determined necessary based upon feed mechanism and/or waste-specific needs]*		*[Volumetric Flow Meter[3] or Mass Flow Meter as applicable to the feed mechanism]*	Feed System	lb/hr	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate *[Not applicable for Tier I or Tier I adjusted metals control limits]*		Volumetric Flow Meter[3] or Mass Flow Meter	Feed System	lb/hr	
Minimum Primary Combustion Chamber Temperature		Thermocouple *[or other device]*	Primary Chamber Exit	°F	Y
Minimum Secondary Combustion Chamber Temperature		Thermocouple *[or other device]*	Secondary Chamber Exit	°F	Y
Maximum Secondary and/or Primary Combustion Chamber Temperature *[Include if using Tier II, III metals controls only]*		Thermocouple *[or other device]*	Secondary Chamber Exit	°F	Y
Maximum Flue Gas Temperature at PM Control Device Inlet *[Tier II and Tier III Metals only as applicable]*		Thermocouple *[or other device]*	At entrance to PM Control Device	°F	Y
Maximum Combustion Gas Velocity Indicator *[If condition is something other than "maximum combustion gas velocity", write specific name of condition]*					Y
Atomization parameters *[as necessary]*					
Feed Rates: (Metals, Total Chlorine, and Ash)		Volumetric Flow Meter[3]			
or Mass Flow Meter	Feed Systems	Limits Specified in Table ____ *[Maximum Constituent Feed Rates]*	N	N	
Secondary Combustion Zone Pressure *[or other method for fugitives monitoring]*				e.g., in. H2O	*[Yes, if neg. pressure is used*

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
					to control fugitives.]
Primary Combustion Zone Pressure *[or other method for fugitives monitoring]*				e.g., in. H2O	*[Yes, if neg. pressure is used to control fugitives.]*
CEMS Monitoring Parameters					
Stack Oxygen	Continuous	CEMS	Stack	No Limit (for correction to 7% O2)	N
Stack CO	Continuous HRA	CEMS	Stack	100 ppmv HRA, 7% O2, dry basis	Y
Stack THC *[If specified in the permit]*	Continuous HRA	CEMS	Stack	20 ppmv HRA, 7% O2, dry basis	Y
APCD Parameters					
Pressure drop across Baghouse *[or fabric filter]*				_____ in. W.C.	
[Wet Scrubbers:]					
Ionizing Wet Scrubber minimum voltage				_____ kilovolts (kV)	
Minimum liquid to flue gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)	
Minimum scrubber blowdown				_____ gallons/min	
Minimum scrubber water pH				_____	
[Venturi Scrubbers:]					
Venturi scrubber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet	

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
				minute (acfm)	
Minimum differential gas pressure across venturi scrubber				____ in. W.C.	
[Dry Scrubbers:]					
Minimum alkaline reagent *[insert name of reagent here, such as lime]* flow to the dry scrubber				_____ pounds per minute	
Maximum flue gas flow rate				_____acfm	
[Absorbers:]					
Absorber minimum pH of incoming liquid				_____	
Absorber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)	
Other Air Pollution Control Devices permit conditions as necessary				_____ gallons/1000 actual cubic feet (acf)	

1 *Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
Continuous monitor is one which continuously samples or measures the regulated parameter without interruption and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
Hourly Rolling Average as defined in 40 CFR 266.102(e)(6)(ii).
For carcinogenic metals and lead feed rates: *Instantaneous* as defined above or, *Rolling average* as defined in 40 CFR 266.102(e)(6)(ii)
2*AWFCO*: *Automatic Waste Feed Cutoff*. For AWFCOs indicated by "Y", the Permit Limit in the table triggers an AWFCO.
3The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.I.3 - Maximum Constituent Feed Rates – N/A

The total feed rate of constituents to the boiler/industrial furnace(s) shall not exceed the following limitations in grams per hour (g/hr) or tons per year (T/yr), as noted. The metals limitations have been evaluated through risk assessment. The ash and chlorine limits are based upon testing or regulatory limits.

Constituent	Maximum Allowable Feed Rate In All Feedstreams Hourly Basis (g/hr)	Maximum Allowable Feed Rate In All Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Pumpable Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Feedstreams Annual Basis (T/yr)
Arsenic				
Beryllium				
Cadmium				
Total Chromium				
Antimony				
Barium				
Lead				
Mercury				
Silver				
Thallium				
(Others as Necessary)				
Total Chlorine		Not applicable	Not applicable	Not applicable
Ash		Not applicable	Not applicable	Not applicable

1Not applicable for Tier I or Tier I adjusted metals feed rate screening limits.

[Hourly feed rate limits must comply with the requirements of 40 CFR 266.106 for carcinogenic metals and non-carcinogenic metals. As applicable, the feed rate limit for chromium may be specified as hexavalent and total chromium limits.]

Table V.I.4. - Maximum Allowable Emission Rates – N/A

[Applicant to use a table for each operating mode as applicable and for each unit]

Carcinogenic Constituent (Compliance Tier)	Maximum Allowable Emission Rate[1]	Units[2]
Arsenic (Tier___)		g/hr
Beryllium (Tier___)		g/hr
Cadmium (Tier___)		g/hr
Chromium, Total (Tier___)		g/hr
Non-Carcinogenic Constituent(Compliance Tier)	Maximum Allowable Emission Rate[1]	Units[2]
Antimony (Tier___)		g/hr
Barium (Tier___)		g/hr
Lead (Tier___)		g/hr
Mercury (Tier___)		g/hr
Silver (Tier___)		g/hr
Thallium (Tier___)		g/hr
Hydrogen Chloride (Tier___)		g/hr
Free Chlorine (Tier___)		g/hr
Particulate Matter	0.08	Grains/dscf

1 Not applicable for Tier I or Tier I adjusted feed rate screening limits.
2 *g/hr* denotes grams per hour. *Grains/dscf* denotes grains per dry standard cubic foot (standard conditions: 760 mm Hg, 68 °F) after correction to a stack gas concentration of 7% oxygen.

Note: Site-specific dispersion modeling factor 'x.xxx *[insert dispersion factor for Tier III as applicable]* micrograms per cubic meter per grams per second emission rate.

Table V.I.5 - Boiler/Industrial Furnace Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems - Short-Term Operation – N/A

[Use this table for each new or modified Boiler/Industrial Furnace unit and fill in all columns with the appropriate information]

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Operating Parameters								
Maximum Total Hazardous Waste Feed Rate *[Additional hazardous waste feed limits shall be added as determined necessary based upon feed mechanism and/or waste-specific needs]*		*[Volumetric Flow Meter[3] or Mass Flow Meter as applicable to the feed mechanism]*	Feed System	lb/hr			Y	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate *[Not applicable for Tier I or Tier I adjusted metals screening limits]*		Volumetric Flow Meter[3] or Mass Flow Meter	Feed System	lb/hr				

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Minimum Primary Combustion Chamber Temperature		Thermocouple *[or other device]*	Primary Chamber Exit	°F			Y	N
Minimum Secondary Combustion Chamber Temperature		Thermocouple *[or other device]*	Secondary Chamber Exit	°F			Y	Y

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Maximum Secondary and/or Primary Combustion Chamber Temperature *[Include if using Tier II/ III metals controls.]*		Thermocouple *[or other device]*	Secondary Chamber Exit	°F			Y	Y
Maximum Flue Gas Temperature at PM Control Device Inlet *[Tier II/III metals controls as applicable.]*		Thermocouple *[or other device]*	At entrance to PM Control Device	°F			Y	Y
Maximum Combustion Gas Velocity Indicator *[If condition is something other than "maximum combustion gas velocity", write specific name of condition]*							Y	Y
Atomization parameters *[as necessary]*								*[as appropriate]*
Feed Rates: (Metals, Total Chlorine, and Ash)		Volumetric Flow Meter[3] or Mass Flow Meter	Feed Systems	Limits Specified in Table ____			N	N

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Secondary Combustion Zone Pressure *[or other method for fugitives monitoring]*				e.g., in. H2O			*[Yes, if neg. pressure is used to control fugitives.]*	*[Yes, if neg. pressure is used to control fugitives.]*
Primary Combustion Zone Pressure *[or other method for fugitives monitoring]*				e.g., in. H2O			*[Yes, if neg. pressure is used to control fugitives.]*	N
CEMS Monitoring Parameters								
Stack Oxygen	C	CEMS	Stack	No Limit (for correction to 7% O2)			N	N
Stack CO	C, HRA	CEMS	Stack	100 ppmv HRA, 7% O2, dry basis			Y	Y
Stack THC *[If specified in the permit]*	C, HRA	CEMS		20 ppmv HRA, 7% O2, dry basis			Y	Y
APCD PARAMETERS								
Pressure drop across Baghouse *[or fabric filter]*				_____ in. W.C.				
[Wet Scrubbers:]								
Ionizing Wet				_____ kilovolts (kV)				
Scrubber minimum voltage								

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post-Trial Burn		
Minimum liquid to flue gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)				
Minimum scrubber blowdown				_____ gallons/min				
Minimum scrubber water pH				_____				
[Venturi Scrubbers:]								
Venturi scrubber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet minute (acfm)				
Minimum differential gas pressure across venturi scrubber				____ in. W.C.				
[Dry Scrubbers:]								
Minimum alkaline reagent [insert name of reagent here, such as lime] flow to the dry scrubber				_____ pounds per minute				
Maximum flue gas flow rate				_____acfm				
[Absorbers:]								
Absorber minimum pH of incoming liquid				_____				
Absorber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)				
Other Air Pollution Control Devices permit conditions as necessary								

1 (I) *Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
(C) *Continuous monitor* is one which continuously samples or measures the regulated parameter without interruption, and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
(HRA) *Hourly Rolling Average* as defined in 40 CFR 266.102(e)(6)(i)(B).
- For carcinogenic metals and lead feed rates: *Instantaneous* as defined above or, *Rolling average* as defined in 40 CFR 266.102(e)(6)(ii).
2 AWFCO: *Automatic Waste Feed Cutoff*. For AWFCOs indicated by "Y", the Permit Limit in the table triggers an AWFCO. During the Trial Burn phase, AWFCOs will be as necessary to ensure protection of human health and the environment.
3 The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.I.8. - Principal Organic Hazardous Constituents – N/A

List the wastes for which the trial burn demonstration will be made and the principal organic hazardous constituents in each waste.

Waste	Principal Organic Hazardous Constituents

Table V.J.1. - Drip Pads – N/A

Permit Unit No.*	Drip Pad	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Overall Dimensions	Collection System Volume

1from Table IV.B, first column

* 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.

Table V.J.2 - Drip Pad Synthetic Liner System – N/A

Drip Pad	Synthetic Liner			Leakage Detection System			Leak Collection System		
	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness

Table V.K. - Miscellaneous Units – N/A

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)

1from Table IV.B, first column

*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.

Table V.L. - Containment Buildings – N/A

Permit Unit No.*	Containment Building	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Overall Dimensions

1 from Table IV.B, first column

*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.

VI. Geology Report

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.

As described throughout this application, none of the permitted hazardous waste management units are being used to manage hazardous wastes. Three of the units are closed, and the other two are managing solid waste in accordance with the delay of closure regulations. Houston Refining LP does not believe there have been any substantial geological changes since the submittal of the Class 1 ED Permit Modification in 2015 which would materially impact the previously submitted information. Therefore, the Geology Report from the 1999 Part B permit application (with revisions submitted in February, 2000) (Attachment VI-1), the Geology Report in the 2006 Compliance Plan application (Attachment VI-2), and the Geology Report in the 2015 Permit Modification (Attachment VI-3) are being re-submitted in their entirety without changes except the removal of Appendix VI-E: Statistical Procedures from the 1999 Geology Report. Note that the sampling procedures described in the 1999 Geology Report and Appendix E of the 2006 Compliance Plan are superseded by the Groundwater Sampling and Analysis Plan included in the 2010 Application and resubmitted in this application as Attachment C to Section XI. Soil core monitoring procedures and geometric frequency for Below Treatment Zone (BTZ) monitoring of the LTUs are presented in the 2015 Geology Report. The next BTZ monitoring event is scheduled for 2027. Additionally, all references in these reports to LYONDELL-CITGO Refining LP (LCR) now refer to Houston Refining LP. The 1999 Geology Report is included as Attachment VI-1, the 2006 report is included as Attachment VI-2 of this application, and the 2015 report is included as Attachment VI-2. Additionally, the 2019 Annual Compliance Monitoring and Corrective Action (CMACA) Data Table 4, included as Attachment XI-3, provide more recent groundwater level measurements.

A. Geology and Topography – Refer to Geology Reports.

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. 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. 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

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. The required number of borings will increase or decrease depending on the heterogeneity of subsurface materials. Locations with stratigraphic complexities such as non-uniform beds which pinch out, vary significantly in thickness, coalesce, or grade into other units, will require a significantly greater degree of subsurface investigation than areas with simple hydrogeologic frameworks. Boring logs should include a detailed description of materials encountered including any discontinuities such as fractures, fissures, slickensides, lenses or seams. Whenever possible, electric logs should be run on each borehole. The hollow stem auger boring method is recommended in those instances where an accurate determination of initial water levels is important. A key explaining both the symbols used on the boring logs and the classification terminology for soil type, consistency, and structure should be provided.

b. Cross-sectional drawings prepared from the borings depicting the generalized soil strata profile at the site. For small waste management areas two cross sections prepared perpendicular to each other will normally suffice.

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 – Refer to Compliance Plan in Section XI.

If past monitoring has shown the presence of hazardous constituents in the groundwater, the owner or operator must submit a Compliance Plan Application with this application. The Compliance Plan Application and instructions can be found in Section XI of this application form.

1. Regional Aquifers

Provide a description of the regional aquifers in the vicinity of the facility based upon available geologic references. The section should provide:

a. Aquifer names and their association with geologic units described in Section VI.A.3.b.;
b. A description of the constituent materials of the aquifer(s);
c. A description of the water-bearing and transmitting properties of the aquifer(s);
d. Whether the aquifers are under water table or artesian conditions;
e. Whether the aquifers are hydraulically connected;
f. A regional water table contour map or potentiometric surface map for each aquifer, if available, from published references;

g. An estimate of the rate of groundwater flow in units of ft/yr;

h. Values for total dissolved solids content of groundwater from the aquifers;

i. Identification of areas of recharge to the aquifers; and

Note: An application for a new hazardous waste surface impoundment, waste pile, land treatment unit, or landfill, which is to be located in the apparent recharge zone of a major or minor aquifer, as designated by the Texas Water Development Board, must include a hydrogeologic report documenting the potential effects, if any, on the regional aquifer in the event of a release from the waste containment system. See the publication entitled Water for Texas, Today and Tomorrow (1990) or subsequent revision (Available at http://www.twdb.texas.gov/waterplanning/swp/1990/index.asp) for more information [30 TAC 305.50(6)]

j. The present use of groundwater withdrawn from aquifers in the vicinity of the facility.

The preparer should update Section III.C.1.e. of the Part A permit application to ensure that all water wells within 1 mile of the property boundaries of the facility have been located. The aquifer(s) yielding water should be identified for each well.

2. Provide groundwater conditions for each land based unit or unit which requires post closure care which includes all the information specified in 30 TAC 335.156-335.167. This discussion should also include:

a. Records of water level measurements in borings. The boring logs prepared in response to Section VI.A.4.a. should be annotated to note the level at which groundwater is first encountered and the level of groundwater after equilibration. Normally a 24-hour period is adequate for equilibration of groundwater but an extended period may be required for saturated clay deposits. This information should also be presented on the cross-sections required in Section VI.A.4.b. and recorded and retained in the facility groundwater monitoring record.

b. Records of historical maximum and minimum static water level measurements in monitor wells. Historic water level measurements made during any previous groundwater monitoring should be presented in a table for each well.

c. Upper and lower limits of the uppermost aquifer and deeper aquifers which are hydraulically interconnected to it beneath the facility boundary. In most cases this identification would include surface contour maps of the top and bottom surfaces. Indicate the typical depth at which groundwater is first encountered.

d. A site specific water table contour map or potentiometric surface map for the uppermost aquifer, and the basis for such identification (the information obtained from hydrogeologic investigations of the facility area). The predicted groundwater flow direction and rate should be indicated.

e. A discussion of the variation of hydraulic gradient across the site, including vertical gradient. Calculations for the maximum, minimum, and average groundwater flow velocities for each aquifer identified should also be provided, including pump test data where appropriate.

f. An analysis of the most likely pathway(s) for pollutant migration in the event that the primary barrier liner system is penetrated.

3. Description of the Detection Monitoring Program

The groundwater monitoring standards apply to owners and operators of facilities that treat, store, or dispose of hazardous waste in surface impoundments, waste piles, land treatment units, landfills, or tanks without satisfactory secondary containment for which a post-closure care plan or permit is required. If a waste management unit meets certain standards it may qualify for an exemption to the groundwater monitoring requirements. An exemption for a unit does not exempt an entire facility. (See the instructions for each type of unit for a specific exemption.) A facility-wide exemption is described in Section VI.C.

It is important to note that even if the proposed program may use the same well system as the present program, the sampling parameters may be different.

a. Include in the design report a description of the proposed detection monitoring program. This description should contain all requirements of 30 TAC 335.163-335.164.
b. Provide a justification for the selected suite of waste specific parameters specified in Table VI.B.3.c. - Groundwater Sample Analysis based on toxicity, mobility, persistence, and concentrations in light and dense non-aqueous phase components of the waste.
c. (Sampling and Analysis Plan) Describe the proposed sampling and analysis methods, as well as statistical comparison procedures to be utilized in evaluating groundwater monitoring data. Note: Methods listed for use in groundwater programs may provide flexibility allowing for updates of the base method. For methods other than the standard acceptable methods, applicant must provide a demonstration that the proposed methods are appropriate for groundwater analysis per 30 TAC 335.163(5).
d. Specify the statistical method and process for determining whether constituent concentrations in groundwater are above background, in accordance with 30 TAC 335.163. Refer to the EPA guidance document entitled Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities – Unified Guidance (March 2009) (document # EPA 530-F-09-020) for recommended methods.

   All data submitted to the TCEQ shall be in a manner consistent with the latest version of the "*Quality Assurance Project Plan for Environmental Monitoring and Measurement Activities Relating to the Resource Conservation Recovery Act and Underground Injection Control*" (TCEQ QAPP) which a can be found on the agency's website.

   Monitoring samples and measurements shall be taken at times and in a manner so as to be representative of the monitored activity. The method used to obtain a representative sample of the material to be analyzed shall be the appropriate method from *Ground Water, Volume II: Methodology*, (document # EPA/625/6-90/016b) or an equivalent method approved by the Executive Director of the TCEQ. Laboratory methods shall be those specified in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846*, 1987, as revised; *Standard Methods for the Examination of Water and Wastewater, Fifteenth Edition*, 1980, and 1981 supplement, or current adopted edition; *RCRA Ground-Water*

Monitoring: Draft Technical Guidance, 1992, *OSWER Directive 9950.1*, or an equivalent method approved in writing prior to use by the Executive Director. [30 TAC Section 305.125(11)(A)]

e. For inclusion into a permit, complete Table VI.B.3.b. - Unit Groundwater Detection Monitoring System to specify the proposed well system for each unit or waste management area which requires groundwater monitoring.

f. For inclusion into a permit, complete Table VI.B.3.c to specify:

   (1) the suite of waste specific parameters (indicator parameters, waste constituents, or reaction products) which will be analyzed at each sampling event for each well or group of wells. These parameters must provide a reliable indication of the presence of hazardous constituents in the groundwater;

   (2) the sampling frequencies and calendar intervals (e.g., monthly; quarterly within the second 30 days of each quarter; semiannually within the first 30 days of the 2nd and 4th quarters, etc.);

   (3) the analytical method and the laboratory predicted detection limit and predicted Practical Quantification Limit (PQL) of the sample preparation and analysis methods for the selected parameters. This detection limit will represent the capability of the sampling and analysis to reliably and accurately determine the presence of the selected parameters in the sample; and

   (4) the concentration limit which will be the basis for determining whether a release has occurred from the waste management unit/area. Concentration limits shall be based on background values for the waste management unit/area, or PQL values developed through laboratory data obtained using practices consistent with the latest version of the TCEQ QAPP. If background values are lower than PQLs, the applicant may choose respective PQLs as concentration limits for hazardous constituents.

g. Submit drawings depicting the monitoring well design, current and proposed.

h. Submit at least one map of the entire facility and additional maps or drawings if necessary on one or more 8.5" x 11" sheets of sufficient scale to show the following in adequate detail:

   (1) Monitoring well locations, current and proposed;
   (2) Soil-pore liquid and core sampling points, current and proposed;
   (3) Waste management unit(s)/area;
   (4) Property boundary;
   (5) Point of compliance;
   (6) Direction of groundwater flow; and
   (7) Extent of any known plume of contamination

i. For the description of site-specific groundwater for inclusion in permit summary documents, please complete the following brief description:

   Groundwater is typically encountered approximately *[###]* feet below grade (*[###]* feet *[above/below]* Mean Sea Level) in the uppermost aquifer. The uppermost aquifer is part of the *[Name]* Formation and consists of *[brief lithological description]* ranging in thickness from *[### to ###]* feet. Groundwater flow is generally toward the *[north/east/south/west].*

C. Exemption from Groundwater Monitoring for an Entire Facility – Refer to Geology Reports.

In accordance with 30 TAC 335.156(b)(4), a waste management facility may be exempt from groundwater monitoring if the owner or operator can demonstrate that there is no potential for migration of liquid from any regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and post-closure care period. This demonstration must be submitted with the permit application, and must be certified by a qualified geologist or geotechnical engineer.

This exemption does not apply to Unsaturated Zone Monitoring. Owners and operators of Land Treatment Units must monitor the unsaturated zone under all circumstances.

The following areas should be addressed in the demonstration, and any predictions must be made on assumptions that maximize the rate of liquid migration:

1. Thickness of soil between the base of the unit and saturated zone;
2. Thickness of saturated zone;
3. Head pressure of the fluids;
4. Properties of the saturated and unsaturated zone (including permeability, effective porosity, and homogeneity), and
5. Total life of facility

The criteria used for the evaluation of this demonstration are more stringent than those used for evaluations of demonstrations submitted prior to permitting. Thus it is necessary for an owner or operator to submit another demonstration even if one was submitted and approved previously.

This type of exemption differs from the exemptions described in Sections V.D. (Surface Impoundments), V.E. (Waste Piles), and V.G. (Landfills). An owner or operator may pursue a facility-wide exemption as well as an exemption for a particular unit, if the owner or operator wishes.

D. Unsaturated Zone Monitoring – Refer to Geology Reports.

This section applies only to facilities which contain land treatment units. Attach any previous monitoring data to the monitoring report. Provide any additional information necessary to demonstrate compliance with 40 CFR 264.278.

1. List all hazardous constituents that have been or will be monitored.
   a. Current parameters.
   b. Proposed parameters.
2. Number of soil-pore liquid sampling points.
   c. Depth of sampling points.
   d. Equipment used for soil pore liquid monitoring.
3. Number of soil core sampling points.
   e. Depth of soil core sampling points.
   f. Indicate on a facility map locations of all sampling points.

Table VI.A.1. – Major Geologic Formations

Names Of Major Geologic Formation(s) Beneath The Facility	Lithology Of The Major Geologic Formation	Formation Thickness (Feet)	Depth To Top Of Formation	
			Feet/MSL(1)	Feet/BGS(2)
1. Recent Alluvium / Fill	Clay, Silt, Sand, Concrete	0-40	19.9*	0
2. Beaumont Formation	Clay, Silt, and Sand	>100	11.9*	10

* - As measured at GMW-46A (RCRA well for the former Northeast Landfarm Unit)

(1) MSL: Mean Sea Level
MLGL: Mean Low-tide Gulf Level
(2) BGS: Below Grade Surface

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

Boring Number	Depth Below Grade	Stratum	USC Symbol	Liquid Limit*	Plasticity Index*	Percent Passing #200 Sieve*	Permeability*	Percent Porosity*
84-1 (620)	2.5-5	Very stiff clay	CH	98	66	97.7	1.9×10^{-8}	49.9
	17.5-20	Very silty fine sand	SM	22	2	45.6	1.3×10^{-5}	38.3
	22.5-25	Hard clay	CH	51	28	99.7	8.0×10^{-9}	38.8
	27.5-30	Silty fine sand	SM	23	3	32.3	1.8×10^{-5}	36.6
	32.5-35	Sandy clay	CL	45	28	83.5	2.6×10^{-8}	35.2
84-2 (618)	2.5-5	Stiff clay	CH	83	57	92.2	1.9×10^{-8}	43.4
	22.5-25	Silty clay to clayey silt	ML-CL	31	14	99.0	2.5×10^{-5}	37.6
	27.5-30	Silty clay with calcareous content	CL	36	19	83.4	7.2×10^{-8}	30.4
	30-32.5	Clayey silt	ML	27	12	77.2	2.3×10^{-7}	35.7
	32.5-35	Sandy clay	CL	38	22	80.6	4.4×10^{-7}	32.6
84-3 (619)	2.5-5	Plastic clay – Fill	CH	61	42	92.7	5.2×10^{-8}	43.1
	17.5-20	Silty fine sand	SM	35	37	76.9	1.1×10^{-5}	44.2
	27.5-30	Sandy clay	CL	42	26	82.7	5.7×10^{-6}	35.2
84-4 (617)	2.5-5	Stiff clay – Fill	CH	75	50	89.6	1.3×10^{-6}	46.4
	17.5-20	Very silty fine sand	SM	23	4	49.3	4.9×10^{-5}	36.3
	27.5-30	Sandy clay	CL	36	19	79.4	4.6×10^{-7}	35.5

Maximum depth: 35 feet below grade
-25 feet above MSL

*For the major soil strata encountered, record the minimum, maximum, and average values of these parameters as applicable.

Table VI.A.4 – Waste Management Area Subsurface Conditions – SWLF Area

Boring Number	Depth Below Grade	Stratum	USC Symbol	Liquid Limit*	Plasticity Index*	Percent Passing #200 Sieve*	Permeability*	Percent Porosity*
84-5	2.5-5	Hard clay	CH	77	53	96.9	4.5×10^{-8}	46.4
	27.5-30	Silty fine sand	SM	23	3	49.3	1.6×10^{-4}	42.9
	33-35	Sandy clay	CL	37	21	68.4	4.2×10^{-8}	35.3
84-6A	2.5-5	Very stiff clay	CH	92	63	96.4	4.7×10^{-8}	50.5
	20-22.5	Silty fine sand	SM	22	1	40.2	1.1×10^{-4}	35.8
	30-32	Sandy clay	CL	36	21	87.6	5.8×10^{-8}	32.9
	50-52.5	Slightly silty clay	CL	47	29	91.5	4.5×10^{-8}	33.4
	70-72.5	Clayey silt	SC-ML	32	15	91.4	1.9×10^{-6}	39.8
	80-82.5	Fine sandy silt	SM	24	4	51.2	2.7×10^{-5}	36.6
	97.5-100	Hard clay – Laminated	CL	42	25	95.9	1.7×10^{-7}	37.9
84-10A	2.5-5	Hard clay	CH	52	33	87.9	6.2×10^{-8}	40.7
	27.5-30	Silty clay	CL	39	21	91.2	5.8×10^{-7}	35.9
	42.5-45	Silty fine sandy clay	SM-CL	31	16	63.7	6.2×10^{-6}	35.4
	57.5-60	Hard clay	CH	53	32	99.3	4.0×10^{-8}	37.0
	68.5-70	Fine sandy silt	SM	29	13	93.6	2.2×10^{-5}	40.2
	82.5-85	Hard clay	CH	70	42	99.4	1.3×10^{-7}	43.6
	97.5-100	Silty clay & fine sand	SC-CL	44	22	92.0	1.4×10^{-7}	45.0
84-11	2.5-5	Silty clay	ML-CL	36	17	82.3	2.4×10^{-7}	42.2
	17.5-20	Silty clay to clayey silt	ML	29	10	85.5	6.3×10^{-6}	36.6
	32.5-35	Silty clay	CL	49	29	92.0	6.2×10^{-7}	33.2

Maximum depth: 100 feet below grade
-90 feet above MSL

*For the major soil strata encountered, record the minimum, maximum, and average values of these parameters as applicable.

Table VI.A.4 – Waste Management Area Subsurface Conditions – EGB and EIB Area

Boring Number	Depth Below Grade	Stratum	USC Symbol	Liquid Limit*	Plasticity Index*	Percent Passing #200 Sieve*	Permeability*	Percent Porosity*
615	2.5-5	Very stiff clay	CH	92	63	96.4	4.7×10^{-8}	50.5
	20-22.5	Silty fine sand	SM	22	1	40.2	1.1×10^{-4}	35.8
	30-32.5	Sandy clay	CL	36	21	87.6	5.8×10^{-8}	32.9
	50-52.5	Slightly silty clay	CL	47	29	91.5	4.5×10^{-8}	33.4
	70-72.5	Clayey silt	SC-ML	32	15	91.4	1.9×10^{-6}	39.8
	80-82.5	Fine sandy silt	SM	24	4	51.2	2.7×10^{-5}	33.6
	97.5-100	Hard clay- Laminated	CL	42	25	95.9	1.7×10^{-7}	37.9
621	2.5-5	Hard clay	CH	52	33	87.9	6.2×10^{-8}	40.7
	27.5-30	Silty clay	CL	39	21	91.2	5.8×10^{-7}	35.9
	42.5-45	Silty fine sandy clay	SM-CL	31	16	63.7	6.2×10^{-6}	35.4
	57.5-60	Hard clay	CH	53	32	99.3	4.0×10^{-8}	37.0
	68.5-70	Fine sandy silt	SM	29	13	93.6	2.2×10^{-5}	40.2
	82.5-85	Hard clay	CH	70	42	99.4	1.3×10^{-7}	43.6
	97.5-100	Silty clay & fine sand	SC-CL	44	22	92.0	1.4×10^{-7}	45.0
611	2.5-5	Silty clay	ML-CL	36	17	82.3	2.4×10^{-7}	42.2
	17.5-20	Silty clay to clayey silt	ML	29	10	85.5	6.3×10^{-6}	36.6
	32.5-35	Silty clay	CL	46	29	92.0	6.2×10^{-7}	33.2

Maximum depth: 100 feet below grade
-90 feet above MSL

*For the major soil strata encountered, record the minimum, maximum, and average values of these parameters as applicable.

Table VI.A.4 – Waste Management Area Subsurface Conditions – EGB and EIB Area

Boring Number	Depth Below Grade	Stratum	USC Symbol	Liquid Limit*	Plasticity Index*	Percent Passing #200 Sieve*	Permeability*	Percent Porosity*
GMW-60	4-6	Clay	CH	84	59	NR	1.0×10^{-9}	NR
	6-8	Clay with silt	CL	84	59	NR	1.6×10^{-9}	NR
	10-12	Sandy clay	CL	84	62	NR	9.2×10^{-9}	NR
	14-16	Clay	CH	44	30	NR	5.1×10^{-9}	NR
	16-18	Fine sandy silt	SM	79	56	70	NR	NR
	18-20	Fine sandy silt	SM	NR	NR	94	NR	NR
	20-22	Clay with silty sand pockets	CL	65	46	NR	4.7×10^{-9}	NR
	22-24	Clay with calcareous nodules and deposits	CH	66	46	NR	1.2×10^{-8}	NR
	26-28	Silty clay	CL	NR	NR	78	NR	NR
GMW-61	1-2	Clay with silt pockets and iron nodules	CL	60	44	NR	5.4×10^{-9}	NR
	16-18	Silty clay	CL	32	18	NR	4.6×10^{-8}	NR
	24-26	Silty clay	CL	NR	NR	52	NR	NR
	32-34	Silty fine sand	SM	NR	NR	25	NR	NR
	35-36	Clay	CH	72	47	NR	3.2×10^{-9}	NR
GMW-64	6-8	Silty sand	SM	NR	NR	24	NR	NR
	26-28	Fine sandy silt	SM	NR	NR	71	NR	NR

Maximum depth: 36 feet below grade
-26 feet above MSL

*For the major soil strata encountered, record the minimum, maximum, and average values of these parameters as applicable.

Table VI.A.4 – Waste Management Area Subsurface Conditions – EGB and EIB Area

Boring Number	Depth Below Grade	Stratum	USC Symbol	Liquid Limit*	Plasticity Index*	Percent Passing #200 Sieve*	Permeability*	Percent Porosity*
	28-30	Clay with silt pockets and iron nodules	CL	46	33	NR	1.7×10^{-8}	NR
GMW-66	9-11	Silty fine sand	SM	NR	NR	21	NR	NR
	24-26	Fine sandy silt	SM	NR	NR	57	NR	NR
	28-30	Fine sandy silt	SM	NR	NR	47	NR	NR
GMW-66	31-32	Clay	CH	37	20	NR	1.9×10^{-11}	NR
GMW-67	12-14	Silty fine sand	SM	NR	NR	58	NR	NR
GMW-68	16-18	Fine sandy silt	SM	NR	NR	50	NR	NR
GMW-69	20-22	Silty fine sand	SM	NR	NR	31	NR	NR
RFI GMW-56	2.0	Fat clay with sand	CH	NR	NR	78	1.2×10^{-7}	NR
RFI GMW-58C	6.0	Silt with sand	ML	NR	NR	83	1.81×10^{-7}	NR
	10.0	Lean clay	CL	NR	NR	88	7.06×10^{-8}	NR
RFI GMW-64	21.0	Lean clay with sand	CL	NR	NR	78	1.34×10^{-7}	NR
RFI GMW-67	4.5	Lean clay with sand	CL	NR	NR	85	1.4×10^{-7}	NR
	7.0	Silty lean clay with sand	CL-ML	NR	NR	81	1.7×10^{-7}	NR
RFI GMW-68	3.5	Lean clay	CL	NR	NR	91	2.3×10^{-7}	NR
RFI GMW-74	30.0	Fat clay	CH	NR	NR	91	3.3×10^{-9}	NR

Maximum depth: 32 feet below grade
-22 feet above MSL

*For the major soil strata encountered, record the minimum, maximum, and average values of these parameters as applicable.

Table VI.B.3.b. – Unit Groundwater Detection Monitoring Systems

Waste Management Unit/Area Name[1] Southwest Landfarm (SWLF) Units 612/614, 613, 616					
Well Number(s):	GMW-32	GMW-33	GMW-48	GMW-49	GMW-50
Hydrogeologic Unit Monitored	The first shallow water-bearing saturated zone				
Type (e.g., point of compliance, background, observation, etc.)	POC	POC	POC	POC	POC
Up or Down Gradient	Down	Down	Down	Down	Down
Casing Diameter and Material	4” PVC	4” PVC	4” PVC	4” PVC	4” PVC
Screen Diameter and Material	4” PVC	4” PVC	4” PVC	4” PVC	4” PVC
Screen Slot Size (in.)	0.020	0.020	0.010	0.010	0.010
Top of Casing Elevation (Ft, MLGL or MSL)	27.30	28.95	32.35	24.23	28.83
Grade or Surface Elevation (Ft, MLGL or MSL)	24.71	26.53	30.28	21.98	27.0
Well Depth (Ft, Below Grade Surface *[BGS]*)	21.0	30.0	42.5	24.5	29.3
Well Depth (Ft, Below Top of Casing *[BTOC]*)	23.59	32.42	44.57	26.75	31.13
Screen Interval From(Ft, BGS) To(Ft, BGS)	16.0 - 21.0	25.0 - 30.0	30.4 - 39.4	14.6 - 21.5	16.1 -26.1
Screen Interval From(Ft, BTOC) To(Ft, BTOC)	18.6-23.6	27.4-32.4	32.5-41.5	16.9-23.8	17.9-27.9

Facility Coordinates (e.g., lat./long. or company coordinates) North	559.30	413.30	432.81	488.53	353.70
West	6574.30	6293.20	6092.53	6678.53	7182.19

1From Tables in Section V.
MSL: Mean Sea Level; *MLGL*: Mean Low-tide Gulf Level; *BGS*: Below Grade Surface; *BTOC*: Below Top of Casing
2The Permitted Northeast Landfarm (NELF) Units 2 and 4, and Southwest Landfarm (SWLF) Units 615 and 617 are closed to Remedy Standard A. Background well numbers GMW-02, GMW-29, and point of compliance well number GMW-51 in association with SWLF 615 and SWLF 617 are no longer necessary for detection monitoring requirements of this permit.
3Background and point of compliance well numbers GMW-40, GMW-42, GMW-44, GMW-45, GMW-46A, and GMW-47A in association with NELF 2 and NELF 4 are deleted and are no longer necessary for detection monitoring requirements of this permit.

Table VI.B.3.b. – Unit Groundwater Detection Monitoring Systems

Waste Management Unit/Area Name[1] East Guard Basin (EGB)				
Well Number(s):	GMW-61	GMW-64	GMW-65	GMW-66
Hydrogeologic Unit Monitored	The first shallow water-bearing saturated zone			
Type (e.g., point of compliance, background, observation, etc.)	BG	POC	POC	POC
Up or Down Gradient	Up	Down	Down	Down
Casing Diameter and Material	4” PVC	4” PVC	4” PVC	4” PVC
Screen Diameter and Material	4” PVC	4” PVC	4” PVC	4” PVC
Screen Slot Size (in.)	0.010	0.010	0.010	0.010
Top of Casing Elevation (Ft, MLGL or MSL)	20.10	20.80	20.39	20.05
Grade or Surface Elevation (Ft, MLGL or MSL)	17.84	18.55	18.51	18.15
Well Depth (Ft, Below Grade Surface *[BGS]*)	30.64	35.00	32.50	32.00
Well Depth (Ft, Below Top of Casing *[BTOC]*)	32.90	37.25	34.38	33.90
Screen Interval From(Ft, BGS) To(Ft, BGS)	20.5-30.5	23.5-33.5	22.5-32.5	21.0-31.5
Screen Interval From(Ft, BTOC) To(Ft, BTOC)	22.8-32.8	25.8-35.8	24.4-34.4	22.9-33.4

Facility Coordinates (e.g., lat./long. or company coordinates)	North	N29° 43' 21.45''	N29° 43' 24.18''	N29° 43' 23.72''	N29°43' 23.04''
	West	W95° 13' 45.39''	W95° 13' 45.45''	W95° 13' 46.69''	W95° 13' 48.44''

1From Tables in Section V.
MSL: Mean Sea Level; *MLGL*: Mean Low-tide Gulf Level; *BGS*: Below Grade Surface; *BTOC*: Below Top of Casing
2The Permitted Northeast Landfarm (NELF) Units 2 and 4, and Southwest Landfarm (SWLF) Units 615 and 617 are closed to Remedy Standard A. Background well numbers GMW-02, GMW-29, and point of compliance well number GMW-51 in association with SWLF 615 and SWLF 617 are no longer necessary for detection monitoring requirements of this permit.
3Background and point of compliance well numbers GMW-40, GMW-42, GMW-44, GMW-45, GMW-46A, and GMW-47A in association with NELF 2 and NELF 4 are deleted and are no longer necessary for detection monitoring requirements of this permit.

Table VI.B.3.b. – Unit Groundwater Detection Monitoring Systems

Waste Management Unit/Area Name[1] East Impoundment Basin (EIB)				
Well Number(s):	GMW-60	GMW-61	GMW-62	GMW-63
Hydrogeologic Unit Monitored	The first shallow water-bearing saturated zone			
Type (e.g., point of compliance, background, observation, etc.)	BG	POC	POC	POC
Up or Down Gradient	Up	Down	Down	Down
Casing Diameter and Material	4” PVC	4” PVC	4” PVC	4” PVC
Screen Diameter and Material	4” PVC	4” PVC	4” PVC	4” PVC
Screen Slot Size (in.)	0.010	0.010	0.010	0.010
Top of Casing Elevation (Ft, MLGL or MSL)	25.60	20.10	16.97	17.07
Grade or Surface Elevation (Ft, MLGL or MSL)	22.80	17.84	16.07	15.04
Well Depth (Ft, Below Grade Surface *[BGS]*)	30.65	30.64	26.0	24.0
Well Depth (Ft, Below Top of Casing *[BTOC]*)	33.45	32.90	26.90	26.03
Screen Interval From(Ft, BGS) To(Ft, BGS)	26.5-32	20.5-30.5	16-23.5	15.75-23.25
Screen Interval From(Ft, BTOC) To(Ft, BTOC)	29.3-34.8	22.76-32.76	16.9-24.4	17.78-25.28

Facility Coordinates (e.g., lat./long. or company coordinates)	North	N29° 43' 14.75''	N29° 43' 21.45''	N29° 43' 20.05''	N29° 43' 18.82''
	West	W95° 13' 44.45''	W95° 13' 45.39''	W95° 13' 47.40''	W95° 13' 48.13''

1From Tables in Section V.
MSL: Mean Sea Level; *MLGL*: Mean Low-tide Gulf Level; *BGS*: Below Grade Surface; *BTOC*: Below Top of Casing
2The Permitted Northeast Landfarm (NELF) Units 2 and 4, and Southwest Landfarm (SWLF) Units 615 and 617 are closed to Remedy Standard A. Background well numbers GMW-02, GMW-29, and point of compliance well number GMW-51 in association with SWLF 615 and SWLF 617 are no longer necessary for detection monitoring requirements of this permit.
3Background and point of compliance well numbers GMW-40, GMW-42, GMW-44, GMW-45, GMW-46A, and GMW-47A in association with NELF 2 and NELF 4 are deleted and are no longer necessary for detection monitoring requirements of this permit.

Table VI.B.3.c. – Groundwater Detection Monitoring Parameters

Unit/Waste Management Area: Southwest Landfarm (SWLF)

Well No(s): GMW-32, GMW-33, GMW-48, GMW-49 and GMW-50

Parameter	Sampling Frequency	Analytical Method	Method Detection Limit (MDL) or Method Quantification Limit (MQL) Value, (units), MDL or MQL[2]	Concentration Limit[1]
Toluene	Semi-Annual	EPA Method SW-846 8260B	5 µg/L	5 µg/L
Ethylbenzene	Semi-Annual	EPA Method SW-846 8260B	5 µg/L	5 µg/L
Phenol	Semi-Annual	EPA Method SW-846 8270C	10 µg/L	10 µg/L
Naphthalene	Semi-Annual	EPA Method SW-846 8270C	10 µg/L	10 µg/L
1-Methylnaphthlene	Semi-Annual	EPA Method SW-846 8270C	10 µg/L	10 µg/L
Lead	Semi-Annual	EPA Method SW-846 6010B	0.01 mg/L	0.01 mg/L
Chromium	Semi-Annual	EPA Method SW-846 6010B	0.06 mg/L	0.06 mg/L

1 The concentration limit is the basis for determining whether a release has occurred from the waste management unit/area.

2 a. Enter the laboratory expected *Method Detection Limit* if determination of *Statistically Significant Increase* (SSI) occurrence is based on detection of the presence of the constituent of concern in the sample.

2 b. Enter the laboratory expected Method Quantification Limit if determination of SSI is based on statistical analysis of detection monitoring data or direct comparison to a limit value.

This should be based on the laboratory's minimum expected level of performance. Please designate which type of limit has been entered for each constituent, with its value and units.

Table VI.B.3.c. – Groundwater Detection Monitoring Parameters

Unit/Waste Management Area: East Guard Basin (EGB)

Well No(s): GMW-61, GMW-64, GMW-65, and GMW-66

Parameter	Sampling Frequency	Analytical Method	Method Detection Limit (MDL) or Method Quantification Limit (MQL) Value, (units), MDL or MQL[2]	Concentration Limit[1]
Benzene	Semi-Annual	EPA Method SW-846 8260B	5 µg/L	5 µg/L

1 The concentration limit is the basis for determining whether a release has occurred from the waste management unit/area.

2 a. Enter the laboratory expected *Method Detection Limit* if determination of *Statistically Significant Increase* (SSI) occurrence is based on detection of the presence of the constituent of concern in the sample.

2 b. Enter the laboratory expected Method Quantification Limit if determination of SSI is based on statistical analysis of detection monitoring data or direct comparison to a limit value.

This should be based on the laboratory's minimum expected level of performance. Please designate which type of limit has been entered for each constituent, with its value and units.

Table VI.B.3.c. – Groundwater Detection Monitoring Parameters

Unit/Waste Management Area: East Impoundment Basin (EIB)

Well No(s): GMW-60, GMW-61, GMW-62, and GMW-63

Parameter	Sampling Frequency	Analytical Method	Method Detection Limit (MDL) or Method Quantification Limit (MQL) Value, (units), MDL or MQL[2]	Concentration Limit[1]
Benzene	Semi-Annual	EPA Method SW-846 8260B	5 µg/L	5 µg/L

1 The concentration limit is the basis for determining whether a release has occurred from the waste management unit/area.

2 a. Enter the laboratory expected *Method Detection Limit* if determination of *Statistically Significant Increase* (SSI) occurrence is based on detection of the presence of the constituent of concern in the sample.

2 b. Enter the laboratory expected Method Quantification Limit if determination of SSI is based on statistical analysis of detection monitoring data or direct comparison to a limit value.

This should be based on the laboratory's minimum expected level of performance. Please designate which type of limit has been entered for each constituent, with its value and units.

VII. Closure and Post-Closure Plans

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.

See Attachment VII-1 (Closure Plan), VII-2 (Deed Recordation), and Tables VII.A, VII.B, VII.D, VII.E.1, and VII.E.2. Attachment VII-2 includes a Notice of Land Use Restriction following the closure of Southwest Landfarm Plots 615, 616, and 617 and Northeast Landfarm Plot 2. At the time these units were closed, there was no local zoning authority or procedure for the local government to receive survey plats in accordance with 40 CFR 264.116. Deed Recordation for the BIOX Unit, the Oily Waste Retention Basin and the West Impoundment Basin are also included in Attachment VII.B.

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

This section applies to owners or operators of all hazardous waste disposal facilities. This section also applies to certain waste piles, tanks and surface impoundments from which the owner or operator intends to remove wastes at closure but which are required to have contingent post-closure plans.

Post-closure care of each hazardous waste management unit must continue for 30 years after the date of completing closure of the unit and must consist of monitoring and reporting of the groundwater monitoring systems in addition to the maintenance and monitoring of waste containment systems. Continuation of certain security requirements may be necessary after the date of closure. Post-closure use of property on

or in which hazardous waste remains after closure must never be allowed to disrupt the integrity of the containment system. In addition, submit the following information.

1. The post-closure care plan for a landfill or of a surface impoundment, waste pile, miscellaneous unit, or tank system closed with wastes or waste constituents left in place, or closed under a contingent closure plan, must demonstrate compliance with 30 TAC 335.174(b).
2. The name, address, and phone number of the person or office to contact about the disposal facility during the post-closure period; and
3. A discussion of the future use of the land associated with each unit.
4. For landfills, surface impoundments, waste piles, and land treatment areas closed under interim status, submit the required documentation of 40 CFR 270.14(b)(14).
5. Landfills, surface impoundments, waste piles and land treatment areas that received hazardous wastes after July 26, 1982 or for which closure was certified after January 26, 1983 must be included in post-closure care plans unless they have been determined to have closed by removal equivalent to the closure standards in 40 CFR 264 Subpart G. If such a demonstration has been made pursuant to 40 CFR 270.1(c)(5), but an equivalency determination has not been made, please submit a copy of the demonstration documentation. If an equivalency determination has been made pursuant to 40 CFR 270.1(c)(6), applicant should submit a copy of the determination. Complete Table VII.C.5. - Land-Based Units Closed Under Interim Status for all land based units closed under interim status.

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

This section regarding post-closure cost estimate applies to owners or operators of all hazardous waste disposal facilities, except state and federal agencies, and certain waste piles, tank systems, and surface impoundments from which the owner or operator intends to remove wastes at closure, but which are required to have contingent closure and post-closure plans. A detailed estimate, in current dollars, of the annual cost of monitoring and maintenance of the facility in accordance with the applicable post-closure regulations must be included in the report. The TCEQ has published Technical Guideline No. 10 for calculating post-closure costs, which should be consulted. Costs should be developed in detail for 30 years of post-closure care activities to be conducted by a third party, for each applicable unit.

1. The applicant should submit details of item costs and number of each item for off-site disposal of leachate and bailed monitor well water, labor and supervision, monitor well sampling and analyses, inspection and repair of the cap(s), mowing and re-seeding of the vegetative cover, maintaining site security, etc. Provide an itemized cost estimate on Table VII.D. - Unit Post-Closure Cost Estimate for complete, third party permitted facility post-closure care.
2. 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. Total annual cost of post-closure care for the facility including costs of contingent post-closure care should be multiplied by 30 years.

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.

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]
Pumps and excavation equipment	Pressure wash	VAC truck/off-site disposal
Concrete or asphalt sidewalls	Pressure wash	Residues vacuumed; Concrete disposal in-place; Asphalt disposal off-site or in-place
Clay bottom	Excavation	Disposal off-site
	Thermal desorption	Replace in basin
	Biodegradation	Not needed
	Stabilize	Not needed

1Applicants may list more than one appropriate method.

Table VII.B. - Unit Closure Cost Estimate

Task	Cost
East Guard Basin	
Wastewater Treatment	$6,129
Backfill	$1,730,591
Clay Cap Construction	$245,206
Liner Installation	$174,474
Fill for Cap	$132,034
Top Soil	$52,817
Vegetation, Seeding	$9,430
Final Certification Report	$7,073
Subtotal	$2,357,754
Contingency (10% minimum)	$235,775
Total Unit Closure Cost	$2,594,000 (2020)
East Impoundment Basin	
Wastewater Treatment	$22,066
Cut Dike Walls	$351,098
Backfill	$2,165,426
Clay Cap Construction	$373,936
Liner Installation	$541,937
Fill for Cap	$283,355
Top Soil	$104,516
Vegetation, Seeding	$20,902
Final Certification Report	$7,742
Subtotal	$3,870,978
Contingency (10% minimum)	$387,098
Total Unit Closure Cost	$4,258,0700 (2020)
Total Permitted Facility Closure Cost *(all unit costs combined)*	$6,852,000 (2020)

Table VII.C.5. - Land-Based Units Closed Under Interim Status – N/A

N.O.R. Unit #	Unit Description[1,2]	Date of Receipt of Last Waste[3]	Date of Closure Certification[3]

1Indicates a unit for which a 40 CFR 264 closure equivalency determination has been requested pursuant to 40 CFR 270.1(c)(5).
2Indicates a unit for which a 40 CFR 264 closure equivalency determination has been made pursuant to 40 CFR 270.1(c)(6).
3Enter month, day, and year.

Table VII.D. - Unit Post-Closure Cost Estimate

Task	Cost
Southwest Landfarm[a]	
Landfarm inspection	$1,089
Landfarm maintenance	$2,287
Landfarm sampling, analysis, and reporting for four events during post-closure period (soil sampling geometric frequency cost)	$2,170
Landfarm semiannual sampling, analysis, and reporting (annual RCRA groundwater sampling cost)	$4,564
Subtotal	$10,110
Contingency (10% minimum)	$1,011
Total Unit Post-Closure Care Cost x 25 yrs.	$278,000 (2020)
East Guard Basin	
Inspection	$349
Maintenance - labor	$699
Maintenance - materials	$440
Maintenance – surveying benchmarks	$440
Sampling	$769
Analyses	$9,055
Well replacement	$2,379
Administration cost	$2,825
Subtotal	$16,956
Contingency (10% minimum)	$1,696
Total Unit Post-Closure Care Cost x 30 yrs. (or other post-closure care period)	$560,000 (2020)
East Impoundment Basin	
Inspection	$914
Maintenance - labor	$1,817
Maintenance - materials	$1,152
Maintenance – surveying benchmarks	$1,147

Task	Cost
Sampling	$765
Analyses	$8145
Well replacement	$9,025
Administration cost	$3,451
Subtotal	$26,416
Contingency (10% minimum)	$2,642
Total Unit Post-Closure Care Cost x 30 yrs. (or other post-closure care period)	$872,000 (2020)
Total Permitted Facility Closure Cost *(all unit costs combined)*	$1,710,000 (2020)

[a]SWLF Plots 612/614, 613, and 616 were closed in 2015

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

Existing Unit Closure Cost Estimate	
East Guard Basin	$2,594,000
East Impoundment Basin	$4,258,000
Total Existing Unit Closure Cost Estimate	$6,852,000 (in 2020 Dollar)[1]

Proposed Unit Closure Cost Estimate	
Unit	Cost

1 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.

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

Existing Unit Post-Closure Cost Estimate	
Southwest Landfarm	$267,000
East Guard Basin	$560,000
East Impoundment Basin	$872,000
Total Existing Unit Post-Closure Cost Estimate	$1,699,000 (in 2020 Dollars)[1]

Proposed Unit Post-Closure Cost Estimate	
Unit	Cost

1 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.

VIII. Financial Assurance

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.

Houston Refining LP has provided a signed statement from an authorized signatory regarding current financial assurance for the closure of the hazardous waste management units in Attachment VIII-1. A copy of the financial mechanism is also included in this attachment.

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.

Houston Refining LP has provided a signed statement from an authorized signatory regarding current financial assurance for the post-closure care of the hazardous waste management units in Attachment VIII-1. A copy of the financial mechanism is also included in this attachment.

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.

N/A.

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.

Houston Refining LP has provided a signed statement from an authorized signatory regarding sudden and non-sudden liability coverage of the facility in Attachment VIII-1. A copy of the mechanism is also included in this attachment.

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).

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

Houston Refining LP has provided signed statements from an authorized signatory regarding established financial assurance for the operation and closure of the hazardous waste management units and liability coverage of the facility in Attachment VIII-1. A copy of the financial mechanism is also included in this attachment. Besides closure activities, no expansion or new construction related to the hazardous waste management units is planned.

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 – N/A

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. (i.e. 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 (i.e. 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 (i.e. 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 (i.e. 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 attached letter with applicable information inserted into the parentheses. *Note that additional information must be provided if requested by TCEQ*.

November 3, 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 Houston Refining LP

Permit Renewal
Hazardous Waste Permit/Compliance Plan No. 50106
Industrial Solid Waste Registration No. 30092
EPA ID No. TXD082688979
RN100218130; CN601313083

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 Houston Refining LP has sufficient financial resources.

In keeping with the above law and rule requirements I hereby certify that Houston Refining LP 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.

Houston Refining LP currently provides a signed statement financial assurance mechanism as set out in 30 TAC, Chapter 37, Subchapter C to meet Houston Refining LP's financial assurance obligations.

I am authorized to make these statements on behalf of Houston Refining LP. I understand that the TCEQ may request additional information as part of their review.

Sincerely,

Greg Neverman

Houston Refining Site Manager

[Note: signatory must be person whose title and job responsibilities meet the requirements in 30 TAC § 305.44]

Table VIII.B - Estimated Capital Costs – N/A

	Estimated Capital Costs
Site preparation, fencing, paving, curbing, lighting, roadways:	$_____
Foundations, buildings, other structures, utilities and connections, drainage system, HVAC system, electrical system, wastewater system:	$_____
Process and control equipment:	$_____
Auxiliary equipment, including but not limited to exhaust hoods fans, ducting, pumps, piping, conveyors, stacks, storage tanks, process tanks, waste disposal facilities, pollution control equipment, and fire protection system:	$_____
Process integration and instrumentation:	$_____
Emergency response equipment:	$_____
Transportation equipment:	$_____
Office equipment:	$_____
Engineering design, supervision, overhead:	$_____
Construction expenses including permits, insurance, temporary facilities, and clean-up	$_____
Contractor's fees and overhead	$_____
Contingency	$_____
Total	$_____

The estimates listed above were derived from the following sources:

IX. Releases from Solid Waste Units and Corrective Action

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]. 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.

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

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2For 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).

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.

Releases and corrective action from solid waste management units and from the RCRA impoundments have been addressed in a RCRA Facility Investigation (RFI),

Baseline Risk Assessment, and Corrective Measures Study (CMS). Updated Preliminary Review Checklists are included in Attachment B.IX.

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.

Instructions for Preliminary Review Facility Checklist

Fill out the information block at the top of the page (the reviewer space should remain blank for the TCEQ authorized agent).

Facility:_____ City:_____

ISW Reg. No:_____ Date:_____

Permit No:_____ Reviewer:_____

EPA ID No:_____

Waste Management Units:

RCRA Regulated Units: List all units that received hazardous wastes after July 26, 1982 or for which closure was certified after January 26, 1983 with the appropriate information under the three provided column headings as explained in the Unit Checklist instructions. [40 CFR 264.90(a)(2)]

Solid Waste Management Units, and/or Areas of Concern (AOC):

List all remaining SWMUs and/or AOCs.

Reviewed Documents:

Enter the appropriate information for sub-items 1-6, including document dates (item 6 should include pertinent company files).

Summary:

Provide an overall summary of the results of this Preliminary Review noting units and areas of concern.

Recommended Actions:

Summarize the Unit Checklist Recommended Actions and list those units recommended for further investigation including appropriate Unit No.

Provide the following information for EACH unit or area of concern:

A. Waste Management Unit: Enter SWMU and/or AOC name and facility designated number (e.g., Tank 101)

B. N.O.R. No.: enter TCEQ Notice of Registration (N.O.R.) Number or, if unassigned, a letter designation (i.e., A-Z)

C. Description: enter type of unit (e.g., above-grade processing tank) and Process Code as listed below:

Instructions for Preliminary Review Unit Checklist (Continued)

Process Types Table

Process Code	Unit Type	Process Code	Unit Type
Disposal		Miscellaneous (Subpart X)	
D79	Injection Well	X01	Open Burning/Open Detonation
D80	Landfill	X02	Mechanical Processing
D81	Land Application	X03	Thermal Unit
D83	Surface Impoundment - Disposal	X04	Geologic Repository
D99	Other Disposal	X99	Other Subpart X
Storage			
S01	Container	S05	Drip Pad
S02	Tank - Storage	S06	Containment Building - Storage
S03	Waste Pile	S99	Other Storage
S04	Surface Impoundment - Storage		
Treatment			
T01	Tank - Treatment	T86	Blast Furnace
T02	Surface Impoundment - Treatment	T87	Smelting, Melting, or Refining Furnace
T03	Incinerator	T88	Titanium Dioxide Chloride Process Oxidation Reactor
T04	Other Treatment	T89	Methane Reforming Furnace
T80	Boiler	T90	Pulping Liquor Recovery Furnace
T81	Cement Kiln	T91	Combustion Device Used in Recovery of Sulfur Values from Spent Sulfuric Acid
T82	Lime Kiln	T92	Halogen Acid Furnace
T83	Aggregate Kiln	T93	Other Industrial Furnaces Listed in 40 CFR 260.10
T84	Phosphate Kiln	T94	Containment Building - Treatment
T85	Coke Oven		

D. Dates of Operation:

Enter the date the unit was placed into service and any other dates the unit changed status (active, inactive, closed, post-closure) with the appropriate status designation.

E. Wastes Managed:

List all solid wastes ever managed in the unit and include the TCEQ NoR waste #, EPA Hazard Codes, and EPA waste codes. For each waste, list any hazardous constituent listed in 40 CFR 261 Appendix VIII and 264 Appendix IX, as appropriate.

F. Evidence of Release:

Completely describe the release, including time frame, waste amount, to what media, and any corrective measures taken.

G. Pollutant Dispersal Pathways:

Completely describe the possible and actual run-off pathways (i.e., to which tributary, creek, river, and bay or through subsoil to which aquifer with groundwater flow gradient, speed, and direction and any discharge point).

H. Summary:

Provide complete unit description including unit type, elements of construction, location, age, condition, dimensions, size, capacity (i.e., gallons, square feet, cubic yards, etc.), and potential for release.

I. Recommended Action:

Recommend No Further Action, Stabilization (interim measures), or Further Investigation and justify. Note, corrective action under another authority is justification for No Further Action.

Preliminary Review Facility Checklist

Facility:_____ City:_____

ISW Reg No:_____ Date:_____

Permit No:_____ Reviewer:_____

EPA ID No:_____

A. Waste Management Units:

RCRA Regulated Units:

NOR No.	Description	Status

Solid Waste Management Units:

NOR No.	Description	Status

B. Reviewed Documents:

RCRA:

Part A _____

Part B _____

Permit _____

CERCLA:

Inspection Reports:_____

Enforcement Actions:_____

Exposure Information:_____

Other Information:_____

C. Summary:

D. Recommended Action:

Preliminary Review Unit Checklist

Facility:_____ City:_____

ISW Reg No:_____ Date:_____

Permit No:_____ Reviewer:_____

EPA ID No:_____

Waste Management Unit:

A. NOR No:

B. Description:

C. Dates of Operation:

Wastes Managed:

Evidence of Release:

Pollutant Dispersal Pathways:

Summary:

Recommended Action:

Appendices to Preliminary Review (PR)

The PR should also include Appendices I-IV to correspond to the Roman numerals in the Unit Checklist:

Appendix I. FACILITY and SWMU LOCATION MAPS

- Regional Location Map
- Site Location Map
- Facility SWMU Map - Use the Notice of Registration (NOR) number to show the location of each unit on a replicate of the topographic map required in Section V.A.1 of this application. Also, please note that the term "facility" includes the entire contiguous property under the control of the owner or operator, which in most cases is the area shown as the legal description of the site in the facility's Part A permit application.

Appendix II. WASTES MANAGED

- List all wastes managed and 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX hazardous constituents. Provide pertinent health, safety, and risk data on each.

Appendix III. EVIDENCE of RELEASE

- Provide any applicable documentation on a release. Provide a map of release locations, SWMU identification, and paths traveled.

Appendix IV. POLLUTANT DISPERSAL PATHWAYS

- Provide a facility, local, and regional map identifying all possible and eventual pathways in which a release from any unit could or did travel. Provide a facility general cross-section to illustrate vertical pathways and lateral movements in groundwater, including discharges (i.e., seeps, creeks, etc.).

Preliminary Review Submittal Format

The PR should be bound with a cover page and contain a Table of Contents with the Facility Checklist entered first followed by all the Unit Checklists in unit NOR numerical order and alphabetical order.

<u>The Preliminary Review Checklist is provided as Attachment IX-1.</u>

X. Air Emission Standards

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.

This section of the application does not apply to the Houston Refining LP facility because none of the hazardous waste management units (Southwest Landfarm, East Guard Basin, and East Impoundment Basin) have process vents or equipment, such as valves, pumps, compressors, pressure relief devices, sampling connection systems, or open-ended valves or lines, that contain or contact hazardous waste streams with organic concentrations of 10 percent by weight or greater.

A. Process Vents – N/A.

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

☐ Yes ☐ No

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 – N/A.

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

☐ Yes ☐ No 0 Not Applicable (facility contains no regulated ancillary equipment types associated with permitted units)

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 – N/A.

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: – N/A.

Does the facility have a "one-stop" permit?

☐ Yes ☐ No

If yes: does this permit application propose to delete the "one-stop" portion of the permit?

☐ Yes ☐ No

Does the facility want the application processed in accordance with 30 TAC Chapter 33 – Consolidated Permit Applications?

☐ Yes ☐ No

If yes: please provide a copy of the notification of intent required by 30 TAC 33.43.

Permittees having "one-stop" permits may elect to combine the air and waste management amendment, modification, or renewal of permitted waste management units. The combined amendment, modification, or renewal application will follow the application processing procedures for an industrial solid waste permit. "One-Stop" permit applications shall include the following air quality information, as applicable.

1. Area map (to scale) showing the location of the plant and land use in the vicinity of the facility including buildings, schools, residences, etc. within 3000 feet.
2. Plot plan (to scale) with latitude and longitude showing the plant layout, property boundary and location of all emission points of air contaminants. Emission points are to be numbered.
3. Specific chemical name of each air contaminant and emission rate in maximum pounds per hour, maximum tons per year and calculations used to determine emission rates. Fugitive emissions are to be included. Complete Table 1(a) entitled "Emission Sources."
4. Process description, operating schedule, and flow chart in sufficient detail that will explain the process and operation and a material balance for processes where applicable. The description should include a discussion of disposal methods for any generated residues and associated air emissions.
5. Design specifications about each emission control device using the appropriate OAQ table.
6. Volatile organic compound (VOC) concentrations in water or sludges or soil and volumes or weights of water, sludges or soils to be processed.
7. Exhaust stack or emission point parameters for each emission point including height, diameter, temperature, velocity and flow rate, except ground level fugitive emissions.
8. Best available control technology (BACT) documentation for all new and modified facilities.
9. Documentation of compliance with any applicable Federal New Source Performance Standard (NSPS) and Federal National Emission Standard for Hazardous Air Pollutants (NESHAPS).
10. Documentation as to whether a permit is required under new source review requirements of part C or D or Title I of the Federal Clean Air Act, 42 U.S.C. 7401 et seq., for a major source or major modification.
11. Information that demonstrates reliability of emission control systems including process instrumentation, equipment redundancy and operating procedures.
12. Results of atmospheric dispersion modeling certified to have been conducted in accordance with applicable TCEQ Office of Air Quality (OAQ) procedures. Model results must show maximum off-property 30-minute and annual ground level concentrations of each air contaminant. Dispersion modeling results must indicate compliance with all OAQ Rules and Regulations. Dimensions of buildings/structures that may influence dispersion modeling are to be furnished. Please consult with OAQ before beginning any modeling study.
13. Storage tank data including capacity in gallons, diameter, height, paint color, composition, density, vapor pressure and molecular weight of liquid stored,

maximum hourly and annual throughput and number of turnovers per year. Complete Table 7 entitled "Storage Tank Summary" for each tank.

14. A statement addressing the applicability of each OAQ regulation.

15. All methods of calculating emissions must be properly referenced with justification for selecting and assuming the values used in any equation.

Table X.A. – Process Vents – N/A

List all process vents covered by this application.

I.D. No. (if any)	Process Vent	Annual Throughput	Operating Hours	Total Vent Facility Emissions

Table X.B. - Equipment Leaks – N/A

List all equipment covered by this application

Equipment I.D. No.	Equipment Type	Waste Management Unit N.O.R. No.	Waste Management Unit Name	% by Weight Total Organics in Haz. Waste Stream	Waste State (gas, vapor, liquid)	Method of Compliance

Table X.C. – Tanks, Surface Impoundments, and Containers Subject to Air Emission Controls – N/A

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]

Permit Unit No.	Surface Impoundments	Control Type (Floating Membrane /Cover Vented through Closed Vent System to Control Device)[3]

Permit Unit No.	Container Storage Areas	Container Design Capacity (Cubic Meters)	In Light Material Service? (Y/N)	Container Level Standard2 (1, 2, 3)	Container Level Standard 3 Control Types (Closed-Vent System/ Enclosure, Control Device Type)[3]

1 Applicable to Tank Level 1 controls determined using procedures in 40 CFR 264.1083(c). If the tank is heated, see 40 CFR 264.1084(b)(ii).
2 See 40 CFR 264.1084(c) and (d) for tanks and 40 CFR 264.1086(b) for containers.
3 See 40 CFR 264.1084(d)(1)-(5) for tanks, 40 CFR 264.1087(c)(1) for control devices, 40 CFR 264.1085(b) for surface impoundments, and 40 CFR 264.1086(c), (d), and (e) for containers.

Table X.D.1(a) – Emission Point Parameters – N/A

Table 1(a) _____ Page _____ of ____

Emission Sources _____ Date _____

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

Air Contaminant Data									Emission Point Discharge Parameters						
Emission Point[1]		Chemical Composition of Total Stream		Air Contaminant Emission Rate		UTM Coordinates of Emission Pt. [6]			Stack Sources (7)					Area Sources [8]	
									Height Above Ground [ft.]	Height Above Structures [ft.]	Exit Data				
Number	Name	Component or Air Contaminant Name [2]	Conc. (%v)	Lb/hr [4]	Tons/ Yr [5]	Zone	East [meters] (Lat.)	North [meters] (Long.)			Dia. [ft.]	Vel. [fps]	Temp. [°F]	Length [ft.]	Width [ft.]

Ground Elevation of Facility Above Mean Sea Level _____ feet.

TACB Standard Conditions Are 68°F and 14.7 psia [RULE 131.01.00.001(55)]

General Instructions for Table X.D.1(a):

1. Identify each emission point with a unique number for this plant site, consistent with emission point identification used on plot plan, previous permits and Emissions Inventory Questionnaire. Limit emission point number to 8 character spaces. For each emission point, use as many lines as necessary to list air contaminant data. Typical emission point names are : heater, vent, boiler, tank, reactor, separator, baghouse, fugitive, etc. Abbreviations are OK.
2. Typical component names are: air, H2O, nitrogen, oxygen, CO2, CO, Nox, SO2, hexane, particulate matter (PM), etc. Abbreviations are OK.
3. Concentration data is required for all gaseous components. Show concentration in volume percent of total gas stream.
4. Pounds per hour (lb/hr) - maximum emission rate expected by applicant.
5. Tons per year (tons/year, t/yr.) is annual maximum emission rate expected by applicant which takes into account process operating schedule.
6. As a minimum, applicant must furnish a facility plot plan drawn to scale showing a plant benchmark, latitude and longitude correct to the nearest second for the benchmark, and all emission points dimensioned with respect to the benchmark as required by General Application, Form PI-1. This information is essential for calculation of emission point UTM coordinates. Please show emission point UTM coordinates if known.
7. Supply additional information as follows if appropriate:
   a. Stack exit configuration other than a round vertical stack. Show length and width for a rectangular stack. Indicate if horizontal discharge with a note.
   b. Stack's height above supporting or adjacent structures if structure is within three (3) "stack heights above ground" of stack.
   c. If emission point is a flare, show flare data on Table 8.
8. Normally used for fugitive sources. Show dimensions of a minimum size rectangle which will "enclose" all fugitive sources included in this emission point number.

Table X.D.7 – For Fugitive Sources – N/A

Table 74-82 Storage Tank Summary

I. Applicant's Name:_____

II. Tank Parameters (one form for each tank).

1. Location (indicate on plot plan or provide coordinates):

   _____

2. Tank No. _____

3. Emission Point No. _____

4. Nominal Capacity : _____ barrels or

   _____ gallons

5. Dimensions: Diameter _____ft.

   Height or Length _____ ft.

6. Color: Chalking white ☐ Aluminum ☐ Light grey or blue ☐

   Dark color or not paint ☐ Other ☐ (Describe _____)

7. Status: New tank ☐ Altered tank ☐ Relocation ☐ Change of Service ☐

8. Previous permit or exemption number

   _____

9. Type: Fixed roof ☐ Pressure ☐ Insulated ☐ External floating roof 0

10. Open top ☐ Underground ☐ Internal floating roof ☐ Horizontal ☐

11. Heated/Cooled ☐ (Temp. _____°F)

12. For floating roof tanks, please supply the following information:

    a. Type of roof: Double deck ☐ Pontoon ☐
       Other ☐ (Describe_____)

    b. Roof color: Chalking white ☐ Aluminum ☐
       Other ☐ (Describe _____)

    c. Shell construction: Riveted ☐ Welded ☐
       Other ☐ (Describe_____)

    d. Seals:

       Primary:

       Mechanical Shoe ☐ Liquid-Mounted ☐ Vapor-Mounted ☐

       Other ☐ (Describe _____)

       Secondary:

       Shoe-Mounted ☐ Rim-Mounted ☐ Weather Shield ☐None ☐
       Other ☐ (Describe_____)

Vent Valve Data	Number	Pressure Setting	Vacuum Setting *[Specify "atmosphere" or Discharging To: (name of abatement device)]*
Combination vent valve			
Pressure vent valve			
Vacuum vent valve			
Open vent			

III. Properties of Stored Material (If tank is to hold several different materials or mixtures, attach appropriate information)

1. Material to be stored in this tank:

   _____

2. Liquid density at average annual bulk storage temperature: _____lbs/gal or _____°API
3. Average vapor molecular weight _____
4. Vapor pressure @ average annual bulk storage temperature: _____psia @ _____°F. (or _____lbs. Reid).
5. Vapor pressure @ maximum bulk storage temperature: _____psia @ _____°F.
6. Initial boiling point: _____°F.
7. If material stored is a solution, please supply the following information:
   a. Name of solvent: _____
   b. Partial pressure of solvent: _____ psia
   c. Name of solute: _____
   d. Partial pressure of solute: _____ psia
   e. Concentration of solute: _____ wt% or _____ vol% or _____lbs/gal.

IV. Operating Data:

1. Maximum filling rate: _____ bbls/hr or _____ gal/hr.
2. Average outage (average distance from top of tank shell to liquid surface): _____ft.
3. Tank turnovers per year: _____ (Use zero (0) for constant-level tanks).

XI. Compliance Plan

Groundwater Monitoring and Corrective Action Requirements for Regulated Units

Owners or operators of facilities that process, store, or dispose of hazardous waste may be required to establish groundwater monitoring and response programs in accordance with the provisions of 30 TAC 335.157. There are three types of groundwater monitoring programs which may be addressed in a Compliance Plan Application for Regulated Units: i) detection monitoring, ii) compliance monitoring, and iii) corrective action monitoring. The applicability of these various monitoring programs and the associated application requirements are illustrated in Figure 2 of the Compliance Plan Application instructions and further outlined below. A Compliance Plan Application will be required to be submitted when establishing a new compliance plan or incorporating changes in an existing compliance plan.

Detection Monitoring: An owner/operator required to conduct detection monitoring per the requirements of 30 TAC 335.164 must monitor for indicator parameters, such as specific conductance, total organic carbon, and total organic halogen, as well as chemical parameters and hazardous constituents specified in the facility permit. If a statistically significant increase in any parameter or hazardous constituent specified in the facility permit is detected in any monitoring well down gradient of the compliance point, the owner/operator must sample the groundwater in all monitoring wells and analyze the samples for the presence of 40 CFR Part 264 Appendix IX hazardous constituents. As shown in the accompanying Flow Diagram (see Figure 2), if the analytical results confirm the presence of Appendix IX constituents down gradient of the compliance point, the owner/operator must submit a Compliance Plan Application to establish a compliance monitoring program or corrective action program.

Compliance Monitoring: The requirements for compliance monitoring programs are detailed in 30 TAC 335.165. Owners/operators required to establish a compliance monitoring program must monitor the groundwater to determine whether Regulated Units are in compliance with the Groundwater Protection Standard (GWPS) specified in the compliance plan (see 30 TAC 335.158 .160). If a statistically significant increase above the GWPS in any chemical parameter or hazardous constituent specified in the compliance plan is confirmed, the owner/operator must submit an application to modify the compliance plan to establish a corrective action program in accordance with 30 TAC 335.166 (see Figure 2). If no such exceedance of the GWPS is detected for three consecutive years and the applicable compliance period has expired, the owner/operator must apply for modification of the compliance plan to re-establish a detection monitoring program for the unit. No further monitoring may be needed if the applicable post-closure care period for the unit is complete.

Regulated Unit Corrective Action Program: Owners/operators required to implement a corrective action program in accordance with the provisions of 30 TAC 335.166 must remove the hazardous waste constituents found in the groundwater or treat the groundwater in-place to levels equal to or less than the GWPS down gradient of the compliance point. The owner/operator must also establish and implement a groundwater monitoring program to demonstrate the effectiveness of the corrective action program. Corrective action measures may be terminated once the concentrations of hazardous constituents are reduced to levels equal to or below their respective concentration limits. After termination of the corrective action measures, the owner/operator must submit an application for modification of the compliance plan to re-establish a compliance monitoring program for the duration of the compliance period (see Figure 2).

Groundwater Corrective Action Requirements for Solid Waste Management Units (SWMUs)

HSWA Solid Waste Management Unit (SWMU) Corrective Action Program: An owner/operator of a Permitted facility or an applicant applying for a hazardous waste permit is required to submit a Compliance Plan Application if hazardous constituents have been released from a SWMU and/or Area of Concern (AOC) to the groundwater and exceeds background or Practical Quantitation Limit (PQL) values, if under Risk Reduction Rules 30 TAC 335 and/or appropriate Protective Concentration Limits (PCLs), if under Texas Risk Reduction Program Rules 30 TAC 350. The Permitted facility must implement a corrective action program for SWMUs and/or AOCs in accordance with provisions 30 TAC 335.167 (see Figure 3, page 122 of the instructions for example of process-alternate, but equivalent process may be authorized by the Executive Director).

Compliance Plan Application Form Structure:

The Compliance Plan Application consists of Sections XI.A. through E.

Application Information Form:

This section contains detailed information necessary for the application and regulatory requirements needed to put in the final compliance plan.

The application form contains the following subsections:

A. Site Specific Information

B. Groundwater Protection Standard (GWPS)

C. Compliance Monitoring Program

D. Corrective Action Program

E. Cost Estimates for Financial Assurance

CP Attachments:

A. Alternate Concentration Limits

B. Well Design and Construction Specifications

C. Sampling and Analysis Plan

Compliance Plan Site Specific Tables:

This section includes the following tables which are to be completed by the applicant, as applicable, and shall be incorporated as part of the final draft Compliance Plan. [Note: include a CD disk with the application providing an electronic copy of the files supporting the compliance plan tables, as applicable, in MS Word format]:

CP Table I – Waste Management Units and/or Areas Subject to Groundwater Corrective Action and Compliance Monitoring

CP Table II – Solid Waste Management Units and/or Areas of Concern for which Corrective Action applies pursuant to 30 TAC 335.167.

CP Table III – CORRECTIVE ACTION PROGRAM Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

CP Table IIIA – CORRECTIVE ACTION PROGRAM Table of Indicator Parameters and the Groundwater Protection Standard

CP Table IV – COMPLIANCE MONITORING PROGRAM Table of Hazardous and Solid Waste Constituents and Practical Quantitation Limits or Method Quantitation Limits for Compliance Monitoring

CP Table IVA – COMPLIANCE MONITORING PROGRAM Table of Detected Hazardous Constituents and the Groundwater Protection Standard for Compliance Monitoring

CP Table V – Designation of Wells by Function

CP Table VI – Compliance Period for RCRA-Regulated Units

Note to the Permittee: All responses to each item in Section XI of the application form should be entered immediately below the original text associated with the form. Do not delete any areas of the application form that are not applicable, retain these areas with a response of either 'Reserved' or 'Not Applicable' below the original text of the form. In addition, if material supporting a response is located elsewhere in the application, the response should provide details as to the specific location within the referenced material.

One of the primary goals of the performance based Compliance Plan is the wells listed in, CP Table V – Designation of Wells by Function (to be included in the final Compliance Plan) are the wells in which the GWPS must be met to verify compliance with Compliance Monitoring program or corrective action objectives, and to change the table would require a modification. On the other hand, the following types of wells Corrective Action Observation Wells, Corrective Action System well, etc., that are included in "Attachment A" maps of the final draft Compliance Plan, should be flexible. The purpose is to provide the permittee with the authority to alter the groundwater monitoring system and Corrective Action System designs, as necessary, to proactively address changing environmental conditions without modifying or amending the Compliance Plan. An application to modify/amend the compliance plan is only required if wells listed in CP Table V are changed; consequently, Corrective Action Observation and Corrective Action System Wells are not listed in CP Table V of the compliance plan so they may be added or removed without modifying/amending the compliance plan. Notification of proposed changes to the groundwater monitoring system and Corrective Action System designs can be included in the semiannual or annual report required by CP Table VIII – Compliance Schedule (to be included in the final Compliance Plan).

Figure 1 – Overview of Required Submittals And Revisions Associated with TCEQ Groundwater Compliance Plan Application

Type of Compliance Plan Application or Revision	Minimum Required Submittals				Additional Application Submittals Or Revisions					
	Description of Modification	Public Notification Evidence	Fee Payment Evidence	Part B, Section I General Information	Section XI.A. Site-Specific Information	Section XI.B. Groundwater Protection Standard	Section XI.C. Compliance Monitoring Program	Section XI.D. Corrective Action Program	Section XI.E. Financial Assurance Cost Estimates	Attachment A Alternate Concentration Limits
RCRA Permitted Units										
Compliance Monitoring Program, commencement or modification per 30 TAC 335.165.	●	●	●	●	●	●	●	○	●	◉
Corrective Action Program, commencement or modification per 30 TAC 335.166.	●	●	●	●	●	●	○	●	●	◉
Compliance Period, termination or extension per 30 TAC 335.162.	●	●	●	●	◉	○	●	○	◉	○
Solid Waste Management Units										
Corrective Measure Implementation (CMI), per 30 TAC 335.167.	●	●	●	●	●	●	◉	●	●	○
Corrective Action Program termination.	●	●	●	●	◉	○	●	○	○	○

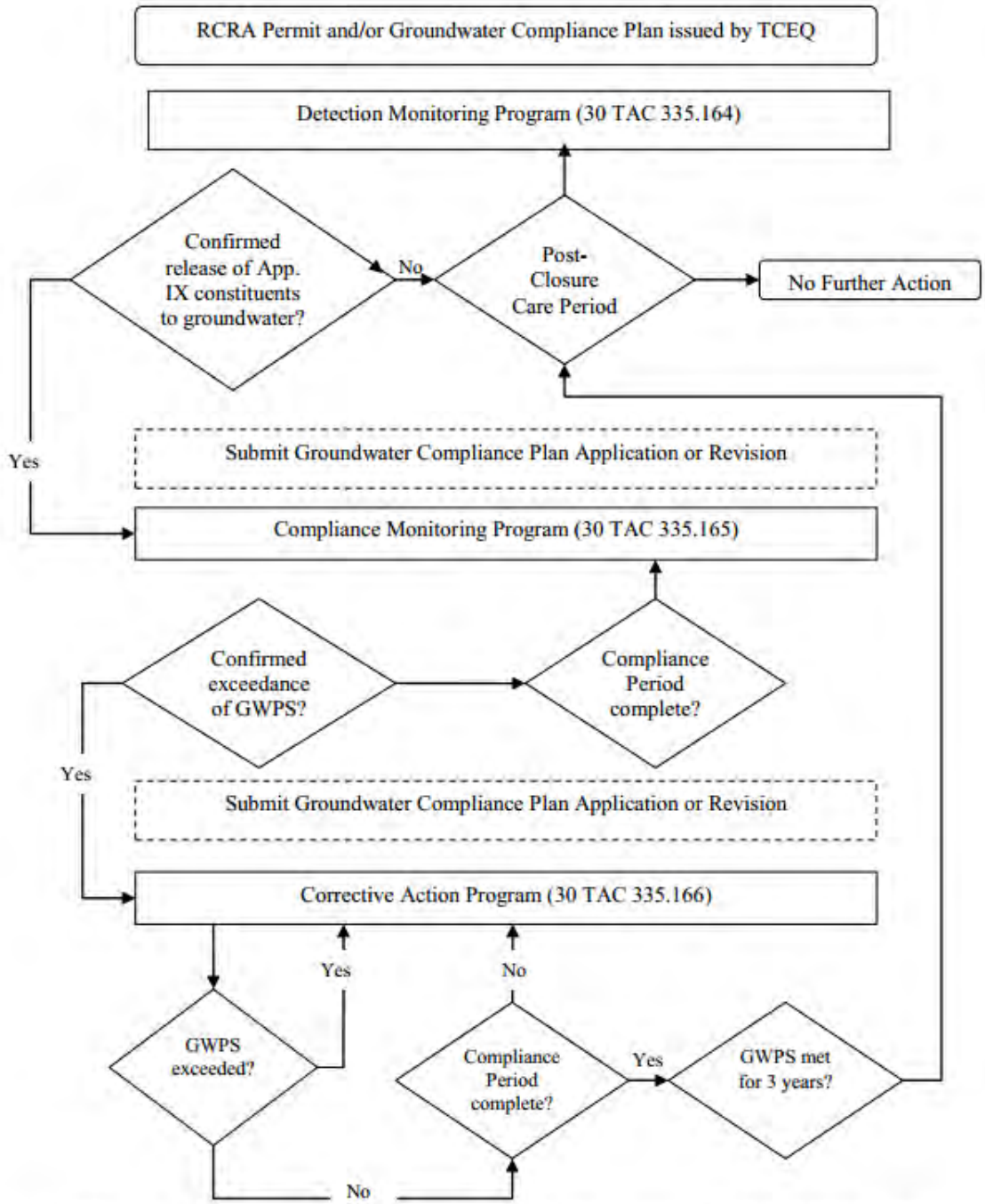
Note:

● Submittal of additional or revised information required.

○ No submittal of additional or revised information required.

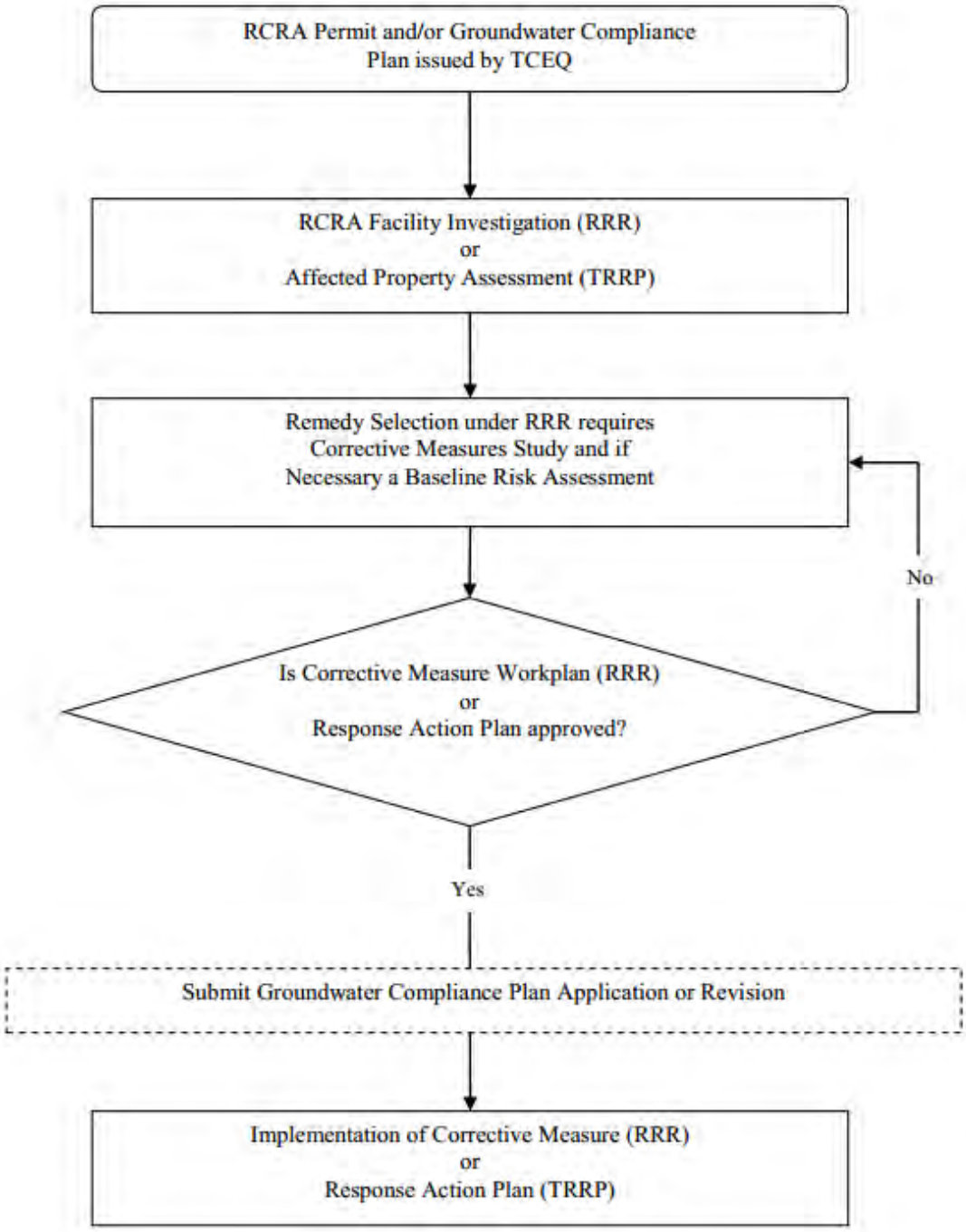
◉ Possible submittal of additional or revised information required.

Figure 2 - Summary of Groundwater Monitoring and Compliance Plan Application Requirements for Regulated Waste Management Units (30 TAC 335 Subchapter F)



Note:
- GWPS = Groundwater Protection Standard (See Section XI.B. of this document, and 30 TAC 335.158 – 160)
- App. IX = Groundwater Monitoring List, 40 CFR 264 Appendix IX.
- Compliance Period = See Section XI.E. of this application, and 30 TAC 335.162.

Figure 3 – Summary of Compliance Plan Applications Requirements for Solid Waste Management Units (SMMUS) (30 TAC 335.167)



Note:
(RRR) – Risk Reduction Rules, 30 TAC 335
(TRRP) – Texas Risk Reduction Program, 30 TAC 350

A. Site Specific Information

1. General Site Information (provide the following information):

   a. An overall plan view map of the entire facility delineating the facility's property boundary, Facility Operations Area (FOA) boundaries, as applicable, and the plume management zone (PMZ) boundaries as applicable;

      See CP Attachment A: Sheet 1 of 3, Plan View Map.

   b. A 7.5 minute U.S.G.S. quadrangle topographic map showing the entire facility;

      See CP Attachment A: Sheet 2 of 3, USGS Map A and CP Attachment A: Sheet 2 of 3, USGS Map B.

   c. All oversized (larger than 8.5" by 11") drawings submitted in accordance with a and b, above, should be accompanied with legible photocopies of the reduced drawing on 8.5" by 11" sheet(s) of paper which shall be used as "CP Attachment A" maps in the final draft Permit/Compliance Plan. The applicant should title the map(s) accordingly as "CP Attachment A, Sheet 1 of xx – Facility Site Map"; "CP Attachment A, Sheet xx of xx, FOA Lateral Boundary Map"; "CP Attachment A, Sheet xx of xx, PMZ Boundary Location Map"; and

   d. Aerial photographs through time depicting changes in the land use, if available.

      One aerial photograph has been provided as Attachment XI-1: Sheet 1 of 10. Historical land aerials were not provided since there have been no land use changes since issuance of the permit.

2. Waste Management

   Provide a complete list and a plan view drawing(s) locating and identifying the following waste management units at the scale of 2.5 centimeters (1 inch) equal to not more than 61.0 meters (200 feet). All oversized (larger than 8.5" by 11") drawings should be accompanied with legible photocopies of the reduced drawing on 8.5" by 11" sheet(s) of paper. Please provide information for each waste management unit listed below on Table XI.A.1. – Facility History for Waste Management Units.

   a. All hazardous waste management units regulated under the Industrial Solid Waste and Municipal Hazardous Waste Rules (Chapter 335) required to be monitored in accordance with 30 TAC 335.164 (Detection Monitoring), 335.165 (Compliance Monitoring Program) and 335.166 (Corrective Action Program);

   b. All solid waste management units (SWMUs) and Areas of Concern (AOCs) regulated under 335.167 which are recommended for further investigation and/or corrective action in the RCRA Facility Assessment (RFA) shall include those identified in accordance with the permit requirements subsequent to the initial RFA.

c. All on site wastewater treatment units.

See Attachment XI-1: Sheet 2 of 10 and Attachment XI-1: Sheet 8 of 10. Larger scaled views of the SWMUs are located in Attachment XI-1: Sheets 3 through 7.

3. Facility History

Based on the information provided in Table XI.A.1., complete CP Table I – Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring accordingly in the format provided.

For the SWMUs or AOCs listed in Table XI.A.1. regulated under 30 TAC 335.167 which are recommended for further investigation and/or corrective action in the RCRA Facility Assessment (RFA), including those identified in accordance with permit requirements subsequent to the initial RFA, complete CP Table II – Solid Waste Management Units and Areas of Concern for which Corrective Action applies pursuant to 30 TAC 335.167. CP Table II will become part of the Compliance Plan.

4. Site Geology, Hydrogeologic Conditions, and Relationship to Surface Water

For New, modified/amended Compliance Plan, please provide a Geology Report as required by Section VI.B of this application containing updated site geologic information including the following descriptions, maps and tables with appropriate supporting documentation [All maps should be at the scale of 1 inch equal to not more than 200 feet and legible when reduced to 8.5" by 11" letter size paper]:

a. A description of the site geology for the facility. The geologic description should include a site geology map and sufficient cross sections (see Item h. below) to describe the uppermost aquifer and any confining stratigraphic unit(s) beneath the site.

Geology associated with this Compliance Plan has not been modified since the 2006 submittal. Geology from the 2006 submittal is summarized in Sections 2.1 and 2.2 (pages four through seven) of the approved Corrective Measures Implementation (CMI) work plan (Attachment XI-2: CMI work plan). Cross sections are provided as Figures 2-2 and 2-3 of CMI work plan. A geologic map is presented as Figure 2-4 in the CMI work plan.

b. A description of the site soils and subsurface lithologies using the Unified Soil Classification System. For those soil units which do not extend beneath the entire site area, the soil description should include a plan view map designating the soil's areal extent;

See Sections 2.2.1 and 2.2.2 (page 5) of the CMI work plan.

c. Where a soil remedy is required in a corrective action program of Section XI.D.1. of this application for a Regulated Unit, SWMU and/or AOC, the applicant shall submit a description of contamination in soils of the vadose zone (unsaturated zone above the uppermost aquifer). The soil description should include maps indicating lateral and vertical extent of contamination;

N/A – Soil remedy is not proposed for a regulated unit. However, Figure 2-1 in the CMI work plan illustrates the extent of fill material at the facility which approximates the extent of soil contamination.

d. A description and designation of the uppermost saturated zone or uppermost aquifer including the name, the type of unit (e.g. perched, confined, etc.,), and groundwater characteristics (flow rates, directions, hydraulic conductivity, etc.). As defined in 40 CFR 260.10, an aquifer is a geologic formation, group of formation, or part of a formation, capable of yielding significant amount of groundwater to wells or springs. Persons using Texas Risk Reduction Program (TRRP) should also consider the definition of a groundwater bearing unit as a saturated geologic formation, group of formations, or part of a formation with a hydraulic conductivity of equal to or greater than 1×10^{-5} centimeters/second (30 TAC 350.4(a)40).

See Section 2.2.3 (page 6) of the CMI work plan.

e. Present the geologic, stratigraphic and hydrogeological information; and

See Section 2.2 (page 6) of the CMI work plan.

f. Maps indicating the lateral and vertical extent of the contamination for each stratigraphic unit affected, with supporting documentation.

See Attachment XI-3: 2019 Annual Compliance Monitoring and Corrective Action (CMACA) Report. Figures 4a and 4b document the LNAPL thickness and Figures 6a, 6b, 7a and 7b consist of benzene and toluene isopleths maps. The extent of subsurface impacts is limited to the upper aquifer (Unit 3) and the RCRA point of exposure monitoring location. The information documenting that the lower aquifer is not impacted was previously presented in the 2002 Risk Assessment Report, which was approved by the TCEQ on June 4, 2004.

g. Current Contaminant Plume Map(s) Locating and identifying the extent of contamination as determined from previous monitoring on a separate facility base map(s). Locate and identify all monitor wells and waste management units/areas.

Current plume location maps are identified in Attachment XI-3: 2019 Annual CMACA Report, Figures 6a, 6b, 7a, and 7b. Monitor wells and waste management units are identified in Attachment

XI-2: CMI work plan, Figures 1-1 and Attachment XI-3: 2019 Annual CMACA Report, Figure 1.

h. Cross section Cross section transect lines should be indicated on the Contaminant Plume Map. The applicant, at a minimum, must submit two (2) stratigraphic cross sections for each waste management unit/area. One cross section should be drawn through all the point of compliance wells and the second cross section should be drawn along the direction of the movement of the contaminant plume released from the unit/area. Cross sections should follow the requirements outlined in the Geologic and Hydrogeologic Report of Parts IV and V of this application. At a minimum, the cross sections should include the following information:

(1) the stratigraphic interpretation (e.g., surface grade, uppermost aquifer, aquiclude);
(2) lithology/geologic description of the uppermost aquifer and aquiclude;
(3) the potentiometric surface;
(4) detected non-aqueous phase liquids (NAPLs) and hazardous constituents; and
(5) screen length and screen depth for each well in the cross section.

Cross-sections are located in Figures 2-2, and 2-3 of the CMI work plan in Attachment XI-2.

i. Well Construction diagram The report should include a well construction diagram for all wells used in the cross section. The well construction diagram should include the information in "Attachment B" of this (Compliance Plan) application. The well construction diagram information may be included on the geologic cross-section(s).

See Attachment XI-4: Well construction logs.

j. Describe the potential for any surface water bodies to be hydraulically connected to groundwater containing hazardous constituents. Apply the guidance provided in Determining PCLs for Surface Water and Sediment, RG-366/TRRP-24 Revised, December 2002, in order to determine the water body type and applicable surface water criteria for human health, aquatic life and wildlife, as applicable.

N/A.

B. Hazardous Constituents In Groundwater And Groundwater Protection Standards (GWPSs)

Hazardous Constituents in Groundwater

For each contaminated hydrogeologic unit beneath a waste management unit/area (40 CFR 264.95), provide a list of all 40 CFR Part 264 Appendix IX hazardous constituents that have been detected in groundwater samples above background values, Practical Quantitation Limits (PQLs), or Method Quantitation Limits (MQLs). Please submit for

each unit/area the most recent Appendix IX laboratory analysis results showing the constituents, constituent concentrations, methods used for analysis and associated laboratory QA/QC.

The groundwater analytical data is provided in Attachment XI-5: Groundwater Analytical Data. The only hydrogeologic unit that is impacted with hazardous constituents is Unit 3 (the uppermost aquifer), as noted in the CMI work plan.

The groundwater samples (collected for the purpose of determining whether constituents listed in Appendix IX are present) shall be from each waste management unit/area monitoring well system as required by 30 Texas Administrative Code (TAC) 335.164 (detection monitoring program).

If the waste management unit/area is subject to Corrective Action Program required by 30 TAC 335.166 or 335.167 and/or Compliance Monitoring required by 30 TAC 335.165, then list the unit/area and include the list of hazardous constituents and their principal degradation constituents in:

CP Table III – Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard; and

CP Table IV – Compliance Monitoring Program Table of Hazardous and Solid Waste Constituents and Practical Quantitation Limits or Method Quantitation Limits for Compliance Monitoring.

1. Groundwater Protection Standards (GWPSs)

   The GWPS (30 TAC 335.158) is designed to ensure that hazardous constituents (30 TAC 335.159) identified in groundwater and their principal degradational constituents do not exceed concentrations that pose a present or potential hazard to human health and the environment. Compliance monitoring and corrective action programs for a Regulated Unit (30 TAC 335.165 and 335.166) and a corrective action program for a solid waste management unit (SWMU) (30 TAC 335.167) require human health and the environment to be protected from all releases of hazardous wastes and constituents. These corrective action and monitoring programs are evaluated using the GWPS. The GWPS is based on the following criteria.

   a. Background Levels Background levels authorized under 30 TAC 335.160(a)(1) are defined as constituent concentration values that are naturally occurring or are not influenced by contamination coming from the waste management unit. These values are established by statistical analysis of upgradient well sampling data. Analytical results from a sufficient number of independent samples are required to be utilized with an approved and appropriate statistical method. For guidance on the statistical methods consult, Statistical Analysis of Groundwater Data at RCRA Facilities-Unified Guidance, U.S. EPA, March 2009, and any subsequent updates to this document.

      Practical Quantitation Limits (PQLs) or Method Quantitation Limits (MQLs) are utilized in lieu of background values unless a background demonstration establishes concentrations for naturally occurring constituents. The PQL or MQL is defined in the footnote of CP Tables III and IV.

b. Primary and Secondary Maximum Contaminant Levels (MCLs) Maximum permissible level of a contaminant in water which is delivered to any user of a public water system (40 CFR Part 141 and 143, Federal Safe Drinking Water Act).

c. Alternate Concentration Limits (ACLs) determined in accordance with 30 TAC 335.160(b) and are defined in footnote of CP Tables III and IV.

2. Establishing the Groundwater Protection Standard (GWPS)

a. If background, PQL or MQLs are proposed for the GWPS, the applicant must list all constituents (i.e., detected and degradational constituents) for which a GWPS is being applied for and the appropriate concentration limits. This information shall be submitted in the format of CP Tables III, and IV.

b. Alternate Concentration Limits (ACLs) ACLs are established at the point of compliance (POC) for a regulated or solid waste management unit (SWMU). All concentration values or limits listed in Section XI.B.1.c. are considered ACLs. ACLs are evaluated in accordance with the provisions of 30 TAC 335.160(b) and other regulations acceptable to the executive director. If an ACL is requested on the basis of Section XI.B.1.c. (MCLs), then no ACL demonstration is necessary. The ACL demonstration must establish constituent concentrations in groundwater in accordance with regulations acceptable to the executive director. This information shall be submitted in the format of CP Tables III and IV. Note that depending upon the rule employed [i.e., 30 TAC 335 Subchapter S – Risk Reduction Rules (RRR) or 30 TAC 350 – Texas Risk Reduction Program (TRRP)], the applicant should determine the GWPS for the point of compliance and point of exposure, as applicable, in accordance with the remedy standard being utilized.

c. If the contaminant plume discharges or has a potential to discharge into surface water, then the facility must also comply with 30 TAC Chapter 307 (Texas Surface Water Quality Standards) unless other regulatory requirements acceptable to the executive director are requested.

d. "Attachment A" of this Compliance Plan Application provides a summary of regulatory requirements for an ACL demonstration in accordance with 30 TAC 335.160(b).

The groundwater protection standards and alternate concentration limits (ACLs) are located in CP Table III. The ACL calculations are presented in Attachment XI-7. Additionally, a copy of the June 19, 2003 TCEQ letter approving the revised Groundwater Quality Assessment Plan (GQAP) is located in Attachment XI-6: TCEQ Correspondence page 3, and the approved GQAP is the basis for the current compliance plan monitoring program.

C. Compliance Monitoring Program – N/A

As required by 30 TAC 335.165, an owner or operator must monitor the groundwater to determine whether Regulated Units are in compliance with the Groundwater Protection Standard (GWPS) under 30 TAC 335.158. The applicant must provide the following information when proposing a compliance monitoring program.

1. Groundwater Monitoring Program Description

a. Describe the proposed groundwater monitoring system to be used to monitor compliance with the GWPS which includes the following information.

(1) Changes, if applicable, from the current detection monitoring system or compliance monitoring system groundwater monitoring program at the waste management unit that will be required to comply with the compliance monitoring program described in 30 TAC 335.165. This description should address changes concerning:

(a) Geological and/or hydrogeological information differences since the submittal of the previous application [must submit an updated Geologic and Hydrogeologic Report required by Section XI.A.4];

(b) Waste management areas/units;

(c) Construction details for monitor wells to evaluate compliance with "Attachment B" well specification requirements;

(d) The number and locations of additional monitor wells [also see Section XI.C.1.b.(2)];

(e) Sample handling, chain of custody, and analytical procedures (also see "Attachment C");

(f) Frequency of monitoring;

(g) Monitoring parameters;

(h) Evaluation of compliance with GWPS (Statistical Methods);

(i) Other Sampling and Analysis Plan information to be compliant with "Attachment C";

(j) Compliance period as defined in Section XI.E.1.c. of the application;

(k) Financial assurance (see Section XI.E.); and

(l) An ACL variance under 30 TAC 335.160(b), if applicable (also see "Attachment A").

(2) The number, depth and location of all monitor wells (Background Wells, Point of Compliance Wells, Observation Wells, Piezometers, etc.). Complete CP Table V – Designation of Wells by Function and make changes as applicable to plans referenced in Section XI.C.1.b.

(3) The proposed hazardous constituent monitoring list which is based on constituents that were monitored during detection monitoring (if applicable), constituents detected in accordance with 30 TAC 335.164, and degradational constituents identified in Table CP IV accordingly to develop the constituent list for the Compliance Monitoring Program. Also, list the PQL, MQL, or background concentration for each constituent in CP Table IV. CP Table IV shall become part of the final Compliance Plan to be analyzed at least annually as required by 30 TAC 335.165(7).

(4) The proposed indicator parameter monitoring list. From the list of constituents and GWPS identified in CP Table IV., complete CP Table IVA – Compliance Monitoring Program, Table of Detected Hazardous Constituents and the Groundwater Protection

Standard for Compliance Monitoring, accordingly. CP Table IVA shall become part of the final Compliance Plan to be analyzed at least semiannually as required by 30 TAC 335.165(6).

(5) Monitoring frequency.

(6) Provisions for reporting of groundwater data at least on an annual basis.

(7) Annual determination of contamination plume rate and direction of migration.

(8) Compliance period. Calculate the compliance period as required by 30 TAC 335.162 and 335.165(1)(d). Include calculations and complete CP Table VI – Compliance Period for RCRA-Regulated Units which shall become part of the final Compliance Plan.

b. Submit the following plans and reports.

(1) Current Sampling and Analysis Plan The Sampling and Analysis Plan must include information required by 30 TAC 335.163(4) and 335.163(5) and 40 CFR Subpart 270.30(j). For guidance, please see "Attachment C" to the application.

(2) Monitoring System Plan If the applicant is proposing a monitoring well or a monitoring system in the application, the applicable well installation specifications outlined in "Attachment B" of this application should be followed. All new monitoring wells must be installed in accordance with the specifications outlined in "Attachment B", unless an alternative design is approved by the agency prior to installation. If the applicant proposes as part of the monitoring system, any well (existing or proposed) that does not meet or exceed the requirements outlined in "Attachment B", then the proposed alternative design must be described in detail in the Monitoring System Plan and must be submitted with this application. The Monitoring System Plan must include:

(a) Monitoring System Design and Specifications Certified by a qualified engineer and/or geologist which provides detailed plans and specifications on the monitoring system design; and

(b) Well Drilling and Well Casing Specifications Certified by a qualified engineer and/or geologist which provides details on well casing specification, drilling logs and reports.

(3) Current Geologic and Hydrogeologic Report Provide a report per Section X.I.A.4 of this application discussing the geologic and hydrogeologic conditions of the facility and the specific area affected by the waste management areas. This report should include the most up-to-date information from which the design of the groundwater monitoring system was based.

2. Waste Management Units Monitored

a. Delineate and identify the following for each waste management unit in the proposed groundwater monitoring program.

(1) Boundary of the waste management unit and, if applicable, the proposed waste management area which includes more than one waste management unit (identify all waste management units which are included in the waste management area). These waste

management units subject to compliance monitoring should be listed in CP Table I – Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring which shall become part of the final Compliance Plan.

(2) The proposed point of compliance (30 TAC 335.161) and point of exposure wells.

(3) Any other proposed monitor wells such as supplemental wells, observation wells, background wells, etc. If appropriate the groundwater monitoring system should have a sufficient number of wells be designated to monitor the downgradient extent of the plume.

(4) Features which may serve as conduits for subsurface contamination.

b. For each waste management unit/area in the proposed groundwater monitoring system, submit the locations of individual waste management unit/area monitor wells (existing or proposed) and any soil borings (plugged and unplugged) specifically drilled for assessment of contamination. These individual monitor wells shall be identified by respective well number on a plan view drawing and only the background, point of compliance and/or point of exposure wells should be indicated in CP Table V – Designation of Wells by Function. The plan view map depicting the location of individual monitoring wells for compliance monitoring should be labeled as "CP Attachment A, sheet xx of xx" in the text box. The title box should also include reference to the facility name, Permit/Compliance Plan Number, Solid Waste Registration Number, Unit Description or name with Notice of Registration (NoR) Unit No. 0000. The "CP Attachment A" map(s) and CP Table V shall also become part of the final Compliance Plan.

3. Implementation Schedule

Itemize and discuss, in detail, the estimated time schedule necessary for any testing and assessments, system design, construction and installation, and final implementation of the groundwater monitoring program for each Regulated Unit and solid waste management unit. If the schedule of implementation for items are not completed at the time of the application, or are not completed at the time of issuance of the final draft Permit/Compliance Plan, then the items should be added to the CP Table VIII - Compliance Schedule of the application.

D. Corrective Action Program

As required by 30 TAC 335.166, the owner or operator must take corrective action to ensure that Regulated Units are in compliance with the Groundwater Protection Standards (GWPS) under 30 TAC 335.158. As required under 30 TAC 335.167, all releases of hazardous constituents from any solid waste management unit at the facility must also be addressed. For existing corrective action programs which have been approved by the TCEQ, the applicant shall provide a copy of the TCEQ corrective action system approval letter, design system specifications and any updates as requested in Section XI.D.3.a.(1) of this section. The applicant must provide the information requested below when proposing a corrective action program which has not been previously approved by the TCEQ including a detailed description of a corrective action or a combination of corrective actions that will remedy the groundwater contamination at the waste management unit and a proposed plan for a monitoring program that will demonstrate the effectiveness of the corrective action.

The owner or operator may also apply for a Facility Operations Area (FOA) pursuant to the requirements of 30 TAC 350.131 - 350.135 of the Texas Risk Reduction Program (TRRP) rules, provided the applicant meets the FOA pre-approval process steps 1 through 3 approved by the Commission.

Also, the owner or operator may apply for alternative groundwater Corrective Action Program pursuant 30 TAC 335.151, 335.156 and 30 TAC 350, where there are commingled releases from RCRA-regulated unit from one or more SWMUs, PCO, and/or AOC.

An existing corrective action program exists to ensure that GWPS are met at the applicable POE wells. The existing system is described in Section 5.1 (page 13) of the CMI work plan (Attachment XI-2). A detailed description of the design and specifications is included in the Revised Hydrocarbon Recovery System Modification Plan, Geraghty & Miller, Inc. December 1995 and the final installation is documented in the Final Report Hydrocarbon Recovery System Modification Plan, Parson Engineering Science, Inc., March 1999. The State approval letters are included in Attachment XI-6: TCEQ Correspondence pages 1-2.

1. Type of Corrective Action Proposed

   From the list below, indicate the type of groundwater corrective action proposed for each hazardous waste unit/area. Discuss in detail if more than one corrective action is to be used in a waste management area. Submit the discussion and descriptions as an attachment to the application.

   a. Groundwater well recovery with surface treatment
   b. Groundwater well recovery/surface treatment/re injection
   c. Groundwater well recovery and disposal
   d. Vapor extraction system
   e. Interceptor trench recovery and disposal
   f. Interceptor trench recovery and surface treatment
   g. In-situ treatment – bioreclamation
   h. In-situ treatment – chemical reaction
   i. Barrier walls/encapsulation
   j. Permeable treatment beds
   k. Other, please describe

2. Program Description

   Attach a technical report providing a detailed description of a complete corrective action system including above and below ground equipment/facilities. Include discussions on the following concerns for each type of corrective action as applicable.

   a. Recovery Wells
      (1) Indicate on a plan view of the waste management area the anticipated location of Recovery Well(s) which would optimize the extraction of the groundwater contaminants.
      (2) Indicate on a plan view the estimated radius of influence of each Recovery Well.

(3) Indicate the optimum pumping rate of each Recovery Well determined from the aquifer pump test.

(4) Describe the design of the Recovery Wells and pump system including diameter, construction material, gravel packing, screen slot sizes and patterns, type of pumps and maintenance requirements.

(5) Describe the collection and storage of the contaminated groundwater which is classified hazardous waste (on site storage of hazardous waste shall require compliance with the applicable regulations):

(a) Less than 90 day tanks (see 40 CFR 262.34/40 CFR 265 Subpart J);

(b) Permitted Tanks (see 40 CFR 264 Subpart J);

(c) (Less than 90 day Container Storage Area (see 40 CFR 262.34/40 CFR 265 Subpart I);

(d) Permitted Container Storage Area (see 40 CFR 264 Subpart I); and

(e) Temporary Units (see CFR 264.553).

(6) Describe the treatment and/or final disposition of the hazardous and nonhazardous contaminated groundwater.

b. Vapor Extraction System

(1) Indicate on a plan view of the waste management area the anticipated location of the vapor extraction system which would optimize the extraction of hazardous constituents from the vadose zone.

(2) Describe the construction design of the vapor extraction system in detail, including all diagrams and drawings.

(3) Describe the emission control equipment used to comply with air quality regulations.

(4) Provide the anticipated volatile contaminants to be remediated along with information on the expected effectiveness of the vapor extraction system at the waste management unit.

(5) Provide established treatability data for the proposed design.

(6) Specify the hazardous constituents affected by this type of treatment.

c. Interceptor Trenches

(1) Indicate on a plan view of the waste management area the anticipated location of the interceptor trench.

(2) Provide the construction design.

(3) Describe the procedure for construction.

(4) Describe the liquid removal and collection system.

(5) Describe the surface storage and/or treatment of the contaminated groundwater.

(6) Describe the final disposition of the contaminated groundwater.

d. In-situ Treatment – Chemical Reaction

(1) Characterize the chemical agents to treat the contaminated groundwater and/or soils in the vadose zone.

(2) Provide laboratory treatability data.

(3) Specify the hazardous constituents affected by this type of

treatment.

(4) Specify the reaction by products produced during the chemical reactions.

(5) Indicate degradation time for each treated hazardous constituent and any resulting chemical reaction by products.

(6) Describe the potential health risks caused by human exposure to the reaction by products.

(7) Describe potential damage to wildlife, crops, vegetation and physical structures caused by exposure to reaction by products.

(8) Describe the persistence and permanence of the potential effects of the reaction by products.

(9) Describe the method of chemical reactant injection and other important aspects of the system design.

e. In-situ Treatment Bioreclamation

(1) Describe the type of bacteria most appropriate for the degradation of the hazardous constituents present in the groundwater and/or soil in the vadose zone.

(2) Describe the nutrients necessary and application frequency to encourage effective bioreclamation.

(3) Provide laboratory data from treatability studies utilizing the contaminated groundwater and describe any potential hazardous by products.

(4) Indicate the degradation time for each hazardous constituent affected by this treatment.

(5) Describe the method of injecting the bacteria and nutrients and describe the delivery system design.

f. Barrier Walls

(1) Provide laboratory permeability data using the actual contaminated groundwater.

(2) Describe the barrier wall materials.

(3) Summarize construction design and installation procedures.

g. Permeable Treatment Beds

(1) Provide laboratory data of treatability simulations using actual contaminated groundwater in combination with the material proposed to be used in treatment beds.

(2) Discuss the properties of the treatment material which would make it effective for use at this site.

(3) Indicate which hazardous constituents will be affected by this treatment. Indicate the reactions which will take place and the resulting reactant by products. Discuss the anticipated lifetime of the permeable treatment beds.

(4) Provide the construction design and installation procedures.

h. Other

Discuss in detail, any other corrective action (soils and groundwater) not included above which is proposed for use at the affected waste management area(s).

The corrective action program currently in place is discussed in Section 5 of the CMI work plan. TCEQ approval letters are located in Attachment XI-6.

3. Groundwater Monitoring and Corrective Action Program Description

a. Describe the proposed groundwater monitoring system to be used to monitor corrective action and compliance with the GWPS which includes the following information.

(1) Changes, if applicable, from the current groundwater monitoring program at the waste management unit that will be required to comply with the corrective action monitoring program described in 30 TAC 335.166. This description should address changes concerning:

(a) Geological and/or hydrogeological information differences since the submittal of the previous application [must submit a Geologic and Hydrogeologic Report in accordance with Section XI.A.4;
(b) Waste management areas/units;
(c) Construction details for monitor wells to evaluate compliance with "Attachment B" well specification requirements;
(d) The number and locations of additional monitor wells [must submit the Monitoring System Plan/Report required by Section XI.D.3.c.(2);
(e) Sample handling, chain of custody, and analytical procedures (also see "Attachment C");
(f) Frequency of monitoring;
(g) Monitoring parameters;
(h) Evaluation of compliance with GWPS (statistical methods);
(i) Other Sampling and Analysis Plan information to be incompliant with "Attachment C";
(j) Compliance period as defined in Section XI.E.1.c. of the application;
(k) Financial assurance; and
(l) An ACL variance under 30 TAC 335.160(b), if applicable (also see "Attachment A").

There are no changes to the Corrective Action Program since the 2010 permit. A Sampling Analytical Plan (SAP) is located in CP Attachment C. There have been not changes to the SAP; therefore, all references in these reports to LYONDELL-CITGO Refining LP (LCR) now refer to Houston Refining LP and references to TNRCC refer to TCEQ.

(2) The number, depth and location of all monitor wells (Background Wells, Point of Compliance Wells, Corrective Action Observation Wells, Supplemental Wells, piezometers, etc.) and all Recovery Wells and complete CP Table V – Designation of Wells by Function. Also, make revisions as applicable to plans referenced in Section XI.D.3.c.

The location of all wells is depicted in Attachment XI-1: Sheets 9 and 10 of 10, as well as Figure 1 in Attachment XI-3: 2019 Annual CMACA Report. Depth and well information are summarized in Attachment XI-1, Table 1, Well Information by Function.

(3) The proposed hazardous constituent monitoring list which is based on constituents that were monitored during detection monitoring (if applicable), constituents detected in accordance with 30 TAC 335.164, and degradational constituents identified in CP Table III accordingly to develop the constituent list for the Corrective Action Monitoring Program. CP Table III shall become part of the final Compliance Plan.

The list of hazardous constituents for monitoring is included in CP Table III.

(4) The proposed indicator parameter monitoring list. From the list of constituents and GWPS identified in CP Table III complete CP Table IIIA – Corrective Action Program Table of Indicator Parameters and the Groundwater Protection Standard, accordingly. CP Table IIIA shall become part of the Compliance Plan to be analyzed at least semiannually as required by 30 TAC 335.166(7).

The indicator parameters are benzene, toluene, 1-methylnaphthalene, naphthalene, and lead (CP Table IIIA).

(5) Monitoring frequency.

The indicator parameters will be monitored on a semi-annual basis during February and August.

(6) Provisions for semiannual reporting of groundwater data.

The reporting of ground water data was conducted on a semi-annual basis during the first year and is now conducted annually as specified in the CMI work plan (Section 5.3, first paragraph, page 15).

(7) Annual determination of contamination plume rate and direction of migration.

An evaluation of the contamination plume velocity and direction of migration will be conducted on an annual basis using the data collected during the second semi-annual event of each year. The results of the evaluation will be included in the next regularly scheduled report, due by July 21st of each year.

(8) Compliance period. Calculate the compliance period as required

by 30 TAC 335.162 and 335.165(1)(d). Include calculations and complete CP Table VI – Compliance Period for RCRA-Regulated Units which shall become part of the final Compliance Plan.

Reserved.

b. Proposed methods of evaluating the effectiveness of the corrective action in the saturated and vadose zone.

As discussed in Section 5.3 (page 15 and 16) of the CMI work plan, the effectiveness of the corrective action system will be evaluated by measuring the thickness of Light Non-Aqueous Phase Liquid (LNAPL) and preparing isopleth maps of the LNAPL thickness. These maps will be compared to previous maps to determine the effectiveness of the system. In addition, recovery volumes of LNAPL and ground water will be recorded and reviewed to evaluate the effectiveness of the system.

c. Submit the following plans and reports.

(1) Current Sampling and Analysis Plan The Sampling and Analysis Plan must include information required by 30 TAC 335.163(4) and 335.163(5) and 40 CFR Subpart 270.30(j). For guidance, please see "Attachment C" to the application.

See CP Attachment C: SAP.

(2) Groundwater Recovery and Monitoring System Plan At a minimum, the plan must include:

(a) Recovery System Plan The applicant should propose a recovery system design that will achieve the performance requirement to protect human health and the environment. The plan should provide detailed plans, information and specifications on the recovery system's design and well installation specifications. All new recovery wells must be installed in accordance with applicable specifications outlined in "Attachment B", unless an alternative well design is approved by the agency prior to installation of the well. The Recovery System Plan must include Recovery System Design and Specifications Certified by a Texas Registered Professional Engineer. 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.;

No changes have been made to the existing recovery system since the 2010 permit. The existing recovery system, which was previously approved by the TCEQ, is described in Section 5.1 (page 13) of the CMI work plan. A detailed description of the design is presented in the

Revised Hydrocarbon Recovery System Modification Plan, Geraghty & Miller, Inc., December 1995 and the final installation is documented in the Final Report Hydrocarbon Recovery System Modification Plan, Parsons Engineering Science, Inc. March 1999. The reports were submitted in 2006 and the approval letters are located in Attachment XI-6.

(b) Monitoring System Plan If the applicant is proposing a monitoring well or a monitoring system in the application, the applicable well installation specifications outlined in "Attachment B" of this application should be followed. All new monitoring wells must be installed in accordance with the specifications outlined in "Attachment B", unless an alternative design is approved by the agency prior to installation. If the applicant proposes as part of the monitoring system, any well (existing or proposed) that does not meet or exceed the requirements outlined in "Attachment B", then the proposed alternative design must be described in detail in the Monitoring System Plan and must be submitted with this application. The Monitoring System Plan must include:

(i.) Monitoring System Design and Specifications Certified by a qualified engineer and/or geologist which provides detailed plans and specifications on the monitoring system design; and

(ii.) Well Drilling and Well Casing Specifications Certified by a qualified engineer and/or geologist which provides details on well casing specification, drilling logs and reports.

The existing monitoring system will be utilized. The well construction logs were submitted in 2006 and well construction details followed CP Attachment B: Summary of Well Construction by Function.

(3) Current Geologic and Hydrogeologic Report - Provide a report per Section XI.A.4 of this application discussing the geologic and hydrogeologic conditions of the facility and the specific area affected by the waste management areas. This report should include the most up-to-date information from which the design of the groundwater monitoring system was based.

There have been no changes to hydrogeologic conditions of the facility. Hydrogeologic conditions and the specific areas affected by the waste management areas are discussed in the CMI work plan, included as Attachment XI-2. The CMI work plan includes the most up-to-date information from which the design of the ground-water monitoring system was completed.

4. Waste Management Units/Areas Monitored Under Corrective Action Programs

a. Delineate and identify the following for each waste management unit/area in the proposed groundwater monitoring and corrective action programs.

The following items for the Facility-wide Corrective Action Program are identified in Attachment XI-1: Sheets 9 and 10 of 10, Contaminant Plume Maps. Also see Figures 1-1 and 2-1 of the CMI work plan, and Attachment XI-3: 2019 Annual CMACA Report.

(1) Boundary of the waste management unit and, if applicable, the proposed waste management area which includes more than one waste management unit (identify all waste management units which are included in the waste management area). These waste management units/areas subject to corrective action pursuant to 30 TAC 335.166 and 335.167 should be listed in CP Table I – Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring. CP Table I shall become part of the final Compliance Plan.

(2) The proposed point of compliance (30 TAC 335.161), point of exposure wells, or alternate point of exposure wells.

(3) Any proposed monitor wells such as supplemental wells, observation wells, background wells, etc. If appropriate the groundwater monitoring system should have a sufficient number of wells to monitor the downgradient extent of the plume.

(4) Features which may serve as conduits for subsurface contamination.

(5) Corrective action system.

b. For each waste management unit/area in the proposed groundwater monitoring system, submit the locations of individual waste management unit/area monitor wells (existing or proposed) and any soil borings (plugged and unplugged) specifically drilled for assessment of contamination. These individual monitor wells shall be identified by respective well number on a plan view drawing and only the background, point of compliance, point of exposure wells and/or alternate point of exposure wells should be indicated in CP Table V – Designation of Wells by Function. The plan view map depicting the location of individual monitoring wells for corrective action monitoring should be labeled as "CP Attachment A, sheet xx of xx" in the text box. The title box should also include reference to the facility name, Permit/Compliance Plan Number, Solid Waste Registration Number, Unit Description or name with Notice of Registration (NoR) Unit No. 0000. The "CP Attachment A" map(s) and CP Table V shall also become part of the final Permit/Compliance Plan.

5. Waste Management Units/Areas Addressed Under Other Corrective Action Programs -Facility Operations Area (FOA), specific to the requirements of 30 TAC 350.131 - 350.135. The Permittee should also complete Sections XI.D.4. for other units not addressed by the FOA that may require corrective action outside the FOA boundary. For other units not addressed by the FOA, either within the

FOA or outside the FOA which may require compliance monitoring, the Permittee should complete Section XI.C. of this application accordingly. Not Applicable.

a. Provide an approved version of the FOA Qualifying Criteria Checklist and evidence that Steps 1 through 3 of the FOA pre-approval process has been approved by the Commission.
b. Provide a discussion on exceptions to the TRRP rule requested.
c. Provide a summary of the SWMUs/AOCs that will be addressed within the FOA boundary and a discussion of the multiple sources of COCs present and how FOA will better address these sources.
d. Provide maps of appropriate scale depicting the following (maps may be combined where appropriate):
    (1) The number, location and type of monitoring points in each stratigraphic unit to be monitored individual monitoring wells should be identified by respective well number on a plan view drawing, to include the background, Point of Compliance (POC), Point of Exposure (POE), FOA Boundary of Compliance wells, FOA piezometers or supplemental wells, Corrective Action Observation ((CAO), Corrective Action System (CAS) wells that are applicable for FOA monitoring program should be labeled as "CP Attachment A, sheet no xx of xx" in the title box. The title box should also include reference to the facility name, Permit/Compliance Plan Number (00000), TCEQ Solid Waste Registration Number and Unit Description or Name. The "CP Attachment A" map(s) shall become part of the final Permit/Compliance Plan.
    (2) HWMUs/SWMUs/AOCs addressed
    (3) Surrounding land use
    (4) FOA lateral boundaries
    (5) Potential source areas
    (6) Potentiometric surface of all relevant transmissive units
    (7) Surrounding water wells
    (8) Extent of known contamination in each transmissive unit
    (9) Areas of potential ecological impact
    (10) Known occurrences of NAPL or DNAPL in each transmissive units
    (11) FOA access control components
e. Provide cross-sections in accordance with Section XI.A.4. depicting the following (maps may be combined where appropriate);
    (1) The vertical boundaries of the FOA;
    (2) The vertical extent of contamination;
    (3) Groundwater level elevations for each transmissive unit.
f. Provide tabulated information for;
    (1) Results of Appendix IX GW sampling.
    (2) Proposed PCLs for each hazardous constituent and principal degradational constituent for each monitoring point with supporting documentation (including a discussion of exposure pathways) should be listed in CP Table III – CORRECTIVE ACTION PROGRAM Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard. CP

Table III shall become part of the final Compliance Plan.

(3) The proposed indicator parameter monitoring list. From the list of constituents and GWPS identified in CP Table IIIA. CP Table IIIA shall become part of the Compliance Plan to be analyzed at least semiannually as required by 30 TAC 335.166(7).

(4) Only the background, POC, POE, FOA Boundary of Compliance wells should be listed in CP Table V which shall become part of the final Permit/Compliance Plan.

g. Provide a discussion of the types of corrective action that will be employed to address contaminated media.

h. Provide detailed descriptions of GW recovery and other remedial technologies such as vapor extraction, interceptor trenches, hydraulic containment, barrier walls, etc., including radius of influence, estimated optimum recovery rates, location of collection, storage or disposal facilities.

i. Provide a detailed description of the ground water monitoring system including placement of monitoring wells, hydrogeologic characteristics of monitored units and well completion details.

j. Provide a Sampling and Analysis plan for the proposed FOA that includes development of COCs to be monitored, sampling methodology, sample handling procedures, sampling frequency and statistical procedures for evaluating analytical results (Appendix C).

k. Propose a methodology for evaluating the effectiveness of remedial measures and potential remedial system enhancements.

l. Propose a reporting schedule to provide updated information on the installation and operation of remedial and monitoring systems.

m. Provide Financial Assurance in accordance with Section XI.E.

n. Provide draft language intended to comply with the deed notification requirements of 30 TAC 350.111 and 350.135(a)(11).

o. Provide a summary of the approved workers protection plan.

p. Provide a discussion of areas of ecological impact, if any, and development of associated Protective Concentration Limits (PCLs).

q. Provide a discussion of how NAPL occurrences, if any, will be addressed inside and outside the FOA.

r. Provide a schedule of implementation for items not completed at the time of application See also Section XI.D.8.

6. Waste Management Units/Areas Monitored Under Corrective Action Programs - Plume Management Zone (PMZ) Groundwater in the facility is monitored under the Facility-Wide Corrective Action Program which includes the Southwest LTU 612/614; Southwest LTU 613; Southwest LTU 616; fLTU 582, 583, and 584; LTU 579; Southwest Landfill; Northeast Landfill; Landfill 100; LTB Pits; WGB; WIB; API Separator; and the Affected fill AOC. These were addressed in the CMI workplan described above.

a. Please provide a summary of the HWMUs and SWMUs/AOCs that will be addressed within the PMZ boundary.

b. Please provide a discussion of the multiple sources of COCs present and how PMZ will better address these sources.

c. Please provide maps of appropriate scale depicting the following (maps may be combined where appropriate);
   (1) HWMUs/SWMUs/AOCs addressed
   (2) surrounding land use
   (3) PMZ lateral boundaries
   (4) potential source areas
   (5) Potentiometric surface of all relevant transmissive units
   (6) Surrounding water wells
   (7) extent of known contamination in each transmissive unit
   (8) number, location and type of monitoring points in each stratigraphic unit to be monitored
   (9) Areas of potential ecological impact
   (10) known occurrences of LNAPL or DNAPL in each transmissive unit

d. Please provide sufficient cross-sections depicting the following (maps may be combined where appropriate);
   (1) The vertical boundaries of the PMZ;
   (2) The vertical extent of contamination;
   (3) potentiometric surfaces for each transmissive unit.

e. Please provide tabulated information for;
   (1) history of all relevant units or AOCs;
   (2) summary of hydrogeologic data for each affected transmissive unit;
   (3) results of Appendix IX GW sampling;
   (4) proposed PCLs for each constituent for each monitoring point (Point of Exposure wells, alternate point of exposure wells, etc.) with supporting documentation (including a discussion of exposure pathways). This should also include the designation/establishment of sufficient number of Attenuation Monitoring Points (AMPs) beginning at an appropriate hydraulically upgradient location within the groundwater protective concentration level exceedance (PLCE) zone and continuing down the approximate central flow path of the constituent of concern (COC) in the downgradient extent of the Plume Management Zone(s) in accordance with 30 TAC 350.33(f)(4)(D).
   (5) Establish/Calculate Attenuation Action Levels (AALs) (critical PCLs) for each attenuation monitoring point in accordance with 30 TAC 350.33(f)(4)(D)(ii). The established AALs (critical PCLs) for each AMP well should be graphically presented in table format on the plan view map depicting the location of individual monitoring wells (including AMP wells) for corrective action monitoring labeled "CP Attachment A, Sheet xx of xx", referenced in XI.D.4.b.

f. Please provide a discussion of the types of corrective action that will be employed to address contaminated media.

g. Please provide detailed descriptions of GW recovery and other remedial technologies such as vapor extraction, interceptor trenches, hydraulic containment, barrier walls, etc., including radius of influence, estimated optimum recovery rates, location of collection, storage or disposal facilities.

h. Please provide a detailed description of the groundwater monitoring system including placement of monitoring wells, hydrogeologic characteristics of monitored units and well completion details.

i. Please provide a Sampling and Analysis plan for the proposed PMZ that includes development of COCs to be monitored, sampling methodology, sample handling procedures, sampling frequency and statistical procedures for evaluating analytical results.

j. Please propose a methodology for evaluating the effectiveness of remedial measures and potential remedial system enhancements.

k. Please propose a reporting schedule to provide updated information on the installation and operation of remedial and monitoring systems.

l. Please provide a thorough detailed description of an estimate of all costs that will be incurred by implementing, operating, and maintaining the corrective action and monitoring systems addressed by the compliance plan.

m. Please provide draft language intended to comply with the deed notification requirements of 350.111, and schedule to verify compliance with institutional control requirements in accordance with 30 TAC 350.31(g) which provides notice of the existence and location of the PMZ and which prevents exposure to groundwater from this zone until such a time as constituents of concern may be reduced to below the GWPS.

n. Schedule for notification requirements if an unexpected event occurs, or a condition is detected, during post-response action care period which indicates that additional response actions will be required at an affected property pursuant to 30 TAC 350.33(k).

o. Please provide a summary of the approved soil response action plan.

p. Please provide a discussion of areas of ecological impact, if any, and development of associated PCLs.

q. Please provide a discussion of how NAPL occurrences, if any, will be addressed inside the PMZ.

r. Please provide a schedule of implementation for items not completed at the time of application {See also Section XI.D.8.}

7. Waste Management Units/Areas Monitored Under Alternative Corrective Action Program for Co-mingled plumes Alternative groundwater Corrective Action Program apply, pursuant 30 TAC 335.151, 335.156 and 350, for commingled release from RCRA-regulated unit and from one or more SWMUs and/or AOC. Not Applicable.

a. Complete Sections XI.D.1. through 4.;

b. In addition to the CP Attachment A maps in Section XI.D.4.b., CP Attachment A maps should clearly depict those waste management unit or areas of the facility which have commingled plumes and the alternative corrective action applies.

c. Please provide a schedule of implementation for items not completed at the time of application {See also Section XI.D.8.}

8. Implementation Schedule

Itemize and discuss, in detail, the estimated time schedule necessary for any testing and assessments, system design, construction and installation, and final

implementation of the groundwater monitoring program for each Regulated Unit and solid waste management unit. If the schedule of implementation for items are not completed at the time of the application, or are not completed at the time of issuance of the final draft Compliance Plan, then the items should be added to the CP Table VIII - (Compliance Schedule) of the application.

The corrective action system and associated monitoring program is in place and is currently operating under the existing Compliance Plan.

The retained landfills for the CMI are the Southwest Landfills. The final corrective measures for the landfills consists of an ongoing inspection and maintenance program to ensure that exposure to the underlying waste materials will not occur. The cover systems for the landfill are inspected on a semiannual frequency and repaired for damages identified during the inspections. Forms are completed during the inspections that document the date and time of the inspection, the name of the inspector, a notification of observations made, and the date and nature of any repair or maintenance activity. Copies of the completed inspection forms are submitted with the annual CMACA Reports submitted by July 21st of each year.

Tank 807 LTB Pit Corrective Measures Implementation Report was submitted in July 2010.

The annual summary report for the Continuing Hydrocarbon Source Abatement Plan is submitted in the CMACA which is due on July 21st of each year.

E. Cost Estimates For Financial Assurance

As required by 30 TAC 335.156 and 335.167, the applicant must provide cost estimates for groundwater monitoring and corrective action to determine the amount of financial assurance. Please complete the applicable parts of this form. Cost estimates should be filled out for each proposed corrective action/monitoring system at the site; or any additional corrective action system not covered in this Part. Please note, the Executive Director may request from the applicant documentary evidence for cost estimates.

If an item is not applicable, please mark it NA.

General Information:

1. For each Waste Management Area (WMA) list the following:
   a. A description of the waste management unit(s) in the WMA (e.g., landfill, surface impoundment, land treatment);

      The facility is under a facility-wide corrective action plan for groundwater.

2. The NoR unit number(s) in the WMA; and the compliance period for the WMA listed above.

   Year(s) = ____30_____

3. (The compliance period is the number of years equal to the active life of the waste

management area as defined in 30 TAC 335.162).

4. In instances where the compliance period is equal to or exceeds 30 years, the maximum amount of financial assurance required will be based on 30 years because the required post-closure care period to perform corrective action and groundwater monitoring is 30 years. In instances where the compliance period is less than 30 years, the financial assurance for corrective action or compliance monitoring will be based on the longest time frame established by one of the following criteria:

   (1) the duration of your compliance plan;
   (2) the time frame for clean-up based on model projections and historical data as approved by the Executive Director; or
   (3) the compliance period for the unit/area.

   Total Years Used To Calculate the Financial Assurance for the Corrective Action and/or Compliance Monitoring Program Year(s) = ____30_____

5. Please complete Table XI.E.1. – Corrective Action Program Cost Estimate.

6. Please complete Table XI.E.2. – Groundwater Monitoring Cost Estimate.

7. Please complete Table XI.E.3. – Financial Assurance Summary.

Table XI.A.1. - Facility History for Waste Management Units

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Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was Last Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
1. Southwest Landfarm 612/614	Land Treatment Unit	001	1960	Pre-RCRA	4.96 acres	Unknown	1998	October 6, 2014	April 21, 2015	No
2. Southwest Landfarm 613	Land Treatment Unit	003	1960	Pre-RCRA	3.27 acres	Unknown	1998	October 6, 2014	April 21, 2015	No
3. Southwest Landfarm 615	Land Treatment Unit	004	1960	Pre-RCRA	Unknown	Unknown	1998	January 9, 2004	April 21, 2015	No
4. Southwest Landfarm 616	Land Treatment Unit	005	1960	Pre-RCRA	2.1 acres	Unknown	1998	January 9, 2004	April 21, 2015	No
5. Southwest Landfarm 617	Land Treatment Unit	006	1960	Pre-RCRA	Unknown	Unknown	1998	October 6, 2014	April 21, 2015	No
6. Northeast Landfarm 2	Land Treatment Unit	007	1960s/ 1970s	Pre-RCRA	Unknown	Unknown	Unknown	January 9, 2004	April 21, 2015	No

Table XI.A.1. - Facility History for Waste Management Units

Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was Last Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
7. Leaded Sludge Weathering Tank	Tank - Surface	008	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
8. Asbestos/ Lead (West of Facility 039)	Container Storage Area	010	Unknown	Hazar-dous	Unknown	Unknown	Active	N/A	N/A	Unknown
9. Equalization Basin	Wastewater Treatment Unit	012	Unknown	N/A	Unknown	Unknown	N/A	Unknown	December 22, 2005	No
10. Northeast Landfarm 4	Land Treatment Unit	022	1960s/ 1970s	Pre-RCRA	Unknown	Unknown	Unknown	February 3, 2005	April 21, 2015	No
11. East Guard Basin	Surface Impoundment	032	1969	N/A	6 MM Gal.	0	Inactive (delay of closure)	N/A	N/A	No

Table XI.A.1. - Facility History for Waste Management Units

Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was Last Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
12. East Impoundment Basin	Surface Impoundment	034	1974	N/A	19.5 MM Gal.	0	Inactive (delay of closure)	N/A	N/A	No
13. Biological Oxidation Basin (BIOX)	Surface Impoundment	037	1957	N/A	Unknown	Unknown	Unknown	1994	April 16, 1996	No
14. Oily Water Retention Basin (East of NOR No. 022)	Surface Impoundment	038	1983	Unknown	2 MM gal.	Unknown	Unknown	1985	November 3, 1993	No
15. West Staging Building	Container Storage Area	039	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown
16. East Staging Building	Container Storage Area	040	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown

Table XI.A.1. - Facility History for Waste Management Units

Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was Last Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
17. Catalyst Staging Area	Container Storage Area	041	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown
18. West of NOR No. 039	Container Storage Area	042	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown
19. C&P Slab (West of C&P Guard Basin)	Container Storage Area	044	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown
20. Bundle Cleaning Slab (West of Paint Shop)	Container Storage Area	045	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown
21.Roll-off Storage (West of East Guard Basin)	Container Storage Area	056	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown

Table XI.A.1. - Facility History for Waste Management Units

Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was Last Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
22.Roll-off Storage (South of West Guard Basin)	Container Storage Area	057	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown
23.Roll-off storage at SSPU	Container Storage Area	062	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown
24.Temporary Roll-off Storage (North of 737 Coker Cooling Tower)	Container Storage Area	063	Unknown	Unknown	Unknown	N/A	Active	N/A	N/A	Unknown
25. Southwest Landfill	Landfill	025	1930	Pre-RCRA	65,100 cy	65,100 cy	1970	1970s	N/A	No
26. Land Treatment Units 582, 583, & 584	Land Treatment Unit	026	1984	Non-hazardous	Unknown	Unknown	Active	N/A	N/A	No

Table XI.A.1. - Facility History for Waste Management Units

(Page _6__ of _8__)

Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was Last Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
27. Land Treatment Unit 578/579	Land Treatment Unit	027	Unknown	Non-hazardous	5,000 cy	5,000 cy	Active	N/A	N/A	No
28. Northeast Landfill	Landfill	028	1935	Pre-RCRA	103,000 cy	103,000 cy	late 1960s	1972	N/A	No
29. Landfill 100	Landfill	029	1935	Pre-RCRA	Unknown	Unknown	1970	1970	N/A	No
30. Leaded Tank Bottom Pits	Landfill	030	1950s	Pre-RCRA	Unknown	Unknown	1979	N/A	N/A	No
31. West Guard Basin	Surface Impoundment	031	1969	N/A	5 MM Gal.	0	Active	N/A	N/A	No

Table XI.A.1. - Facility History for Waste Management Units

Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was Last Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
32. West Impoundment Basin (Northern Portion)	Surface Impoundment	033	1974	N/A	~17 MM Gal.	0	Active / south ½ closed in 1994	N/A	N/A	No
33. API Separator	Wastewater Treatment Unit	035	Unknown	N/A	Unknown	0	Active	N/A	N/A	No
34. Acid Retention Basin	Surface Impoundment	036	1957	N/A	Unknown	Unknown	1980	1994	December 22, 2005	No
35. West Impoundment Basin (So. Portion of NOR No. 033)	Surface Impoundment	049	Unknown	Unknown	Unknown	Unknown	Inactive	N/A	N/A	Unknown
36. Processing Cooling Tower Sludge	Land Treatment Unit	050	Unknown	Unknown	Unknown	Unknown	Inactive	N/A	N/A	Unknown

Table XI.A.1. - Facility History for Waste Management Units

Name of Waste Management Unit(1)	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was First Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was Last Placed in Unit(2)	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed(3)	Is There Evidence of a Release of Hazardous Constituent(s)(4) to Groundwater? (Yes, No, or Unknown)
36. Processing Cooling Tower Sludge	Land Treatment Unit	051	Unknown	Unknown	Unknown	Unknown	Inactive	N/A	N/A	Unknown
36. Processing Cooling Tower Sludge	Land Treatment Unit	052	Unknown	Unknown	Unknown	Unknown	Inactive	N/A	N/A	Unknown
36. Processing Cooling Tower Sludge	Land Treatment Unit	053	Unknown	Unknown	Unknown	Unknown	Inactive	N/A	N/A	Unknown
36. Processing Cooling Tower Sludge	Land Treatment Unit	054	Unknown	Unknown	Unknown	Unknown	Inactive	N/A	N/A	Unknown
37. Area Fill AOC	Other		Unknown	Unknown	Unknown	Unknown	Unknown	N/A	N/A	Yes

1 Indicate by asterisk (*) those waste management units that have received any hazardous waste constituent listed in Appendix VIII of 40 CFR Part 261.
2 For the purposes of this Compliance Plan Application, a waste management unit receiving hazardous waste after July 26, 1982 shall be considered a Regulated Unit. A waste management unit that ceased receiving hazardous waste on or before that date shall be considered a Solid Waste Management Unit (SWMU).
3 Date the applicant submitted certification of closure to the Commission.
4 Hazardous constituents are those hazardous constituents listed in Appendix IX of 40 CFR Part 264.

Table XI.E.1. Corrective Action Program Cost Estimate

1. Pumping Capacity Per Year:		
A. Daily average system pumping rate	19,666	gal/day
B. Annual groundwater volume recovered	7,200,000	gal/yr
2. Off-Site Liquid Treatment / Disposal Cost:		
A. Volume of treated contaminated water to be disposed of off-site yearly	7,200,000	gal/yr
B. Transportation of liquid waste disposed of off-site yearly		
(1) Transportation cost per gallon	0	$/gal
(2) Gallons of contaminated water shipped per year	0	gal/yr
(3) Annual cost of transportation (1 x 2)	0	$/yr
C. On-site yearly storage cost prior to off-site disposal	0	$/yr
D. Off-site yearly treatment cost of liquid waste		
(1) Treatment charge per gallon	0	$/gal
(2) Total volume to be treated per year	0	gal/yr
(3) Annual treatment cost (1 x 2)	0	$/yr
E. Off-site disposal cost of liquid waste per year		
(1) Disposal charge per gallon	0.0012	$/gal
(2) Total volume to be disposed per year	7,200,000	gal/yr
(3) Annual disposal cost (1 x 2)	8,625	$/yr
*ANNUAL OFF-SITE LIQUID TREATMENT / DISPOSAL COST (2B3 + 2C +2D3 + 2E3)	8,625	$
3. On-site Waste Water Treatment System Cost and On-site Treatment / Disposal Cost:		
Submit a cost estimate for a treatment system specifically designed and used exclusively for the groundwater corrective action program and operational after some start up maintenance. Estimates to clean out the system should also be included in the following cost.		
A. Initial capital expenditure for treatment system including start up maintenance	0	$
*ON-SITE WASTE WATER TREATMENT SYSTEM CAPITAL COST (3A)	0	$
B. Gallons of contaminated water to be treated on-site per year	0	gal/yr
C. Cost of on-site treatment per gallon	0	$/gal
D. Cost of sludge, or solids disposal per year	0	$/yr
E. Cost per year of maintenance on treatment system and recovery system, along with any additional equipment and repairs needed for the systems	0	$/yr
F. Cost of on-site disposal per year	0	$/yr
*ANNUAL ON-SITE TREATMENT / DISPOSAL COST [(3B X 3C) + 3D + 3E + 3F]	0	$

4. Inspections, Maintenance and Operation Cost for the Corrective Action Program:

A. Operator's time on-site for inspections and maintenance per year	500	hour/yr
B. Charge of salary per hour	16	$/hr
C. Annual cost of labor (4A x 4B)	8,168	$/yr
D. Replacement of parts and equipment per year	2,178	$/yr
E. Electricity cost per year	1,742	$/yr
*ANNUAL INSPECTIONS / MAINTENANCE / OPERATION COST FOR THE CORRECTIVE ACTION PROGRAM (4C + 4D + 4E)	12,088	$

Table XI.E.2.e Groundwater Monitoring Cost Estimate

1. Annual Sampling and Analysis Cost:
   - A. Background Wells
     - (1) Number of wells: 4
     - (2) Sample analysis cost per well: 263.54 $/well
     - (3) Number of sampling events per year: 2 /yr
     - (4) Sampling cost (1 x 2 x 3): 2,108.30 $
   - B. Point of Compliance Wells
     - (1) Number of wells: 0
     - (2) Sample analysis cost per well: 0 $/well
     - (3) Number of sampling events per year: 0 /yr
     - (4) Sampling cost (1 x 2 x 3): 0 $
   - C. Recovery Wells
     - (1) Number of wells: 21
     - (2) Sample analysis cost per well: 151.47 $/well
     - (3) Number of sampling events per year: 2 /yr
     - (4) Sampling cost (1 x 2 x 3): 6,361.70 $
   - D. Corrective Action Observation Wells
     - (1) Number of wells: 9
     - (2) Sample analysis cost per well: 151.47 $/well
     - (3) Number of sampling events per year: 2 /yr
     - (4) Sampling cost (1 x 2 x 3): 2,726.44 $
   - E. Point of Exposure Wells
     - (1) Number of wells: 10
     - (2) Sample analysis cost per well: 263.54 $/well
     - (3) Number of sampling events per year: 2 /yr
     - (4) Sampling cost (1 x 2 x 3): 5,270.76 $
   - F. Supplemental Wells
     - (1) Number of wells: 0
     - (2) Sample analysis cost per well: 0 $/well
     - (3) Number of sampling events per year: 0 /yr
     - (4) Sampling cost (1 x 2 x 3): 0 $
   - G. Field Quality Control Sampling
     - (1) Number of wells: 9
     - (2) Sample analysis cost per well: 226.19 $/well
     - (3) Number of sampling events per year: 2 /yr
     - (4) Sampling cost (1 x 2 x 3): 4,071.34 $
2. Sampling Labor Cost:
   - A. Hours of sampling per well: 1 hrs/well
   - B. Number of sampling technicians per well: 1
   - C. Charge per hour: 65.34 $/hr

D. Total number of wells to be sampled annually	0	Wells
E. Total number of wells sampled semi-annually	44	Wells
F. Total number of wells sampled quarterly	0	Wells
G. Total number of wells sampled monthly	0	Wells
H. Total number of wells sampled per year (2D) + (2E x 2) + (2F x 4) + (2G x 12)	88	total wells sampled/yr
I. Sampling Labor Cost (2A x 2B x 2C x 2H)	5,749.92	$
*ANNUAL GROUNDWATER MONITORING COST	26,288.46	$
3. Well Installation (typical cost):		
A. Monitor well installation cost per well	N/A	$/well
B. Number of monitor wells to be installed	0	Wells
C. Cost of monitor well system (A x B)	0	$
D. Recovery well installation cost per well	N/A	$/well
E. Number of Recovery Wells to be installed	0	Wells
F. Cost of Recovery well system (D x E)	0	$
*TOTAL WELL INSTALLATION COST (3C + 3F)	0	$
4. Administrative Cost:		
A. Annual cost for record-keeping and report preparation	10,890	$
*ANNUAL ADMINISTRATIVE COST (4A)	10,890	$
5. Inspection and Maintenance Cost for the Monitoring Program:		
A. Operator's time (hours) on-site for inspections and maintenance per year	8	hour/yr
B. Charge or salary per hour	65.34	$/hr
C. Annual cost of labor (4A x 4B)	217.80	$/yr
D. Replacement of parts and equipment per year	740.52	$/yr
*ANNUAL INSPECTIONS / MAINTENANCE COST FOR THE GROUNDWATER MONITORING PROGRAM (5C + 5D)	680	$

Table XI.E.3. – Financial Assurance Summary

ANNUAL OFF-SITE LIQUID TREATMENT / DISPOSAL COST	$	8,625.00	
ANNUAL ON-SITE TREATMENT / DISPOSAL COST	$	0	
ANNUAL INSPECTION / MAINTENANCE / OPERATION COST FOR THE CORRECTIVE ACTION PROGRAM	$	12,088.00	
ANNUAL GROUNDWATER MONITORING COST	$	26,288.46	
ANNUAL ADMINISTRATIVE COST	$	10,890.00	
ANNUAL INSPECTION AND MAINTENANCE COST FOR THE GROUNDWATER MONITORING PROGRAM	$	740.52	
ANNUAL SUB TOTAL	$	58,631.98	
TOTAL YEARS USED FOR CALCULATING FINANCIAL ASSURANCE		30	Yrs
REMEDIATION COST (Annual Sub Total x Total Years Used)	$	1,758,959.40	
ON-SITE WASTE WATER TREATMENT SYSTEM CAPITAL COST	$	0	
TOTAL WELL COST	$	0	
10% Contingency	$	175,895.94	
GRAND TOTAL COST (nearest $1000) (2020)	$	1,935,000	

CP Table I: Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring

A. Corrective Action[1] (30 TAC §335.166)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
RESERVED			

B. Compliance Monitoring[1] (30 TAC §335.165)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
RESERVED			

C. Corrective Action[2] (30 TAC §335.167)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
Historical	Affected Fill AOC	025, 026, 027, 028, 030, 031, 033, 035	Various

D. Alternative Corrective Actions[3] (30 TAC §335.151)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
RESERVED			

E. Facility Operations Area (FOA)[4] (30 TAC §335.156 and Chapter 350)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
RESERVED			

[Note: Enter "Reserved" if a specific program (referenced in CP Table I.A., I.B., I.C., I.D., and/or I.E.) is not applicable. More than one program may apply to a facility. Also, include a CD disk with the application that provides an electronic copy of the applicable files supporting CP TABLES I-VI in MS Word format.]

Foot Notes:

1 Program applies to RCRA-regulated units only.

2 Program applies to releases from solid waste management units (SWMUs) and/or areas of concern (AOCs).

3 Program applies to commingled releases from RCRA-regulated unit and from one or more SWMUs and/or AOCs.

4 List SWMUs, additional units/areas of Investigation, AOCs, RCRA-regulated units within the FOA that are subject to corrective action. For RCRA units, SWMUs and/ or AOC outside the FOA boundary for which compliance monitoring and/ or corrective action applies should be listed separately in Items A, B or C as appropriate.

5 Specify the date of Commissions No Further Action approval letter for program requirement and remedy standard completed for all media of concern. [Note: for the purpose of maintaining a historical record, the permittee shall update CP Table I to reflect the new status of the unit / area to include the remedy standard achieved for all media of concern and the date of the Commissions No Further Action approval letter. The units/area shall not be deleted from this table even though the program objectives have been completed and no further action has been approved. Put "N/A" in this column if not applicable.]

CP Table II: Solid Waste Management Units and/or Areas of Concern for which Corrective Action applies pursuant to 30 TAC 335.167

Unit Number[1]	Unit Name	Notice of Registration (NOR) Number, if applicable	SWMU or AOC	Media Affected[2]	Date Program Requirement and Remedy Standard Completed[3]
37	Affected Fill AOC	None	AOC	Groundwater	NA
1.	Southwest Landfill	025	SWMU	Groundwater	NA
2.	Land Treatment Units 582, 583, 584	026	SWMU	Groundwater	NA
3.	Land Treatment Unit 579	024 and 027	SWMU	Groundwater	NA
4.	Northeast Landfill	028	SWMU	Groundwater	NA
5.	Landfill 100	029	SWMU	Groundwater	NA
6.	Leaded Tank Bottom Pits	030	SWMU	Groundwater	NA
7.	West Guard Basin	031	SWMU	Groundwater	NA
8.	West Impoundment Basin	033	SWMU	Groundwater	NA
33.	API Separator	035	SWMU	Groundwater	NA
34.	Acid Retention Basin	036	SWMU	Groundwater	Closure approved December 22, 2005

12.	Oily Water Retention Basin	038	SWMU	Groundwater	Closure approved November 3, 1993
9.	Equalization Basin	012	SWMU	Groundwater	Closure approved December 22, 2005
13.	Biological Oxidation Basin	037	SWMU	Groundwater	Closure approved April 16, 1996

Foot Notes:
SWMU ‘ Solid Waste Management Unit
AOC ‘ Area of Concern
1 For sites with FOA Authorization, list SWMUs and/or AOCs that were not included in the FOA, and are subject to corrective action.
2 Specify affected media groundwater, soils, etc.
3 Specify the date of Commissions No Further Action approval letter for program requirement and remedy standard completed for all media of concern.
4 Facility-wide groundwater contamination is managed under the Affected Fill AOC. All of the listed units are contained within that AOC.

CP Table III: Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

Unit Name	COLUMN A: Hazardous Constituents	COLUMN B: Concentration Limits at POE at Property Boundary (mg/L)[1]	COLUMN C: Concentration Limits at POE at Property Boundary along Houston Ship Channel (mg/L)[2]
Facility Wide Groundwater			
1. Organics			
	Benzene	0.005 ^{MCL}	3.1 ^{SED}GW
	Carbon Disulfide	2.4 ^{MSC}	770,000 ^{SED}GW
	Ethylbenzene	0.7 ^{MSC}	1.2 ^{SED}GW
	1-Methylnaphthalene	0.031 $^{GW}GW_{ING}$	2,200 ^{SED}GW
	2-Methylnapthalene	0.098 $^{GW}GW_{ING}$	0.00317 ^{SED}GW
	Naphthalene	0.49 ^{MSC}	0.072 ^{SED}GW
	Toluene	1.0 ^{MCL}	3.2 ^{SED}GW
	Xylenes	10.0 ^{MSC}	1.9 ^{SED}GW
2. Inorganics			
	Antimony	0.2 ^{BKG}	0.2 ^{BKG}
	Arsenic	0.0173 ^{BKG}	0.02 ^{SED}GW
	Barium	2.0 ^{MCL}	55 ^{SED}GW
	Beryllium	0.004 ^{MCL}	0.3 ^{SED}GW
	Cadmium	0.005 ^{MCL}	0.077 ^{SED}GW
	Cobalt	0.24 $^{GW}GW_{ING}$	0.7 ^{SED}GW

Unit Name	COLUMN A: Hazardous Constituents	COLUMN B: Concentration Limits at POE at Property Boundary (mg/L)[1]	COLUMN C: Concentration Limits at POE at Property Boundary along Houston Ship Channel (mg/L)[2]
	Lead	0.04 ^{BKG}	13 ^{Sed}GW
	Mercury	0.002 ^{MCL}	1.6 ^{Sed}GW
	Nickel	0.049 $^{GW}GW_{ING}$	2.2 ^{Sed}GW
	Selenium	0.05 ^{MCL}	6.4 ^{Sed}GW
	Vanadium	0.044 $^{GW}GW_{ING}$	0.01 ^{BKGD}

[1] GWPS applies to Point of Exposure (POE) wells located at property boundary
[2] GWPS applies to POE Wells located at property boundary along Houston Ship Channel

[Note: This Table should present the long list of hazardous constituents that are reasonably expected to be in or derived from waste placed in the units, and may not necessarily be detected and that are to be monitored semi-annually. Also, instead of listing individual constituents of concern (COCs), Appendix IX can be referenced in this table. If Appendix IX list and associated Practical Quantitation Limit (PQL) or Method Quantitation Limit (MQLs) are being required instead of listing individual COCs, add this sentence: The Permittee may petition the Executive Director for deletion of specific parameters from Appendix IX analysis if the Permittee can demonstrate that the constituents were never used in the facility's operation or were never disposed in the waste management area.]
[*Add COLUMN C if there is a GWPS assigned at a Point of Exposure (POE) (e.g. monitored natural attenuation and Plume Management Zone established in accordance with 30 TAC 350, if applicable). Modify Table and footnotes as necessary.]
Foot Note:
Use the following GWPS footnote designations if Risk Reduction Rules (RRR) or Texas Risk Reduction Program (TRRP) apply:
* For RRR use the following GWPS designation:*
MSC ACL pursuant to 30 TAC §335.160(b) based upon the Groundwater Medium-Specific Concentration, Residential {...or Industrial...) Risk Reduction Standard No. 2 {...or No. 3}specified in 30 TAC §335 Subchapter S.
MCL ACL pursuant to 30 TAC §335.160(b) based upon the Groundwater Maximum Contaminant Level specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subparts B and G.
SMCL ALC pursuant to 30 TAC §335.160(b) based upon the Groundwater Secondary Maximum Contaminant Level (MCL) specified in 40 CFR Part 143, National Secondary Drinking Water Regulations.
AL ACL pursuant to 30 TAC §335.160(b) based upon the Action Level specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subpart I.
BKG Background as determined in accordance with 30 TAC 350.4(a)(6).
ND Non-detectable at PQL as determined by the analytical methods of the EPA SW-846 most recent edition, and as listed in the July 8, 1987 edition of the Federal Register and later editions. PQL is indicated in parentheses. PQL is the lowest concentrations of analytes in groundwaters that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating condition.
* or Use the following GWPS designation if TRRP applies:*
$^{GW}GW_{Ing}$ ACL pursuant to 30 TAC §335.160(b) based upon the Protective Concentration Level (PCL) determined under Remedy Standard A (RSA) or Remedy Standard B (RSB) (Residential or Commercial / Industrial) for Class 1 or Class 2 Groundwater ingestion PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table. In

accordance with §350.72(b), $^{GW}GW_{Ing}$, PCLs may need to be adjusted to lower concentrations to meet the cumulative carcinogenic risk level (less than or equal to 1x10-4) and hazard index criteria (less than or equal to 10) when there are more than 10 carcinogenic and/or more than 10 non-carcinogenic chemicals of concern within a source medium.

GWGWClass3 ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB (Residential or Commercial /Industrial), Tier I for Class 3 Groundwater ingestion PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

$^{Air}GW_{Inh\text{-}V}$ ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB (Residential or Commercial /Industrial) for Class 1 or Class 2 Groundwater inhalation PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

^{SW}GW ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB for Groundwater- to-surface water PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

^{SED}GW ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB for Groundwater- to-sediment PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

^{ECO}GW ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB for Groundwater- based on ecological receptor(s) PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

AAL ACL derived pursuant to 30 TAC §335.160(b) based upon the Attenuation Action Level as defined in 30 TAC §350(a)(4).

BKG Background as determined in accordance with 30 TAC 350.4(a)(6).

ND Non-detectable at MQL as determined by the analytical methods of the EPA SW-846 most recent edition, and as listed in the July 8, 1987 edition of the Federal Register and later editions. MQL is indicated in parentheses. MQL is defined in 30 TAC §350.4 (54) as the lowest non-zero concentration standard in the laboratory's initial calibration curve and is based on the final volume of extract (or sample) used by the laboratory.

CP Table IIIA: Corrective Action Program Table of Indicator Parameters and Groundwater Protection Standard

Unit Name	COLUMN A: Hazardous Constituents	COLUMN B: Concentration Limits at POE at Property Boundary (mg/L)[1]	COLUMN C: Concentration Limits at POE at Property Boundary along Houston Ship Channel (mg/L)[2]
1. Organics			
	Benzene	0.0050 MCL	3.1 SED GW
	Toluene	1.0 MCL	3.2 SED GW
	1-Methylnaphthalene	.031 GW GW_{ING}	2,200 SED GW
	Naphthalene	0.49 MSC	0.072 SED GW
2. Inorganics			
	Lead	0.040 BKG	13 SED GW

[1] *GWPS applies to Point of Exposure (POE) wells located at property boundary*
[2] *GWPS applies to POE Wells located at property boundary along Houston Ship Channel*

[Note: This Table should list the short list of constituents (i.e., indicator parameters) developed from CP Table III – Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard to be monitored semiannually during the Corrective Action Program to verify GWPSs are met.]
[*Add COLUMN C if there is a GWPS assigned at a Point of Exposure (POE) (e.g. monitored natural attenuation and Plume Management Zone established in accordance with 30 TAC 350, if applicable). Modify Table and footnotes as necessary.]
Foot Note:
Use the following GWPS footnote designations if Risk Reduction Rules (RRR) or Texas Risk Reduction Program (TRRP) apply:
* For RRR use the following GWPS designation:*
MSC ACL pursuant to 30 TAC §335.160(b) based upon the Groundwater Medium-Specific Concentration, Residential {...or Industrial...) Risk Reduction Standard No. 2 {...or No. 3}specified in 30 TAC §335 Subchapter S.
MCL ACL pursuant to 30 TAC §335.160(b) based upon the Groundwater Maximum Contaminant Level specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subparts B and G.
SMCL ALC pursuant to 30 TAC §335.160(b) based upon the Groundwater Secondary Maximum Contaminant Level (MCL) specified in 40 CFR Part 143, National Secondary Drinking Water Regulations.
AL ACL pursuant to 30 TAC §335.160(b) based upon the Action Level specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subpart I.
BKG Background as determined in accordance with 30 TAC 350.4(a)(6).
ND Non-detectable at PQL as determined by the analytical methods of the EPA SW-846 most recent edition, and as listed in the July 8, 1987 edition of the Federal Register and later editions. PQL is indicated in parentheses. PQL is the lowest concentrations of analytes in groundwaters that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating condition.

* or Use the following GWPS designation if TRRP applies:*

[GW]GW_{Ing} ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB (Residential or Commercial /Industrial) for Class 1 or Class 2 Groundwater ingestion PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table. In accordance with §350.72(b), GWGWIng, PCLs may need to be adjusted to lower concentrations to meet the cumulative carcinogenic risk level (less than or equal to 1x10-4) and hazard index criteria (less than or equal to 10) when there are more than 10 carcinogenic and/or more than 10 non-carcinogenic chemicals of concern within a source medium.

GWGWClass3 ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB (Residential or Commercial /Industrial), Tier I for Class 3 Groundwater ingestion PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

AirGWInh-V ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB (Residential or Commercial /Industrial) for Class 1 or Class 2 Groundwater inhalation PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

SWGW ACL pursuant to 30 TAC §335.160(b) based upon the Protective PCL determined under RSA or RSB for Groundwater- to-surface water PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

SEDGW ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB for Groundwater- to-sediment PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

ECOGW ACL pursuant to 30 TAC §335.160(b) based upon the PCL determined under RSA or RSB for Groundwater- based on ecological receptor(s) PCL of 30 TAC Chapter 350. The PCL value, Column B, will change as updates to the rule are promulgated. Changes to the rule automatically change the concentration value established in Column B in this table.

AAL ACL derived pursuant to 30 TAC §335.160(b) established as an Attenuation Action Level as defined in 30 TAC §350(a)(4).

BKG Background as determined in accordance with 30 TAC 350.4(a)(6).

ND Non-detectable at MQL as determined by the analytical methods of the EPA SW-846 most recent edition, and as listed in the July 8, 1987 edition of the Federal Register and later editions. MQL is indicated in parentheses. MQL is defined in 30 TAC §350.4 (54) as the lowest non-zero concentration standard in the laboratory's initial calibration curve and is based on the final volume of extract (or sample) used by the laboratory.

CP Table IV: Compliance Monitoring Program Table of Hazardous and Solid Waste Constituents and Quantitation Limits

RESERVED

CP Table IVA: Compliance Monitoring Program Table of Detected Hazardous Constituents and the Groundwater Protection Standard

RESERVED

CP Table V: Designation of Wells

Point of Compliance Wells:

None

Point of Exposure Wells:

1. POE Wells at Property Boundary
   GMW-4, GMW-5, GMW-79, GMW-92

2. POE Wells at Property Boundary along Houston Ship Channel
   GMW-11, GMW-14, GMW-56, GMW-83, GMW-84, GMW-85

Alternate Point of Exposure Wells:

None

Background Wells:

1. Upgradient Wells
   GMW-21, GMW-22, GMW-35, GMW-86

FOA Boundary of Compliance Wells Background Wells:

None

Exposure Pathway:

N/A

Note: Wells that are not listed in this table are subject to change, upon approval by the Executive Director, without modification to the Compliance Plan.

CP Table VI: Compliance Period for RCRA-Regulated Units

RESERVED

CP Table VIII: Compliance Schedule

Item	Compliance Schedule *(from the date of issuance of the Compliance Plan unless otherwise specified)*	Regulatory Citation	Requirement
A.	60	Compliance Plan	Submit to the Executive Director a schedule summarizing all activities required by the Compliance Plan. The schedule shall list the starting dates of all routine activities. The Permittee shall include an updated schedule in the report required by Compliance Plan CP Table VII – Reporting Requirements. The schedule shall list the activity or report, the Compliance Plan Section which requires the activity or report and the calendar date the activity or report it to be completed or submitted (if this date can be determined).

Attachment A

Alternate Concentration Limits

Alternate Concentration Limits (ACLs) must be submitted by hazardous waste facility owners or operators who seek ACLs for any hazardous constituent as provided by 30 TAC 335.160(b) as a part of a compliance monitoring or corrective action program. An ACL demonstration should follow the guidance provided in this attachment. Compliance Plan Application, Section XI.B.2.b. outlines when an ACL demonstration must be conducted. Where possible in "Attachment A", the applicant may copy information previously submitted to the Commission and reference the information submitted in other Sections (Sections I and XI.B. through E.) of this Compliance Plan Application.

Alternate Concentration Limit Demonstration

An ACL petition is based on a demonstration that hazardous constituents detected in the groundwater will not pose a substantial present or future threat to human health or the environment at the ACL levels. Potential adverse effects on both groundwater quality and hydraulically connected surface water quality must be addressed. Using Environmental Protection Agency published lists of 40 CFR Part 264 Appendix IX hazardous constituents, the applicant must submit a list of all contaminants in the groundwater. For all the petitioned ACL constituents, the applicant must address all known synergistic and additive effects on human health and the environment to develop appropriate ACL levels.

Required Information for Alternate Concentration Limits

In addition to rule specific requirements (i.e., 30 TAC Chapter 335 Subchapter S RRR, or 30 TAC Chapter 350 TRRP), the following items must be addressed for each hazardous constituent for which an alternate concentration is sought (CP Tables III and IV, XII.B.). If the information required in this part has been furnished in other parts of Compliance Plan Application, please provide an adequate reference.

1. Potential adverse effects on groundwater quality, considering:
    a. The physical and chemical characteristics of the waste in the Regulated Unit, Solid Waste Management Unit (SWMU) or Area of Concern (AOC), including its potential for migration;
2. The hydrogeological characteristics of the facility and surrounding land;
3. The quantity of groundwater r and the direction of groundwater flow;
4. The proximity and withdrawal rates of groundwater users;
5. The current and future uses of groundwater in the area;
6. The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater quality;
7. The potential for health risks caused by human exposure to waste constituents;
8. The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and,
9. The persistence and permanence of the potentially adverse effects.

10. Potentially adverse effects on hydraulically connected surface water quality, considering:
    a. The volume and physical and chemical characteristics of the waste in the Regulated Unit, Solid Waste Management Unit (SWMU) or Area of Concern (AOC);
11. The hydrogeological characteristics of the facility and surrounding land;
12. The quantity and quality of groundwater, and the direction of groundwater flow;
13. The patterns of rainfall in the region;
14. The proximity of the Regulated Unit to surface waters;
15. The current and future uses of surface waters in the area and any water quality standards established for those surface waters;
16. The existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality;
17. The potential for health risks caused by human exposure to waste constituents;
18. The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and,
19. The persistence and permanence of the potentially adverse effects.

Attachment B

Well Design And Construction Specifications

The following well design and construction specifications should be used as guidance when designing a groundwater Compliance Monitoring Program (Section XI.C.) or a Corrective Action Program (Section XI.D.). This guidance is provided to establish minimum well design and construction specifications for the Compliance Plan.

1. Well drilling methods that minimize potential adverse effects on the quality of water samples withdrawn from the well and that minimize or eliminate the introduction of foreign fluids into the borehole must be utilized.

2. All wells shall be constructed such that the wells can be routinely sampled with a pump, bailer, or alternate sampling device. Piping associated with recovery wells should be fitted with sample ports or an acceptable alternative sampling method to facilitate sampling of the recovered groundwater on a well by well basis.

3. Above the saturated zone the well casing may be two (2) inch diameter or larger schedule 40 or 80 polyvinyl chloride (PVC) rigid pipe or stainless steel or polytetrafluoroethylene (PTFE or "teflon") or an approved alternate material. The PVC casing must bear the National Sanitation Foundation logo for potable water applications (NSF pw). Solvent cementing compounds shall not be used to bond joints and all connections shall be flush threaded. In and below the saturated zone, the well casing shall be stainless steel or PTFE.

   PVC or fiberglass reinforced resin may be used as an alternate well casing material in and below the saturated zone provided that it yields samples for groundwater quality analysis that are unaffected by the well casing material.

4. Any well that has deteriorated due to incompatibility of the casing material with the groundwater contaminants or due to any other factors must be replaced.

5. Well casings and screens shall be steam cleaned prior to installation to remove all oils, greases, and waxes. Well casings and screens made of fluorocarbon resins shall be cleaned by detergent washing.

6. Screen length shall not exceed ten (10) feet within a given transmissive zone unless otherwise approved by the executive director. Screen lengths exceeding ten (10) feet may be installed in groundwater recovery or injection wells to optimize the groundwater remediation process in accordance with standard engineering practice.

7. The intake portion of a well shall be designed and constructed so as to allow sufficient water flow into the well for sampling purposes and minimize the passage of formation materials into the well during pumping. The intake portion of a well shall consist of commercially manufactured stainless steel or PTFE screen or approved alternate material. The annular space between the screen and the borehole shall be filled with clean siliceous granular material (i.e., filter pack) that has a proper size gradation to provide mechanical retention of the formation sand and silt. The well screen slot size shall be compatible with the filter pack size as determined by sieve analysis data. The filter pack should extend no more than three (3) feet above the well screen. A silt trap, no greater than one (1) foot in length, may be added to the bottom of the well screen to collect any silt that may enter the well. The bottom of the well casing shall be capped with PTFE or stainless steel or approved alternate material.

Groundwater recovery and injection wells shall be designed in accordance with standard engineering practice to ensure adequate well production and accommodate ancillary equipment. Silt traps exceeding one (1) foot may be utilized to accommodate ancillary equipment. Well heads shall be fitted with mechanical well seals, or equivalent, to prevent entry of surface water or debris.

8. A minimum of two (2) feet of pellet or granular bentonite shall immediately overlie the filter pack in the annular space between the well casing and borehole. Where the saturated zone extends above the filter pack, pellet or granular bentonite shall be used to seal the annulus. The bentonite shall be allowed to settle and hydrate for a sufficient amount of time prior to placement of grout in the annular space. Above the minimum two (2) foot thick bentonite seal, the annular space shall be sealed with a cement/bentonite grout mixture. The grout shall be placed in the annular space by means of a tremie pipe or pressure grouting methods equivalent to tremie grouting standards.

   The cement/bentonite grout mixture or TCEQ approved alternative grout mixture shall fill the annular space to within two (2) feet of the surface. A suitable amount of time shall be allowed for settling to occur. The annular space shall be sealed with concrete, blending into a cement apron at the surface that extends at least two (2) feet from the outer edge of the monitor well for above ground completions. Alternative annular space seal material may be proposed with justification and must be approved by the executive director prior to installation.

   In cases where flush to ground completions are unavoidable, a protective structure such as a utility vault or meter box should be installed around the well casing and the concrete pad design should prevent infiltration of water into the vault. In addition, the following requirements must also be met 1) the well/cap juncture is watertight; 2) the bond between the cement surface seal and the protective structure is watertight; and 3) the protective structure with a steel lid or manhole cover has a rubber seal or gasket.

9. Water added as a drilling fluid to a well shall contain no bacteriological or chemical constituents that could interfere with the formation or with the chemical constituents being monitored. For groundwater recovery and injection wells, drilling fluids containing freshwater and treatment agents may be utilized in accordance with standard engineering practice to facilitate proper well installation. In these cases, the water and agents added should be chemically analyzed to evaluate their potential impact on in-situ water quality and to assess the potential for formation damage. All such additives shall be removed to the extent practicable during well development.

10. Upon completion of installation of a well, the well must be developed to remove any fluids used during well drilling and to remove fines from the formation to provide a particulate free discharge to the extent achievable by accepted completion methods and by commercially available well screens. Development shall be accomplished by reversing flow direction, surging the well or by air lift procedures. No fluids other than formation water shall be added during development of a well unless the aquifer to be screened is a low yielding water bearing aquifer. In these cases, the water to be added should be chemically analyzed to evaluate its potential impact on in-situ water quality, and to assess the potential for formation damage.

For recovery and injection wells, well development methods may be utilized in accordance with standard engineering practice to remove fines and maximize well efficiency and specific capacity. Addition of freshwater and treatment agents may be utilized during well development or re development to remove drilling fluids, inorganic scale or bacterial slime. In these cases, the water and agents added should be chemically analyzed to evaluate their potential impact on in-situ water quality and to assess the potential for formation damage. All such additives shall be removed to the extent practicable during well development.

11. Each well shall be secured and/or designed to maintain the integrity of the well borehole and groundwater.

12. The above ground portion of the well must be protected by bumper guards and/or metal outer casing protection when wells are located in traffic areas or outside the secured plant area.

13. The attached Table of Well Construction Details is to be completed or updated for each well installed and kept on site. Items in the table that require a yes or no answer indicate diagrams plans, or procedures that shall be kept on site and made available to inspection. The completed table and other records shall include all of the following information:

    - name/number of well (well designation);
    - intended use of the well(sampling, recovery, etc.);
    - date/time of construction;
    - drilling method and drilling fluid used;
    - well location (+ 0.5 ft.);
    - bore hole diameter and well casing diameter;
    - well depth (+ 0.1 ft.);
    - drilling and lithologic logs;
    - depth to first saturated zone;
    - casing materials;
    - screen materials and design;
    - casing and screen joint type;
    - screen slot size/length;
    - filter pack material/size;
    - filter pack volume (how many bags, buckets, etc.);
    - filter pack placement method;
    - sealant materials;
    - sealant volume (how many bags, buckets, etc.);
    - sealant placement method;
    - surface seal design/construction;
    - well development procedure;
    - type of protective well cap;
    - ground surface elevation (+ 0.01 ft. MSL);
    - top of casing elevation (+ 0.01 ft. MSL); and,
    - detailed drawing of well (include dimensions).

14. Construction or plugging and abandonment of each well shall be completed in accordance with the requirements of 16 TAC Chapter 76 and must be reported/certified to the TCEQ that such proper construction or plugging and abandonment has occurred following installation or plugging and abandonment.

Well completion logs for each newly installed or replaced well shall be included with the report. The certification shall be prepared by a qualified geologist or geotechnical engineer. Each well certification shall be accompanied by a certification report, including an accurate log of the soil boring, which thoroughly describes and depicts the location, elevations, material specifications, construction details, and soil conditions encountered in the boring for the well. A copy of the certification and certification report shall be kept on site, and a second copy shall be submitted to the executive director.

15. The well number must be clearly marked and maintained on each well at the site.

16. The elevation of the top of each well casing must be measured in feet above mean sea level to the nearest 0.01 foot.

17. Wells must be replaced at any time the well integrity or materials of construction or well placement no longer enable the well to yield samples representative of groundwater quality.

18. Soil test borings shall be plugged and wells removed from service with a cement/bentonite grout mixture so as to prevent the preferential migration of fluids in the area of the borehole. Certification of each plugging shall be reported in accordance with Provision 14. The plugging of wells shall be in accordance with 16 TAC Chapter 76 dealing with Well Drilling, Completion, Capping and Plugging.

19. A well's screened interval shall be appropriately designed and installed to meet the well's specific objective (i.e., either DNAPL, LNAPL, both, or other objective of the well). All wells designed to detect, monitor, or recover DNAPL must be drilled to intercept the bottom confining layer of the aquifer. The screened interval to detect DNAPL should extend from the top of the lower confining layer to above the portion of the aquifer saturated with DNAPL. The screened interval for all wells designed to detect, monitor, or recover LNAPL must extend high enough into the vadose zone to provide for fluctuations in the seasonal water table. In addition, the sandpacks for the recovery or monitoring well's screened interval shall be coarser than surrounding media to ensure the movement of NAPL to the well.

Table of Well Construction Details (Item 13)

Well number					
Hole diameter (in)					
Well diameter (in)					
Total borehole depth (ft)					
Constructed well depth (ft)					
Well location available (Y/N)					
Intended Use of Well (sampling, recovery, etc.)					
Drilling & lithologic logs available (Y/N)					
Drill method					
Date drilled					
Casing I.D. (in)					
Casing type/materials					
How joined					
Stick-up length					
Top of casing (+0.01 MSL)					
Ground surface elevation (+0.01 MSL)					
Capped/lockable					
Surface pad size(ft)					
Detailed drawing of well (include dimensions) Y/N					
Depth to surface seal(ft)					
Surface seal design & construction available (Y/N)					
Well development procedure available (Y/N)					
Annulus fill					
Depth to annulus seal(ft)					

Depth to gravel pack(ft)					
Depth to 1st saturated zone					
Length of gravel pack(ft)					
Size-gravel pack					
Filter pack volume (how many bags, buckets, etc.)					
Filter pack placement method					
Depth to screen(ft)					
Sealant materials					
Sealant volume (how many bags, buckets, etc.)					
Sealant placement method					
Screen slot size/length(in)					
Screen type					
Screen length(ft)					
Blank length(ft)					
Dev. method					
Well coordinates (lat & long)					

Attachment C - Sampling And Analysis Plan

Introduction and Purpose

This Attachment was prepared for the purpose of providing guidance for the preparation of a Groundwater Sampling and Analysis Plan (SAP) to meet the requirements of 30 Texas Administrative Code (TAC) 335.163(4) and (5) and also 40 CFR 270.30(j). This guidance is based on the publication, RCRA Groundwater Monitoring: Draft Technical Guidance (TEGD Update) (November 1992, USEPA), and its updates, and is not intended to be rule or policy, or include all acceptable practices.

When preparing the SAP, the applicant may insert copies of areas of the Compliance Plan Application already completed which provides any necessary information for completion of the SAP. The SAP should include the information described in the following sections. When certain sections are not applicable, please provide justification for omission from the SAP.

1. Pre Field Activity
    a. A. The log book format should be outlined in the SAP and should contain at a minimum:

- the names of those conducting the sampling event;
- the purpose and provision(s) of the compliance plan requiring the sampling event;
- weather conditions at time of sampling;
- date and time of collection;
- well identification;
- integrity of well;
- monitoring well measurements, including: total well depth; static water level depth; measurement techniques; height of water column; well volume; and, notation of the presence or absence of accumulated silt (including thickness and measurement procedures);
- notation of the presence or absence of NAPLs (including thickness and detection method);
- well purging procedures, including equipment, purge volume, pumping rate, and well purge time;
- sampling methods, including well sampling sequence, sampling equipment and withdrawal procedures;
- visual and measured water quality parameters required for analysis, such as appearance, pH, conductivity, temperature and turbidity; and,
- sample preservation and handling procedures, including types of sample bottles, sample identification numbers, preservatives used, and internal temperature of field and shipping containers.

2. B. The SAP should reference the Provisions or Tables within the Compliance Plan regarding monitor well designations, parameters to be monitored, and sampling frequency, rather than utilizing detailed lists.

3. C. The SAP should include examples of the log book format, chain of custody, and information to be included on the container labels and seals.

4. D. The SAP should reference both the Health and Safety Plan, and Field Emergency Contingency Plan. These Plans should be checked to determine if they adequately address health and safety issues that may occur during a

sampling event.

5. Prior to Purging Well

   a. Procedures for evaluating the physical condition and integrity of the well should include:

- inspecting the casing and cap for cracks, signs of deterioration or tampering;
- determination if the cap and monitoring well are secure;
- inspecting the well pad for cracks, or signs of deterioration, erosion, settling, and/or animal and insect burrowing; and,
- where appropriate, inspect any dedicated equipment for signs of cleanliness, structural integrity and deterioration.

6. Procedures and equipment used for measuring groundwater elevations, well depths, silt accumulation, and Non Aqueous Phase Liquids (NAPLs) should be included in the SAP. Water levels should be measured from the surveyed datum on the top of the well casing, with a precision of ±0.01 foot. If present, accumulated silt and light/dense NAPLs should be measured for thickness.

7. Procedures for monitoring site specific weather conditions at the time of sampling should be incorporated into the SAP, including precipitation (when applicable), temperature, and approximate wind speed and direction.

8. Sampling Preparation Activity

   a. Well purging methods:

      (1) A sampling contingency plan should be developed for wells which are purged to dryness or purged such that full recovery exceeds two hours. In such instances, samples should be taken as soon as a sufficient volume of groundwater has entered the well to enable the collection of the necessary groundwater samples.

      (2) In all instances of purging, the SAP should describe in detail the equipment used (dedicated or non-dedicated), purging rate, and the method for determining volume purged.

      (3) Although purging and sampling by bailers is acceptable, the EPA recommends the use of dedicated pumping equipment designed for low flow rates.

      (4) When utilizing micropurging methods, the purge rate may range between 0.1 to 0.5 liter/minute. During micropurging, drawdown should not exceed 0.1 meter. The applicant should provide justification for any alternate sampling procedure. The SAP should also specify the well screen interval at which the pump intake is placed and a copy of the boring log for each well utilizing micropurging. In line measurements of redox, dissolved O2 and turbidity during purging of groundwater should stabilize within 10% over at least two measurements prior to sampling.

9. Field filtering of groundwater samples should not be conducted unless the applicant has provided a justification and field filtration is approved by the TCEQ. If samples are field filtered, a 10 micron filter should be used while still fulfilling the data quality objectives for the groundwater monitoring program.

10. The container type, size, and labeling method for each procedure performed should be referenced and/or tabulated in the SAP.

11. Sample blanks, field blanks, trip blanks and split sampling procedures, including frequency and preservation should be specified in the SAP as quality control checks for each sampling event. The preparation, analysis, and evaluation of replicates, duplicates and spikes should also be included.

12. Well Sampling

    a. Well sampling equipment, collection procedures, and sampling sequence of wells, should be specified in the SAP. The SAP should include sampling equipment that is constructed of inert material, which should not alter analyte concentration due to loss of analyte via absorption, or gain via desorption, degradation or corrosion.

13. Field QA/QC and sample preservation methods used to control pH, chemical addition and refrigeration of samples should be described in the SAP and follow the methods described in the current editions of EPA Report SW 846, "Test Methods for Evaluating Solid Waste" and American Society for Testing and Materials (ASTM) Standard Test Methods or other methods accepted by the TCEQ. The SAP should indicate that chemical preservatives are to be added to samples in the field and not in the laboratory. The SAP should indicate that coolants used for refrigerating samples need to be contained (e.g. blue ice).

14. Procedures for sampling inorganics and volatile/semi volatile organics should be described in the SAP and follow the methods of SW 846 and ASTM or other methods accepted by the TCEQ.

15. Post Sampling Activity

    a. Decontamination procedures should be included in the SAP when dedicated equipment is not used for purging and sampling, or when dedicated equipment is stored outside the well. The procedures should include disassembly, cleaning of equipment, packaging and storage of equipment when not in use.

16. Analytical methods and holding times should be tabulated in the SAP in accordance with SW 846 and ASTM or other methods accepted by the TCEQ.

17. Chain of custody and shipping procedures should be described and intended to prevent misidentification of samples, to identify and prevent tampering of the samples during shipping and storage, and allow easy tracking of the shipment from the field to final analyses. A Chain of Custody Form should accompany each sample shipment and include the following information:

    - sample identification number;
    - signature of collector;
    - date and time of collection;
    - sample type (e.g. groundwater);
    - identification of sampling point (well);
    - number of containers;
    - parameters requested for analysis;
    - preservatives used;
    - signature(s) of person(s) involved in the chain of possession;
    - inclusive dates and time of possession;
    - internal temperature of shipping container when samples were sealed into the container for shipping; and,
    - internal temperature of container upon opening in the laboratory.

Samples should be shipped in coolers or similar containers designed to keep samples at a constant 4°C and prevent breakage. Containers used for sample shipment should be sealed with the seal signed and dated by the sampler.

18. Disposal methods of contaminated equipment, wash water and purged groundwater should be described.

19. Laboratory QA/QC procedures should include control samples as defined in Chapter I of SW 846. An appropriate statistical method/procedure should be used to monitor and document performance and to implement an effective program to resolve testing problems (instrument maintenance). Data from the control samples (i.e. spiked samples, duplicates and blanks) should be used as a measure of performance or as an indicator of potential source of cross contamination (i.e. from instrumentation). QA/QC documentation for reporting values should be tabulated on laboratory data sheet and include: target analyte; unit of measure (e.g. ppm); method analyses; and, time/dates of sample collection and analyses.

XII. Hazardous Waste Permit Application Fee –

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);
4. 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)
5. 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).
6. Each incinerator, boiler/industrial furnace unit, surface impoundment, waste pile, land treatment unit, drip pad, miscellaneous unit, or containment building.
7. 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.
8. 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;

5. site-specific or regional geology report;

6. site-specific or regional geohydrology report;

7. groundwater and/or unsaturated zone monitoring;

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

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

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

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

12. 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;

13. Facility Operations Area (FOA).

14. 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);

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

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

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

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

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

20. 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.

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]
East Guard Basin	6 M gallons	2 acres	1	
East Impoundment Basin	20 M gallons	6 acres	1	
Southwest Plot 612/614		3 acres	1	
Southwest Plot 613		3 acres	1	
Southwest Plot 616		2 acres	1	
		Total[4] 16	Total[4] 5	

1 Number of calculated acres.
2 Enter number of units except for units identical in type and use which only count toward a single $500.00 fee.
3 Explain justification for any units claimed as identical in type and use.
4 Enter these totals on the worksheet.

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

Name of Facility: Houston Refining LP

Solid Waste Registration Number: SW30092

1. Process Analysis - $1,000..... $ 1,000
2. Facility Management Analysis - $500..... $ 500
3. Unit Analysis - ___5___ units @ $500 per unit..... $ 2,500
4. Site Evaluation - __16___ acres @ $100 per acre..... $ 1,600

   (Maximum of 300 acres)

5. Minor amendment, Class 1, or Class 1[1] modification - $100..... 100
6. Cost of Providing Notice - $50 (+ $15 for a renewal)..... $ 65

Pay This Amount ☐ Total $____5,765_____

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
e-payment		$100

XIII. Confidential Material – N/A.

Any information requested in the previous Sections I. through XI. of this application which is deemed confidential shall be provided in this Section as a separate collective document and clearly labeled CONFIDENTIAL.

PART B.I

MAILING LABELS

PORT OF HOUSTON AUTHORITY 111 EAST LOOP N HOUSTON TX 77029-4326	SOUTHERN PACIFIC RAILROAD COMPANY UNION PACIFIC RAILROAD CO 1400 DOUGLAS ST STOP 1640 OMAHA NE 68179-1001	COASTAL INDUSTRIAL WATER 1200 SMITH ST STE 2260 HOUSTON TX 77002-4500
BARESCH SHERRY 6307 NYOKA ST HOUSTON TX 77041-5313	FLINT HILLS RESOURCES HOUSTON CHEMICAL LL C/O PROPERTY TAX DEPT PO BOX 3755 WICHITA KS 67201-3755	FLINT HILLS RESOURCES PROPERTY HOLDINGS I LLC 4111 E 37TH ST N WICHITA KS 67220-3203
FLINT HILLS RESOURCES HOUSTON CHEMICAL LLC 4111 E 37TH ST N WICHITA KS 67220-3203	GURRUSQUIETA MARIA L 2305 LILLIAN ST PASADENA TX 77502-3414	WEST CHASE PROPERTY SOLUTIONS LLC 5925 ALMEDA RD UNIT 11705 HOUSTON TX 77004-7677
SPRAGGINS ALVIN 704 IOWA ST SOUTH HOUSTON TX 77587-4816	LEAL JAVIER V 5523 SWEETBRIAR ST HOUSTON TX 77017-6423	PHICON LLC 941 N WILCREST DR HOUSTON TX 77079-3503
CENTERPOINT ENERGY HOU ELE PROPERTY TAX DEPT 38TH FLR PO BOX 1475 HOUSTON TX 77251-1475	TOMPKINS CHRISTINE MRS 1615 BANKS ST HOUSTON TX 77006-6021	MILTON RRUNCIMAN HANKS TR 2822 KINGSDALE DR DEER PARK TX 77536-6012
10132 BUXTON LP % JIM STARK 8300 WINNINGHAM LN HOUSTON TX 77055-7530	THORP CLAYTON 4706 JASON ST HOUSTON TX 77096-1703	CURRENT OWNER 11827 MIGHTY REDWOOD DR HOUSTON TX 77059-5511
STERLING FAMILY PROPERTIES LLC PO BOX 1837 BELLAIRE TX 77402-1837	MACLEONARD LLC PO BOX 131436 HOUSTON TX 77219-1436	BARTEE WM P PO BOX 751 KINGSLAND TX 78639-0751
PARDUE BRET 19 LEGEND PARK DR SUGAR LAND TX 77479-2862	CITY OF HOUSTON PARCEL NO DS-218A PO BOX 1562 HOUSTON TX 77251-1562	ENTERPRISE PRODUCTS CO ATTN AD VALOREM TAX PO BOX 4018 HOUSTON TX 77210-4018
ENTERPRISE GC LLC C/O ENTERPRISE PRODUCTS COMPANY PO BOX 4018 HOUSTON TX 77210-4018	TEXAS BAY AREA CREDIT UNION ATTN: ACCOUNTS PAYABLE 12611 FUQUA ST HOUSTON TX 77034-4646	VALENTI DOMINICK VALENTI XIMENA 2527 PLATINUM CHASE DR ROSHARON TX 77583-3276
PBK PROPERTIES LLC 15011 LAWNDALE ST HOUSTON TX 77017-2800	W R NATH INVESTMENTS LP PO BOX 133095 SPRING TX 77393-3095	LOPEZ NINETH 1508 N BETHEL ST ROMA TX 78584-5529

ANAYA SOFIR & ELOY 5114 PARKRIDGE DR HOUSTON TX 77053-5210	LOMAS JESSE N & KATIE 113 LIGHT COMPANY RD PASADENA TX 77506-1009	FLORES LEONEL & ENEDINA 111 LIGHT COMPANY RD PASADENA TX 77506-1009
DIAZ ANTONIO 3215 CHESTERSHIRE DR PASADENA TX 77503-1432	ROJAS LEONEL FLORES 107 LIGHT COMPANY RD PASADENA TX 77506-1009	ONTIVEROS EDWARDO ESTATE OF 105 LIGHT COMPANY RD PASADENA TX 77506-1009
CHAPEK JANICE MARILYN 103 LIGHT COMPANY RD PASADENA TX 77506-1009	ZAVALA KELLY A 2007 ISLAND MANOR LN LEAGUE CITY TX 77573-4612	CENTERPOINT ENERGY INTRASTATE PO BOX 1475 HOUSTON TX 77251-1475
BLANCHARD PIPELINE COMPANY LLC C/O PROPERTY TAX DEPT 539 S MAIN ST FINDLAY OH 45840-3229	MOTIVA ENTERPRISES LLC EQUIVA SERVICES LLC % PROPERTY TAX DEPT PO BOX 2727 HOUSTON TX 77252-2727	AES DEEPWATER INC % CL JETER JRT 1 MONUMENT CIR INDIANAPOLIS IN 46204-3025
AES WESTERN POWER LLC LEON BALLARD 1 MONUMENT CIR INDIANAPOLIS IN 46204-3025	GATX TERMINALS CORP PROPERTY TAX DEPT % KINDER MORGAN BULK TERM PO BOX 4372 HOUSTON TX 77210-4372	KINDER MORGAN GALENA PARK WEST LLC C/O PROPERTY TAX DEPT PO BOX 4372 HOUSTON TX 77210-4372
WILLIAMS FIELD SERVICES GULF COAST COMPANY LP ONE WILLIAMS CENTER TULSA OK 74172-0140	K M LIQUIDS TERMINALS LLC C/O PROPERTY TAX DEP PO BOX 4372 HOUSTON TX 77210-4372	PUCKETT DWIGHT S 4303 SAO PAULO ST PASADENA TX 77504-2431
LOPEZ JUAN ABEL SANTILLANO 404 FINFROCK ST PASADENA TX 77506-1740	SUAREZ EDUARDO & CLAUDIA 406 FINFROCK ST PASADENA TX 77506-1740	RAMIREZ LUZ C 408 FINFROCK ST PASADENA TX 77506-1740
MACEDO RAYMUNDO & MIREYA D 1019 NANTUCKET ST PASADENA TX 77503-2846	PUENTE RAMIRO & MARIA D 412 FINFROCK ST PASADENA TX 77506-1740	GARCIABENAVIDES GUADALUPE 414 FINFROCK PASADENA TX 77506-1740
RUBIO MARIO & ALICIA DEL 416 FINFROCK ST PASADENA TX 77506-1740	RUBIO MARIO & ALICIA D 418 FINFROCK ST PASADENA TX 77506-1740	LEWIS RHONDA N & JOE A 420 FINFROCK ST PASADENA TX 77506-1740
ALMAGUER ARMANDO 120 COUNTY ROAD 291 ALVIN TX 77511-1284	TORRES JOSE AGRIPINO MEDINA 3210 CEDAR CREST DR PASADENA TX 77503-2120	GARCIA BENITO ESCOBAR 426 FINFROCK ST PASADENA TX 77506-1740

LINDSEY JASON A 428 FINFROCK ST PASADENA TX 77506-1740	AVILA CARLOS & HILARIA 430 FINFROCK ST PASADENA TX 77506-1740	BAYVIEW HOLDINGS LLC PO BOX 907 KEMAH TX 77565-0907
COASTAL SPRAY CO 1321 W JACKSON AVE PASADENA TX 77506-1709	CITY OF PASADENA % CITY SECRETARY PO BOX 672 PASADENA TX 77501-0672	LEOS JESUS BENAVIDEZ SONIA 1311 W JACKSON AVE PASADENA TX 77506-1709

MAYOR SYLVESTER TURNER CITY OF HOUSTON PO BOX 1562 HOUSTON TX 77251		STEPHEN L WILLIAMS HOUSTON HEALTH DEPARTMENT 8000 NORTH STADIUM DRIVE HOUSTON TX 77054		HARRIS COUNTY JUDGE LINA HIDALGO 1001 PRESTON STREET SUITE 911 HOUSTON TEXAS 77002
EXECUTIVE DIRECTOR UMAIR A SHAH HARRIS COUNTY PUBLIC HEALTH 2223 WEST LOOP SOUTH HOUSTON TX 77027		SENATOR CAROL ALVARADO SENATE DISTRICT 6 8799 NORTH LOOP FREEWAY EAST SUITE 240 HOUSTON TX 77029		REPRESENTATIVE MARY ANN PEREZ HOUSE DISTRICT 144 101 SOUTH RICHEY STREET SUITE F PASADENA TX 77506

PART B.I

LANDOWNER’S LIST

LOT NUMBER	MAILING ADDRESS
1	PORT OF HOUSTON AUTHORITY 111 EAST LOOP N HOUSTON TX 77029-4326
2	SOUTHERN PACIFIC RAILROAD COMPANY UNION PACIFIC RAILROAD CO 1400 DOUGLAS ST STOP 1640 OMAHA NE 68179-1001
3	COASTAL INDUSTRIAL WATER 1200 SMITH ST STE 2260 HOUSTON TX 77002-4500
4	BARESCH SHERRY 6307 NYOKA ST HOUSTON TX 77041-5313
5	FLINT HILLS RESOURCES HOUSTON CHEMICAL LL C/O PROPERTY TAX DEPT PO BOX 3755 WICHITA KS 67201-3755
6	FLINT HILLS RESOURCES PROPERTY HOLDINGS I LLC 4111 E 37TH ST N WICHITA KS 67220-3203
7	FLINT HILLS RESOURCES HOUSTON CHEMICAL LLC 4111 E 37TH ST N WICHITA KS 67220-3203
8	GURRUSQUIETA MARIA L 2305 LILLIAN ST PASADENA TX 77502-3414
9	WEST CHASE PROPERTY SOLUTIONS LLC 5925 ALMEDA RD UNIT 11705 HOUSTON TX 77004-7677
10	SPRAGGINS ALVIN 704 IOWA ST SOUTH HOUSTON TX 77587-4816
11	LEAL JAVIER V 5523 SWEETBRIAR ST HOUSTON TX 77017-6423
12	PHICON LLC 941 N WILCREST DR HOUSTON TX 77079-3503
13	CENTERPOINT ENERGY HOU ELE PROPERTY TAX DEPT 38TH FLR PO BOX 1475 HOUSTON TX 77251-1475

14	TOMPKINS CHRISTINE MRS 1615 BANKS ST HOUSTON TX 77006-6423
15	MILTON RRUNCIMAN HANKS TR 2822 KINGSDALE DR DEER PARK TX 77536-6012
16	10132 BUXTON LP % JIM STARK 8300 WINNINGHAM LN HOUSTON TX 77055-7530
17	THORP CLAYTON 4706 JASON ST HOUSTON TX 77096-1703
18	CURRENT OWNER 11827 MIGHTY REDWOOD DR HOUSTON TX 77059-5511
19	STERLING FAMILY PROPERTIES LLC PO BOX 1837 BELLAIRE TX 77402-1837
20	MACLEONARD LLC PO BOX 131436 HOUSTON TX 77219-1436
21	BARTEE WM P PO BOX 751 KINGSLAND TX 78639-0751
22	PARDUE BRET 19 LEGEND PARK DR SUGAR LAND TX 77479-2862
23	CITY OF HOUSTON PARCEL NO DS-218A PO BOX 1562 HOUSTON TX 77251-1562
24	ENTERPRISE PRODUCTS CO ATTN AD VALOREM TAX PO BOX 4018 HOUSTON TX 77210-4018
25	ENTERPRISE GC LLC C/O ENTERPRISE PRODUCTS COMPANY PO BOX 4018 HOUSTON TX 77210-4018
26	TEXAS BAY AREA CREDIT UNION ATTN: ACCOUNTS PAYABLE 12611 FUQUA ST HOUSTON TX 77034-4646

27	VALENTI DOMINICK VALENTI XIMENA 2527 PLATINUM CHASE DR ROSHARON TX 77583-3276
28	PBK PROPERTIES LLC 15011 LAWNDALE ST HOUSTON TX 77017-2800
29	W R NATH INVESTMENTS LP PO BOX 133095 SPRING TX 77393-3095
30	LOPEZ NINETH 1508 N BETHEL ST ROMA TX 78584-5529
31	ANAYA SOFIR & ELOY 5114 PARKRIDGE DR HOUSTON TX 77053-5210
32	LOMAS JESSE N & KATIE 113 LIGHT COMPANY RD PASADENA TX 77506-1009
33	FLORES LEONEL & ENEDINA 111 LIGHT COMPANY RD PASADENA TX 77506-1009
34	DIAZ ANTONIO 3215 CHESTERSHIRE DR PASADENA TX 77503-1432
35	ROJAS LEONEL FLORES 107 LIGHT COMPANY RD PASADENA TX 77506-1009
36	ONTIVEROS EDWARDO ESTATE OF 105 LIGHT COMPANY RD PASADENA TX 77506-1009
37	CHAPEK JANICE MARILYN 103 LIGHT COMPANY RD PASADENA TX 77506-1009
38	ZAVALA KELLY A 2007 ISLAND MANOR LN LEAGUE CITY TX 77573-4612
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40	BLANCHARD PIPELINE COMPANY LLC C/O PROPERTY TAX DEPT 539 S MAIN ST FINDLAY OH 45840-3229

41	MOTIVA ENTERPRISES LLC EQUIVA SERVICES LLC % PROPERTY TAX DEPT PO BOX 2727 HOUSTON TX 77252-2727
42	AES DEEPWATER INC % CL JETER JRT 1 MONUMENT CIR INDIANAPOLIS IN 46204-3025
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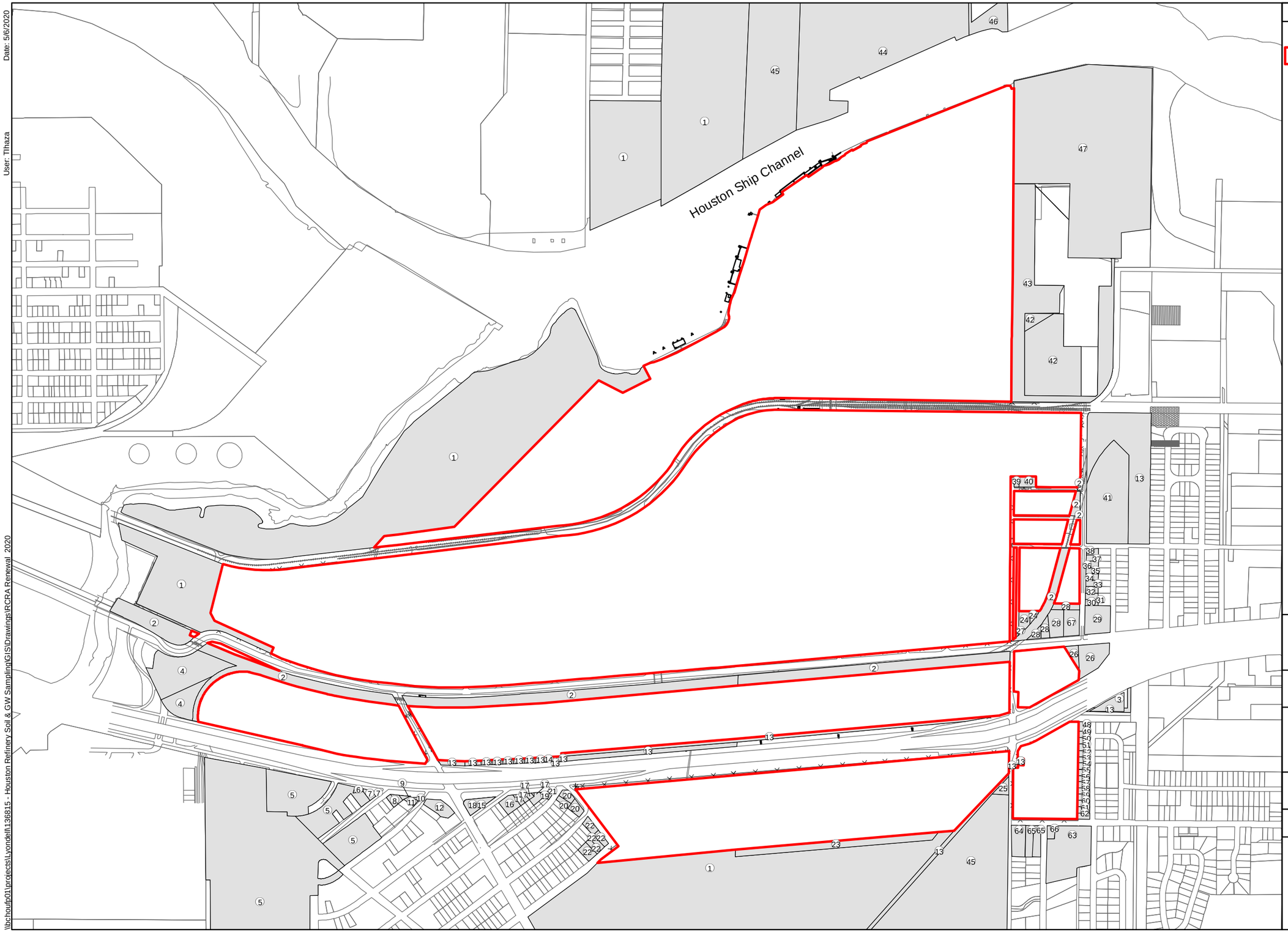
44	GATX TERMINALS CORP PROPERTY TAX DEPT % KINDER MORGAN BULK TERM PO BOX 4372 HOUSTON TX 77210-4372
45	KINDER MORGAN GALENA PARK WEST LLC C/O PROPERTY TAX DEPT PO BOX 4372 HOUSTON TX 77210-4372
46	WILLIAMS FIELD SERVICES GULF COAST COMPANY LP ONE WILLIAMS CENTER TULSA OK 74172-0140
47	K M LIQUIDS TERMINALS LLC C/O PROPERTY TAX DEP PO BOX 4372 HOUSTON TX 77210-4372
48	PUCKETT DWIGHT S 4303 SAO PAULO ST PASADENA TX 77504-2431
49	LOPEZ JUAN ABEL SANTILLANO 404 FINFROCK ST PASADENA TX 77506-1740
50	SUAREZ EDUARDO & CLAUDIA 406 FINFROCK ST PASADENA TX 77506-1740
51	RAMIREZ LUZ C 408 FINFROCK ST PASADENA TX 77506-1740
52	MACEDO RAYMUNDO & MIREYA D 1019 NANTUCKET ST PASADENA TX 77503-2846

53	PUENTE RAMIRO & MARIA D 412 FINFROCK ST PASADENA TX 77506-1740
54	GARCIABENAVIDES GUADALUPE 414 FINFROCK PASADENA TX 77506-1740
55	RUBIO MARIO & ALICIA DEL 416 FINFROCK ST PASADENA TX 77506-1740
56	RUBIO MARIO & ALICIA D 418 FINFROCK ST PASADENA TX 77506-1740
57	LEWIS RHONDA N & JOE A 420 FINFROCK ST PASADENA TX 77506-1740
58	ALMAGUER ARMANDO 120 COUNTY ROAD 291 ALVIN TX 77511-1284
59	TORRES JOSE AGRIPINO MEDINA 3210 CEDAR CREST DR PASADENA TX 77503-2120
60	GARCIA BENITO ESCOBAR 426 FINFROCK ST PASADENA TX 77506-1740
61	LINDSEY JASON A 428 FINFROCK ST PASADENA TX 77506-1740
62	AVILA CARLOS & HILARIA 430 FINFROCK ST PASADENA TX 77506-1740
63	BAYVIEW HOLDINGS LLC PO BOX 907 KEMAH TX 77565-0907
64	COASTAL SPRAY CO 1321 W JACKSON AVE PASADENA TX 77506-1709
65	CITY OF PASADENA % CITY SECRETARY PO BOX 672 PASADENA TX 77501-0672
66	LEOS JESUS BENAVIDEZ SONIA 1311 W JACKSON AVE PASADENA TX 77506-1709
67	PBK PROPERTIES LLC 15011 LAWNDALE ST HOUSTON TX 77017-2800

PART B.I

MAP



LEGEND

Subject Property

Note: Base map and Property ownership information: Harris County Appraisal District, 2020

N

0 400 800 Feet

Figure I-1:
Adjacent Landowners Map

Houston Refining, L.P.
12000 Lawndale
Houston, Texas

Date: 5/6/2020

Brown AND Caldwell

HW-50106, Rev 0
November 2020

Date: 5/6/2020

User: TIhaza

\\bchoufp01\projects\Lyondell\136815 - Houston Refinery Soil & GW Sampling\GIS\Drawings\RCRA Renewal 2020

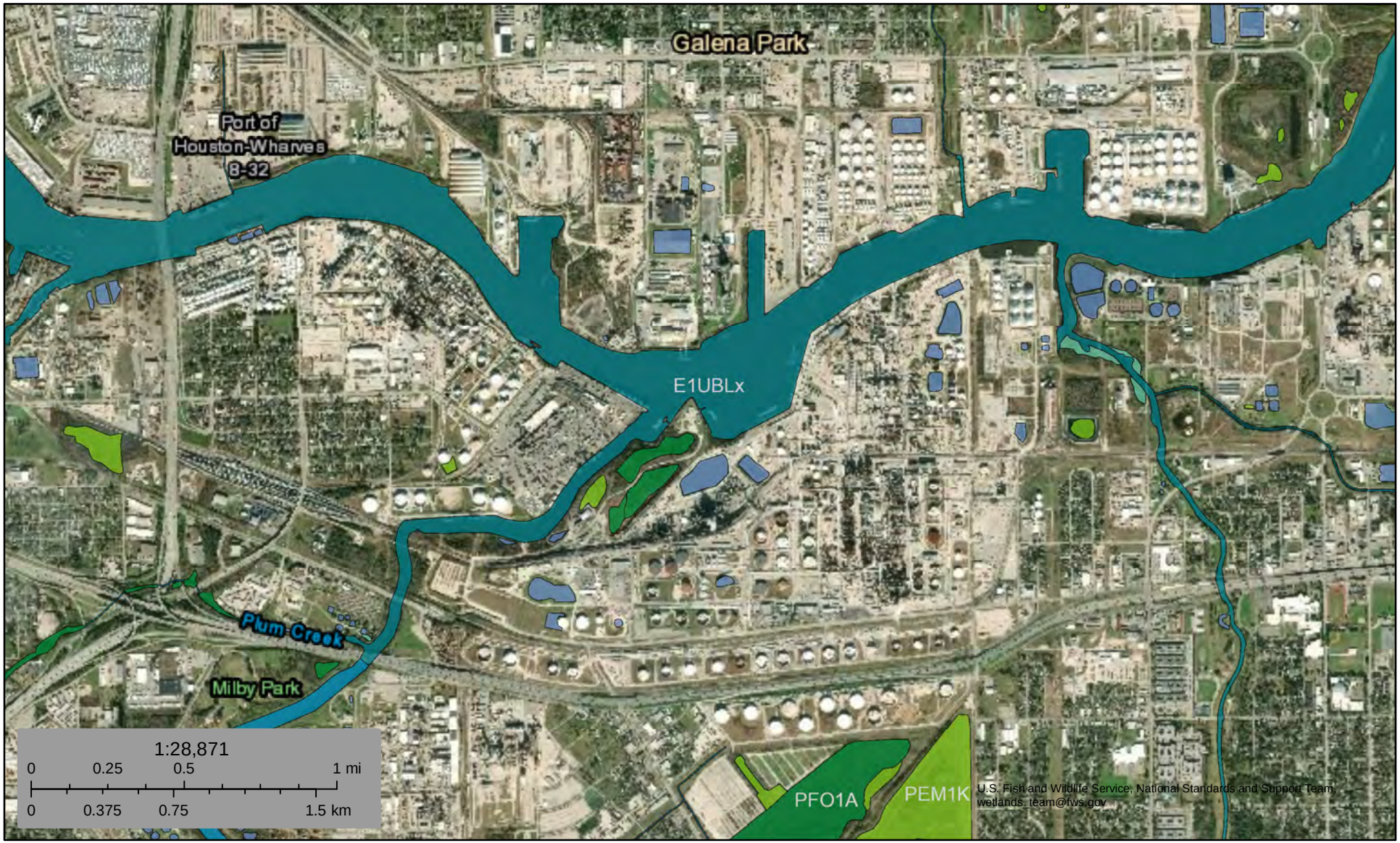
PART B.II

NWI WETLAND MAPS

U.S. Fish and Wildlife Service

National Wetlands Inventory

Houston Refining LP



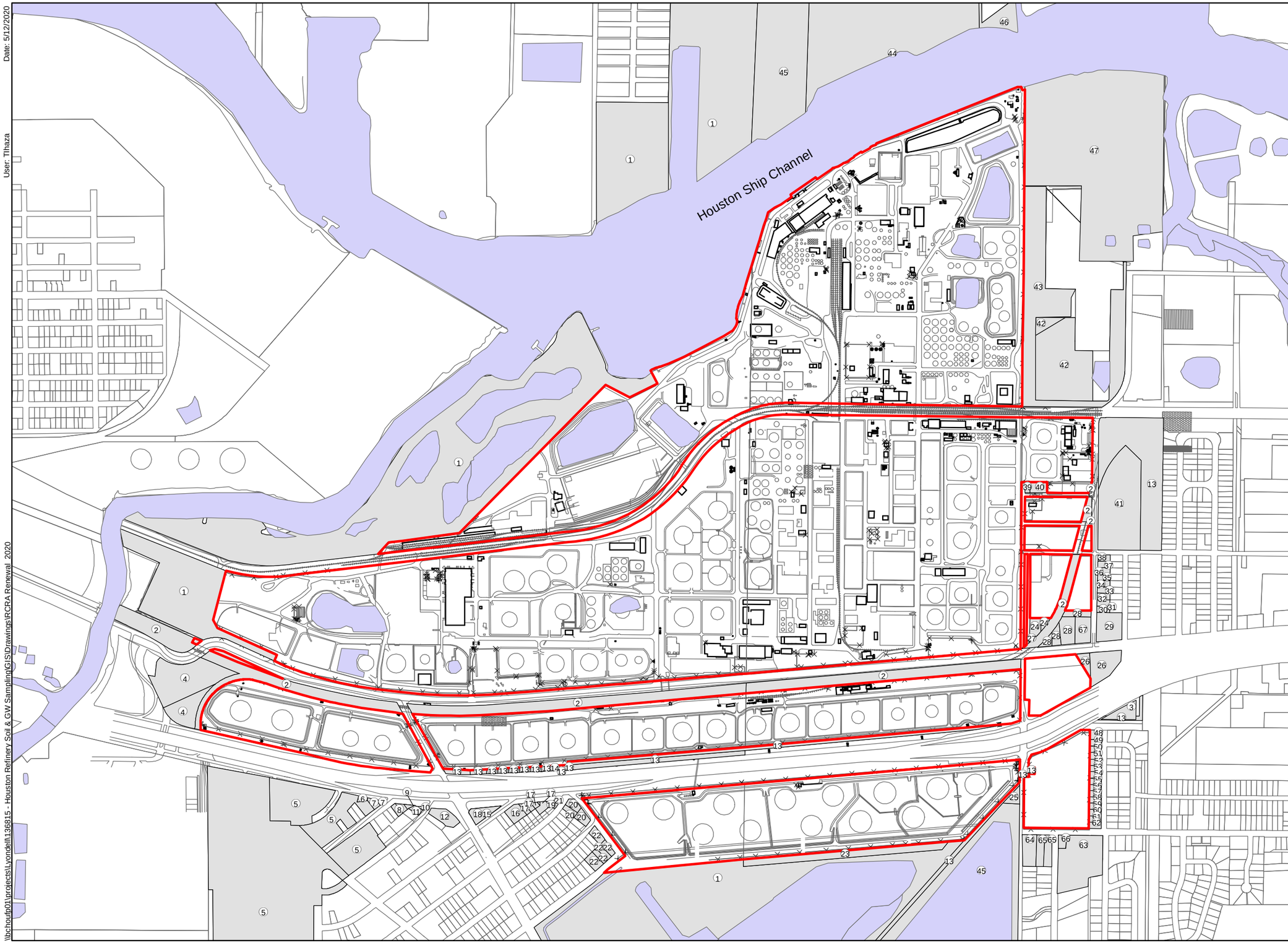
April 16, 2020

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper



LEGEND

- Subject Property
- Wetlands
- Adjacent Property

Note: Base map and Property ownership information: Harris County Appraisal District, 2020

N

0 400 800 Feet

Attachment II-1b:
Wetlands Map

Houston Refining, L.P.
12000 Lawndale
Houston, Texas

Date: 5/12/2020

Brown AND Caldwell

HW-50106, Rev 0
November 2020

Date: 5/12/2020
User: Tlhaza
\\bchoufp01\projects\Lyondell\136815 - Houston Refinery Soil & GW Sampling\GIS\Drawings\RCRA Renewal 2020

PART B.II

BLRA APPROVAL

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 4, 2004

Mr. Jerry Barnhill
Manager, Health, Safety, and Environmental
Lyondell-Citgo Refining Company, Ltd.
12000 Lawndale
P.O. Box 2451
Houston, TX 77252-2451

Re: Approval of the following Lyondell-Citgo documents:

- *Response to TCEQ letter dated January 6, 2003*, requesting clarification of issues associated with the Facility-wide Baseline Risk Assessment and Interim Corrective Measures Report for Soils and Waste Materials, and Phase III RFI Facility-Wide Groundwater Report, dated January 27, 2004
- Revised Table 5-3 for Baseline Risk Assessment, dated February 26, 2004

RCRA Facility Investigation Units 1, 2, and 4-13, Facility-wide Fill Soil Contamination AOC
Lyondell-Citgo Refining Co., Ltd. - Houston, TX
TCEQ SWR No. 30092
TCEQ Hazardous Waste Permit No. HW-50106
TCEQ Agreed Order issued April 30, 1993
EPA ID No. TXD082688979

Dear Mr. Barnhill:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above referenced response dated January 27, 2004, and subsequent revision dated February 26, 2004, submitted to address TCEQ letters dated January 6, 2004, August 12, 2003, October 15, 2002, February 27, 2002, January 28, 2002, May 7, 2001, June 13, 2000, and September 15, 1999, regarding completion of the Facility-Wide Baseline Risk Assessment and Interim Corrective Measures Report for Soils and Waste Materials, and the Phase III RFI Facility-wide Groundwater Report for the above referenced RFI Units and Area of Concern (AOC). Based on our review, the Facility-Wide Baseline Risk Assessment and Interim Corrective Measures Report for Soils and Waste Material, and Phase III RFI Facility-wide Groundwater Report can be approved, as modified by the January 27, 2004 response, and revision dated February 26, 2004. Lyondell-Citgo has also sufficiently addressed the RFI portion of the RCRA Corrective Action Program requirements associated with the above referenced TCEQ Hazardous Waste Permit (HW-50106) for RFI Units 1, 2, 4-13 and the Facility-wide Fill Soil Contamination AOC.

The above referenced documents indicate that RCRA Facility Investigation Units 1, 2, 4-13, and the Facility-wide Fill Soil Contamination AOC have impacted the environment to the extent that corrective measures are required. The RFI Units and AOC were evaluated in the Baseline Risk Assessment Report (BLRA) in accordance with Risk Reduction Standard No. 3 requirements [30 Texas Administrative Code (TAC) 335.561]. The conclusions of the BLRA document that releases associated with the above referenced RFI

Units and AOC pose a potential risk to human health and the environment. Therefore, Lyondell-Citgo is hereby directed to submit for approval a Corrective Measures (CMS) Report to identify and evaluate corrective measures alternatives and recommend appropriate corrective measure(s) that will appropriately address the releases associated with the above referenced RFI Units and AOC and adequately protect human health and the environment. The CMS Report is required to address all of the items listed for 'CMS Report' contained in the U.S. EPA publications EPA/520-R-94-004, OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), May 1994 and EPA/530/SW-89-031, OSWER Directive 9502.00-6DS, RCRA Facility Investigation (RFI) Guidance (Interim Final), May, 1989.

For future reference, please note that upon TCEQ approval of the CMS Report, the final remedy selection proposal(s) for RFI Units 1, 2, 4-13 and the Facility-wide Fill Soil Contamination AOC, must be submitted for approval in a Corrective Measures Implementation (CMI) Workplan. If the CMI Workplan does not propose a permanent remedy (e.g. Risk Reduction Standard No. 3 for grandfathered projects, TRRP Remedy B, etc.), then Lyondell-Citgo must include the CMI Workplan in an application for a Compliance Plan. Implementation of the final corrective measure(s) in such case will be addressed through issuance of the Compliance Plan via the TCEQ Waste Permits Division. In addition, in order to comply with TCEQ Corrective Action Section policy requirements associated with the corrective action program (effective August 1, 2001) please be aware that the proposed final corrective measure(s) for the above referenced RFI Units and AOC cannot be implemented until the public has been provided an opportunity to comment. The procedures and applicable language will be provided to Lyondell-Citgo upon review of the proposed final corrective measure.

An original and one copy of a CMS Report for the above referenced RCRA Facility Investigation Units/AOC must be submitted to the TCEQ Corrective Action Section at the letterhead address using mail code number MC-127. An additional copy should be submitted to the TCEQ Region 12 Office in Houston. **The CMS Report must be received within ninety (90) days from the date of this letter.** The facility name, location and identification number(s) in the TCEQ reference line above should be included in your response.

Please call me at (512) 239-2358 if you need additional information or wish to discuss these comments or the due date. Thank you for your cooperation in this matter.

Sincerely,

Eleanor T. Wehner

Eleanor T. Wehner, P.G., Project Manager
Team II, Corrective Action Section
Remediation Division
Texas Commission on Environmental Quality

EW/ew

cc: Waste Program Manager, TCEQ Region 12 Office, Houston

PART B.II

SOLE SOURCE AQUIFER

Sole Source Aquifer Map

4/16/2020, 12:41:09 PM

Sole_Source_Aquifers

1:4,622,324

0 30 60 120 mi

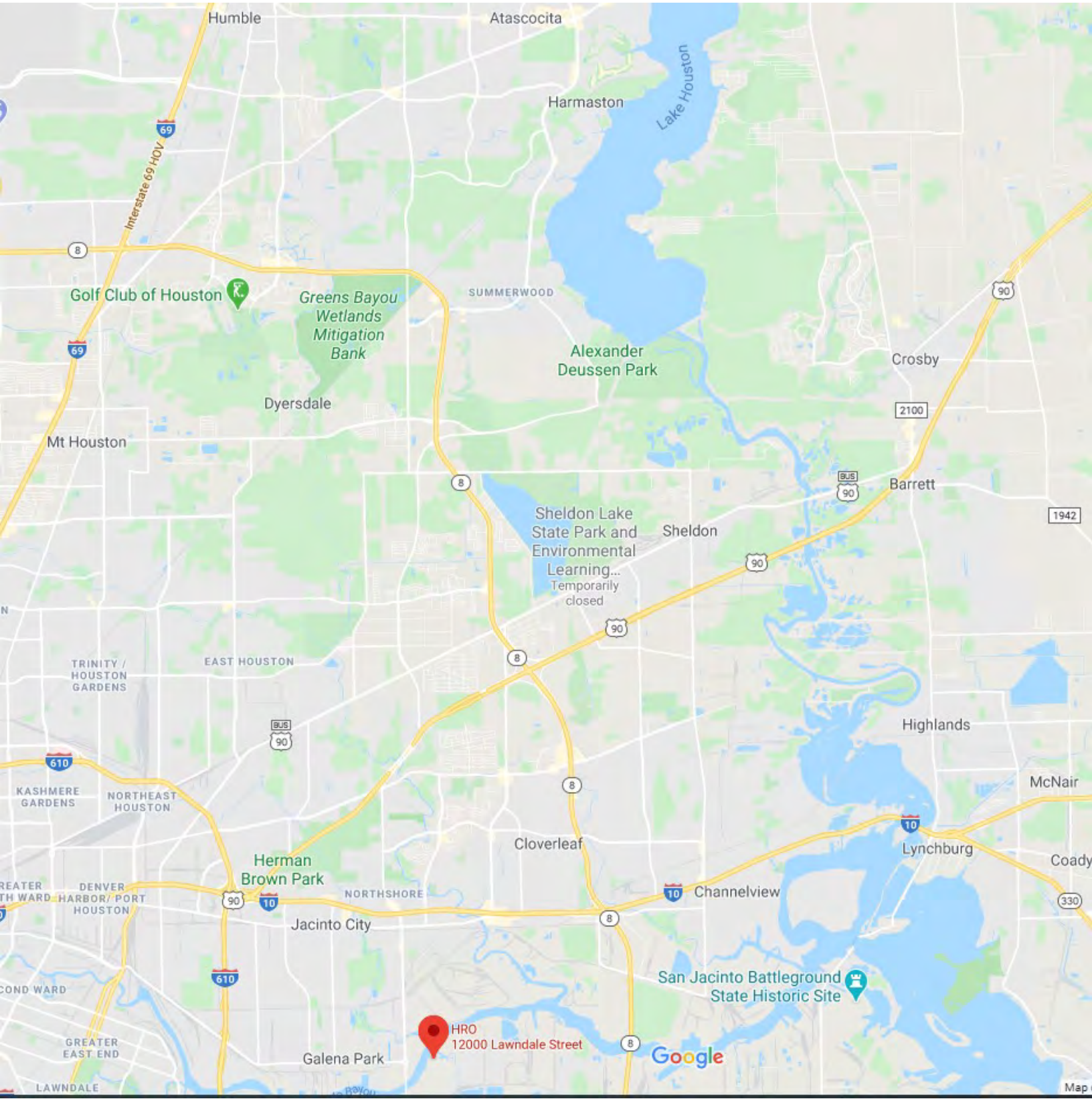
0 55 110 220 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand),

U.S. Environmental Protection Agency

PART B.II

LAKE HOUSTON

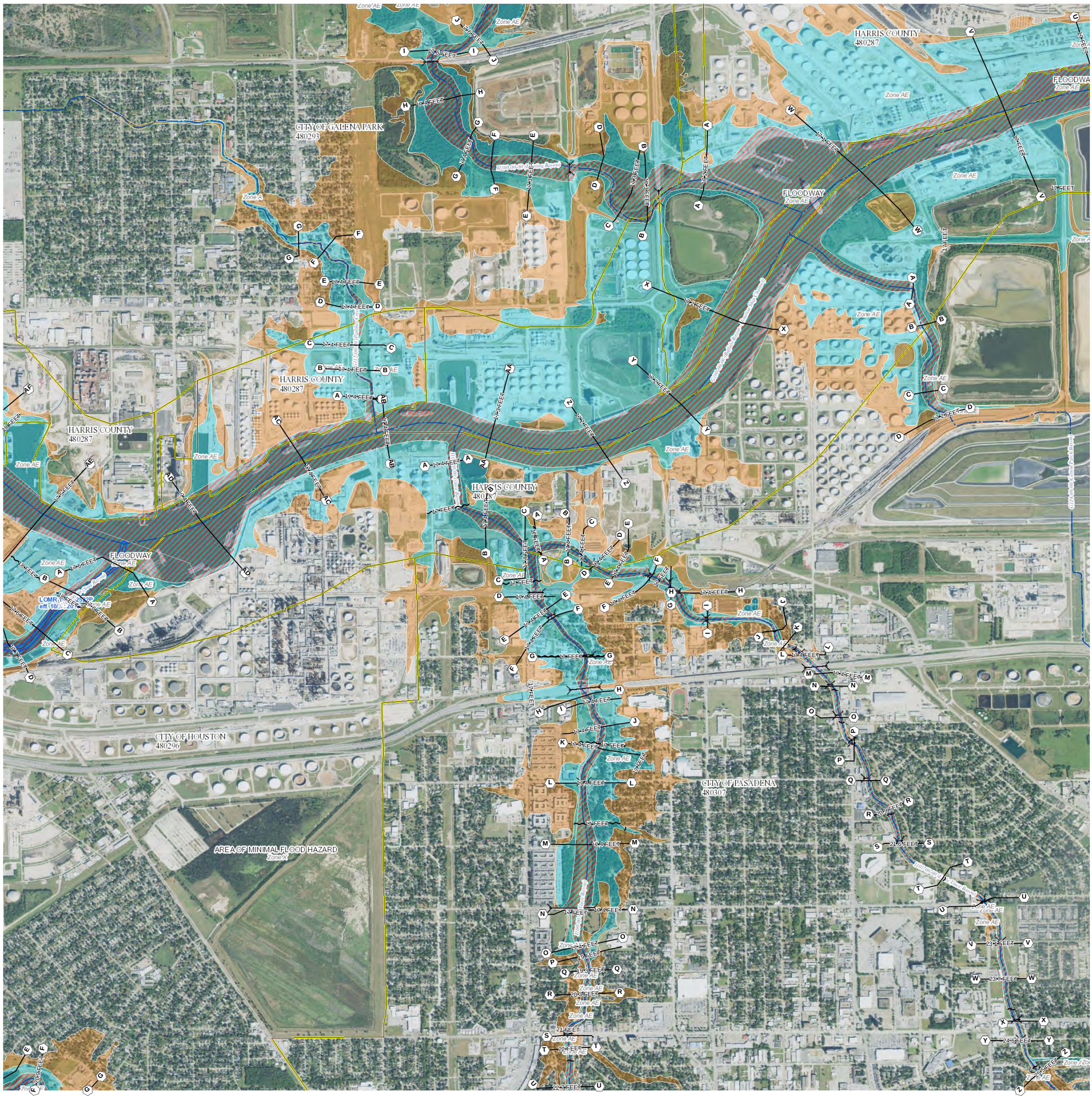

Humble
Atascocita
Harmaston
Lake Houston
Interstate 69 HOV
Golf Club of Houston
Greens Bayou Wetlands Mitigation Bank
SUMMERWOOD
Alexander Deussen Park
Crosby
Dyersdale
Mt Houston
Barrett
Sheldon Lake State Park and Environmental Learning...
Temporarily closed
Sheldon
TRINITY / HOUSTON GARDENS
EAST HOUSTON
Highlands
KASHMERE GARDENS
NORTHEAST HOUSTON
McNair
Cloverleaf
Lynchburg
Herman Brown Park
DENVER HARBOR/ PORT HOUSTON
NORTHSHORE
Channelview
Jacinto City
San Jacinto Battleground State Historic Site
HRO
12000 Lawndale Street
GREATER EAST END
Galena Park
LAWNDALE
Google

PART B.II

FEMA FIRM FLOODPLAIN MAPS

29°45'13.34"N

95°15'1.01"W



USGS The National Map: Orthoimagery. Data refreshed April, 2019.

29°41'1.70"N

95°11'4.08"W

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Effective LOMRs
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	20.2 Cross Sections with 1% Annual Chance
	17.5 Water Surface Elevation
	Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can beordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **4/16/2020 1:11:27 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

N

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map please see the Flood Insurance Study(FIS) Report for your community at https://msc.fema.gov

1 inch = 1,000 feet **1:12,000**

0 500 1,000 2,000 3,000 4,000 Feet

0 105 210 420 630 840 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

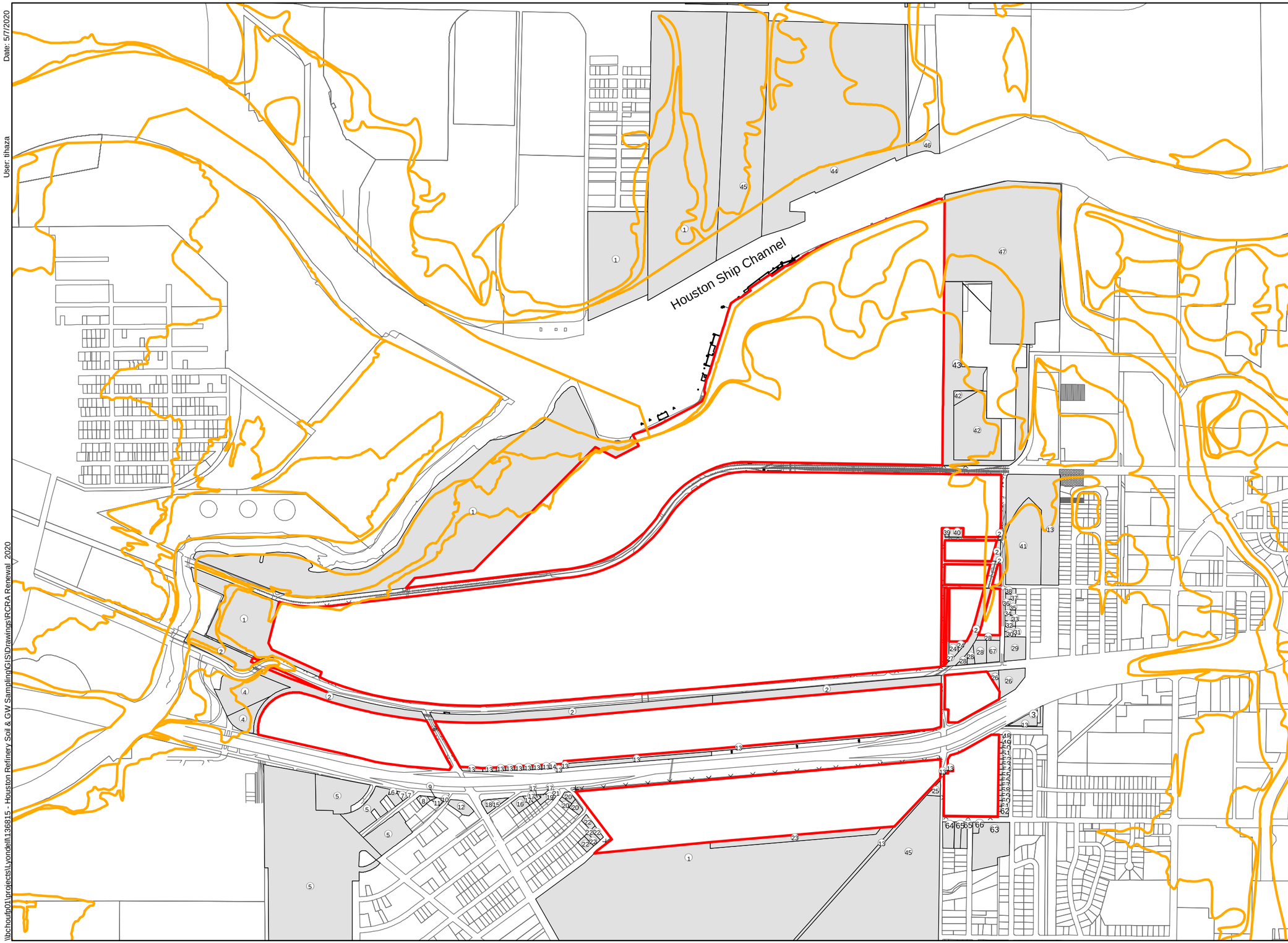
HARRIS COUNTY, TEXAS AND INCORPORATED AREAS

PANEL **905** OF **1105**

Panel Contains:

COMMUNITY	NUMBER	PANEL
HARRIS COUNTY TEXAS	480287	0905
CITY OF GALENA PARK TEXAS	480293	0905
CITY OF HOUSTON TEXAS	480296	0905
CITY OF PASADENA TEXAS	480307	0905

MAP NUMBER
48201C0905N
EFFECTIVE DATE
05/02/2019



LEGEND

- 0.2% Annual Chance Flood Hazard
- Subject Property
- Adjacent Property

Note: Base map and Property ownership information: Harris County Appraisal District, 2020

N

0 400 800 Feet

Attachment II-5b:
Floodplain Map

Houston Refining, L.P.
12000 Lawndale
Houston, Texas

Date: 5/7/2020

Brown AND Caldwell

Date: 5/7/2020

User: tihaza

\\bchoufp01\projects\Lyondell\136815 - Houston Refinery Soil & GW Sampling\GIS\Drawings\RCRA Renewal_2020

HW-50106, Rev 0
November 2020

PART B.III

SECURITY PLAN

FACILITY SECURITY

Houston Refining LP (Houston Refining) limits access to the facility's grounds and units. The HRO facility is staffed for and operated on a 24-hour-per-day basis and is completely fenced for security. Entrances are locked and either have “No admittance” signs posted with video monitors or are staffed by security personnel. Roving patrols also monitor plant security. Perimeter lighting around the facility is adequate to maintain plant security. Bollards are installed at each of the drive-in entrances. HRO is also governed under the Maritime Transportation Security Act (MTSA) and has implanted the Transportation Workers Identification Credential (TWIC) program. This includes government -issued card access system. The methods used to limit access to the facility include:

1. Fencing: A combination of 8-foot-high and 6-foot-high chain link fences. The 6-foot high fence includes a three-strand barbed wire course.

2. 24-hour Surveillance System: The surveillance system consists of television monitoring and mobile guard patrol.

    a. Video Monitoring Cameras. Eight cameras monitor the fence line and the entrances to the facility. These cameras have zoom-focus remote control capability. Seven cameras have full 360 degree rotation.

    b. Mobile Guard Patrol. The refinery security personnel patrol all the areas of the refinery and the perimeter fences on a regular basis 24 hours per day.

3. Gates: Remote control gates are kept closed at all times. They are opened to permit egress/ingress by remote control from the Guard Office, located at the refinery entrance Gate No. 3.

PART B.III

INSPECTION PLAN

INSPECTION SCHEDULE

1.0 INTRODUCTION

This Inspection Schedule has been prepared in accordance with the regulatory requirements of 40 CFR 264.15 and 40 CFR 270.14(b)(5) to identify any malfunctions, deterioration, operator errors, or discharges associated with the RCRA permitted units at the Houston Refining LP (Houston Refining) facility which could potentially release hazardous waste constituents to the environment or threaten human health. Use of this Inspection Schedule will allow sufficient time to identify and correct potential problems associated with these units before they endanger human health or the environment.

2.0 ADMINISTRATION OF INSPECTION PROGRAM

Inspection of RCRA permitted units and associated equipment and structures will be conducted by inspectors trained to identify conditions requiring adjustment or correction to prevent adverse consequences. The inspectors will prepare a written record documenting inspection items and observations. Information recorded by operations personnel on an operator's log will be included as part of the inspection record, where applicable. Inspection records will be kept at the facility for at least 3 years from the date of the inspection.

The inspector will be familiar with the location and normal configuration of the units and systems to be inspected. For any discrepancy observed, the inspector will determine the potential for harm to human health or the environment, assess the nature and timing of any remedial action required, and make any appropriate recommendations. An inspector's determination will consider: (1) the location and nature of the problem; (2) the presence of containment or control; (3) the amount and type of waste involved; (4) the potential for human exposure; and (5) the likelihood of waste migration.

When an inspection indicates equipment malfunction or deterioration, or any other improper condition, the following actions will be taken, as appropriate:

- Assess the situation;
- Determine the corrective/remedial measures needed, including appropriate interim measures.
- Establish a time frame within which remedial action should occur; and
- Provide adequate follow-up to verify that the specified response has occurred and that the condition has been satisfactorily resolved.

3.0 INSPECTION SCHEDULES

The hazardous waste management units listed below are subject to this plan:

- Surface Impoundment Units; and
- Land Treatment Units

Each hazardous waste management unit, ancillary components, or system will be inspected regularly for malfunction, deterioration, failure, and other problems that could potentially endanger human health or the environment. The parameters and frequencies of the inspection schedules are based on the potential problems and hazards that are uniquely associated with each unit, component, or system. Predetermined schedules for facility inspections are presented in Table 3-1. The specified content and frequency of each inspection item are designed so facility personnel can be alerted prior to development of a serious condition. The level of response and its timing are determined by the nature and potential significance of the identified condition, with protection of personnel and the prevention of adverse environmental impact being of paramount concern.

3.1 SURFACE IMPOUNDMENT UNITS

Two surface impoundments known as the East Guard Basin (EGB) and the East Impoundment Basin (EIB) are permitted as hazardous waste management units at the facility. These units managed hazardous wastes until March 1994, at which time, all hazardous sludges and wastewaters were removed from the units. However, some hazardous waste residuals may still remain in the clay liner components of these basins.

Each of these units now operate as inactive hazardous waste management units in accordance with the delay of closure requirements of 40 CFR 264.113(d). The EGB is designed to retain non-hazardous stormwater on the property and discharge this water for treatment to the Gulf Coast Waste Disposal Authority (GCWDA). The EIB receives stormwater from the EGB.

Transfer pumps move stormwater from the EGB to the EIB during storm events if the EGB's capacity is reached.

Since both of these units are inactive with respect to hazardous waste management and are only used to manage non-hazardous wastes under the delay of closure requirements, these units do not have any specific inspection items other than those involving continued groundwater monitoring and security.

3.2 LAND TREATMENT UNITS

One landfarm area known as the Southwest Landfarm is located at the facility. The Southwest Landfarm contains three permitted units. This landfarm has historically been used to treat oily sludges and refinery waste. This landfarm no longer accepts any wastes and is currently closed. Due to the closed status of the permitted hazardous waste management units at the facility, the potential for a release of hazardous waste constituents into the environment is minimal. For example, since there are no hazardous waste loading or unloading operations associated with these units, there are no hazards from such operations.

4.0 DOCUMENTATION AND REPORTING

The inspector will conduct and document inspections using forms that are specifically designed to contain all pertinent inspection information. Separate inspection forms may be provided for specified weekly, monthly, or other scheduled periodic inspections. These forms are subject to periodic modification to accommodate changing needs of the facility. Each inspection form will contain appropriate administrative information including: (1) identification of the unit or area; (2) the name of the inspector; and (3) the date and time of the inspection.

The inspection checklist section of the form will identify the possible error, malfunction, or deterioration items to be evaluated as discussed in Section 3.0 and noted on Table III.D. The status of each of these items will be noted by the inspector on the form. For each item determined to require maintenance or correction, the inspector will note the nature of the problem, recommended actions for resolution of the problem, and the urgency of the response actions. The completed form will be forwarded to the appropriate personnel for review and action, as necessary. For each problem noted (unless immediately resolved), the inspector will perform a re-inspection to verify the necessary maintenance occurred. The re-inspection may be documented on a separate re-inspection form or on the form for the next routine inspection. Documentation for re-inspection will include the date and nature of any repairs or other remedial actions.

Completed inspection and re-inspection forms and attachments will comprise the inspection log which fulfils the requirements of 40 CFR 264.15(d). These records will be retained in the facility operating record for a minimum of 3 years. In cases where specialized outside contractors are used to perform testing and/or inspection services, the results will be reported on the contractor's forms which will be made part of the inspection operating record when received.

Table III.D. – Inspection Schedule

Facility Unit(s) and Basic Elements	***Possible Error, Malfunction, or Deterioration***	***Frequency of Inspection***
LAND TREATMENT UNITS		
1) Monitoring System - Groundwater Wells	Check for damage to pipe Check well covers: closed & locked	Weekly
2) Inspect vegetative cover (during post-closure care)	Check for erosion, settling, or subsidence, Check for ponding, check for proper drainage of stormwater.	Semi-annually and after significant rainfall event
SURFACE IMPOUNDMENT UNITS		
1) Warning Signs	Check for presence, damage	Monthly
2) Monitoring System - Groundwater Wells	Check for damage to pipe Check well covers: closed & locked	Weekly
3) Inspect vegetative cover (during post-closure care for contingent closure)	Check for erosion, settling, or subsidence	Semi-annually and after significant rainfall event
4) Stormwater Run-on/Run-off (during post-closure care for contingent closure)	Check dikes for erosion, seepage breaches, leaks, discoloration	Weekly and after storms
5) Bench marks (during post-closure care for contingent closure)	Check for cover system settlement	Annually
SECURITY SYSTEM		
1) Video Monitoring Cameras	Malfunction	Monthly
2) Security Fencing	Evidence of Unauthorized Entry Breach or Visible Damage	Monthly
3) Remote Control Security Gates	Malfunction Vehicle Damage	Monthly
4) Warning Signs	Missing Illegible	Monthly

As applicable, all closed units subject to post-closure care with cover will be sloped to ensure proper drainage and conveyance of stormwater.

PART B.III

CONTINGENCY PLAN

HoustonRefining

RCRA
Generator Contingency Plan

Prepared by:

HRO Environmental Department
12000 Lawndale, P.O. Box 2451
Houston, Texas 77252-2451

October 2020

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This plan is reviewed annually and amended whenever changes occur that will significantly affect the ability of this facility to respond to an emergency situation. This includes revision of the regulations, if the plan fails in an emergency, if this facility changes in a way that materially increases the potential for an emergency or changes in the response necessary in an emergency, if the list of emergency coordinators changes or if the list of emergency equipment changes.

1.0 INTRODUCTION

Although this facility is designed, constructed, maintained and operated in a manner that minimizes the possibility for emergency incidents such as fire, explosions and any unplanned sudden or non- sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water, this plan is designed to minimize hazards to human health and the environment in the unlikely event of such incidents. This plan is designed to satisfy the requirements of 40 CFR Part 264, Subpart C (Preparedness and Prevention), 40 CFR Part 264, Subpart D (Contingency Plan and Emergency Procedures), 30 TAC §335.153 (Post-Incident Written Report; and the TCEQ Part B application instructions (Emergency Equipment Locations).

2.0 COMPANION DOCUMENTS

Companion HRO documents, the Emergency Assistance Plan (EAP), Spill Response and Prevention Plan (SRPP) are used in conjunction with this RCRA Generator Contingency Plan. The EAP contains the facility procedures for handling various types of emergency situations, including fires, spills, medical, training, and communication. The SRPP contains the facility procedures for handling various situations that involve oil. Only regulatory required details are presented in the RCRA Contingency Plan since much of the emergency and oil response information is contained in the EAP and the SRPP, Therefore, the EAP, SRPP, RCRA Contingency Plan Quick Response Guide and the RCRA Generator Contingency Plan are complementary documents maintained electronically in LiveLink.

3.0 GENERAL SITE DESCRIPTION

Houston Refining LP (HRO) is located at 12000 Lawndale in Houston, Texas. The facility is sited on approximately 700 acres located in the City of Houston and the City of Pasadena on the south bank of the Houston Ship Channel. The refinery is located generally north of State Highway 225 between Scarborough and Allen-Genoa, approximately 3 miles east of IH610, and due east of Sims Bayou.

HRO is a large integrated petroleum refinery with a nominal crude oil (combined heavy sour crude and “Grade A” crude) processing capacity of around 300,000 barrels per day and is comprised of numerous manufacturing process units. The processing units at HRO include: two heavy Crude Units, two Coker Units, a Sulfur Recovery Complex, a Fluidized Catalytic Cracking Unit, seven Hydro-desulfurization Units, two Reforming Units, a Lubes Complex, and various

other production and treating units. The facility operates 24 hours per day, 7 days per week, and maintains a staff of approximately 850 people (excluding contractors).

4.0 HAZARDOUS WASTE MANAGEMENT UNITS

4.1 PERMITTED HAZARDOUS WASTE MANAGEMENT UNITS (INACTIVE)

The permitted hazardous waste management units located at the refinery consist of two land treatment areas (Northeast Landfarm and the Southwest Landfarm) and two surface impoundments (East Guard Basin [EGB] and the East Impoundment Basin [EIB]).

All of the permitted hazardous waste management units at the facility are inactive. Five of the seven land treatment units are closed while the other two are currently undergoing closure in accordance with the approved closure plan. The surface impoundments are managing non-hazardous stormwater under the delay of closure regulations.

4.2 LESS THAN 90-DAY HAZARDOUS WASTE MANAGEMENT UNITS

Less than 90-day hazardous waste management units are strategically located throughout the refinery and manage a variety of listed and/or characteristically hazardous waste.

39 The West Staging Building

40 East Staging Building

41 Catalyst Staging Area

42 Solid Waste Storage Area, West of Unit 039

44 C&P Slab

45 Bundle Cleaning Slab

56 Roll-Off Storage, West of East Guard Basin

57 Roll-Off Storage, South of West Guard Basin

010 Asbestos/Lead, West of Unit 039

62 Roll-Off Storage at SSPU

63 Temporary Roll-Off Storage, North of 737 Coker Cooling Tower

4.3 SURFACE IMPOUNDMENT BASINS

The material managed at the surface impoundment basins is primarily stormwater with some process wastewater. The West Guard Basin (WGB) receives stormwater runoff from the west side of the refinery, and the West Impoundment Basin (WIB) receives stormwater from the WGB. The EGB receives stormwater runoff from the east side of the refinery, and the EIB receives stormwater from the EGB. Prior to system modifications in 1994, the water entering the EGB, when analyzed using the Toxicity Characteristic Leaching Procedure (TCLP), contained benzene in excess of the Toxicity Characteristic (TC) Rule (40 CFR 261.24).

On March 29, 1994, these basins ceased receipt of hazardous waste and are now operating in accordance with the delay of closure requirements of 40 CFR 265.113(d).

4.4 HAZARDOUS WASTE STORAGE UNITS (ACTIVE)

The active hazardous waste storage units at HRO are strategically located throughout the facility and are used to manage listed and/or characteristically hazardous waste materials, not to exceed 90 calendar days.

These waste storage units are primarily either buildings or staging areas and are most typically used to manage waste in roll-off boxes, totes, or drums.

39 The West Staging Building

The West Staging Building may store several listed or characteristically hazardous wastes from petroleum refining and primary sludges, including:

D007		Chromium
D008		Lead
D018		Benzene
	K050	Heat exchanger bundle cleaning sludge
K051		API separator sludge
K052		Leaded tank bottoms
F037		Petroleum Refinery Primary Oil/Water/Solids Separation sludge

40 East Staging Building

The East Staging Building may store several characteristic and/or listed hazardous wastes from petroleum refining and primary sludges, including:

D007		Chromium
D008		Lead
D018		Benzene
	K050	Heat exchanger bundle cleaning sludge
K051		API separator sludge
K052		Leaded tank bottoms
	F037	Petroleum Refinery Primary Oil/Water/Solids Separation sludge

41 Catalyst Staging Area

The Catalyst Staging Area may store characteristic and/or hazardous waste catalyst, sludges and spent hydrotreating wastes, including:

D018	Benzene
K171	Spent Hydrotreating Catalyst

42 Solid Waste Storage Area, West of Unit 039

The Solid Waste Storage Area, West of Unit 039, may store several characteristic and/or listed hazardous wastes from petroleum refining and primary sludges, including:

D007		Chromium
D008		Lead
D018		Benzene
	K050	Heat exchanger bundle cleaning sludge
K051		API separator sludge
K052		Leaded tank bottoms
	F037	Petroleum Refinery Primary Oil/Water/Solids Separation sludge

44 C&P Slab

The C&P Slab may store characteristic and/or listed hazardous wastes from petroleum refining and primary sludges, including:

D018		Benzene
K051		API separator sludge
	F037	Petroleum Refinery Primary Oil/Water/Solids Separation sludge

45 Bundle Cleaning Slab

The Bundle Cleaning Slab may store several characteristic and/or listed hazardous wastes from petroleum refining and primary sludges, including:

D007		Chromium
D008		Lead
D018		Benzene
	K050	Heat exchanger bundle cleaning sludge
K051		API separator sludge
K052		Leaded tank bottoms
	F037	Petroleum Refinery Primary Oil/Water/Solids Separation sludge

56 Roll-Off Storage, West of East Guard Basin

The Roll-Off Storage Area, West of the EGB, may store listed hazardous waste from petroleum refining, including:

F037	Petroleum Refinery Primary Oil/Water/Solids Separation sludge

57 Roll-Off Storage, South of West Guard Basin

The roll-off storage area, south of the WGB, may store listed hazardous waste from petroleum refining, including:

F037	Petroleum Refinery Primary Oil/Water/Solids Separation sludge

010 Asbestos/Lead, West of Unit 039

The Asbestos/Lead Area, West of Unit 039, may store asbestos waste, and hazardous waste including lead contaminated debris.

62 Roll-Off Storage at SSPU

The Roll-Off Storage at SSPU may store several characteristic and/or listed hazardous wastes from petroleum refining and primary sludges, including:

D007	Chromium
D008	Lead
D018	Benzene
K050	Heat exchanger bundle cleaning sludge
K051	API separator sludge
K052	Leaded tank bottoms
F037	Petroleum Refinery Primary Oil/Water/Solids Separation sludge

63 Temporary Roll-Off Storage, North of 737 Coker Cooling Tower

The Temporary Roll-Off Storage, North of 737 Coker Cooling Tower may store several characteristic and/or listed hazardous wastes from petroleum refining and primary sludges, including:

D007	Chromium
D008	Lead
D018	Benzene
K050	Heat exchanger bundle cleaning sludge
K051	API separator sludge
K052	Leaded tank bottoms
F037	Petroleum Refinery Primary Oil/Water/Solids Separation sludge

5.0 TYPES OF POTENTIAL EMERGENCIES

The active waste management units contain compatible materials and none of the units are subject to any impact due to power outages. Any spilled wastes will be returned to drums or other appropriate containers. Material in any leaking drums will be overpacked or transferred to

new drums. Water used to fight fires will be contained and disposed of in accordance with applicable regulations.

Fire or the release of potentially contaminated stormwater are the most credible potential emergencies which could realistically occur at any of the hazardous waste management units.

6.0 EMERGENCY RESPONSE COORDINATOR

The Plant Shift Superintendent is assigned the responsibilities of the Emergency Coordinator (EC). A Plant Shift Superintendent is on site at all times, 24 hours per day, 7 days per week at **713-321-4211**. The EC is responsible for coordinating all emergency response measures for the permitted hazardous waste management units. The EC is thoroughly familiar with all aspects of this contingency plan, all hazardous waste management units at the site, characteristics of the hazardous wastes managed in these units, the location of pertinent site records, and the site layout. The EC is authorized to activate emergency response procedures under this plan by initiating the use of appropriate equipment and coordinating its use and application. The EC also has the authority to designate other employees to assist in an emergency.

A list of current names, addresses, and phone numbers for the emergency coordinator is maintained at the site can be found in the Emergency Response Action Plan. One of these individuals, who all serve as the Plant Shift Superintendent, will be on site at all times; hence no alternate coordinators are listed.

Figure 6-1 presents the Emergency Response Command Structure for the Facility and Figure 6-2 presents the Emergency Operations Structure. Table 6-1 presents internal Notification References for the Facility.

Table 6-1 Internal Notification References

INTERNAL NOTIFICATIONS - GENERAL FACILITY			
FACILITY	**ADDRESS**	**OFFICE**	**FAX NUMBER**
Houston Refining LP	12000 Lawndale Houston, Texas 77252-2451	713-321-4111 713-321-4211 (SOC)	713-321-4700

INTERNAL NOTIFICATIONS - LOCAL RESPONSE TEAM				
POSITION/TITLE	**RESPONSE TIME**	**TRAINING LEVEL**	**CONTACT NUMBER**	**SPILL EVENT RESPONSIBILITY**
Plant Shift Superintendent / QI*	Immediate 1-On Duty/Shift On-Site 24/7	HAZWOPER Operations Level Plant/Field Coord. Training (Includes QI Training)	713-321-4223 – Office 713-321-4211 – SOC	Plant Coordinator
First Line Supervisor / Alternate QI*	Immediate 1 -On Duty/Shift On-Site 24/7	HAZWOPER Operations Level Plant/Field Coord. Training (Includes QI Training)	713.321-5374 – Office 713-321-4211 – SOC	Field Coordinator
Emergency Response Team (ERT) - Officers* Shift Commander and other ERT Officers	Immediate 1 On Duty/Shift On-Site 24/7	HAZWOPER Incident Command Level	713-321-4211 – SOC	Shift Commander (Incident Command) Other officers ICS positions as required.
Chief Officers: Chief Assistant Chief	Respond To Callout When Not On Shift	HAZWOPER Incident Command Level	713-321-4211 – SOC	Incident Command or other ICS positions as required
Emergency Response Team (ERT)	Immediate 10 - On Duty/Shift On-Site 24/7 Respond To Callout When Not On Shift	HAZWOPER Hazmat Tech Level Firefighter/Hazmat Techs	713-321-4211 – SOC	Emergency response services to include supporting Marine Spill Team
ERT Marine Spill Team Personnel	Immediate 3 - On Duty/Shift On-Site 24/7 Respond To Callout When Not On Shift	HAZWOPER Hazmat Tech Level Firefighter/Hazmat Techs	713-321-4211 – SOC	Emergency marine spill response

* All of these positions are manned 24 hours per day, and any of these personnel can be reached through SOC at (713) 321-4211 at any time. Other specific training for individuals is maintained at the facility.

Figure 6-1 Emergency Response – Command Structure

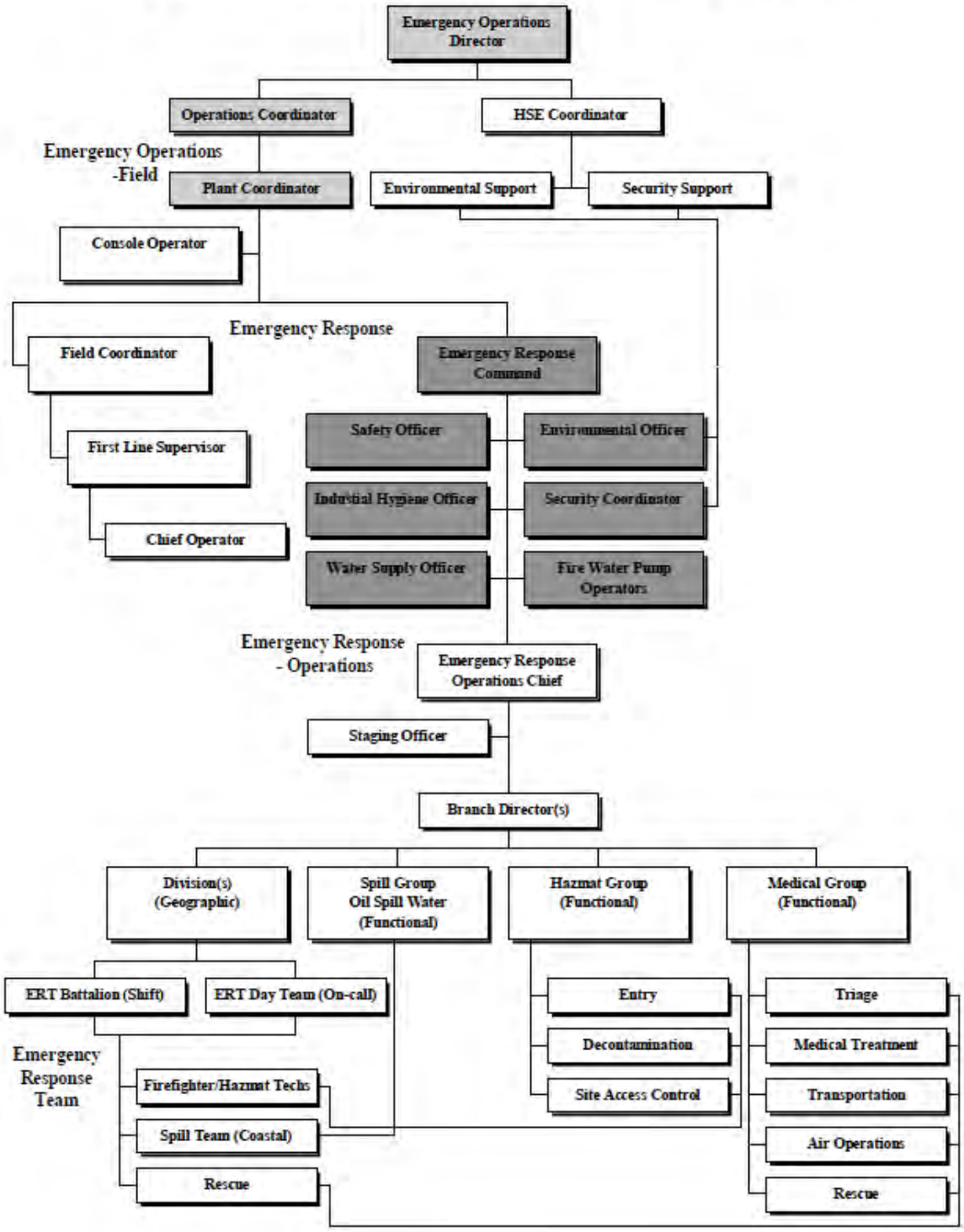
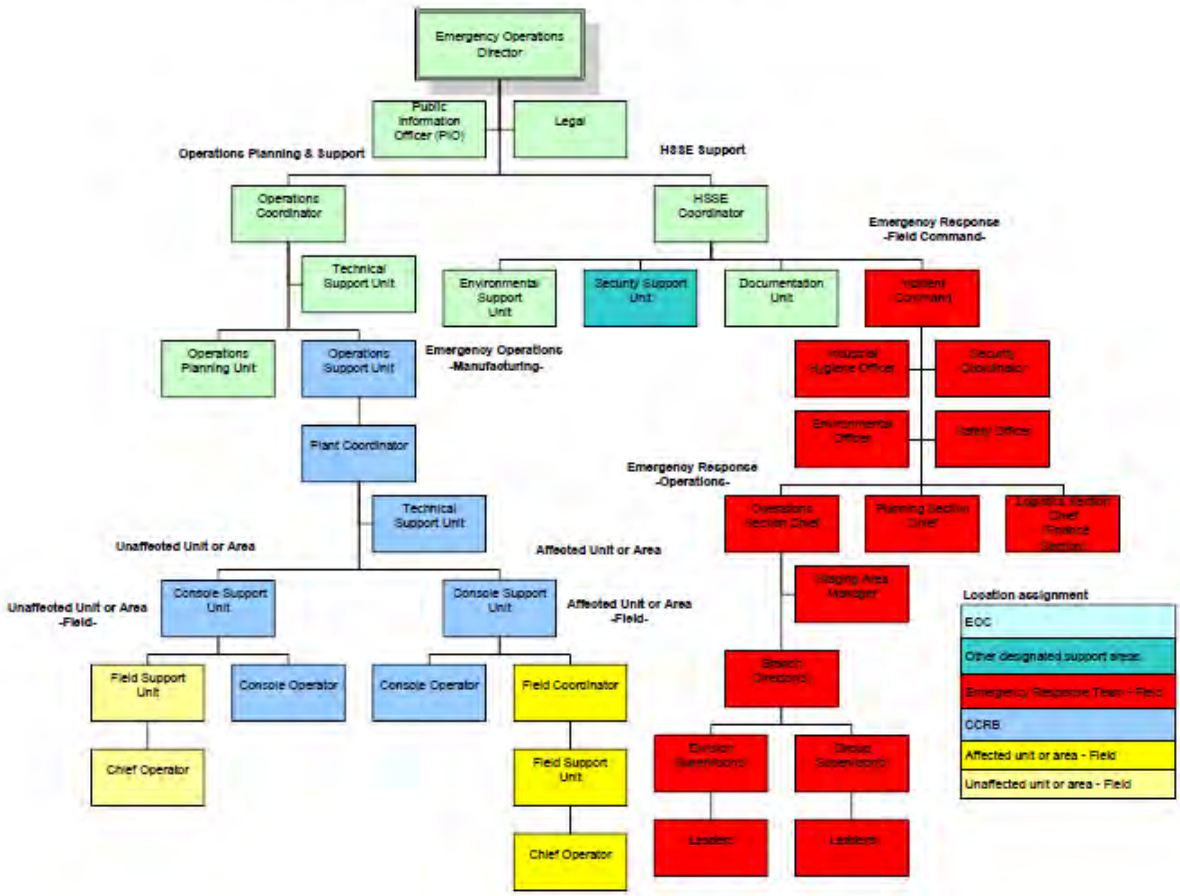


Figure 6-2 Emergency Operations Structure



7.0 AVAILABLE EMERGENCY EQUIPMENT

The available emergency equipment at the plant will enable facility personnel to react and respond to emergencies which may arise at one of the hazardous waste management units. If needed, supplemental emergency equipment and supplies may be obtained from outside sources.

The plant is equipped with a radio notification system capable of providing immediate emergency instructions to facility personnel through building notification systems and plant radios. Telephones at the site are immediately available to summon emergency assistance from outside sources such as the local police or fire departments.

A list of emergency equipment available at the site is provided in the Emergency Response Action Plan. The emergency equipment listed in this document will be adequate to handle emergencies which could reasonably be expected to occur within a hazardous waste management area. Table 7-1 presents the current list of emergency equipment at the facility.

Table 7-1. – Emergency Equipment

Equipment	Location	Physical Description	Capabilities
Ambulance	Station 1	BLS Ambulance; ALS equipped	Texas Fire Commission ALS equipped
Spill Boats	Spill Station	Flat-bottom boats (2)	Spill tow boat with boom anchor systems
Breathing Air/Light Unit	Station 1	Air cascade unit with generator and light tower	50+ SCBA units with spare 30- and 60-minute SCBA cylinders, 9-bank 100 30-minute capacity air cascade system and filling station. SAR equipped
Field Command Post	Medical	Mobile field command post	Mobile command post, fully equipped with communications and information systems
Foam Aerial	Site D Station	Foam Aerial 110’ ladder with 3,000 gpm pump	Servo-Command Foam System, 1000 gal foam tank, 1,000’ 6” hose and 500’ 5” hose
Foam Engine	Station 3	Foam Engine, 3,000 gpm, fully enclosed pump panel	High volume 6,000 gpm deck gun, Husky foam system, 1,000 gal foam tank, 500 gal. water tank, 1,500’ + of 6” hose and 500’ 5”hose

Table 7-1. Continued

Equipment	Location	Physical Description	Capabilities
Foam Engine	Station 1	Foam Engine, 3,000 gpm, top mounted pump panel	High volume 6,000 gpm deck gun, Husky foam system, 1,000 gal foam tank, 2,000’ + of 6” hose and 500’ 5”hose
Foam Engine	Station 1	Foam Engine, 1,500 gpm, side pump panel	2,000 gpm deck gun, Servo-Command Foam System, 1000. Gal foam tank, 1,000’ 6” hose, 500’ 5” hose
Foam Monitor Tender	Station 4	Mobile 1,500 gpm self-educting mobile foam monitor with 500 gal storage tank	Self-educting foam nozzle, Blitz fire portable monitor and 500 gal of 3 x 6 firefighting foam
HAZMAT	Station 4	2 Fully self-contained HAZMAT trailers	Truck and Self-Contained HAZMAT Trailer with full CPC, SCBAs, plugging and patching equipment, off-loading fittings and assorted tools
Hose Tender	Station 4	Hose tender reel	Powered hose reel with 4-lays of 7 1/4” hose totalling 3600
Hose Tender	Station 4	Hose tender flat bed trailer	Flat-bed trailer with 1000 of 7 ¼: hose. Assorted fire water appliances

Table 7-1. Continued

Equipment	Location	Physical Description	Capabilities
Quick Attack	Station 1	Quick attack unit with 2-fixed monitors	Fixed monitors: 1-1250 gmp water and 1-1250 gpm foam self-educting. 250’ of 5” hose. 175 gal 1% X3 firefighting foam
Quick Attack	Station 3	Quick attack unit with 2-fixed monitors	Fixed monitors: 1-1250 gmp water and 1-1250 gpm foam self-educting. 250’ of 5” hose. 175 gal 1% X3 firefighting foam
Large Delivery Device	Station 4	Trailer mounted 2,000-8,000 gpm monitor	2,000 – 8,000 trailer mounted large diameter water/foam monitor
Portable Pump	Station 4	4,000 gpm portable pump	4,000 gpm self-contained pump trailer unit
Rescue Unit	Station 2	Walk-in Heavy Rescue Unit with generator and light tower	4-bank air cascade system and filling station, SAR equipped, high angle and confinded space rescue equipment, hydraulic rescue tools, forcible entry tools and equipment
Spill Boom	Spill station	Spill reel trailer	750’ spill boom on powered reel
Spill Boom	Gate 23	Spill reel trailer	1,000’ spill boom on powered reel
Spill Boom	D Dock	Spill reel trailer	1,000’ spill boom on powered reel

Table 7-1. Continued

Equipment	Location	Physical Description	Capabilities
Spill Boom	B dock	Spill reel trailer	500’ Flat-bed spill boom trailer
Fire-water pumps	A-Dock	4,000 gpm fire-water pump	Brackish water from Ship Channel 4,000 gpm diesel fire-water pump
Fire-water pumps	B-Dock	4,000 gpm fire-water pump	Brackish water from Ship Channel 4,000 gpm diesel fire-water pump
Fire-water pumps	C-Dock	2,500 gpm fire-water pump	Brackish water from Ship Channel 2,500 gpm diesel fire-water pump
Fire-water pumps	D-Dock	4,000 gpm fire-water pump	Brackish water from Ship Channel 4,000, diesel fire-water pump
Fire-water pumps	E-Dock	4,000 gpm fire-water pump	Brackish water from Ship Channel 4,000 gpm diesel fire-water pump
Fire-water pumps	East Tank Farm, CWA	1,500 gpm fire-water pump	1,500 gpm Electric Fire-water pump
Fire-water pumps	East Tank Farm, CWA	3,000 gpm fire-water pump	3,000 gpm Diesel Fire-water pump
Fire-water pumps	East of 735 Unit, CWA	2,500 gpm fire-water pump	2,500 gpm Electric Fire-water pump

Table 7-1. Continued

Equipment	Location	Physical Description	Capabilities
Fire-water pumps	East of 735 Unit, CWA	2,500 gpm fire-water pump	2,500 gpm Steam Turbine Fire-water pump
Oil boom	Spill station	1500’ 18” conventional oil containment boom	1500’ 18” conventional oil containment boom
Oil boom	Boom Box between B and C Dock	250’ Oil Boom	250’ Oil Boom
Oil boom	Boom Box between C and D Dock	250’ Oil Boom	250’ Oil Boom
Absorbents – Spill Textiles	East Staging Building, Waste Crew Truck, 7 HAZMAT Trailer	Assorted Sorbent Booms and Pads	Assorted Sorbent Booms and Pads
Absorbents	East Staging Building, Waste Crew Truck, 7 HAZMAT Trailer	Sorbent Granules	Sorbent Granules
900 MHZ Motorola Radios, MTS 2000 Smartnet Trunked Portable Radio, Model HOIQZ/207H	HSE Communications Equipment Cabinet	Plant Radio Communication	Plant Radio Communication
Leased from Veolia			
Vacuum Truck	Various	3 x 70 barrel capacity vacuum truck	Vacuum Truck
Vacuum Truck	Various	Liquid Ring Ace	Vacuum Truck

8.0 IMPLEMENTATION OF EMERGENCY PROCEDURES

When there is an imminent or actual emergency situation associated with the hazardous waste management units, the EC (or his designee) immediately activates the plant radio notification system to notify all facility personnel. The EC or designee also notifies appropriate State and local agencies with designated response roles if their help is required.

Upon discovery of a release from the hazardous waste management units, the EC or designee will identify the character, source, amount, and areal extent of released materials. Concurrently, the primary and secondary hazards to human health or the environment that may result from the release will be assessed.

During an emergency associated with the hazardous waste management units, the EC will take steps to prevent releases from recurring or spreading. This will include stopping processes and/or operations, where appropriate, and containing and collecting released materials. The EC will also verify that any materials released in the incident area are isolated from any incompatible materials, and that any potentially incompatible materials are removed from the area.

Immediately after an emergency involving the hazardous waste management units, the EC will provide for the treatment, storage, and/or disposal of the recovered waste materials, or any other material that results from the release. All equipment utilized in the emergency will be cleaned and readied for its intended use prior to commencing operations within the affected area. The equipment will be checked for damage prior to storage. Damaged equipment will be repaired or replaced as appropriate prior to storage.

The Contingency Plan will be reviewed periodically and amended whenever any of the following events occur:

- The facility permit is revised, and the revisions materially affect the Contingency Plan
- Applicable regulations are revised
- The Plan fails in an emergency
- Changes are made to the facility that materially increase the potential for fires, explosions, or release of hazardous waste or hazardous waste constituents, or that changes the response necessary in an emergency

- The list of emergency coordinators (ECs) changes or
- The list of emergency equipment changes.
-

A permit modification will be requested, as necessary, pursuant to the requirements of 30 TAC §305.69, whenever the Plan is revised.

9.0 EMERGENCY REPAIRS

40 *CFR* 264.227 requires a surface impoundment to be taken out of service when the level of liquids in the impoundment suddenly drops and the drop is not known to be caused by changes in the flows into or out of the impoundment, or if the dike leaks. The Contingency Plan must specify the procedures necessary for removing a surface impoundment from service under this section. The procedures to be used by Houston Refining when removing a surface impoundment from service for emergency repairs in accordance with this regulation are described below.

The EGB is a below-grade structure with a nominal perimeter berm for run-on diversion and an overflow weir which maintains the water level below the perimeter berm. Consequently, there are no dikes associated with this impoundment. The EIB does utilize a dike for some of its stormwater holding capacity. Since the surface impoundments are used solely for management of stormwater runoff, they are normally empty except during and for a period of time after rainfall events. Given this method of operation, the only possible scenario which would trigger a response action under 40 *CFR* 264.227 would be failure of the EIB dike.

If the EIB dike should fail while holding water from a rainfall event, the transfer pumps to the EIB will be shut off. Any surface leakage will be contained by use of absorbents, temporary berms, or other measures. The leak will be stopped by plugging the breach or other means, if possible. If the leak cannot be stopped by any other means, the EIB will be emptied to the extent necessary to stop the leak. The Executive Director of the TCEQ will be notified of the problem in writing within seven days after the problem is detected.

10.0 EVACUATION PLAN

This section is provided as a summary of the full evacuation plan contained in the EAP and applies to all HRO employees, contractors, and visitors within the confines and jurisdiction of the refinery.

The plan also provides emergency accountability procedures for all personnel within the facility. Each area of the refinery has designated Accountability Coordinators responsible for managing accountability for their assigned area during a non-essential personnel evacuation of a unit, area, or building.

During Non-Essential Personnel Evacuation Plant-Wide or All Personnel Evacuations of unit or area, personnel are required to report to their designated Rally Point. During times when personnel cannot safely get to their primary Rally Point or to an alternate Rally Point, personnel are trained to report to pre-designated Evacuation Point locations. Based on the severity of the emergency, personnel may be moved from Rally Points to Evacuation Points due to the potential of changing conditions. Evacuation and Rally points throughout the refinery are clearly marked with signs at locations indicate on the Refinery Evacuation Map in Figure 10-1.

11.0 ARRANGEMENTS WITH LOCAL AUTHORITIES

Houston Refining has made arrangements to familiarize local fire departments, police departments, and emergency response teams with the location of the hazardous waste management units within the facility, properties of hazardous waste in these units and associated hazards, areas where hazardous waste management facility personnel would normally be working, and ingress and egress routes. Arrangements have been made to familiarize local hospitals with the properties of hazardous materials handled at the site and the types of injuries or illnesses which could result from chemical exposures. Emergency Medical Services Plan, part of the Emergency Response Action Plan, lists the arrangements that have been made with local authorities. Table 11-1 presents a summary of the local authorities.

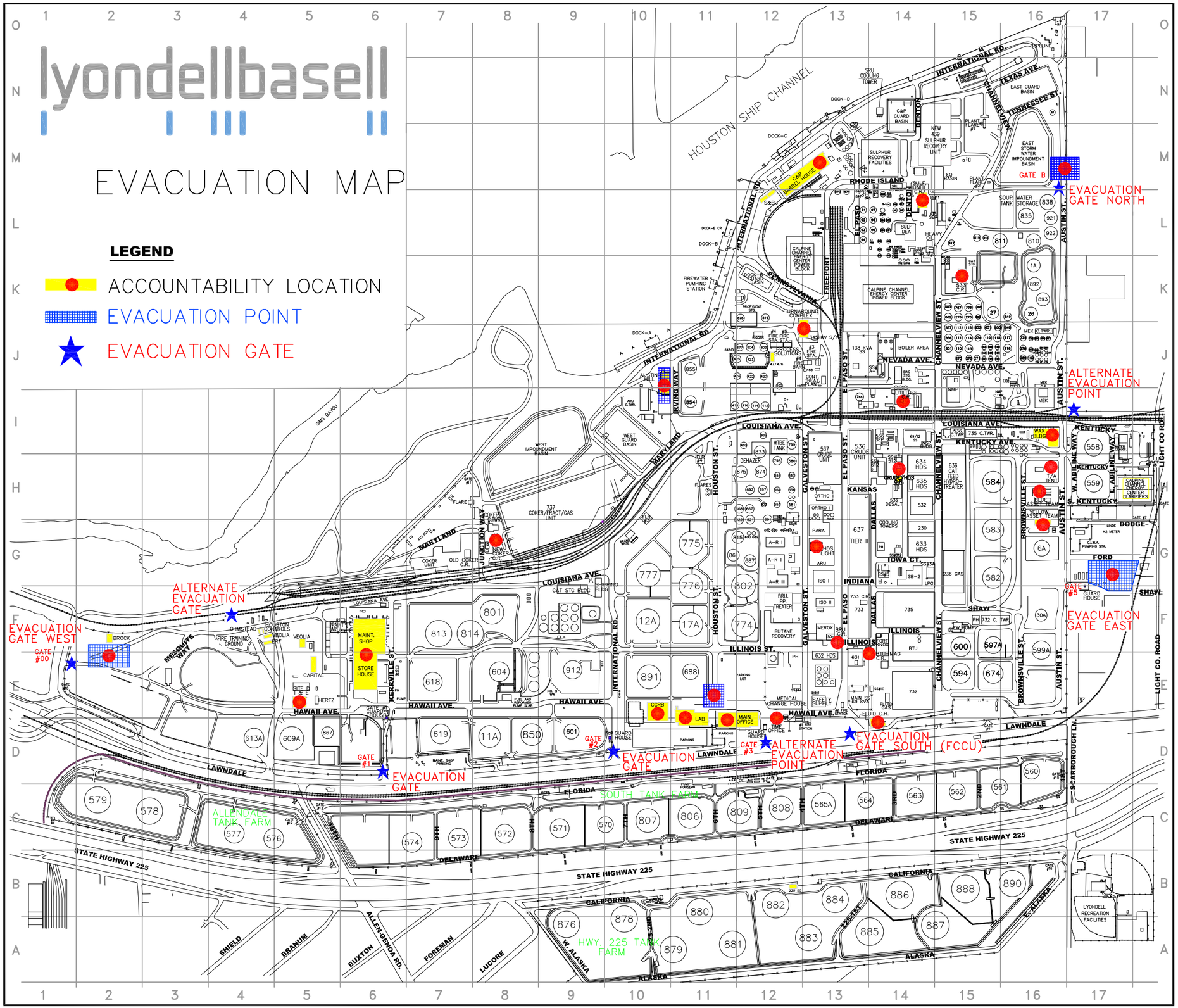


Figure 10-1 HRO Evacuation Map

SYM.	REVISIONS	DATE	REV. BY	CHK. BY	APP. BY
6	2011 UPDATE	09/11	LB	JW	JW
5	2010 UPDATE	04/10	RM	JW	JW
4	2009 UPDATE	12/09	JW	RM	JW
3	2002 UPDATE	06/02	DM	AC	PG
2	2001 UPDATE	03/01	DM	AC	PG
1	1999 UPDATE	10/99	RR	AC	PG

REVISED

DESIGN BY GDS
DRAWN BY JAB 05/96
CHECKED BY JS 05/96
APPROVED BY

GENERAL DESIGN APPROVED
BY
BY

AUTHORIZATION NO.

JOB NO. ACCT. NO.

lyondellbasell

UNIT

REFINERY
EVACUATION MAP
112

SCALE NONE
DATE 05-24-96
DR. NO. HT-0000 DB-0701
REV. 6

CAD FILE NAME: 000B0701

Table 11-1 External Notification References

GOVERNMENTAL EMERGENCY NOTIFICATION/ADVISORY (CALL 911 IN CASE OF EMERGENCY)			
Service	**Location**	**Office**	**Alternate**
City of Houston Municipal Water Supply	Houston, TX	(713) 837-0311	
City of Pasadena Fire Department	Pasadena, TX	(713) 473-2273	
City of Pasadena LEPC	Pasadena, TX	(713) 473-2273	
City of Pasadena Ambulance Service	Pasadena, TX	(713) 472-1911	
City of Pasadena Water Department	Pasadena, TX	(713) 475-5566	
City of Pasadena Fire Marshal's Office	Pasadena, TX	(713) 475-5556	
City of Pasadena City Marshal's Office	Pasadena, TX	(713) 475-5559	
Port of Houston Fire Department	Houston, TX	(713) 670-3611	
F.B.I. – Houston	Houston, TX	(713) 693-5000	
Harris County Sheriff	Houston, TX	(713) 221-6000	
Texas Department of Public Safety	Houston, TX	(281) 517-1300	
Gulf Coast Authority – Washburn Tunnel Facility	Pasadena, TX	(713) 472-5507	(713) 648-2373 (pager for Greg Seay)
Texas Commission on Environmental Quality	Houston, TX	(713) 767-3563	(713) 767-3561 (fax)
EPA Region 6 Spill Hotline	Dallas, TX	(866) EPA-SPIL	(866) 372-7745
National Response Center (NRC)	**Washington, DC**	**(800) 424-8802**	
USCG Sector Houston - Galveston	**Houston, TX**	**(281) 464-4800**	
Texas General Land Office	**La Porte, TX**	**(800) 832-8224**	

OUTSIDE ASSISTANCE/ADVISORY NOTIFICATIONS			
Company	**Location**	**Office**	**Alternate**
CenterPoint Energy	Houston, TX	(281) 894-0491	
Southwestern Bell Telephone Company	Houston, TX	(800) 286-8343	
KHOU – TV (CBS)	Houston, TX	(713) 521-4384	
KPRC – TV (NBC)	Houston, TX	(713) 778-4910	
KTRK – TV (ABC)	Houston, TX	(713) 666-0713	
KRIV – TV (FOX)	Houston, TX	(713) 479-2600	
KTRH Radio	Houston, TX	(713) 212-8000	
KPRC Radio	Houston, TX	(713) 212-8000	
KILT Radio	Houston, TX	(713) 881-5170	
Infinity Radio Houston (KILT)	Houston, TX	(713) 881-5957	
Weather Report	Houston, TX	(281) 337-5074	

Table 11-1 External Notification References, continued

LOCAL MEDICAL EMERGENCY SERVICES			
Service	**Location**	**Office**	**Alternate**
Rural/Metro Ambulance	Pasadena, TX	(713) 472-1911	
Columbia Bayshore Medical Center	Pasadena, TX	(713) 359-1440	
Memorial Hermann Southeast	Pasadena, TX	(281) 929-6100	
Kindred Hospital	Pasadena, TX	(713) 473-9700	
Hermann Hospital	Houston, TX	(713) 704-4000	(713) 704-7284

WILDLIFE ASSISTANCE/ADVISORY NOTIFICATIONS			
Company	**Location**	**Office**	**Alternate**
Wildlife Center of Texas (24 Hrs) (Sharon Schmalz)	League City, TX	(281) 332-8319	(713) 279-1417 (Pager) (713) 643-9453 (Menu)
Texas Parks & Wildlife Department (24 Hrs) (Law Enforcement Center)	La Porte, TX	(281) 842-8100	(281) 842-8404 (Fax)
Texas Parks & Wildlife Department (Local Field Office - South)	Houston, TX	(713) 779-8977	(713) 779-7742 (Fax) (281) 931-6471 (North)
U.S. Fish and Wildlife Service (Ron Brinkley)	Houston, TX	(281) 286-8282	(281) 488-5882 (713) 542-1873 (Cell)

USCG CLASSIFIED OIL SPILL REMOVAL ORGANIZATIONS (OSRO)			
Company	**Location**	**Office**	**Alternate**
Garner Environmental Services, Inc.	Deer Park, TX	(800) 424-1716	(281) 930-1200
Clean Channel Association (CCA)	Houston, TX	(713) 534-6195	
Administrative Director: (Phil Glenn)	Houston, TX	(713) 534-6195	(713) 534-6197 (Fax) (281) 532-9744 (Home) (281) 413-5851 (Mobile)
Equipment and Maintenance Supervisor: (Steven Bigby)	Houston, TX	(713) 534-6195	(713) 534-6197 (Fax) (281) 332-0656 (Home) (281) 413-5852 (Mobile) Nextel ID: 142*54*11950
Administrative Assistant: (Karen Storm)	Houston, TX	(713) 534-6195	(713) 534-6197 (Fax) (281) 383-7069 (Home) (281) 413-5853 (Mobile)

12.1 REPORTING

In accordance with 30 *TAC* §335.153 and the State of Texas Oil and Hazardous Substances Spill Contingency Plan, a telephone report will be filed immediately with the Texas Emergency Response Center (TERC). If the EC's hazard assessment indicates that evacuation of local areas may be advisable, the appropriate local authorities will be contacted at once.

In accordance with 40 *CFR* 264.56(j) and 30 *TAC* §335.155, any incident that requires the implementation of this contingency plan will be reported in writing within 15 days to the TCEQ Executive Director. The report will include:

(1) name, address, and telephone number of the owner or operator;

(2) name, address, and telephone number of the facility;

(3) date, time, and type of incident (e.g., fire, explosion);

(4) name and quantity of material(s) involved;

(5) the extent of injuries, if any;

(6) an assessment of actual or potential hazardous to human health or the environment, where this is applicable; and

(7) estimated quantity and disposition of recovered material that resulted from the incident.

PART B.V

PROFESSIONAL ENGINEER CERTIFICATION

Professional Engineer Certification

I hereby certify that, based on information provided by the Owner/Operator of the hazardous waste management units, the following information is correct:

1. The Southwest Land Treatment Units 612/614, 613, and 616 are closed.
2. The East Guard Basin and East Impoundment Basin are operating as non-hazardous waste management areas under the delay of closure requirements of 40 CFR 264.113(d).

I do not otherwise certify the contents of the Engineering Report or any of the corresponding Figures. Except for changes related to the information above that I am certifying, these items have been submitted largely unchanged from the version submitted without the seal of a registered professional engineer for the 1999 application as accepted by the Texas Natural Resources Conservation Commission.

Signature of Professional Engineer	
Name of Professional Engineer	Austin I. Cooley
Registration Number	57523
Name of Engineering Firm	Brown and Caldwell
Engineering Firm Registration Number	2139
Date	10/22/20
Seal	

PART B.V

ENGINEERING REPORT

ATTACHMENT V-1

ENGINEERING REPORT

TABLE OF CONTENTS

SECTION **PAGE**

LIST OF FIGURES

LIST OF APPENDICES

ENGINEERING REPORT

1.0 GENERAL INFORMATION

This report has been prepared to provide general information regarding existing hazardous waste management units permitted at the Houston Refining LP (Houston Refining) facility located in Houston, Harris County, Texas, and it addresses the informational requirements of 40 CFR 270.14(b) that are not addressed in other portions of the application document. No new hazardous waste management units are proposed in this renewal application. The existing RCRA permitted hazardous waste management units consist of the following:

Hazardous Waste Management Unit	Type	Status
Southwest Land Treatment Units (Units 612/614,613, 616)	Land Treatment	All are closed.
East Guard Basin	Surface Impoundment	Inactive; operating as a non-hazardous stormwater basin under delay of closure regulations.
East Impoundment Basin	Surface Impoundment	Inactive; operating as a non-hazardous stormwater basin under delay of closure regulations.

An overall plan view of the refinery is shown in Attachment C-2 of Part A of the application. This figure shows the location of the RCRA permitted hazardous waste management units, within the refinery complex. Note that waste segregation practices are not applicable to any of the inactive units, and do not apply to the closed units since they are no longer used to manage hazardous wastes. A topographic map of the entire facility is provided in Appendix V.A-A. The facility access and traffic pattern descriptions in 40 CFR 270.14(b) (10) are not applicable to this facility since the hazardous waste management units are inactive or closed. Vehicles used to manage hazardous wastes do not access these units.

2.0 FEATURES TO MITIGATE UNSUITABLE SITE CHARACTERISTICS

This section is not applicable, because this is not a new hazardous waste management facility or an areal expansion of an existing hazardous waste management facility.

3.0 PLANNING AND CONSTRUCTION SCHEDULE

The permitted hazardous waste management units at the facility are existing units and no retrofitting and/or modification is proposed. No additional units are proposed to be permitted. As such, no planning or constructions schedules are required.

4.0 DETAILED PLANS AND SPECIFICATIONS

All of the RCRA permitted hazardous waste management units are inactive and either closed or continue to operate as non-hazardous waste management units under the delay of closure regulations found at 40 CFR 264.113(d). As such, these units do not require detailed plans and/or specifications for new construction. The general design of each these hazardous waste management units is described in Section 5.0.

5.0 UNIT DESIGN AND OPERATION

5.1 WASTE ROUTING

No hazardous wastes generated at the facility are processed or disposed on-site. All hazardous wastes are containerized at the point of generation, staged on-site at one of two less than 90-day accumulation areas, and ultimately disposed at an authorized off-site facility. Industrial wastewater is routed through the site's wastewater handling system and pumped to an authorized off-site facility.

5.2 LAND TREATMENT UNITS

The one existing landfarm area covered by this application is Southwest Landfarm (SWLF). The SWLF covers approximately 10.33 acres in the southwest section of the facility and is composed of three land treatment units, known as 612/614, 613, and 616. All three units are closed. The location of the landfarm is shown on Attachment C-2 of Part A of the application. Plan and cross-sectional views of the land treatment unit is shown in Figures V.A-5 through V.A-6.

The SWLF was originally developed as product storage tank farms during the 1920's. It contained 80,000 barrel storage tanks surrounded by dike walls for spill containment. Oily wastes were landfarmed at the SWLF during the 1960's in the areas surrounding the storage tanks. The tanks were phased out and demolished in the 1970's and 1980's due to changing product storage requirements and high maintenance costs. The entire area within the tank farm dike walls was then dedicated to treatment and disposal of oily sludges and other authorized wastes produced at the refinery. As previously discussed in Section 5.1, wastes are no longer being applied to any of the land treatment units.

Stormwater run-on and run-off are controlled through the use of the existing dike walls that surround each of the land treatment units. As approved by the TCEQ in previous RCRA Part B Permit Application submittals, these dike walls provide adequate run-on and run-off control for a 100-year, 24-hour rainfall event. Drainage outlets exist in each of the land treatment units. These drainage outlets, which range in size from six to ten inches in diameter, are equipped with

block valves located outside the dike wall in concrete valve boxes. The facility keeps these valves in the closed position except when the unit is actively draining. Drainage from these units discharges directly to the refinery stormwater collection system. A flow diagram of stormwater discharge from these units is shown in Figure V.A-7.

5.3 SURFACE IMPOUNDMENTS

The two existing surface impoundments covered by this application are the East Guard Basin (EGB) and the East Impoundment Basin (EIB). These surface impoundments became RCRA regulated units as a result of the Toxicity Characteristic (TC) regulations. In September 1990, these units received interim status to manage wastewater containing characteristically hazardous concentrations of benzene. However, to continue operation as hazardous waste management units after March 29, 1994, these impoundments would have been required to retrofit to meet the Minimum Technology Requirements (MTR) for double liner systems. As a result, the facility removed all hazardous wastewaters and sludges and ceased acceptance of any additional hazardous wastes as of that date. These impoundments are now operating as non-hazardous stormwater basins under the delay of closure requirements of 40 CFR 264.113(d).

The EGB was constructed in 1969 and has a capacity of approximately 19 acre-feet. It is a below-grade impoundment that was constructed with 6-inch thick, reinforced concrete slope protection paving and reinforced concrete grade beams at the bottom and top of the slope. The basin was originally constructed with a bottom liner composed of native soil. However, following sludge removal operations in 1991, 2 feet of clay were installed in the bottom of the EGB. In 1994, additional sludge was removed and compacted clay was installed with an average permeability of 3.8×10^{-9} cm/sec. The EGB's stormwater capacity is approximately 6 million gallons. The unit’s dimensions are 450 feet by 215 feet at the top and 350 feet by 115 feet at the bottom, with a depth of 18 feet from the top of the dike.

The EIB was constructed in 1974 and has the capacity to contain approximately 59.8 acre-feet. The EIB is a partially below grade impoundment that was constructed with asphalt-sprayed walls and a natural clay liner. The dimensions of the basin are 560 feet by 440 feet at the top and 470

feet by 350 feet at the bottom, with a depth of 20 feet from the top of the dike. The EIB's stormwater capacity is approximately 20 million gallons.

The EIB is surrounded by a sloped berm which would ordinarily prevent stormwater run-on and run-off. While the EGB is not specifically constructed with a berm or other control mechanism to prevent run-on, both the EGB and EIB are presently used to manage non-hazardous stormwater. Therefore, stormwater run-on into either of these structures will not in any way interfere with their intended use. Under normal circumstances, collected stormwater from the impoundments, which may be pre-treated, is routed to an off-site treatment facility prior to discharge. As described in Section 3.1 of the Closure Plan, excessive stormwater inflow to the impoundments will result in the permitted discharge of overflow stormwater from the EGB to Outfall 001. This overflow mechanism prevents the unpermitted release of stormwater runoff from either of these impoundments.

The locations of these surface impoundments with respect to the entire facility layout are shown on Attachment C-2 of Part A of the application. Plan and profile drawings of these surface impoundments are shown in Figures V.A-8 to V.A-10.

5.4 HAZARD CONTROL FEATURES

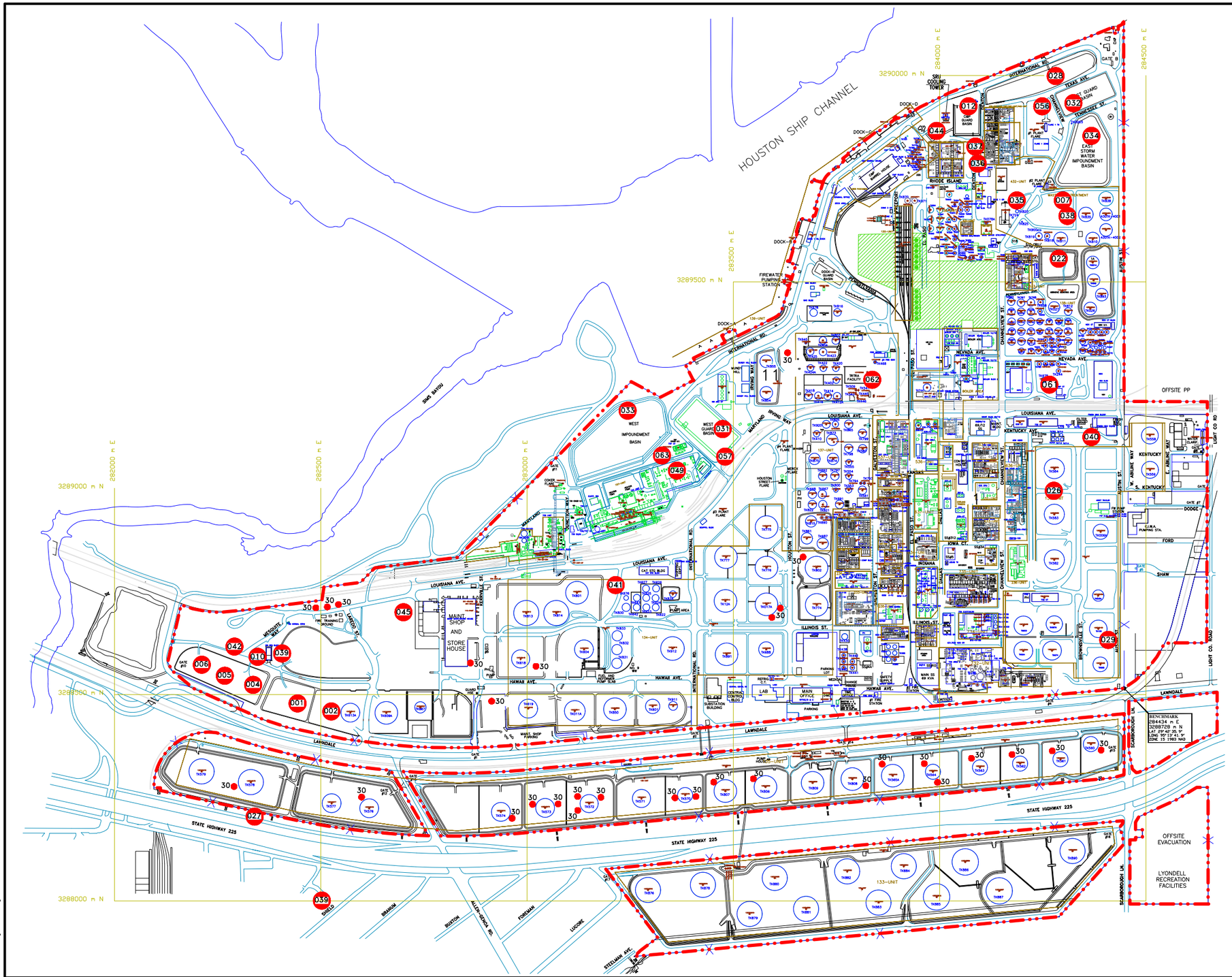
40 CFR 270.14(b) (8) requires information be included in the Part B application to address the procedures, structures, or equipment used at the facility to minimize hazards. Due to the inactive status of the permitted hazardous waste management units at the facility, potential hazards are minimal. For example, there are no waste loading or unloading operations associated with these units, therefore, there are no hazards from such operations. None of the units are subject to any impact due to power outages.

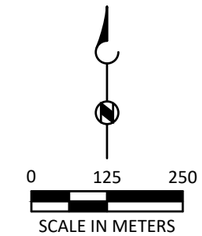
Runoff control and prevention of contamination of water supplies are accomplished through the presence of dikes and stormwater management practices and equipment, as described in Sections 5.2 and 5.3. Undue personnel exposure is avoided through facility security and appropriate health and safety measures, as required by the Occupational Safety and Health Agency (OSHA).

FIGURES

APPENDIX V.A-A

TOPOGRAPHIC MAPS





EXPLANATION

- AFFECTED FILL OUTLINE (#27)
- HAZARDOUS WASTE MANAGEMENT UNITS
- 30 LEADED TANK BOTTOMS PIT (#30)

WASTE UNIT CROSS REFERENCE

NOR #	Unit ID	Description
1	1	Southwest Landfarm 612/614
3	2	Southwest Landfarm 613
4	3	Southwest Landfarm 615
5	4	Southwest Landfarm 616
6	5	Southwest Landfarm 617
7	6	Northeast Landfarm 2
8	7	Lead Sludge Weathering Tank
10	8	Asbestos/Lead (West of Facility 039)
12	9	Equalization Basin
22	10	Northeast Landfarm 4
32	11	East Guard Basin
34	12	East Impoundment Basin
37	13	Biological Oxidation Basin
38	14	Oily Water Retention Basin
39	15	West Staging Building
40	16	East Staging Building
41	17	Catalyst Staging Area
42	18	West of NOR No. 039
44	19	C&P Slab (West of C&P Guard Basin)
45	20	Bundle Cleaning Slab (West of Paint Shop)
56	21	Roll-off Storage (West of East Guard Basin)
57	22	Roll-off Storage (South of West Guard Basin)
62	23	Roll-off storage at SSPU
63	24	Temporary Roll-off Storage (North of 737 Coker Cooling Tower)
25	25	Southwest Landfill
26	26	Land treatment Units 584, 583, and 582
27	27	Land Treatment Units 578/579
28	28	Northeast Landfill
29	29	Landfill 100
30	30	Leaded Tank Bottoms Pits
31	31	West Guard Basin
33	32	West Impoundment Basin (Northern Portion)
35	33	API Separator
36	34	Acid Retention Basin
49	35	West Impoundment Basin (Southern Portion of NOR No. 33)
50	36	Processing Cooling Tower Sludge
XX	37	Affected Fill AOC

Brown AND Caldwell

SCALE: 1" = 250'

JOB #: 140978

DATE: 10/13/2020

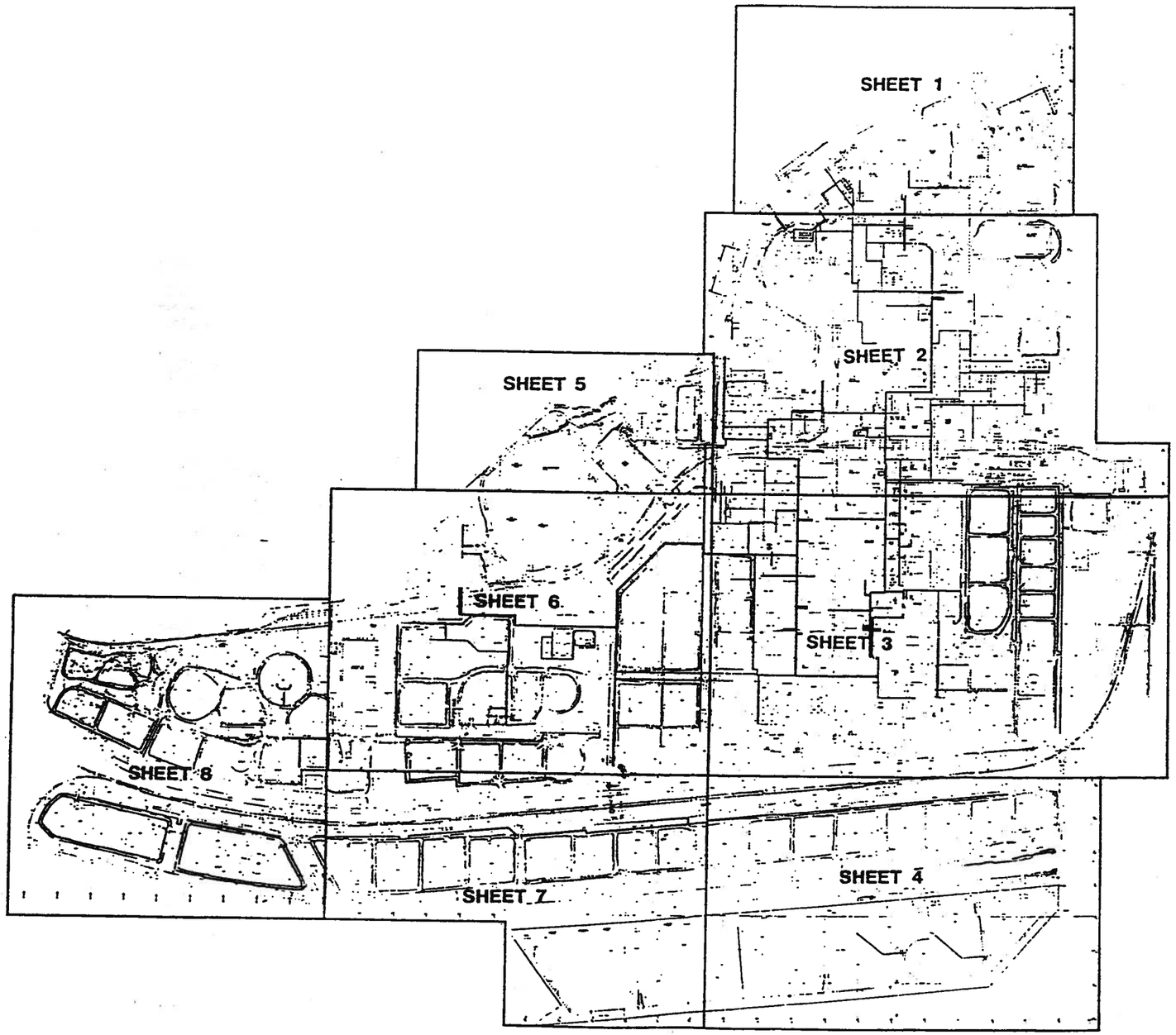
HOUSTON REFINING LP
WASTE MANAGEMENT UNITS

HOUSTON, TEXAS

FIGURE

B.V.A-A

Path: \\BCHOUFP01\Projects\Lyondell\140978 - LBI HRO 2011\GIS\RCRA Renewal File: BASEPLOT2 Date: October 14, 2020 10:47 AM User: Eric Stiles



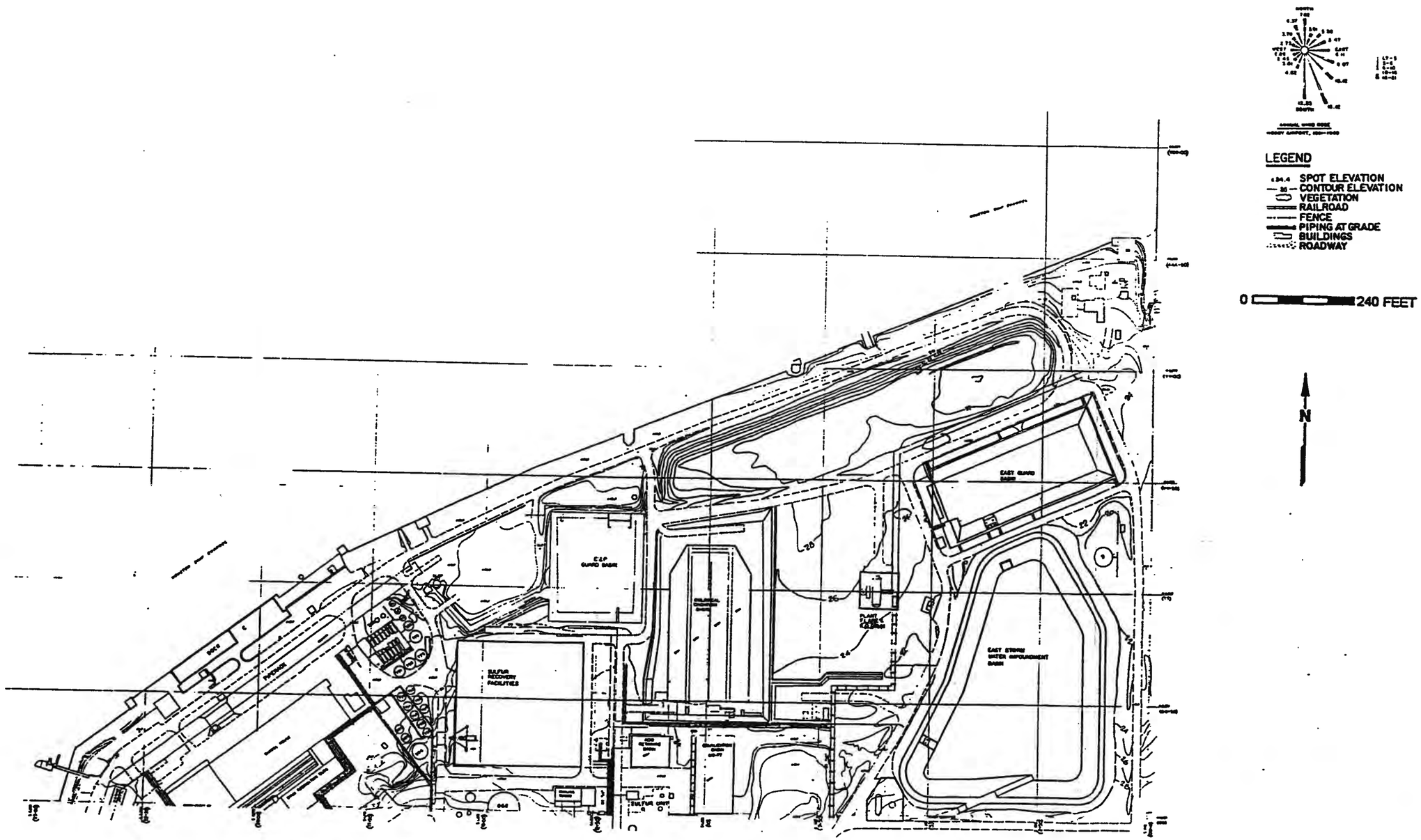
APPENDIX V.A.-A

PREPARED BY _____	GENERAL DESIGN APPROVED
APPROVED BY _____	BY _____

LYONDELL–CITGO
REFINING COMPANY LTD.
HOUSTON REFINERY

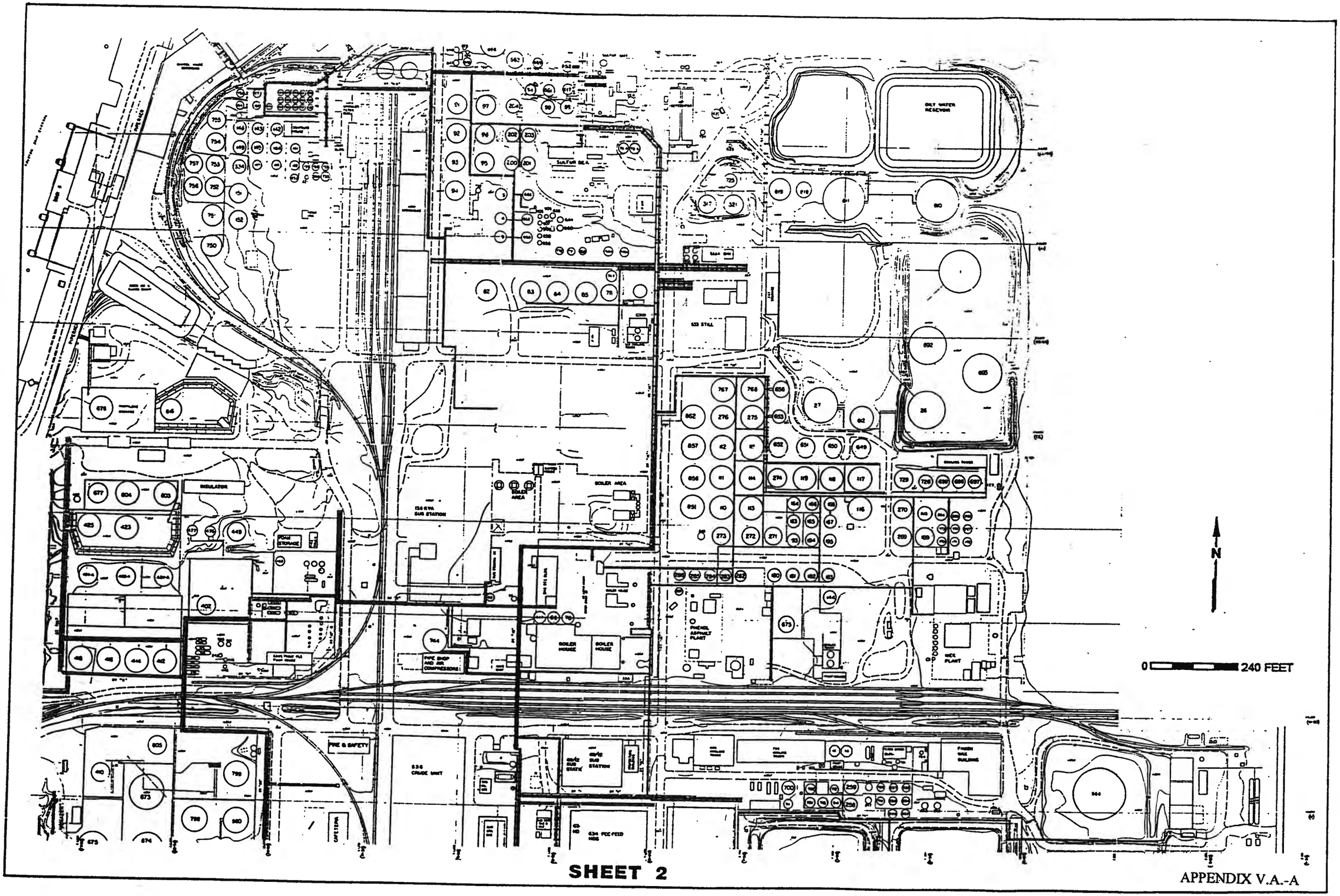
REFINERY TOPOGRAPHY KEY MAP

DATE	9/19/95	DR. NO.	HT 0190	SH. NO.	BD–75



SHEET 1

APPENDIX V.A.-A



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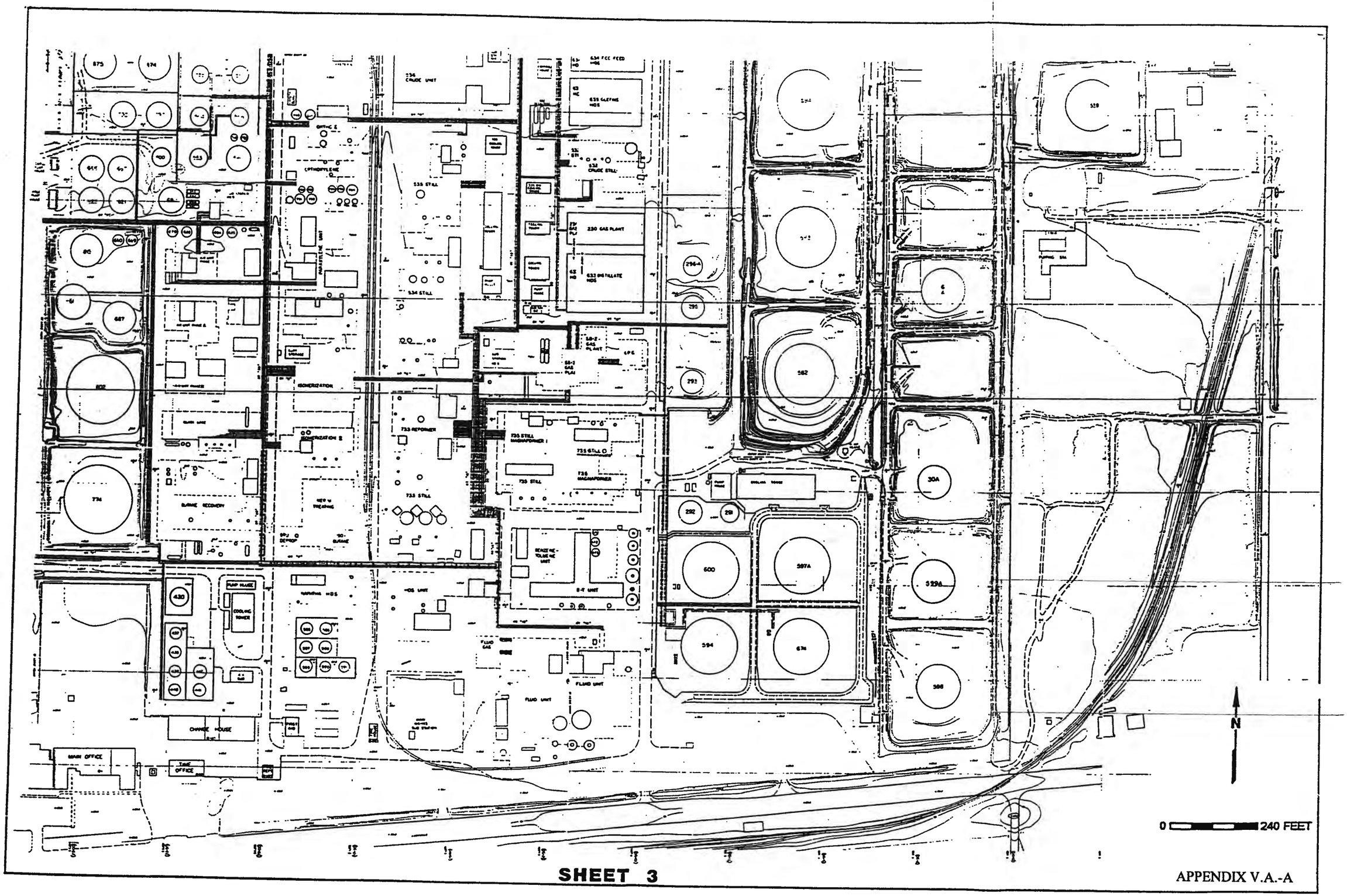

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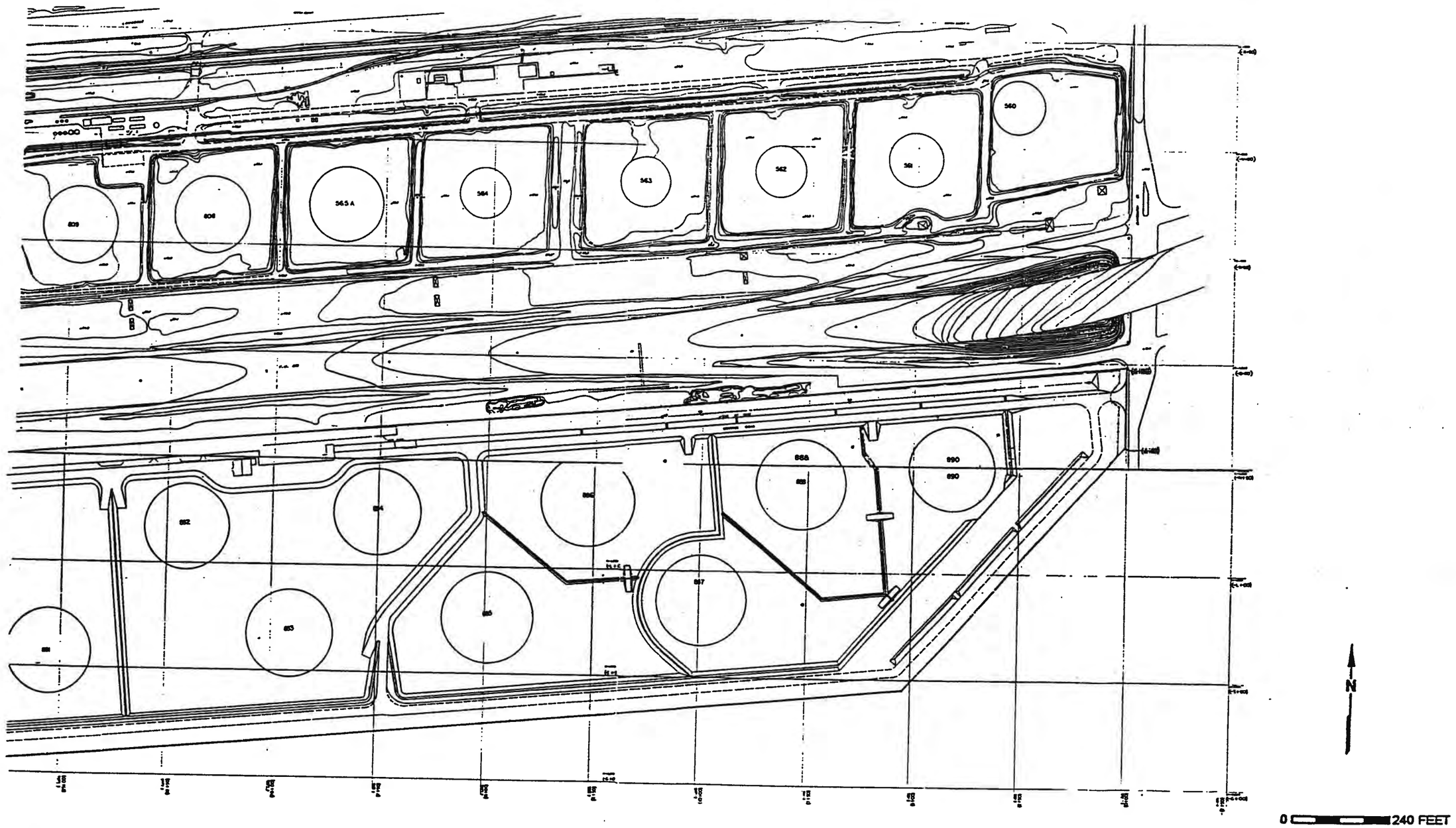
APPENDIX V.A.-A

HT 0190 DB-78



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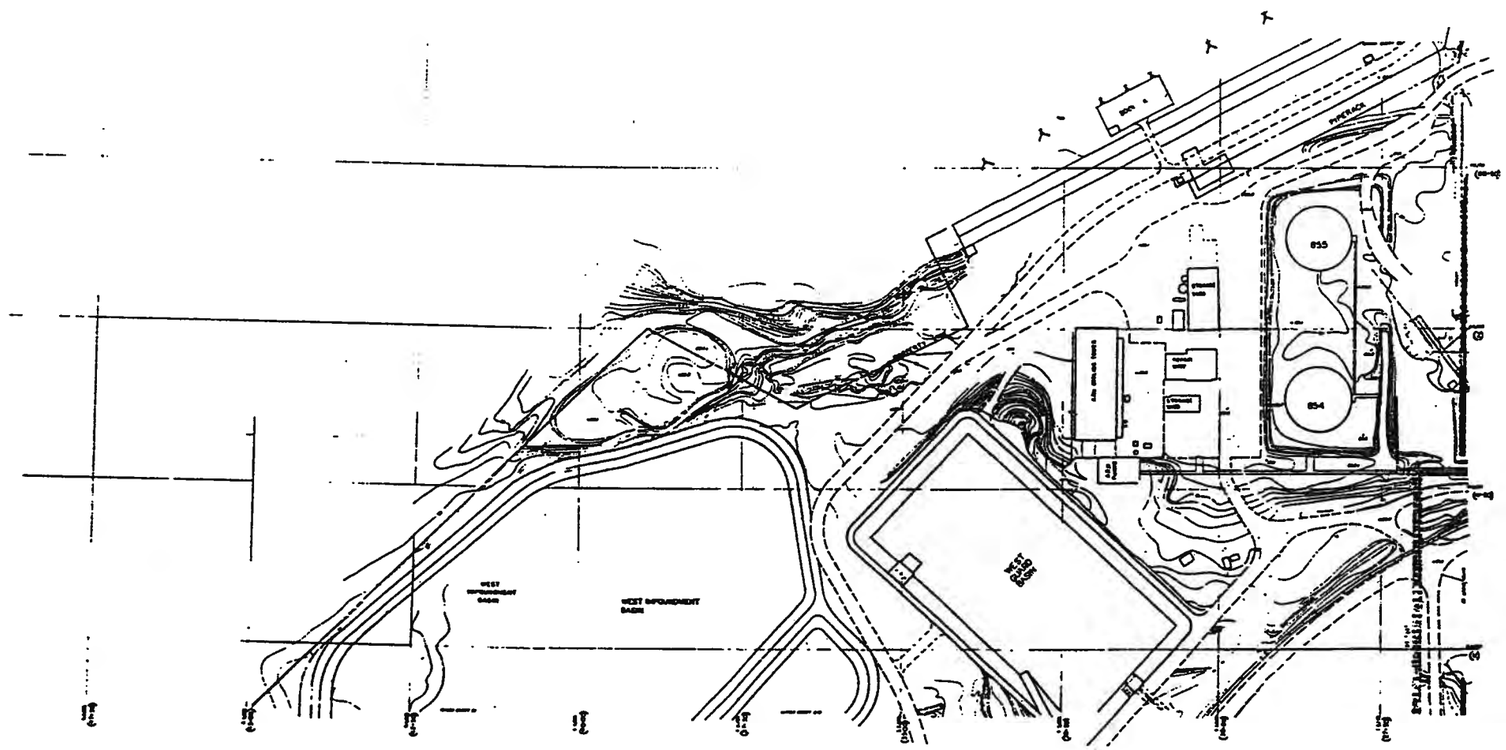

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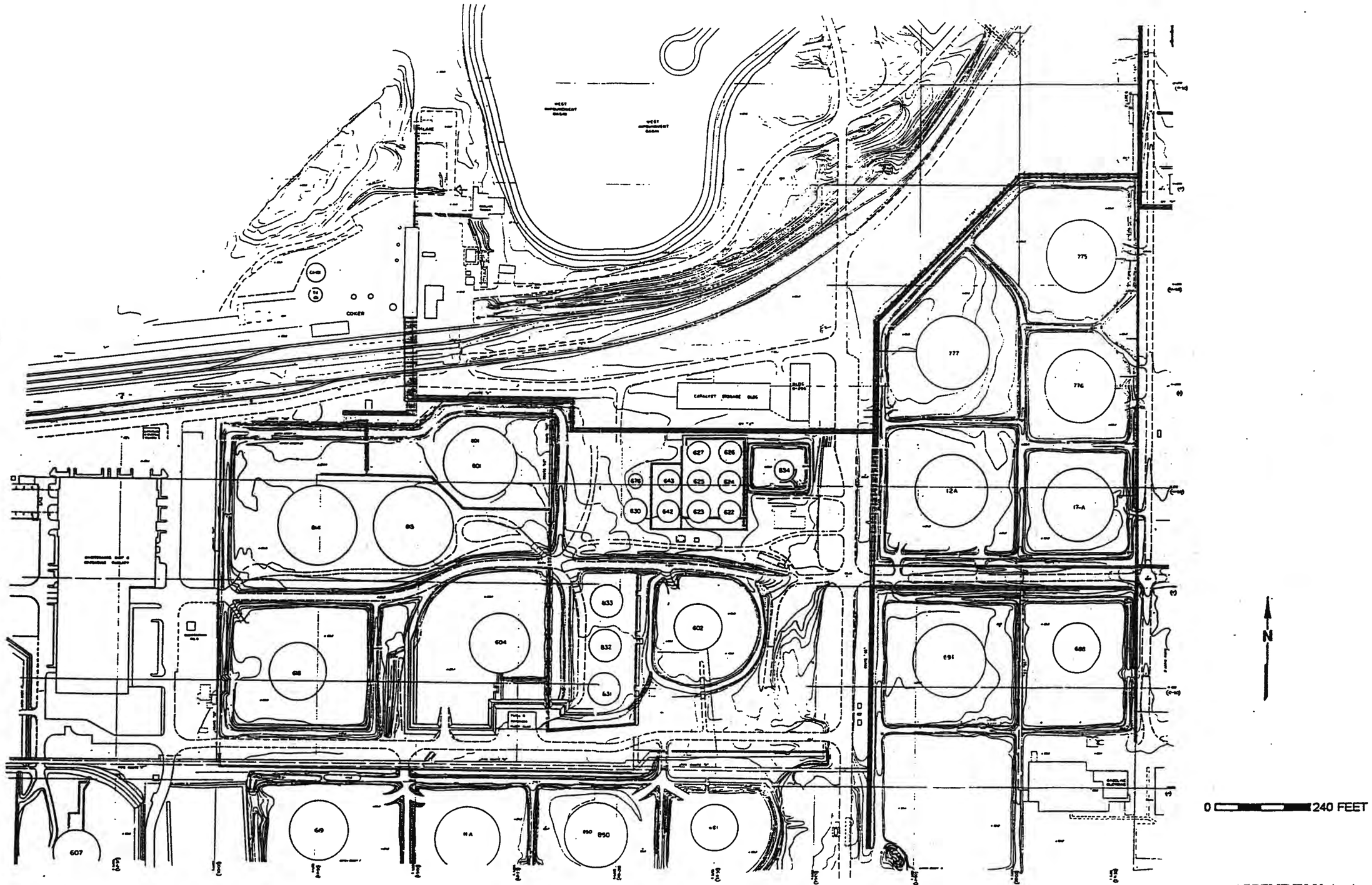
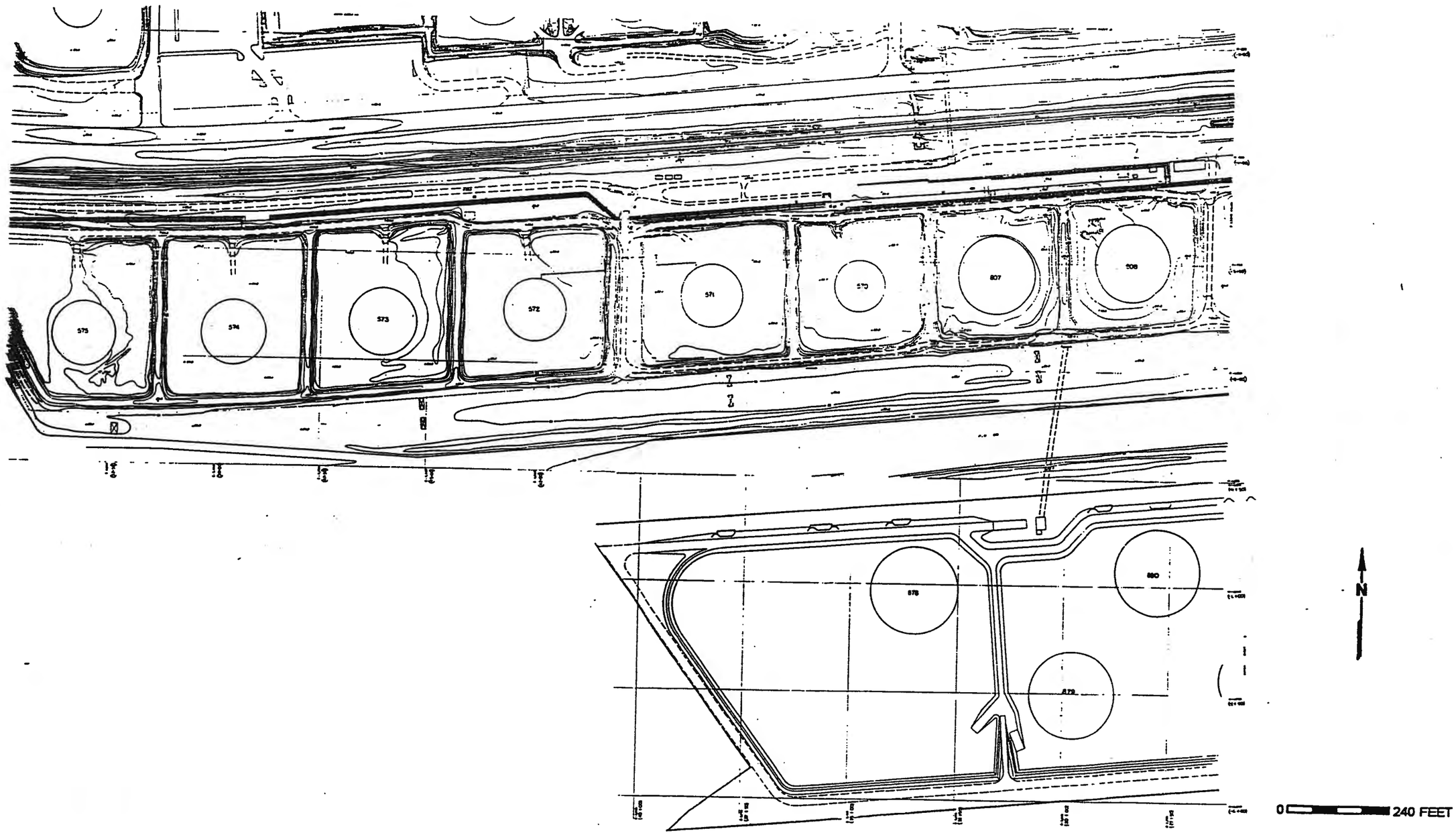
SHEET 5

APPENDIX V.A.-A



SHEET 6

APPENDIX V.A.-A



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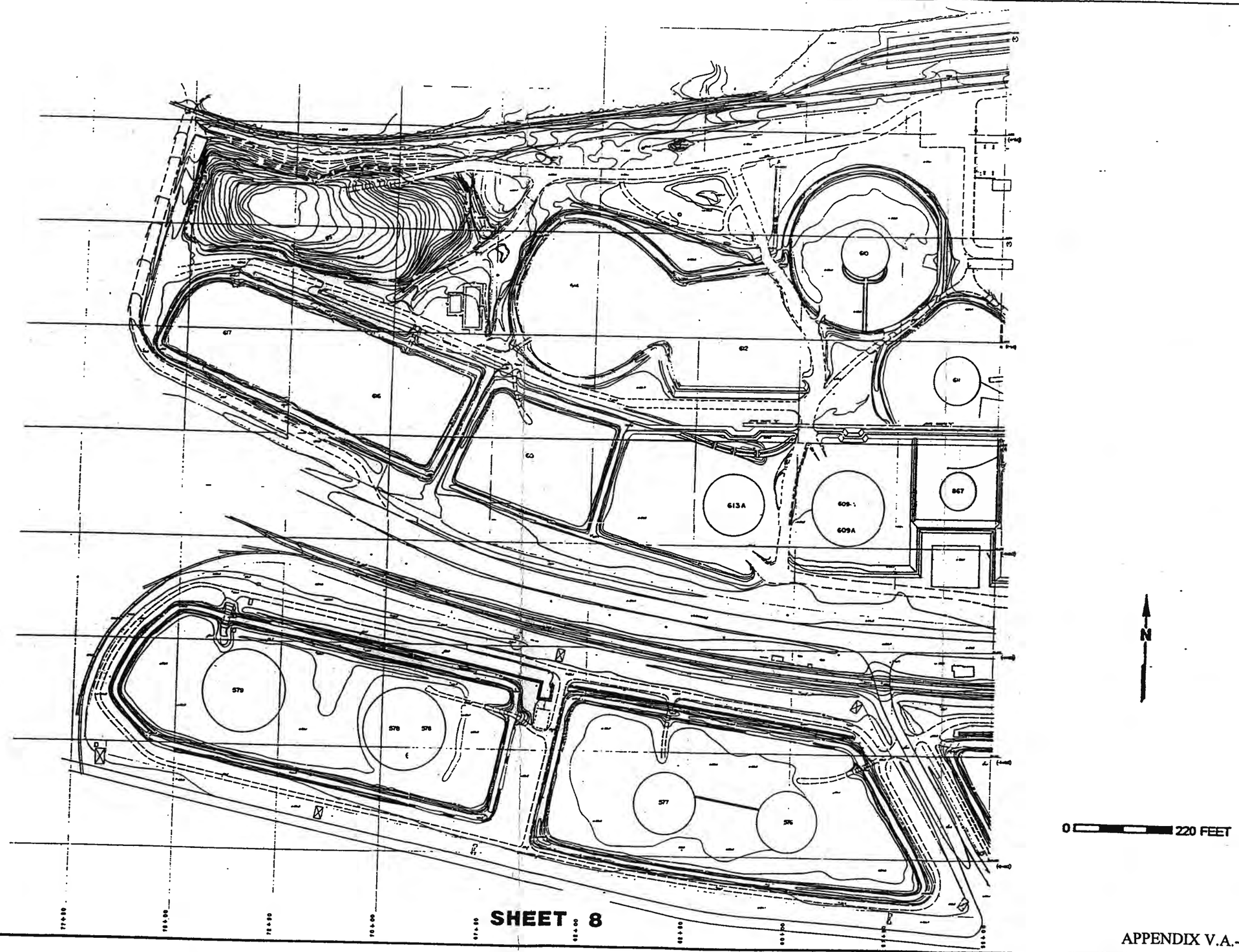
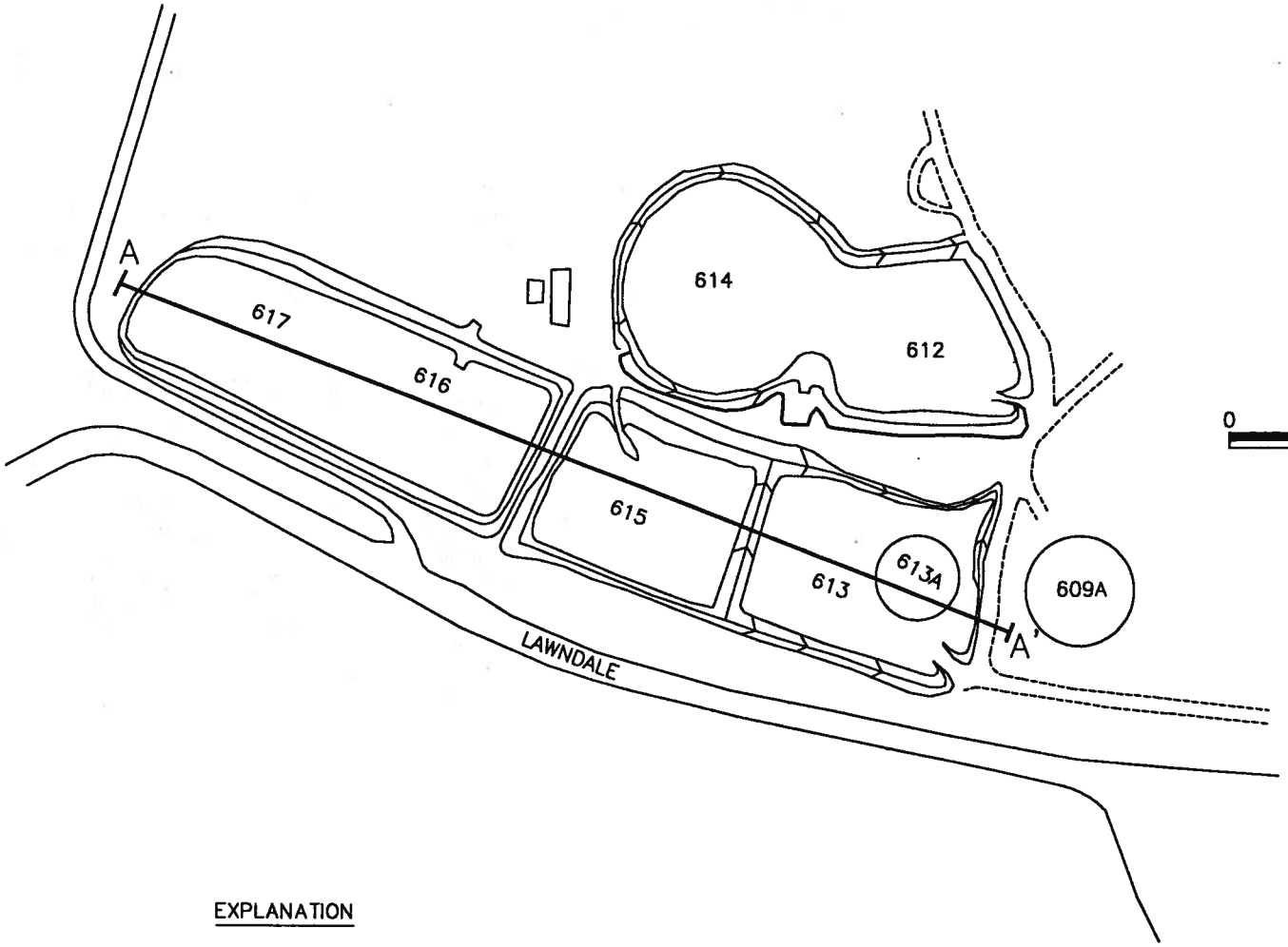
APPENDIX V.A.-A

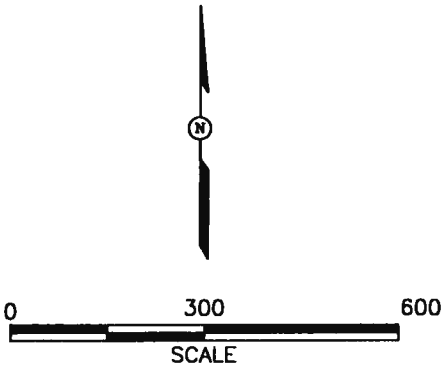


SHEET 8

APPENDIX V.A.-A

HT 0190 DB-83





EXPLANATION

A ——— A' LOCATION OF CROSS-SECTION

MAP SOURCE: GERAGHTY & MILLER, INC.
SOUTHWEST LANDFARM
PLOT PLAN
SEPTEMBER 11, 1997

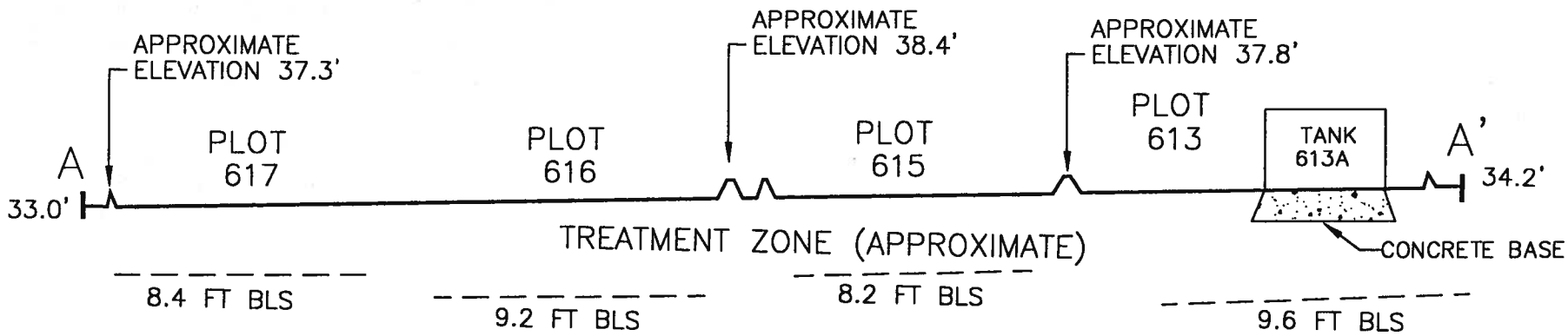
REV.	DATE	DESCRIPTION	DR BY	APP BY

COOK-JOYCE INC.
ENGINEERING AND CONSULTING
812 WEST ELEVENTH 512-474-9097
AUSTIN, TEXAS 78701

PROJECT:
LYONDELL-CITGO
RCRA PERMIT RENEWAL

SHEET TITLE:
SOUTHWEST LANDFARM
PLOT PLAN

DES BY			SCALE: SEE BAR SCALE
DR BY	SDB	SDB	PROJECT NO. 98023
CHK BY	CKK	CKK	CJI NO. 98023005
APP BY	KLM	KLM	SHEET 1 OF 1 SHEETS
DATE ISSUED: 30 JULY 1999			FIGURE NO. V.A-5
PURPOSE: TNRCC SUBMITTAL			



EXPLANATION

33.0'	ALL ELEVATIONS FROM PLANT DATUM
FT BLS	FEET BELOW LAND SURFACE

0 200 400 FEET

HORIZONTAL SCALE

VERTICAL SCALE – NOT TO SCALE

MAP SORUCE: GERAGHTY & MILLER, INC.
SOUTHWEST LANDFARM
CROSS–SECTION
SEPTEMBER 11, 1999

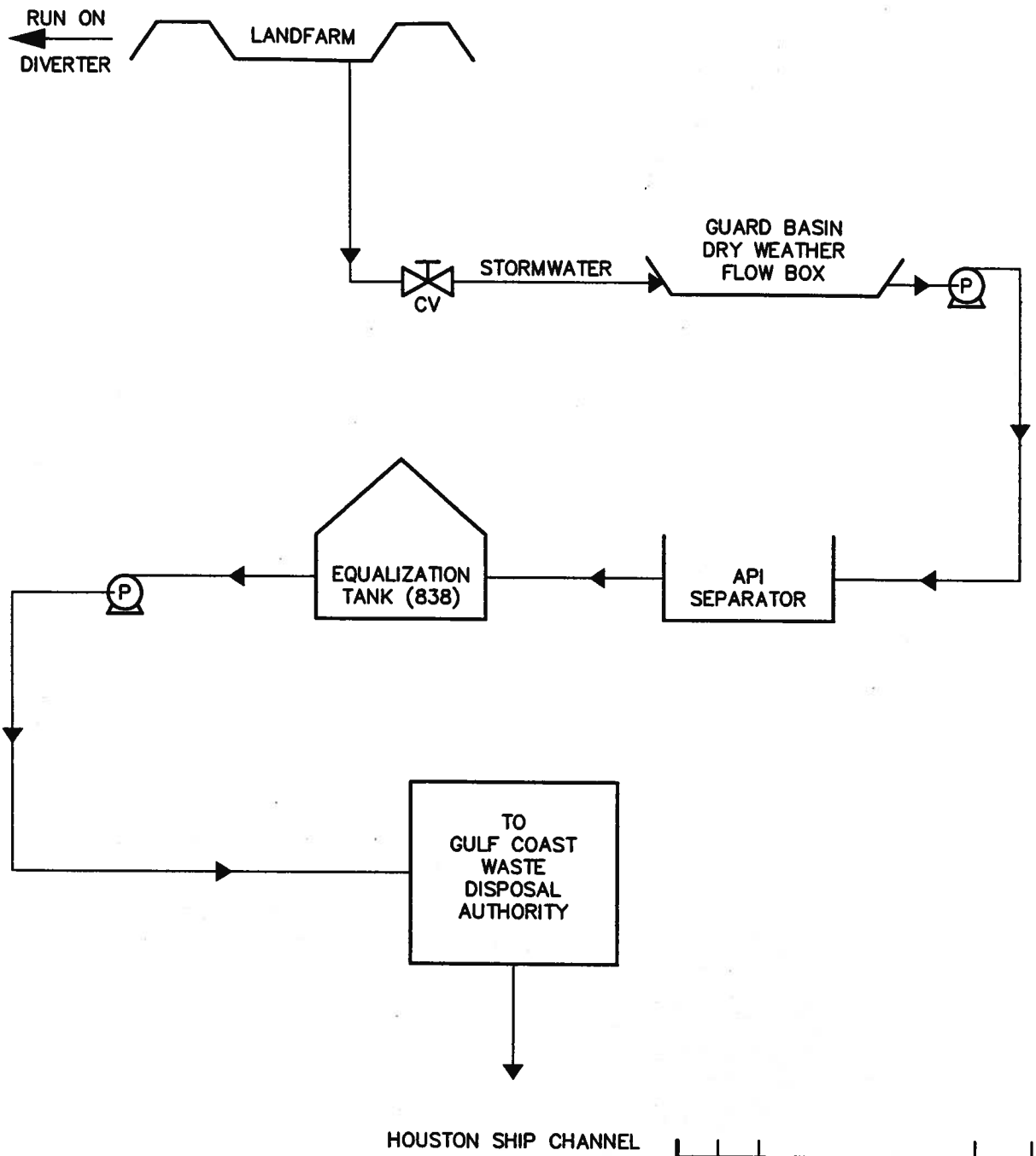
REV.	DATE	DESCRIPTION	DR BY	APP BY

COOK-JOYCE INC.
ENGINEERING AND CONSULTING
812 WEST ELEVENTH 512-474-9097
AUSTIN, TEXAS 78701

PROJECT: SOUTHWEST LANDFARM CROSS–SECTION

SHEET TITLE: LYONDELL–CITGO RCRA PERMIR RENEWAL

DES BY			SCALE: SEE BAR SCALE
DR BY	SDB	SDB	PROJECT NO. 99023
CHK BY	CKK	CKK	CJI NO. 99023006
APP BY	KLM		SHEET 1 OF 1 SHEETS
DATE ISSUED: 30 JULY 1999			FIGURE NO. V.A–6
PURPOSE: TNRCC SUBMITTAL			



MAP SOURCE: GERAGHTY & MILLER, INC.
SCHEMATIC FLOW DIAGRAM
LANDFARM STORMWATER MANAGEMENT
SEPTEMBER 4, 1997

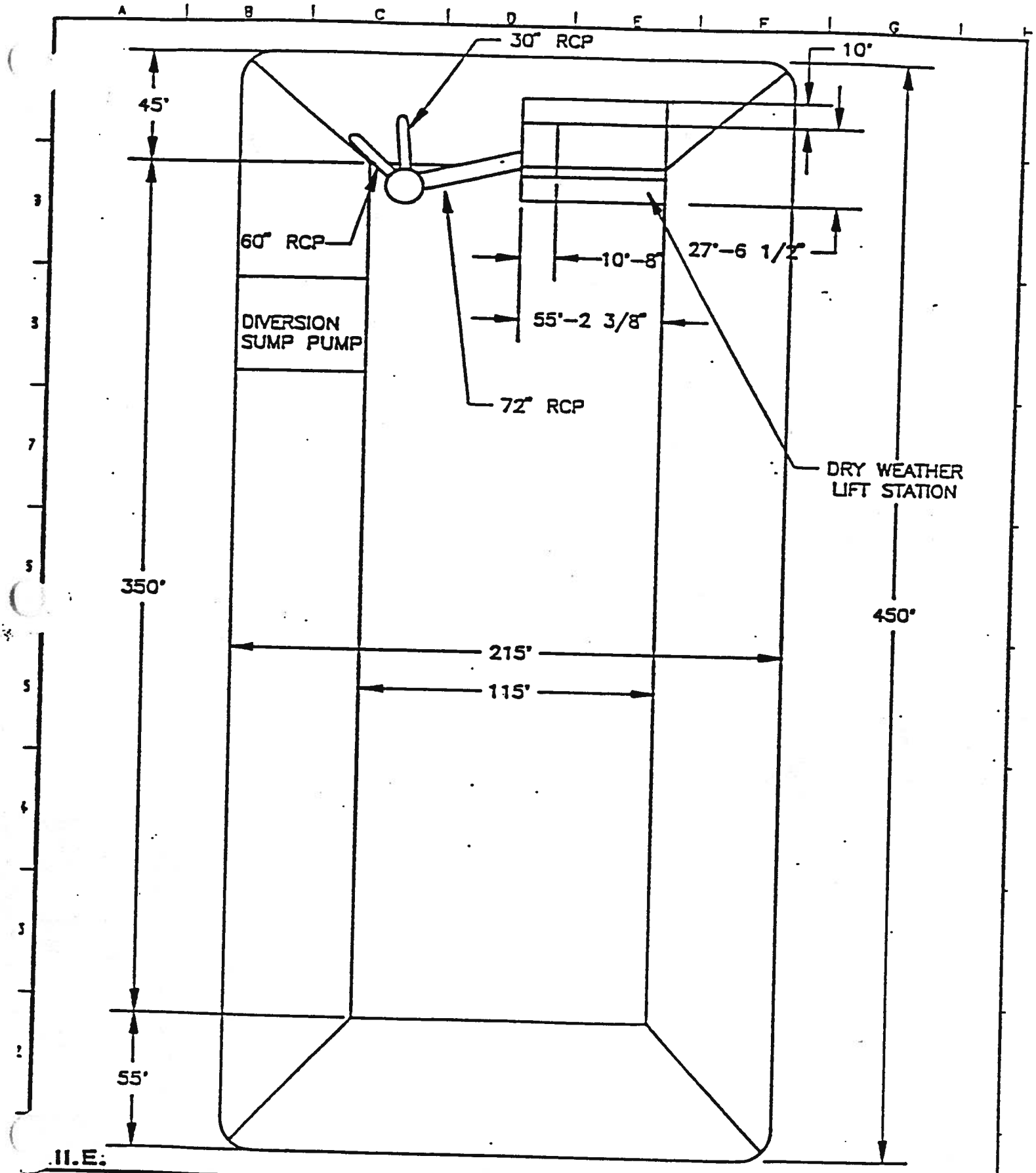
REV.	DATE	DESCRIPTION	DR BY	APP BY

COOK-JOYCE INC.
ENGINEERING AND CONSULTING
812 WEST ELEVENTH 512-474-9097
AUSTIN, TEXAS 78701

PROJECT:
LYONDELL-CITGO
RCRA PERMIT RENEWAL

SHEET TITLE:
SCHEMATIC FLOW DIAGRAM
LANDFARM STORMWATER MANAGEMENT

DES BY			SCALE: SEE BAR SCALE
DR BY	SDB	SDB	PROJECT NO. 99023
CHK BY	CKK	CKK	CJI NO. 99023002
APP BY	KLM	KLM	SHEET 1 OF 1 SHEETS
DATE ISSUED: 30 JULY 1999			FIGURE NO. V.A-7
PURPOSE: TNRCC SUBMITTAL			



Brown and Caldwell Consultants
DALLAS-HOUSTON, TEXAS

0 25 50
SCALE: 1" = 50'

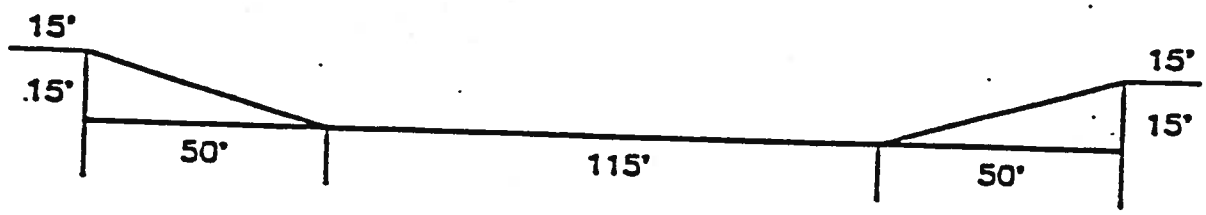
TITLE EAST GUARD BASIN PLAN

DATE 3-18-91

CLIENT LYONDELL-CITGO REFINING COMPANY

PROJECT NUMBER 5830-04

FIGURE V.A-8



Brown and Caldwell Consultants
DALLAS–HOUSTON, TEXAS

0 20 40
SCALE: 1" = 40'

REV.	DESCRIPTION	BY	DATE

DRAWN BY: JCN DATE 3-18
CHK'D BY: ____ DATE ____
APPROVED: ____ DATE ____

TITLE EAST GUARD BASIN PROFILE

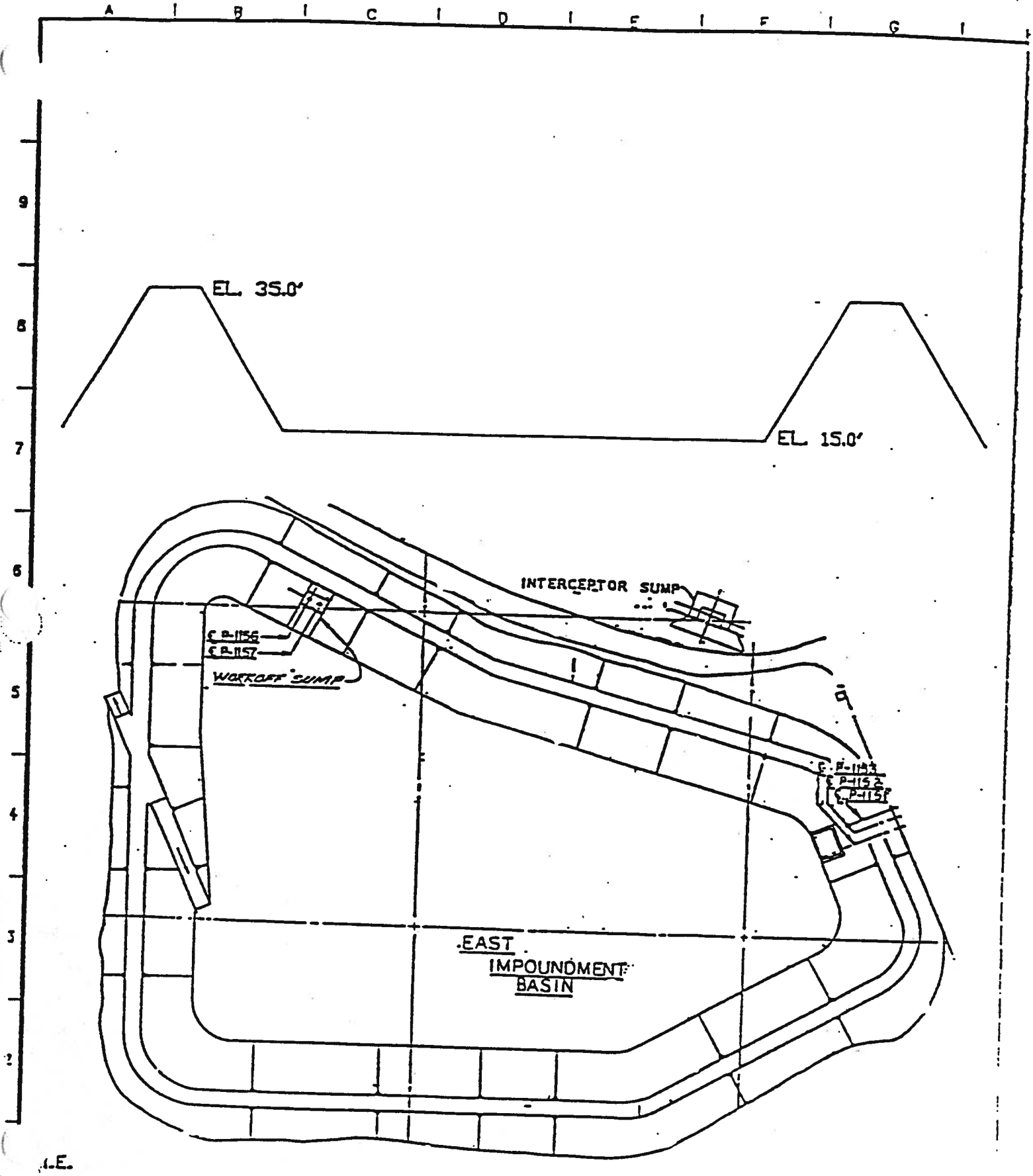
CLIENT LYONDELL-CITGO REFINING COMPANY

FIGURE V.A–9

DATE 3–18–91

PROJECT NUMBER 5830–04

FIGURE NUMBER 2–3



Brown and Caldwell Consultants
DALLAS-HOUSTON, TEXAS

NO SCALE

TITLE: EAST IMPOUNDMENT AREA X-SECTION

CLIENT: LYONDELL-CITGO REFINING COMPANY

FIGURE V.A-10

DATE: 3-19-91

PROJECT NUMBER: 5830-04

Current Imagery Overlay Map - 1 Mile Buffer

BANKS ENVIRONMENTAL DATA
A DIVISION OF THE BANKS GROUP

12000 Lawndale Street

Well

Well Cluster

Target Property

Search Buffer

1 : 31,500
1 inch = 0.497 miles
1 inch = 2625 feet
1 centimeter = 0.315 kilometers
1 centimeter = 315 meters

N

Lambert Conformal Conic Projection
1983 North American Datum
First Standard Parallel: 33 0' 00" North
Second Standard Parallel: 45 0' 00" North
Central Meridian: 96 0' 00" West
Latitude of Origin: 39 0' 00" North

Banks Environmental Data, Inc. - 1601 Rio Grande, Ste. 331 - Austin, TX 78701 - 800.531.5255 P - 512.478.1433 F
www.banksenvdata.com

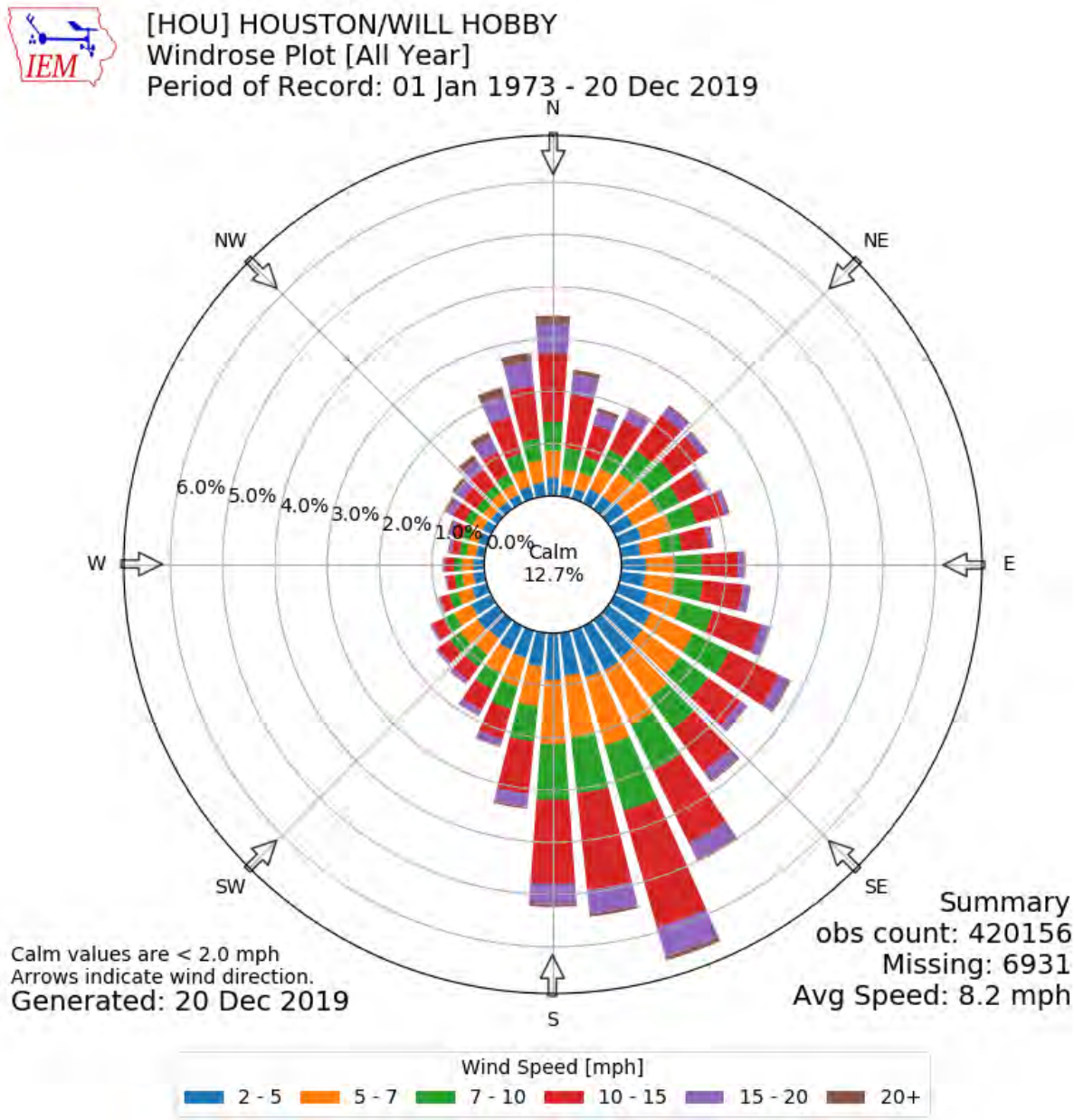
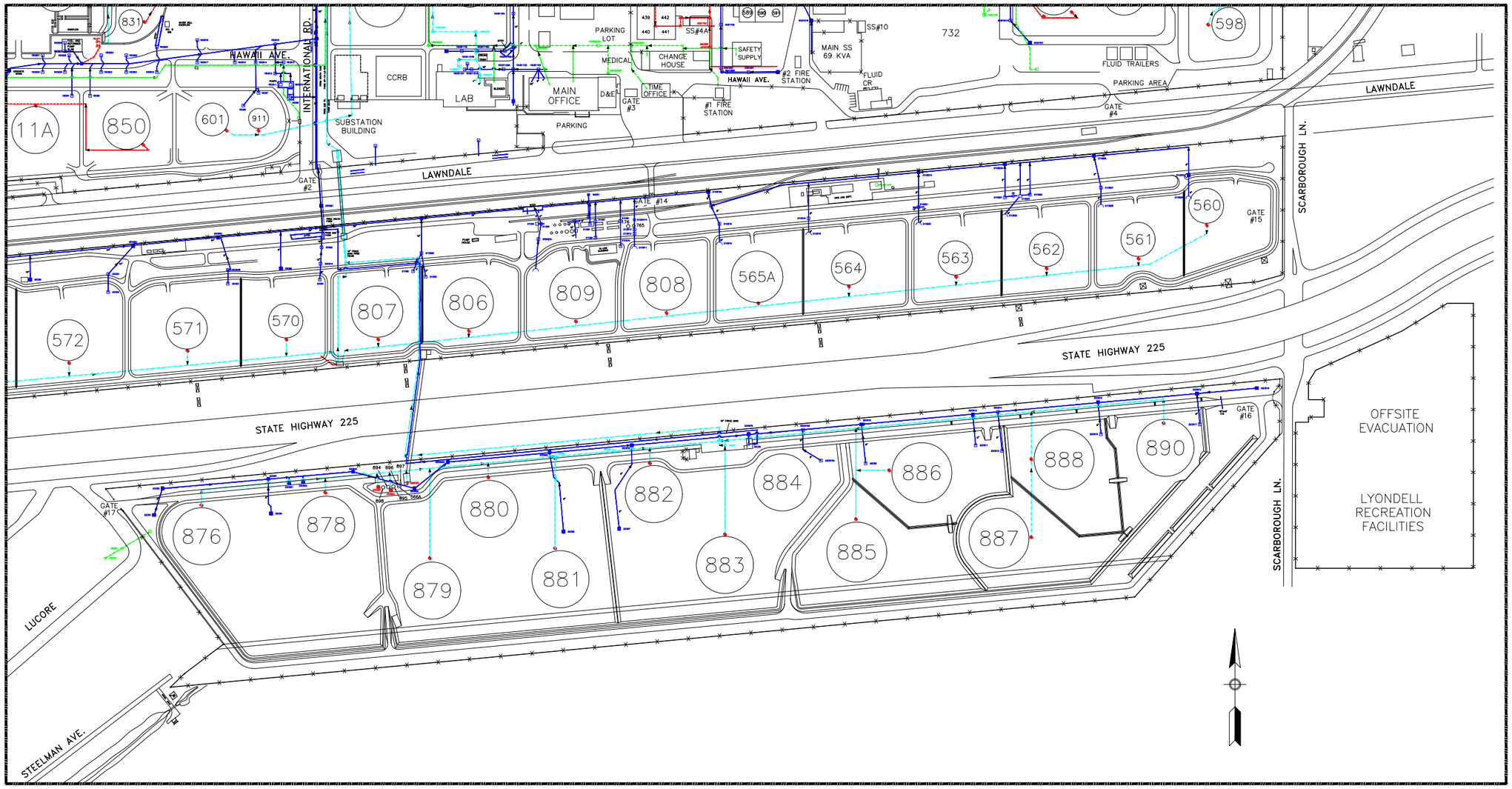


Figure V.A-D Wind Rose



SYMBOL LEGEND

- SUMP
- ACCESSIBLE MANHOLE
- INACCESSIBLE MANHOLE
- MANHOLE
- CATCH BASIN
- CATCH BASIN
- PUMP

MAP KEY

101B0201

101B0203

101B0202

101B0200

SEWER LINE LEGEND

- STORM
- OILY
- SANITARY
- NESHAP
- NSPS

SYM.	REVISIONS	DATE	REV. BY	CHK. BY	APP. BY
2					
1					

REVISED

DESIGN BY MTG
DRAWN BY DS 9/01
CHECKED BY FM 9/01
APPROVED BY

BY GENERAL DESIGN APPROVED
BY OPERATING DEPARTMENT

AUTHORIZATION NO.

JOB NO. ACCT. NO.

HOUSTON REFINING LP

UNIT

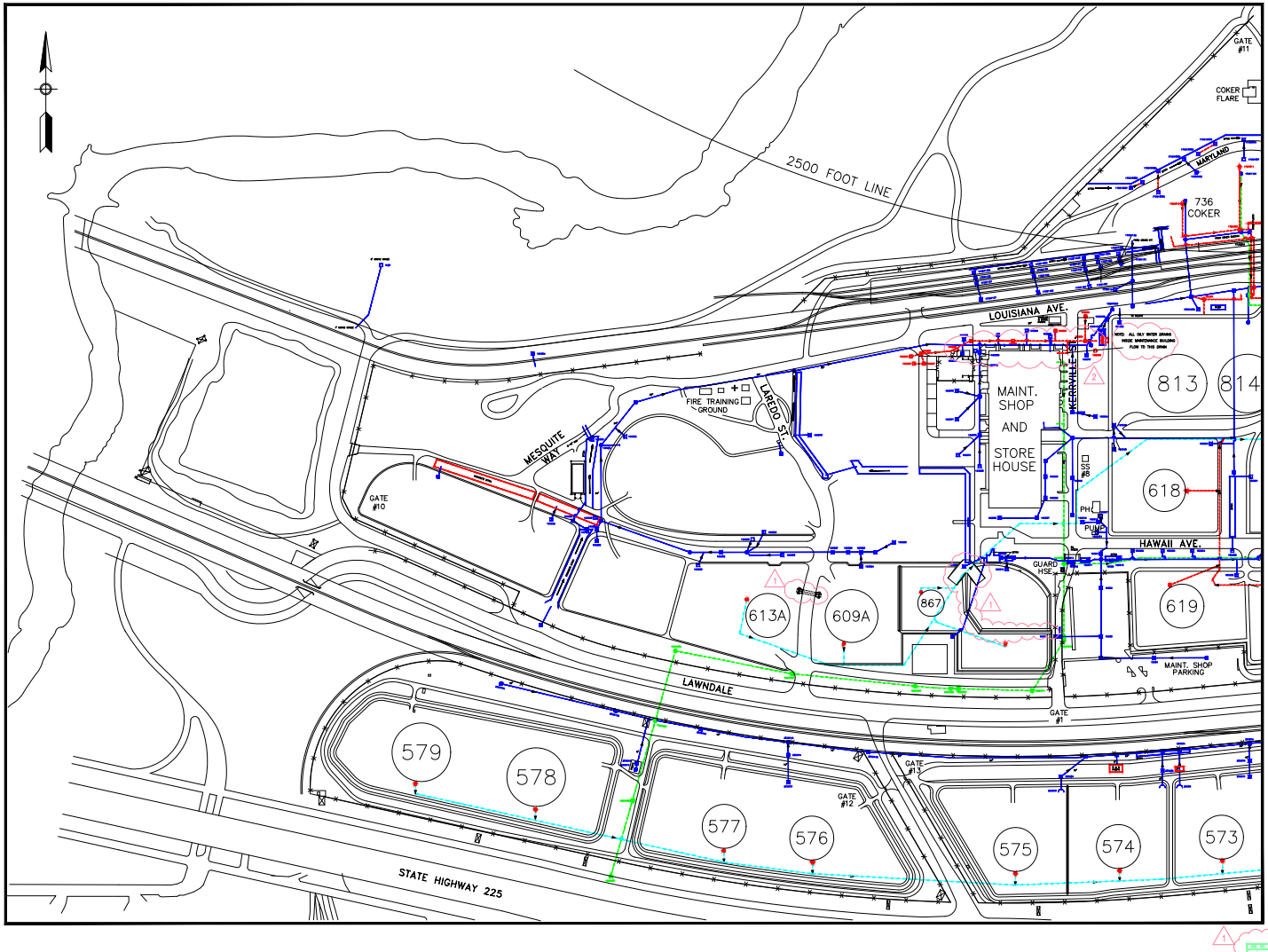
2001 SEWER MAP

SHEET 1 OF 4

CAD FILE NAME: 101B0200

SCALE NONE DR. NO. HT-0101 SH. NO. FB-0200 REV. 0

DATE 9/25/01



SYMBOL LEGEND

- SUMP
- ACCESSIBLE MANHOLE
- INACCESSIBLE MANHOLE
- MANHOLE
- CATCH BASIN
- CATCH BASIN
- PUMP

MAP KEY

	101B0203
101B0201	101B0202
	101B0200

SEWER LINE LEGEND

- STORM
- OILY
- SANITARY
- NESHAP
- NSPS

SYM.	REVISIONS	DATE	REV. BY	CHK. BY	APP. BY
3	VERIFICATION OF EXISTING LINES	12/11	BM	JW	BG
2	REVISED PER MOC#2006294-002	5/09	AC	JS	DN
1					

REVISED

DESIGN BY MTG
DRAWN BY DB 9/01
CHECKED BY TM 9/01
APPROVED BY
AUTHORIZATION NO.
JOB NO.

GENERAL DESIGN APPROVED
BY
BY

ACCT. NO.

lyondellbasell

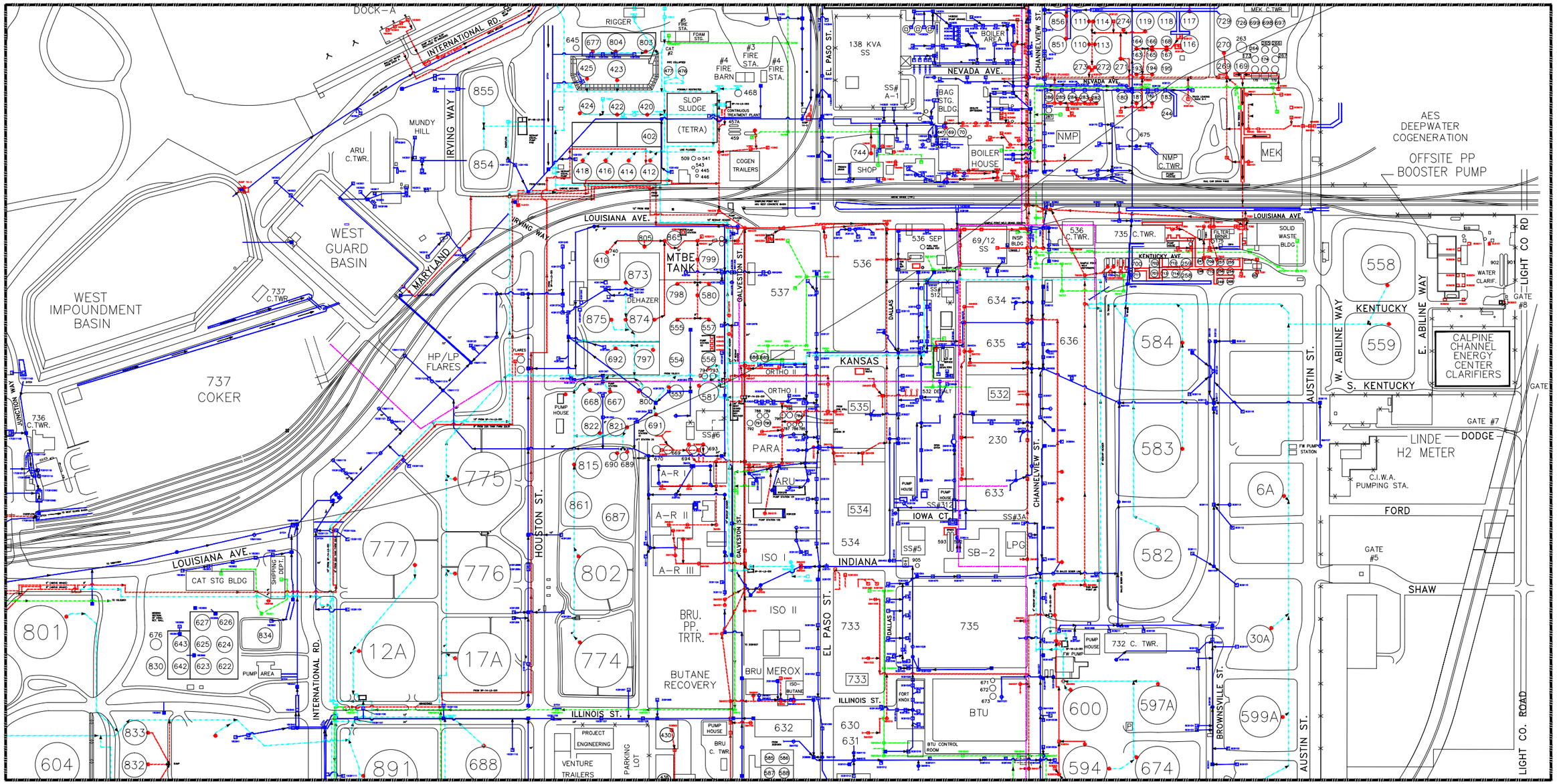
UNIT

2001 SEWER MAP

SHEET 2 OF 4

SCALE NONE
DATE 9/25/01
DR. NO. HT-0101
SH. NO. FB-0201
REV. 2

CAD FILE NAME: 101B0201



SYMBOL LEGEND

- SUMP
- ACCESSIBLE MANHOLE
- INACCESSIBLE MANHOLE
- MANHOLE
- CATCH BASIN
- CATCH BASIN
- PUMP

MAP KEY

101B0203
101B0201 | 101B0202 | 101B0200

SEWER LINE LEGEND

- STORM
- OILY
- SANITARY
- NESHAP
- NSPS

SYM.	REVISIONS	DATE	REV. BY	CHK. BY	APP. BY
0					

REVISED

DESIGN BY MTG
DRAWN BY DS 9/01
CHECKED BY FM 9/01
APPROVED BY

BY GENERAL DESIGN APPROVED
BY OPERATING DEPARTMENT

AUTHORIZATION NO.

JOB NO. ACCT. NO.

HOUSTON REFINING LP

UNIT

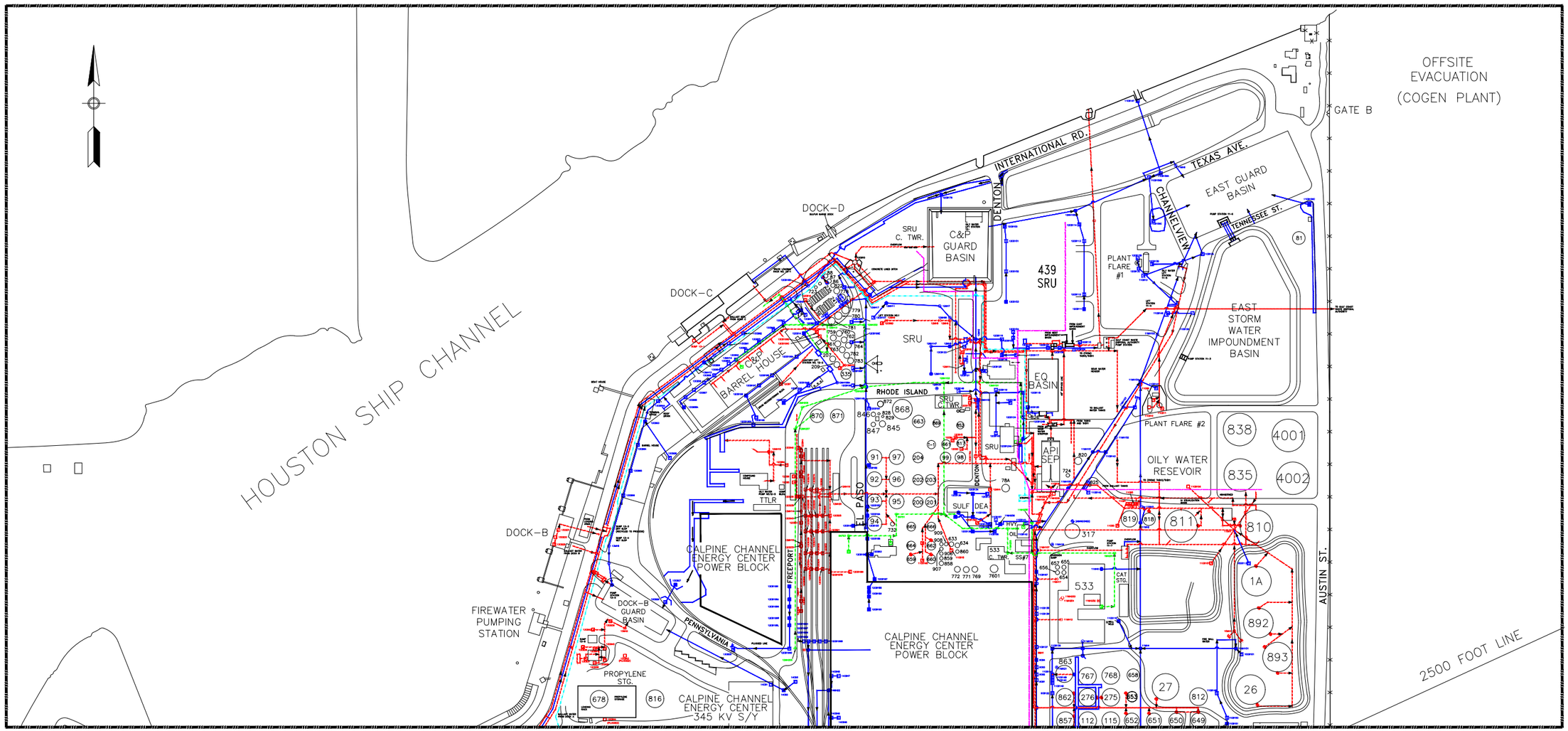
2001 SEWER MAP

SHEET 3 OF 4

CAD FILE NAME: 101B0202

SCALE NONE DR. HT-0101 SH. FB-0202 REV. 0

DATE 9/25/01 NO.



SYMBOL LEGEND

- SUMP
- ACCESSIBLE MANHOLE
- INACCESSIBLE MANHOLE
- MANHOLE
- CATCH BASIN
- CATCH BASIN
- PUMP

MAP KEY

101B0203
101B0202
101B0201
101B0200

SEWER LINE LEGEND

- STORM
- OILY
- SANITARY
- NESHAP
- NSPS

SYM.	REVISIONS	DATE	REV. BY	CHK. BY	APP. BY
	REVISED				

DESIGN BY MTG
DRAWN BY DS 9/01
CHECKED BY FM 9/01
APPROVED BY
AUTHORIZATION NO.
GENERAL DESIGN APPROVED BY
OPERATING DEPARTMENT BY
JOB NO. ACCT. NO.

HOUSTON REFINING LP

UNIT

2001 SEWER MAP

SHEET 4 OF 4

CAD FILE NAME: 101B0203

SCALE NONE
DATE 9/25/01
DR. NO. HT-0101
SH. NO. FB-0203
REV. 0

APPENDIX V.A-B

EAST IMPOUNDMENT DIKE CERTIFICATION

LYONDELL-CITGO Refining Company Ltd.

12000 Lawndale
P. O. Box 2451
Houston, Texas 77252-2451
(713) 321-4111
Fax (713) 321-4700

2 June, 1999

Certified Mail / Return
Receipt Requested # Z 401 895 757

Mr. Jeff Saitas, Executive Director
Texas Natural Resource Conservation Commission
PO Box 13087
Austin, Texas 78711-3087

RE: SWR # 30092
Hazardous Waste Permit No. HW 50106
East Impoundment Basin Dike Certification

Dear Mr. Saitas:

Enclosed please find LYONDELL-CITGO Refining LP (LCR)'s engineering certification of the dike wall of the East Impoundment Basin. The certification was performed, as required, by a third-party consultant P.E.

LCR's East Impoundment Basin (EIB), as well as the East Guard Basin (EGB) were recently added to LCR's hazardous waste permit No. HW 50106. The EGB is a below-grade surface impoundment unit and therefore does not require a dike wall certification.

If you have any questions, please contact Ms. Ruth Holdcroft at (713) 321-5644.

Sincerely,

Lloyd Stone

Lloyd H. Stone
Superintendent, Environmental

RCRA East Impoundment Basin Dike Certification

LYONDELL-CITGO Refining LP-HT000310.0003

ARCADIS
GERAGHTY & MILLER

12000 Lawndale
P.O. Box 2451
Houston, TX 77252-2451

REPORT

May 1999

ARCADIS GERAGHTY & MILLER

RCRA East Impoundment Basin Dike Certification

LYONDELL-CITGO Refining LP-HT000310.0003

Prepared for:
LYONDELL-CITGO Refining LP
12000 Lawndale
P.O. Box 2451
Houston, TX 77252-2451

Prepared by:
ARCADIS Geraghty & Miller, Inc.
11000 Richmond Avenue
Suite 350
Houston
Texas 77042

REPORT

May 1999

ARCADIS GERAGHTY & MILLER

RCRA East Impoundment Basin Dike Certification
LYONDELL-CITGO Refining LP

May 1999

Prepared by ARCADIS Geraghty & Miller, Inc.

Sabrina E. Sweeney (by DAL)

Sabrina E. Sweeney
Task Manager/Project Engineer

Laurie W. Rodriguez

Laurie W. Rodriguez
Project Manager/Principal Scientist

Denise A. Lant

Denise A. Lant
Regional Manager/Associate

Table of Contents

Certification Statement

I, Sabrina E. Sweeney, certify that I have evaluated and/or overseen the evaluation of the dike design and materials of construction for the East Impoundment Basin at the LYONDELL-CITGO Refining LP located at 12000 Lawndale, Houston, Texas. As required under the RCRA TSD Facility Standard found in 40 CFR 264.226(c), I have determined using accepted engineering procedures that the dike, and the portion of the dike providing freeboard, has structural integrity and:

- will withstand the stress of the pressure exerted by the types and amount of wastes to be placed in the impoundment.
- will not fail due to scouring or piping, without dependence on any liner system included in the surface impoundment construction.

The engineering methods used to evaluate the existing dike are provided in the attached report.

Sabrina E. Sweeney

Signature

81495

Texas Registration Number

May 21, 1999

Date

STATE OF TEXAS
SABRINA E. SWEENEY
81495
LICENSED
PROFESSIONAL ENGINEER

{seal}

Introduction

Under the laws of the Resource Conservation Recovery Act (RCRA), all facilities that treat, store, or dispose (TSD) hazardous waste must comply with 40 CFR Part 264 Subpart K - Surface Impoundments. This report has been prepared to fulfill the requirements as stipulated in the September 1998 modification to the RCRA Part B permit (Permit No. HW-50106) issued to LYONDELL-CITGO Refining LP. The modified permit requires the re-certification of the East Impoundment Basin (EIB) in accordance with RCRA standard 40 CFR 264.226 (c). The East Guard Basin (EGB) has not been included in the analysis because the basin is not contained by a dike.

An engineering analysis was performed on the EIB to determine the structural integrity of the dike. Structural integrity, as stated by the standard, is defined as:

1. The dike will withstand the stress of the pressure exerted by the types and amount of wastes to be placed in the impoundment.

2. The dike will not fail due to scouring or piping, without dependence on any liner system included in the surface impoundment construction.

To determine the structural integrity of the dike enclosing the east impoundment basin, a slope stability analysis and a seepage analysis were performed on a typical cross-section obtained from the east impoundment basin construction plans. The typical cross-section used in these analyses is shown in **Figure 1**.

Engineering Analysis

Soil Parameters

A limited soil testing program was performed to provide data for the engineering analysis. Two soil borings were advanced into the east and west dike walls of the EIB, and two relatively undisturbed soil samples, at depths of 8 to 10 feet, and 10 to 12 feet below ground surface (bgs), were collected from each boring (four samples total). Laboratory testing consisted of Atterberg Limit tests, #200 sieve washes, and consolidated-undrained triaxial shear tests for two of the samples, and the determination of the natural moisture content for all four samples.

Geophysical testing was performed by HTS, Inc. of Houston, Texas.

Interpretation of the test results indicatesthat the dike soils are mainly moderate to high plasticity sandy clays (CH), with a cohesion intercept of 265 pounds per square feet (psf) and an angle of internal friction of 22 degrees. The soils have a moist unit weight of 129 pounds per cubic feet (pcf) and a saturated unit weight of 132 pcf. Detailed results of the tests are presented in Appendix A.

The stratigraphic data for the in-situ soils under the EIB used for the analyses was obtained from the RCRA Part B Permit Application (Geraghty and Miller, Volume 1 of 3, Section V, Geologic Cross-Section 525-298 and Geologic Cross-Section K-K', September 1997) (Appendix B). The cross-sections identify the stratigraphy of the soils underneath the EIB as a 10-foot layer of high plasticity clay underlain by silty and sandy clays. The native soils under the EIB are assumed to be fully saturated because the cross-sections indicate that the water table is located close to the base of the EIB.

The design parameters used in the seepage and stability analyses were based on information contained in Section VI.A.4 of the RCRA Part B Permit Application (Appendix C). The highly plastic clays were assigned a cohesion of 3500 psf, and a saturated unit weight of 130 pcf. The silty and sandy clays were assigned an angle of friction of 30 degrees, a cohesion of 1000 psf, and a saturated unit weight of 125 pcf. These are typical values for highly plastic clays.

Seepage Analysis

A seepage analysis was performed to determine if the dike surrounding the east impoundment basin would fail due to scouring or piping. The impoundment basin has a capacity of 19.5 million gallons, with two feet of freeboard remaining at full capacity. A flow net was constructed to determine the critical exit gradient and the phreatic surface through the embankment. A flow net is a graphical interpretation of the flow of water in two-dimensions through a soil medium, following the principle of continuity. This analysis was performed without dependence on the asphalt-sprayed walls, nor the seven feet of fill material placed along the toe of the outside slope. The native soil material surrounding and under the EIB was assumed to be isotropic, with a permeability of 1×10^{-8} ft/sec (RCRA Part B Permit Application, Section VI.A4., Geraghty and Miller, September 1997) (Appendix C).

Figure 2 represents the flow net produced for the EIB. For piping to occur, the exit gradient, that is the rate of dissipation of head over a given length, must be large enough to remove the soil particles. Removal of the soil particles by flowing groundwater, called floatation, can lead to undermining and loss of the dike. The gradient at which floatation occurs is termed the critical gradient, and is approximately

equal to 1.0. The critical exit gradient occurs at the toe of the dike, as indicated in Figure 2. The exit gradient is calculated to be 0.3, indicating that the impoundment basin has a factor of safety of 3.3 against failure due to piping. Soil heave, which can lead to piping, is also not a concern, as the seepage force is not capable of overcoming the buoyant weight of the soil material.

Stability Analysis

A slope stability analysis was performed to determine the stability of the east impoundment basin at full capacity. An analysis was also performed under a rapid drawdown condition, in which the stormwater standing against the basin slope drops suddenly, and the dike remains saturated. Within the slope, high pore pressures would exist until the excess water could drain from the dike.

The computer program STABLE6 was used to complete the analyses. The critical failure surface and corresponding factor of safety for both the basin at full capacity and during a rapid drawdown event are shown in Figures 3 and 4, respectively. The results of the stability analyses are also indicated in Table 1.

Table 1

Results of Slope Stability Analysis

Loading Condition of Impoundment Dike	Computed Factor of Safety	Recommended Minimum Factor of Safety[1]
Basin at Full Capacity	2.1	1.5
Basin Under Rapid Drawdown Conditions	1.4	1.0

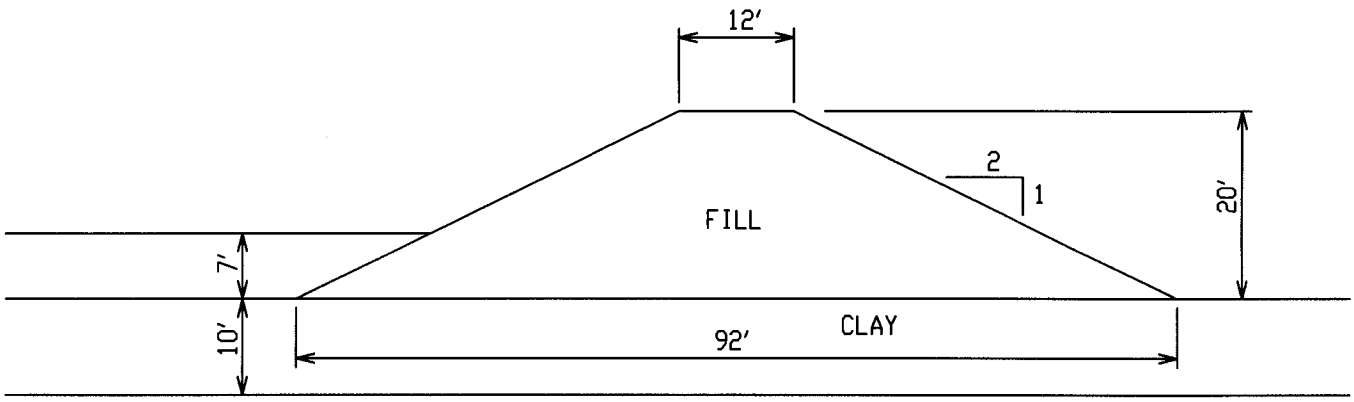
[1] U.S. Army Corps of Engineers Manual Number 1110-2-1902, "ENGINEERING AND DESIGN: Stability of Earth and Rock-Fill Dams", April 1, 1970

Usually, the computed factor of safety against sliding is compared to a well-established standard. The recommended minimum factor of safety shown in Table 1 is the standard used by the U.S. Army Corps of Engineers for the respective loading condition. Both computed factors of safety for the two loading conditions exceed the recommended standards.

Conclusions

The dike surrounding the east impoundment basin has structural integrity as defined by RCRA Standard 264.226 (c) Stability analyses demonstrate that the dike walls of the EIB meet or exceed recognized standards for sliding safety at both full capacity (F.S. = 2.1) and during a rapid drawdown event (F.S. = 1.4). Seepage analysis indicates that even without the asphalt coating and the seven feet of fill placed at the toe of the outside slope, the dike has a critical exit gradient of 0.3 indicating a factor of safety against piping of 3.3.

Figures



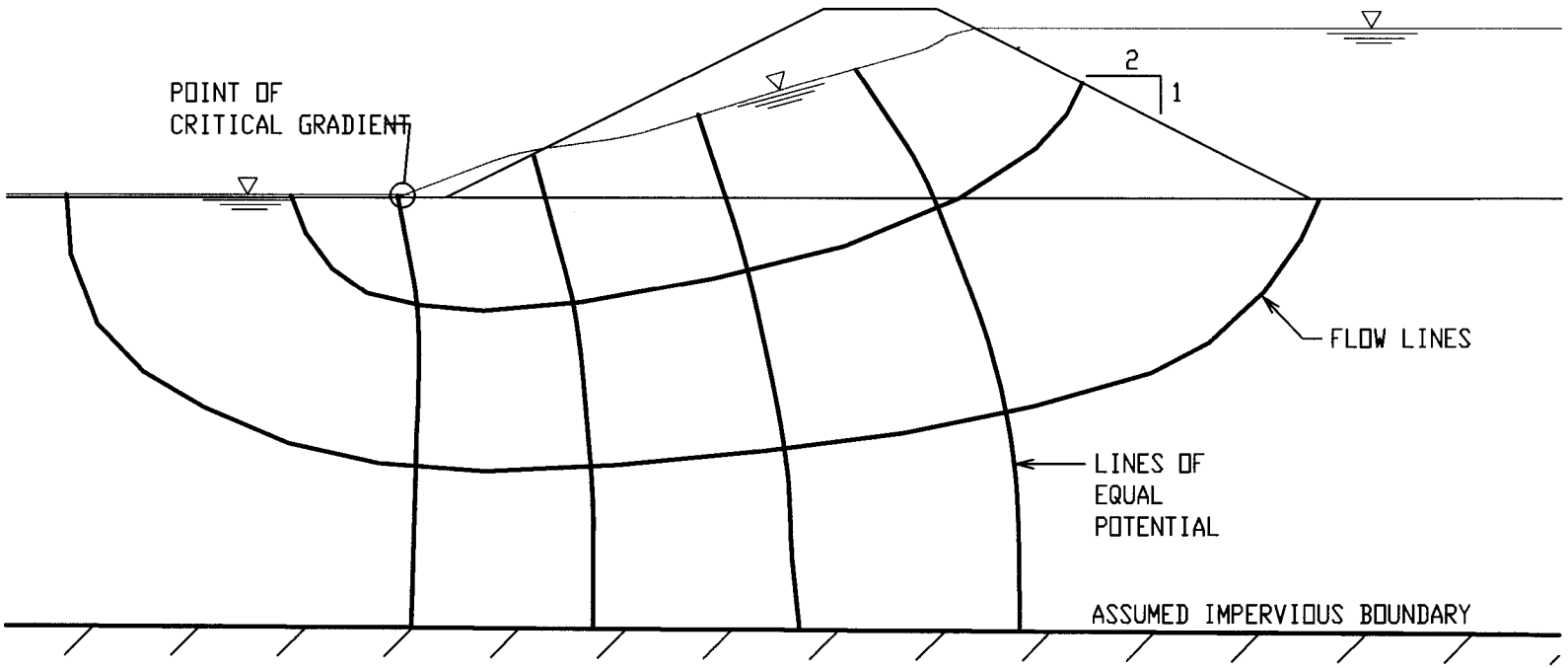
SILTY AND SANDY CLAYS

ARCADIS GERAGHTY&MILLER
611 CHESTNUT ST., SUITE 200
CHATTANOOGA, TN 37450
Tel: 423/756-7193 Fax: 423/756-7197

TYPICAL CROSS SECTION
LCR EAST IMPOUNDMENT BASIN
LYONDELL - CITGO REFINING LP
HOUSTON, TEXAS

PROJECT NUMBER
HT000310

FIGURE NUMBER
1



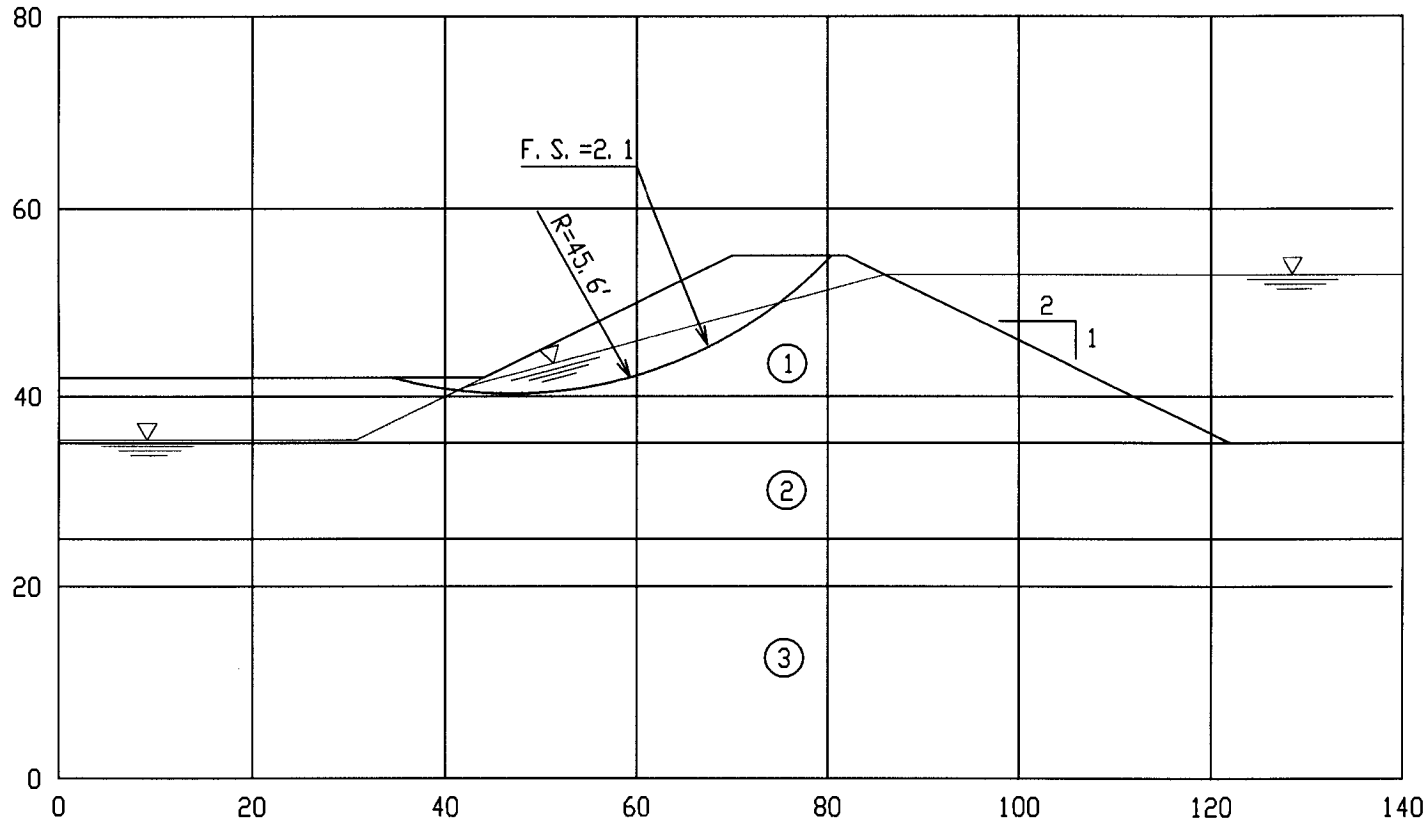
ASSUMPTION:
DIKE PERMEABILITY AND FOUNDATION
PERMEABILITY ARE THE SAME

ARCADIS GERAGHTY&MILLER
611 CHESTNUT ST., SUITE 200
CHATTANOOGA, TN 37450
Tel: 423/756-7193 Fax: 423/756-7197

FLOW NET
LCR EAST IMPOUNDMENT BASIN
LYONDELL - CITGO REFINING LP
HOUSTON, TEXAS

PROJECT NUMBER
HT000310

FIGURE NUMBER
2



NOTE:
ONLY THE CRITICAL FAILURE ARC IS SHOWN. APPROXIMATELY 300 TRIAL FAILURE SURFACES WERE GENERATED DURING THE ANALYSIS.

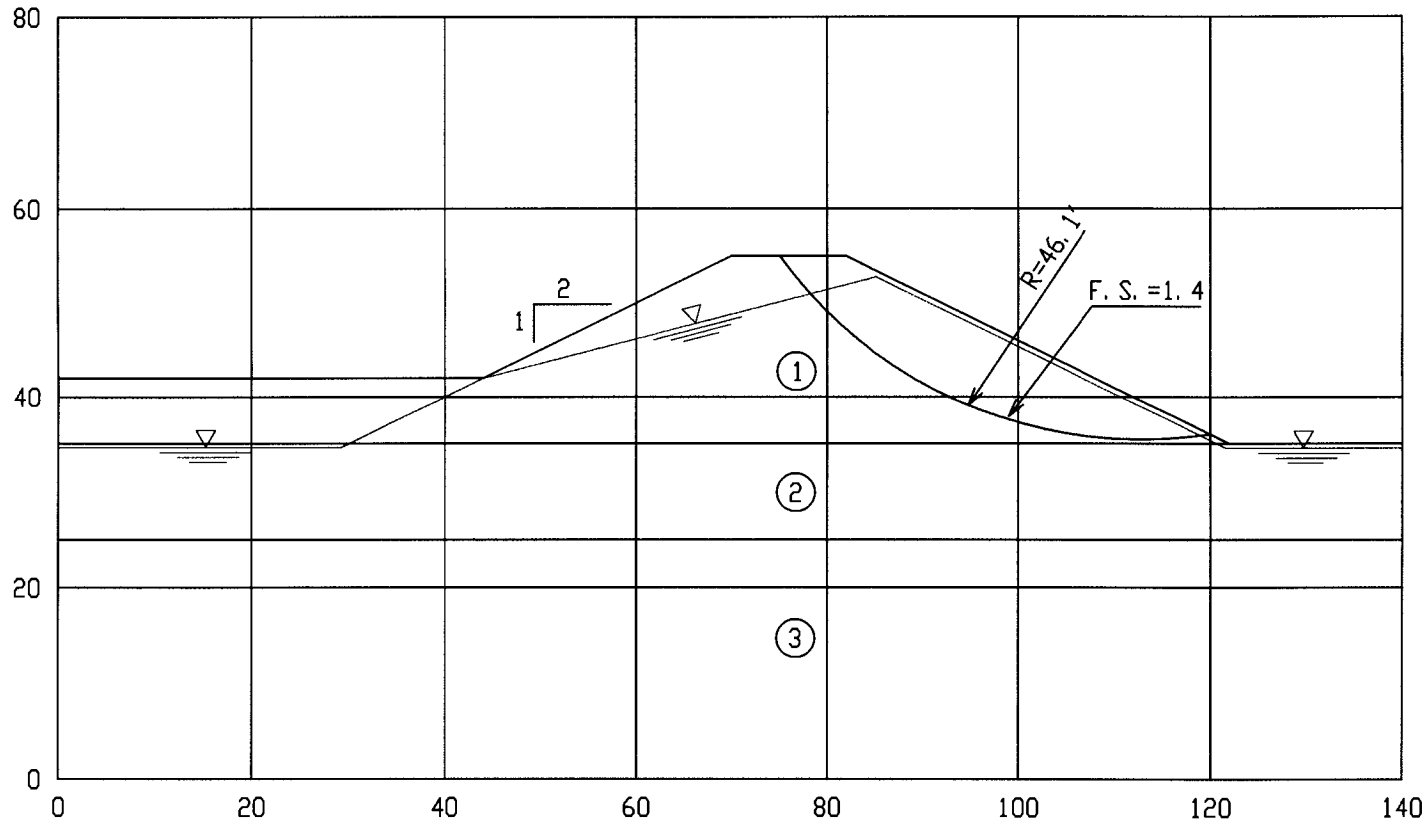
NO.	MOIST UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION (PSF)	ANGLE OF INTERNAL FRICTION
1	129	132	265	22°
2	125	130	3500	0°
3	120	125	1000	30°

ARCADIS GERAGHTY&MILLER
611 CHESTNUT ST., SUITE 200
CHATTANOOGA, TN 37450
Tel: 423/756-7193 Fax: 423/756-7197

SLOPE STABILITY ANALYSIS
LCR EAST IMPOUNDMENT BASIN
(FULL CAPACITY)
LYONDELL - CITGO REFINING LP
HOUSTON, TEXAS

PROJECT NUMBER
HT000310

FIGURE NUMBER
3



NOTE:
ONLY THE CRITICAL FAILURE ARC IS SHOWN. APPROXIMATELY 300 TRIAL FAILURE SURFACES WERE GENERATED DURING THE ANALYSIS.

NO.	MOIST UNIT WT. (PCF)	SATURATED UNIT WT. (PCF)	COHESION (PSF)	ANGLE OF INTERNAL FRICTION
1	129	132	265	22°
2	125	130	3500	0°
3	120	125	1000	30°

ARCADIS GERAGHTY&MILLER
611 CHESTNUT ST., SUITE 200
CHATTANOOGA, TN 37450
Tel: 423/756-7193 Fax: 423/756-7197

SLOPE STABILITY ANALYSIS
LCR EAST IMPOUNDMENT BASIN
(RAPID DRAWDOWN CONDITION)
LYONDELL - CITGO REFINING LP
HOUSTON, TEXAS

PROJECT NUMBER
HT000310

FIGURE NUMBER
4

Appendix A

TABLE 1

LABORATORY TEST SUMMARY

PROJECT: LCR-DI6 Certification

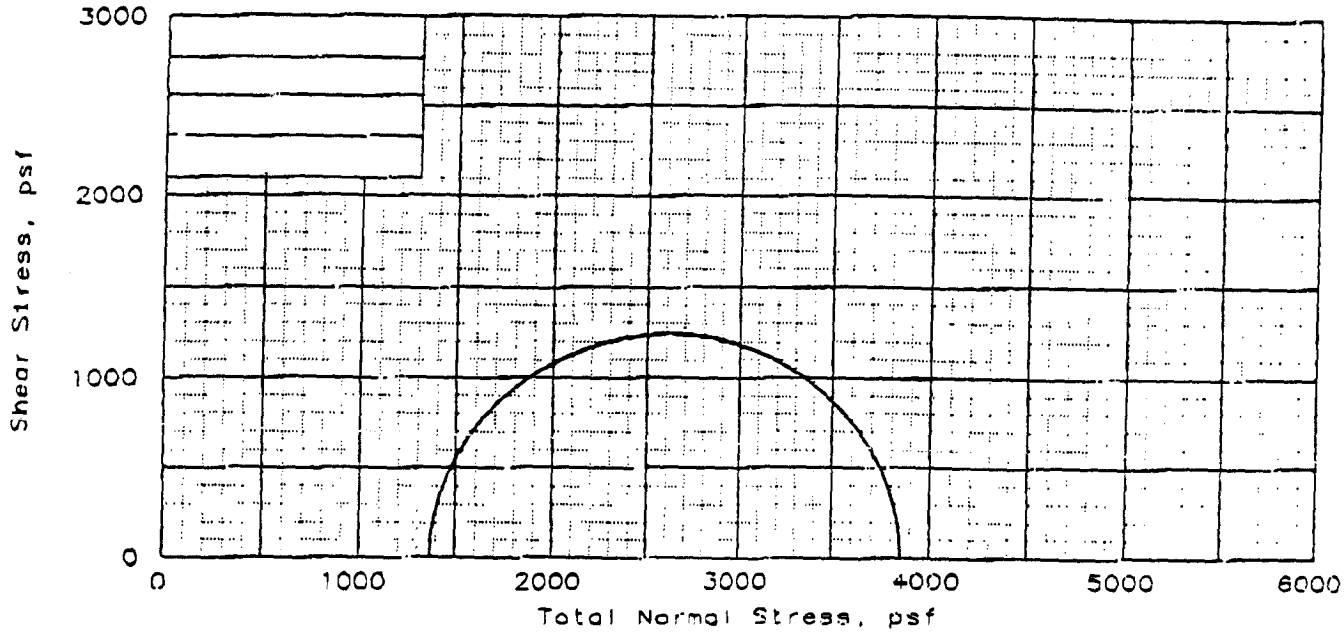
HTS PROJECT NO.: 98-S-190

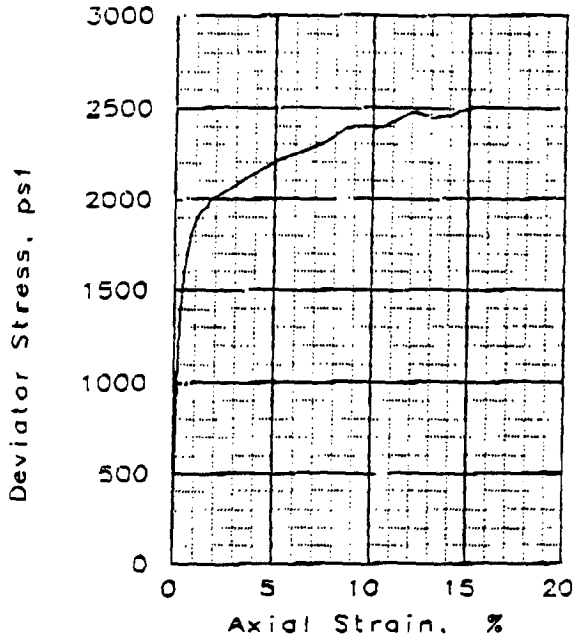
LOCATION: LCR/ Houston

CLIENT: Arcadis Geraghty & Miller

Boring No.	Sample Depth (feet)	Type of Material	Moisture Content (%)	Dry Density (pcf)	Atterberg Limits (%)			-200 Sieve (%)	Unconfined Compressive Strength (tsf)	Strain (%)	Lateral Pressure (psi)	Remarks
					LL	PL	PI					
EW	8-10	Lean Clay W/ Sand (CL)	19.9		46	19	27	74.7				(1) Compressive strength from consolidated undrained triaxial test (ASTM D 4767). Data plots are provided in figure 1 and 2.
	10-12	Sandy Fat Clay (CH)	19.5	108.1					2,490 (1,2)	15.0	9.5	
WW	8-10	Sandy Fat Clay (CH)	29.1		70	24	46	66.0				
	10-12	Sandy Fat Clay (CH)	19.2	104.7					2, 450 (1,2)	15.0	9.5	(2) Sample bulged at failure.

HTS, INC





SPECIMEN NO.:		1
INITIAL	WATER CONTENT, %	19.5
	DRY DENSITY, pcf	108.1
	SATURATION, %	91.3
	VOID RATIO	0.589
	DIAMETER, in	2.84
	HEIGHT, in	5.80
AT TEST	WATER CONTENT, %	27.2
	DRY DENSITY, pcf	108.5
	SATURATION, %	128.5
	VOID RATIO	0.582
	DIAMETER, in	2.83
	HEIGHT, in	5.79
Strain rate, in/min		0.0040
BACK PRESSURE, psf		5496
CELL PRESSURE, psf		6864
FAIL. STRESS, psf		2486
TOTAL PORE PR., psf		5499
ULT. STRESS, psf		2486
TOTAL PORE PR., psf		5499
$\bar{\sigma}_1$ FAILURE, psf		3851
$\bar{\sigma}_3$ FAILURE, psf		1365

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Shelby tube
DESCRIPTION: Sandy Fat Clay(CH)

SPECIFIC GRAVITY= 2.75
REMARKS: AGM2

Tested by: RL

Checked by: TJ

Fig. No.: 2

CLIENT: Arcadis Geraghty & Miller

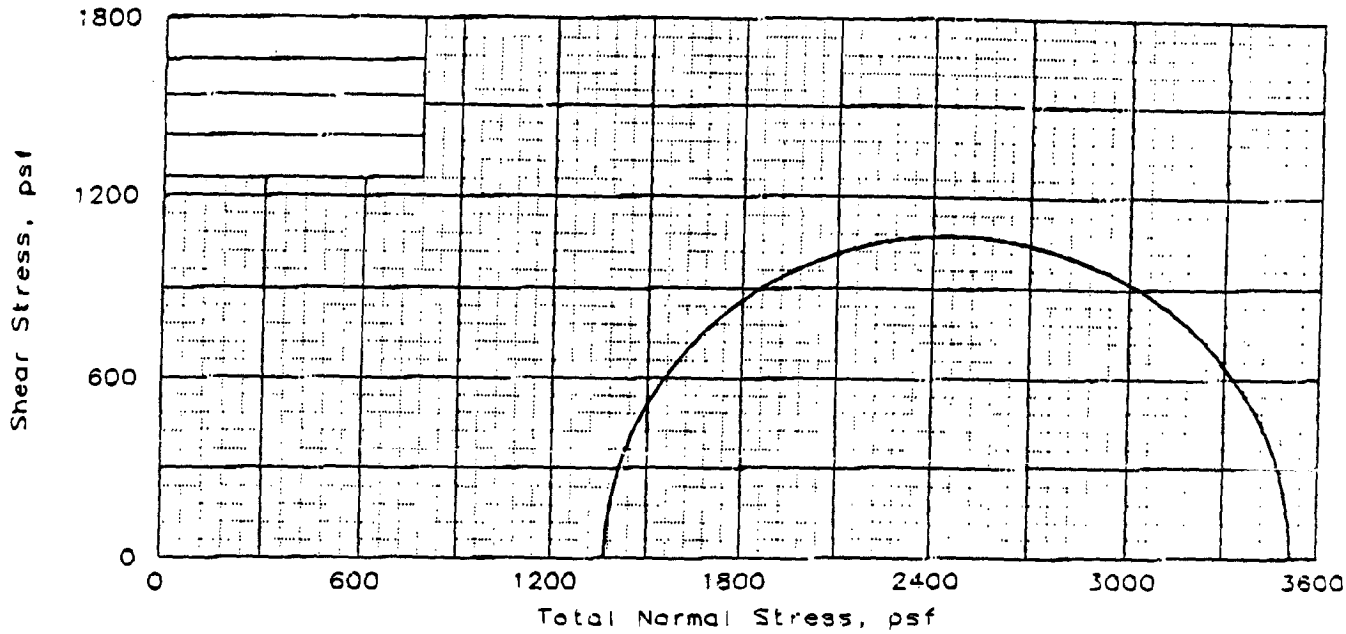
PROJECT: LCR-DI6 Certification

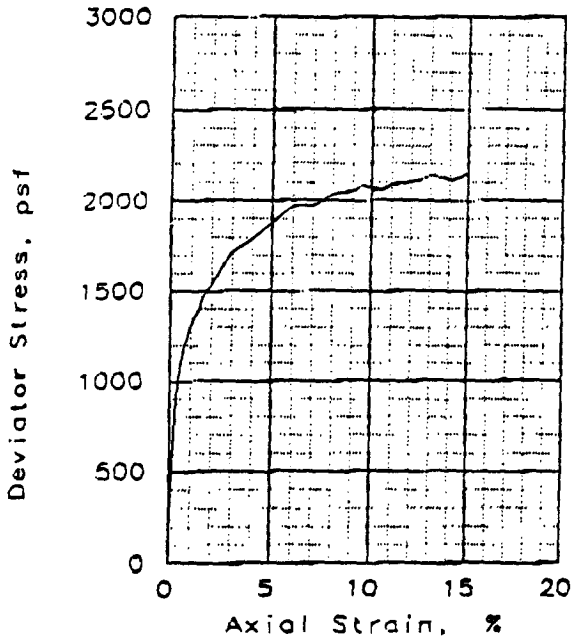
SAMPLE LOCATION: East Wall 10'-12'

PROJ. NO.: 98-S-190 DATE: 12-14-98

TRIAXIAL SHEAR TEST REPORT

HTS, INC Consultants





SPECIMEN NO.:		1
INITIAL	WATER CONTENT, %	19.2
	DRY DENSITY, pcf	104.7
	SATURATION, %	80.4
	VOID RATIO	0.669
	DIAMETER, in	2.81
	HEIGHT, in	5.82
AT TEST	WATER CONTENT, %	32.0
	DRY DENSITY, pcf	105.5
	SATURATION, %	136.5
	VOID RATIO	0.657
	DIAMETER, in	2.80
	HEIGHT, in	5.81
Strain rate, in/min		0.0040
BACK PRESSURE, psf		5351
CELL PRESSURE, psf		6719
FAIL. STRESS, psf		2147
TOTAL PORE PR., psf		5573
ULT. STRESS, psf		2147
TOTAL PORE PR., psf		5573
$\bar{\sigma}_1$ FAILURE, psf		3293
$\bar{\sigma}_3$ FAILURE, psf		1146

TYPE OF TEST:
CU with Pore Pressures
SAMPLE TYPE: Shelby tube
DESCRIPTION: Sandy Fat Clay(CH)

SPECIFIC GRAVITY= 2.8
REMARKS: AGM1

Tested by: RL

Checked by: TJ

Fig. No.: 1

CLIENT: Arcadis Geraghty & Miller

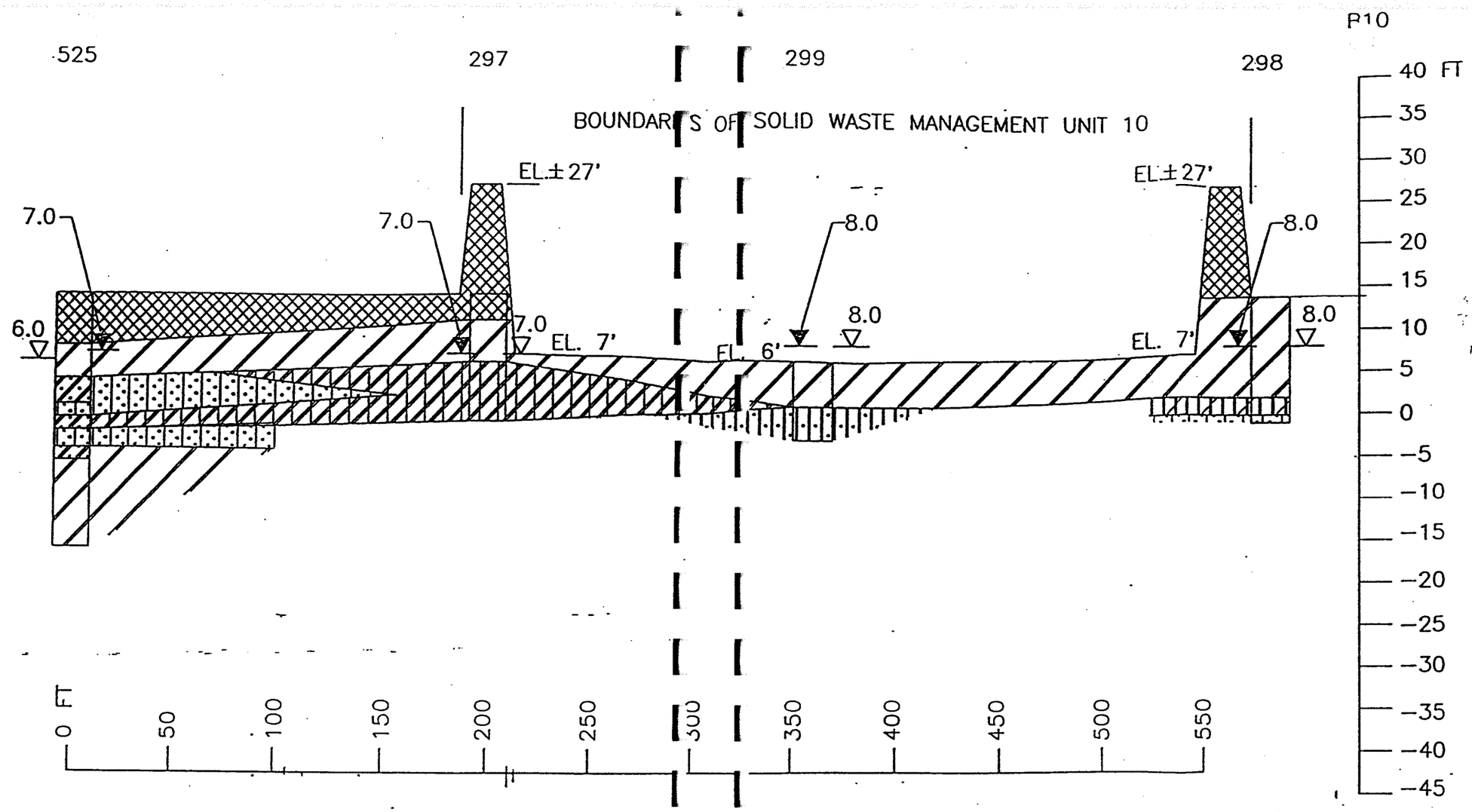
PROJECT: LCR-OI6 Certification

SAMPLE LOCATION: West Wall 10'-12'

PROJ. NO.: 98-S-190 DATE: 12-14-98

TRIAXIAL SHEAR TEST REPORT

HTS, INC
Consultants



LEGEND

CLAY (CH)

SILTY CLAY (CL)

CLAYEY SILT

FILL

9.58 STATIC WATER LEVEL, JUNE 1990

SANDY CLAY (CL)

SILTY SAND (SM)

SANDY SILT

9.58 STATIC WATER LEVEL, MARCH 1988

Brown and Caldwell Consultants
DALLAS–HOUSTON, TEXAS

SUBMITTED STEVEN A. MELLON DATE 6-28-90
APPROVED DONALD R. FUNDERLIC, V.P. DATE
APPROVED DATE

SCALE: AS SHOWN
LINE IS 2 INCHES AT FULL SIZE
FILE 5175
DRAWN DHD
DESIGNED DC

NOTE:
STATIC WATER LEVELS FOR BORINGS ARE PROJECTED FROM WATER LEVEL CONTOUR MAPS

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

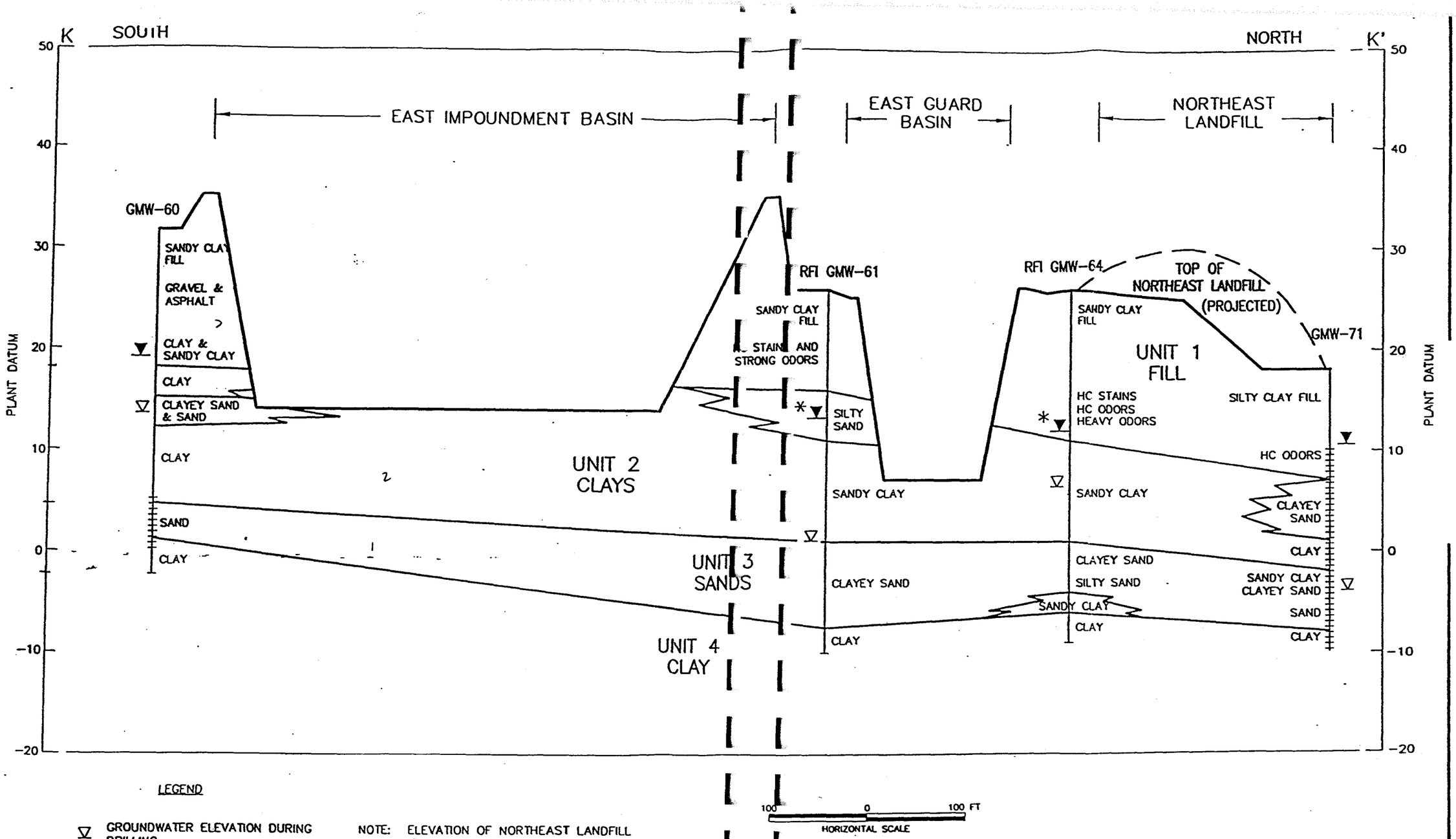
SOLID WASTE MANAGEMENT UNITS
HOUSTON REFINERY

GEOLOGIC CROSS-SECTION 525 – 298

SWMU 10
EAST IMPOUNDMENT BASIN

ELEVATIONS IN MEAN SEA LEVEL (MSL = 8.2)

IV
FIGURE NO.
VI.-2
SHEET NO.



LEGEND

▽ GROUNDWATER ELEVATION DURING DRILLING

▼ GROUNDWATER ELEVATION AFTER WELL INSTALLATION

* THE STATIC WATER LEVEL ELEVATIONS (▼) INDICATED FOR THE BORINGS RFI GMW-61 AND RFI GMW-64 ARE ACTUALLY THE NOVEMBER 1994 DATA FOR THEIR RESPECTIVE WELLS.

NOTE: ELEVATION OF NORTHEAST LANDFILL IS NOT TO SCALE

GERAGHTY & MILLER, INC.
Environmental Services

GEOLOGIC CROSS-SECTION K-K'
NORTHEAST UNITS

LYONDELL - CITGO REFINING COMPANY, LTD
12000 LAWNDALE
HOUSTON, TEXAS

FIGURE
VI.-22

A.4.d Geotechnical Properties of the Subsurface Soils

Laboratory physical tests have been completed for all the major strata encountered during field investigations at the hazardous waste treatment units. The following is a list of the physical tests performed and the corresponding ASTM standards:

Test	ASTM Standard
Liquid Limit	D 423-66 (1972)
Plastic Limit and Plasticity Index	D 424-59 (1971)
Definition of Terms and Symbols	D 653-81
Percent Passing No. 200	D 1140-54
Unconfined Compression	D 2166-66 (1979)
Moisture Content	D 2216-80
Description and Classification of Soils	D 2487 & 2488-69 (1975)
Falling Head Permeability	Suggested Method
Specific Gravity	Values Assumed
Void Ratio	Values Calculated
Porosity	Values Calculated
Degree of Saturation	Values Calculated

The results are summarized in Tables VI.-2 (Application Table VI.A.4) and VI.-3 and the Unified Soil Classification is provided in Appendix B. The coefficient of permeability "K_{20}" presented in Table VI.-2 (Application Table VI.A.4) has been corrected to 20 degrees C. All laboratory results are summarized by strata in Table VI.-3.

A.4.e Surficial Soils at Land Treatment Units

As previously mentioned, the soil in both landfarm areas is from the Lake Charles (Urban complex) series which consists of deep, nearly level to gently sloping, neutral to mildly alkaline clays. When dry, the profile is characterized by deep, wide shrinkage cracks, intersecting slickensides, and blocky structure. The soils are naturally poorly drained, surface

TABLE VI.-3
SUMMARY OF GEOTECHNICAL DATA BY STRATA
LCR NORTHEAST LANDFARM, EAST GUARD BASIN, EAST IMPOUNDMENT BASIN, HOUSTON, TEXAS

Approx. Depth	Primary Universal Soil Classification	Moisture Content	Percent Passing #200 Sieve	Dry Density	Liquid Limit	Plastic Limit	Plasticity Index	Permeability(a) X 10^{-7} cm/sec	Field Cohesive Strength(tsf)	Compressive Strength (tsf)	Porosity	
		26	88.87	94.3	60	22.3	37.7	1.16	2.5	2.30	0.445	Mean
0-14	ML, CH	22-34	82.3-96.4	85-101	36-92	19-29	17-63	0.45-2.4	1-4.5	0.81-4.85	.407-.505	(Range)
		3	3	3	3	3	3	3	3	3	3	n
		19.5	62.75	105.5	25.5	20	5.5	581.5	1.1	0.55	0.362	Mean
14-26	ML	18-21	40.2-85.5	105-106	22-29	19-21	1-10	63-1100	0.2-1.7	0.55	.358-3.66	(Range)
		2	2	2	2	2	2	2	2	1	2	n
		16.5	89.4	113	37.5	16.5	25	3.19	3.1	2.89	0.331	Mean
25-35	CL	16-18	87.6-92	113	36-39	15-18	21-29	0.58-5.8	2.5-3.7	2.8-2.98	.329-.332	(Range)
		2	2	2	2	2	2	2	2	2	2	n
		16.5	77.6	110.5	39	16.5	22.5	31.23	4.0	2.19	0.344	Mean
35-45	SM, CL	16-18	63.7-91.5	108-113	31-47	15-18	16-2	0.45-62	4.0	1.41-2.98	.334-.354	(Range)
		2	2	3	2	2	2	2	2	2	2	n
		22	99.3	107	53	21	32	0.40	4.5	4.04	0.370	Mean
45-70	CH	22	99.3	107	53	21	32	0.40	4.5	4.04	0.370	(Range)
		1	1	1	1	1	1	1	1	1	1	n
		21	92.5	99.5	30.5	16.5	14	119.5	2.1	---	0.4	Mean
70-74	SM, ML	20/22	91.4-93.6	98-101	29-32	16-17	13-15	190-2200	1.0-3.2	---	.398-.402	(Range)
		2	2	2	2	2	2	2	2	---	2	n
		27	99.4	96	70	28	32	1.3	4.5	2.52	0.436	Mean
74-86	CL	27	99.4	96	70	28	32	1.3	4.5	2.52	0.436	(Range)
		1	1	1	1	1	1	1	1	1	1	n
		23.5	93.9	99	43	19.5	23.5	1.55	3.5	2.29	0.414	Mean
86-±100	SM, CH	20-27	92-95.9	93-105	42-44	17-22	22-25	1.4-1.7	3.0-4.0	2.29	.379-.450	(Range)
		2	2	2	2	2	2	2	2	2	2	n

n = number of samples
a = laboratory vertical permeability
CH = inorganic clay, high plasticity
CL = inorganic clay, low to medium plasticity
tsf = tons/ft

Mean = average value
b = field horizontal permeability
ML = inorganic silts and very fine sands
SM = silty sands, sand-silt mixtures

Revised August 1997

PART B.VI

2020 GEOLOGY REPORT

ATTACHMENT VI – GEOLOGY REPORT – UNSATURATED ZONE MONITORING

Prepared for
Houston Refining LP, Houston, Texas
November 2015

Prepared By: _____ Prepared By: _____

Minell Enslin
Engineer II

Ruth Hammervold
Principal Engineer

STATE OF TEXAS
AUSTIN I. COOLEY
57523
REGISTERED PROFESSIONAL ENGINEER

_____

Prepared under the direction of
Austin I. Cooley, P.E., P.G.
Vice President

11/17/15

Certification is only for these portions of the Geology Report revised herein, specifically Section D, Table VI.-15 and Table VI.-17.

Brown AND Caldwell

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Brown and Caldwell is Texas Registered Engineering
Firm No. F-2139

D. UNSATURATED ZONE MONITORING

This section describes the methodology and procedures to be used for soil core monitoring at the landfarm treatment units (LTUs) as required by 40 CFR 264.278. In accordance with 40 CFR 264.280(a)(7), soil-pore liquid monitoring is no longer required at the landfarms since it has been more than 90 days after the last application of waste to the treatment units.

D.1 SOIL CORE MONITORING

D.1.a Sample Number, Frequency, And Depths

Soil cores samples will be collected from random locations within each plot of the applicable SWLF when covered by vegetation. Once/If an impermeable cover (e.g., asphalt, concrete or clay) is placed over the applicable SWLF plots, soil core samples will be collected from the perimeter area of the LTU with impermeable cover. Two soil core locations will be selected per plot, with one sample being collected per location. The soil samples will be collected at a depth greater than 8 inches below treatment zone. The analytical protocol for the collected samples is discussed below in Section D.1.c. Soil core sampling will be conducted on a geometrically progressive schedule identified within the 1982 RCRA Guidance Document, Land Treatment (USEPA, 1982). At the time of implementation of geometric progressive sampling frequency, the site had over eight years of soil core sampling data with no protective concentration level (PCL) exceedances. Therefore, it is appropriate and conservative to begin the progressive schedule in the third quarter of post-closure year 4 (2019). Subsequent sampling will be conducted in every third quarter at years 8, 16 and 30. If there is a PCL exceedance from any of these events, the progressive schedule will start again at year 4.

At the laboratory, each sample is homogenized by laboratory personnel prior to analysis, and the remaining portion of each sample is saved. In the event that an apparent anomaly is noted, individual samples are available for re-analysis to evaluate the situation.

D.1.b Random Selection of Locations for Soil Core Monitoring

For hazardous waste facilities, RCRA guidance suggests that a standard procedure be followed in selecting sample locations. The following discussion outlines the random sampling protocol (derived from RCRA guidance) and includes an easy-to-follow procedure for selecting random numbers (see Appendix VI.-D).

If "n" units are to be selected from the population, a simple random sample is defined as a sample obtained so that each possible combination of "n" units has an equal chance of being selected. In practice, each unit is selected separately, randomly, and independently of any units previously drawn.

It is convenient to spot the field location for soil coring by selecting random distances on a Cartesian coordinate system and by using the intersection of the two random distances as the location at which a soil core should be taken. This system works well for fields of both regular and irregular shape, since the points outside the area of interest are merely discarded, and only the points inside the area are used in the sample.

The location within a given uniform area of a land treatment unit (i.e., active portion monitoring) at which a soil core should be taken may be determined by the following procedure:

1. Divide the land treatment unit into uniform areas. For the Houston Refining facility, a uniform area will be defined as a single plot since run-on and runoff structures currently exist to define the boundaries of each plot.

2. Map each uniform area by establishing two base lines at right angles to each other which intersect at an arbitrarily selected origin, for example, the southwest corner. Each baseline should extend to the boundary of the uniform area.

3. Establish a scale interval along each base line. The units of this scale may be feet, yards, miles, or other depending on the size of the uniform area. Both baselines must have the same scale. In this case, the scale is in feet.

4. Draw two random numbers from the table located at the end of this section. Use these numbers to locate one point along each of the base lines.

5. Locate the intersection of two lines drawn perpendicular to these two baseline points. This intersection represents one randomly selected location for collection of one soil core. If this location is outside the uniform area, disregard it and repeat the above procedure.

6. For soil core monitoring, repeat the above procedure as many times as necessary to obtain two soil coring locations within each uniform area of the land treatment unit. (If the same location is selected twice, disregard the second selection and repeat as necessary to obtain different locations.)

A specific random sample location selection procedure is specified in the existing permit and is applicable when the unit consists of a vegetative cover. Once/If an impermeable cover is placed over the plot, soil core samples will be collected from the closest periphery location outside the impermeable cover adjacent to the random sample location specified.

D.1.c Analytical Protocol

The analytical protocol for soil core samples has historically consisted of lead, chromium, barium, phenol, naphthalene, 1-methylnaphthalene, toluene, ethylbenzene, pH, total organic carbon (TOC), and specific conductance. These parameters have been approved and Houston Refining will continue to retain all of these parameters, except barium, in the soil core monitoring program. TOC, pH and specific conductance will continue to be analyzed for informational purposes but will not be evaluated statistically.

Barium is not a significant constituent of concern in the waste materials that were applied to the landfarms. Based on historical sampling events of refinery waste, the maximum barium concentration observed in the waste was only 210 mg/kg whereas lead and chromium concentrations were as high as 410 mg/kg and 1,100 mg/kg, respectively. Further, barium is not listed as a potential refinery contaminant on the EPA's Skinners List. As such, barium has been removed as a soil core monitoring constituent.

The analytical protocol and sampling frequencies for the soil core samples is shown on Table VI.-15.

D.1.d PCL Comparisons

PCL comparisons will be conducted on soil core samples to determine if there is evidence of contamination in soils underlying the treatment zone of the land treatment units. This will be accomplished by comparing the analytical results of the soil core samples to commercial/industrial

PCLs approved in the December 18, 2014 Class 2 permit modification. The approved PCLs for LTUs 612/614, 613, and 616 are presented in the revised Table VI.17.

If the original sample result equals or exceeds the approved PCL for a particular parameter, then one resample will be collected and re-analyzed for that specific parameter. If the resample result also equals or exceeds the PCL for that parameter, there is significant evidence of contamination below the treatment zone.

TABLE VI.-15
SAMPLING AND ANALYSIS FREQUENCIES
FOR SOIL CORE MONITORING
SOUTHWEST LANDFARM PLOTS 612/614, 613, AND 616

Year	4 (2019)	8 (2027)	16 (2043)	30 (2045)
pH	A	A	A	A
Specific Conductance	A	A	A	A
Total Organic Carbon	A	A	A	A
Lead	AS	AS	AS	AS
Chromium	AS	AS	AS	AS
Ethyl Benzene	AS	AS	AS	AS
Toluene	AS	AS	AS	AS
Phenol	AS	AS	AS	AS
Naphthalene	AS	AS	AS	AS
1-Methyl- Naphthalene	AS	AS	AS	AS

Notes:
A = Laboratory analysis performed.
S = Statistical analysis

TABLE VI.17
HIGHEST COC CONCENTRATIONS DETECTED IN BTZ SOIL FROM 2000 TO 2015
SWLF 612
HOUSTON REFINING LP

COC	Units	$^{GW}Soil_{Ing}$ PCL	$^{Air}Soil_{Inh-V}$ PCL	Highest Concentration
Lead	mg/kg	1,636	NA	104
Chromium	mg/kg	26,000,000	NA	32.2
Phenol	µg/kg	172,000	NA	899.5 U
Naphthalene	µg/kg	288,000	190,000	416 J
1-Methylnaphthalene	µg/kg	19,600	NA	1,100
Toluene	µg/kg	24,800	45,000,000	11.79
Ethylbenzene	µg/kg	22,900	21,000,000	4.14 J

Notes:
COC - constituent of concern
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
$^{GW}Soil_{Ing}$ PCL - TRRP Tier 2 soil to groundwater ingestion PCL approved in the 2014 Closure Plan.
$^{Air}Soil_{Inh-V}$ PCL - TRRP Tier 1 commercial/industrial PCL for inhalation of volatiles from soil.
NA - not applicable
U- Indicates the analyte was not detected above the laboratory Method Detection Limit.
J-Result is an estimated value between the Reporting Limit and the Method Detection Limit.

TABLE VI.17
HIGHEST COC CONCENTRATIONS DETECTED IN BTZ SOIL FROM 2000 TO 2015
SWLF 614
HOUSTON REFINING LP

COC	Units	$^{GW}Soil_{Ing}$ PCL	$^{Air}Soil_{Inh-V}$ PCL	Highest Concentration
Lead	mg/kg	1,636	NA	59.7
Chromium	mg/kg	26,000,000	NA	33.3
Phenol	mg/kg	158,000	NA	2,300 U
Naphthalene	mg/kg	204,000	190,000	979 J
1-Methylnaphthalene	mg/kg	13,900	NA	1,000
Toluene	mg/kg	19,700	45,000,000	1.71
Ethylbenzene	mg/kg	17,800	21,000,000	6.34

Notes:
COC - constituent of concern
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
$^{GW}Soil_{Ing}$ PCL - TRRP Tier 2 soil to groundwater ingestion PCL approved in the 2014 Closure Plan.
$^{Air}Soil_{Inh-V}$ PCL - TRRP Tier 1 commercial/industrial PCL for inhalation of volatiles from soil.
NA - not applicable
U- Indicates the analyte was not detected above the laboratory Method Detection Limit.
J-Result is an estimated value between the Reporting Limit and the Method Detection Limit.

TABLE VI.17
HIGHEST COC CONCENTRATIONS DETECTED IN BTZ SOIL FROM 2000 TO 2015
SWLF 613
HOUSTON REFINING LP

COC	Units	$^{GW}Soil_{Ing}$ PCL	$^{Air}Soil_{Inh-V}$ PCL	Highest Concentration
Lead	mg/kg	2,727	NA	104
Chromium	mg/kg	43,000,000	NA	96.6
Phenol	µg/kg	264,000	NA	1,248
Naphthalene	µg/kg	341,000	190,000	736.5 J
1-Methylnaphthalene	µg/kg	23,100	NA	8,260
Toluene	µg/kg	32,800	45,000,000	3.89 J
Ethylbenzene	µg/kg	29,600	21,000,000	311

Notes:
COC - constituent of concern
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
$^{GW}Soil_{Ing}$ PCL - TRRP Tier 2 soil to groundwater ingestion PCL approved in the 2014 Closure Plan.
$^{Air}Soil_{Inh-V}$ PCL - TRRP Tier 1 commercial/industrial PCL for inhalation of volatiles from soil.
NA - not applicable
J-Result is an estimated value between the Reporting Limit and the Method Detection Limit.

TABLE VI.17
HIGHEST COC CONCENTRATIONS DETECTED IN BTZ SOIL FROM 2000 TO 2015
SWLF 616
HOUSTON REFINING LP

COC	Units	$^{GW}Soil_{Ing}$ PCL	$^{Air}Soil_{Inh-V}$ PCL	Highest Concentration
Lead	mg/kg	2,727	NA	61
Chromium	mg/kg	43,000,000	NA	37.9
Phenol	µg/kg	260,000	NA	330 U
Naphthalene	µg/kg	317,000	190,000	360 J
1-Methylnaphthalene	µg/kg	21,600	NA	880
Toluene	µg/kg	31,400	45,000,000	5.27 J
Ethylbenzene	µg/kg	28,100	21,000,000	239

Notes:
COC - constituent of concern
mg/kg - milligrams per kilogram
µg/kg - micrograms per kilogram
$^{GW}Soil_{Ing}$ PCL - TRRP Tier 2 soil to groundwater ingestion PCL approved in the 2014 Closure Plan.
$^{Air}Soil_{Inh-V}$ PCL - TRRP Tier 1 commercial/industrial PCL for inhalation of volatiles from soil.
NA - not applicable
U- Indicates the analyte was not detected above the laboratory Method Detection Limit.
J-Result is an estimated value between the Reporting Limit and the Method Detection Limit.

PART B.VI

1999 GEOLOGY REPORT

VI. GEOLOGY REPORT

CONTENTS

VI. GEOLOGY REPO1RT

CONTENTS (continued)

TABLES

FIGURES

FIGURES (continued)

APPENDICES

1.0 INTRODUCTION

1.1 BACKGROUND

LYONDELL-CITGO Refining LP(LCR) is located in Houston, Texas. Several hazardous waste management units (HWMUs) are present at the refinery. These units consist of the Northeast Landfarm, the Southwest Landfarm, the East Guard Basin, and the East Impoundment Basin. A closed hazardous waste management unit, the Biological Oxidation Basin, is also located at the refinery.

This report describes the geology and groundwater characteristics of the site on a regional basis and on a site-specific basis. The geologic setting of the land-based HWMUs is described for purposes of RCRA permitting. This report is organized in accordance with TNRCC Part B instructions for the required Geology Report

1.2 SITE DESCRIPTION

LCR's Houston Refinery is a 265,000 barrel per calendar day crude oil refinery located within the city limits of Houston, Harris County, Texas (Figure VI.-1). The 700-acre refinery site is located adjacent to the south side of the Houston Ship Channel just outside Loop 610. The site lies on the Coastal Prairie portion of the Gulf Coast Physiographic Province, which was originally characterized by tall grasslands and/or bottom land or mixed hardwood/pine forest. Surface sediments consist of Quaternary Beaumont Formation clays, silts and sands. Surface soils derived from the Beaumont Formation consist mainly of the Lake Charles Urban Soil Series.

Hazardous waste resulting from refining operations was landfarmed in the Northeast and Southwest Landfarms at the refinery. The Northeast Landfarm (NELF) consists of two units (plots 2 and 4) totaling approximately 3.22 acres and the Southwest Landfarm (SWLF) consists of five subunits (plots 612/614, 613, 615, 616, and 617) totaling approximately 13.83 acres. The

NELF is located to the south of the East Guard Basin and the East Impoundment Basin. Storage tanks border the NELF to the south, east, and west. The SWLF is located adjacent to the West Staging Building, a 90 day accumulation area. Storage tanks are located to the south and an inactive, capped, non-hazardous waste pile and Sims Bayou are located to the north of the SWLF. All of the plots used in both landfarm areas are enclosed by earthen dikes and graded to control run-on and run-off. Both landfarm areas historically contained product storage tanks.

Two stormwater detention basins, the East Guard Basin (EGB) and the East Impoundment Basin (EIB), are also permitted hazardous waste management units. The EGB and the EIB are active components of the watershed collection system serving the east side of the refinery. Both of these basins may have periodically received wastewaters considered hazardous according to the Toxicity Characteristic (TC) Rule for benzene prior to 1990. On March 29, 1994, these basins ceased receipt of hazardous waste and are now operating in non-hazardous waste service, in accordance with the delay of closure requirements of 40 CFR 264.113(d).

The EGB consists of a concrete structure which is approximately 210 feet wide, 450 feet long and 20 feet deep and has a capacity of approximately 19 acre-feet. The bottom of the basin is clay lined, and the basin is bordered by the EIB to the south. Inactive landfills lie to the west and north of the EGB, and to the east this basin adjoins a pipeline corridor along the refinery boundary.

The EIB consists of an earthen impoundment which holds approximately 63-acre-feet of stormwater prior to treatment in the wastewater system for the refinery. This impoundment lies directly south of the EGB and also adjoins the pipeline corridor along the refinery's eastern boundary. South of the impoundment lie the Sour Water Storage Tanks, and the Equalization Basin lies west of the impoundment.

The site is typical of upper Texas Coastal prairie/pineywoods, which are characterized by flat topography and heavily vegetated surfaces (both grassland and forest). Elevations range

from 25 to 10 feet above mean sea level (MSL), and the surface slopes gently to the northwest toward the Houston Ship Channel (Figure VI.-2). See Appendix VI.-A for an explanation of the datum used in this report.

Current land use in the site vicinity is associated with ship channel access to this area and consists of gas and oil refinement and storage of partially refined hydrocarbons. Neighboring facilities related to the channel include other petroleum and chemical refineries and several sewage disposal facilities (e.g. Crown Petroleum and Gulf Coast Sewage Disposal).

A. GEOLOGY AND TOPOGRAPHY

A.1 ACTIVE GEOLOGIC PROCESSES

Active regional geologic processes which may be applicable to the refinery and specific hazardous waste management units (HWMUs) are:

1. Growth faults and lineaments associated with local salt domes and generalized regional downwarping of the Gulf Coastal Plain;

2. Subsidence associated with groundwater withdrawal, oil and gas production from Salt Domes in the area, and coastal downwarping;

3. Natural erosional/depositional processes associated with area bayous and rivers and overland flow.

Geologic processes which are not applicable to the refinery include:

1. Shoreline erosion. The refinery is located on the Houston Ship Channel. In order to prevent any active shoreline erosion, the shoreline has been stabilized by sheet piling bulkhead or cement erosion deterent. In addition, these HWMUs are located in areas safely away from any shoreline erosion.

2. Channeling and gullying. The gentle surface gradient of this area (less than 0.002 ft/ft) prevents much of this type of potential erosion from occurring. Surface erosion on the refinery is prevented by vegetation or, where vegetation is lacking, by concrete and limestone rock. Sediment loss directly from the HWMUs is prevented by concrete sidewalls and containment or dikes.

3. Fluvial processes, such as meandering and undercut banks. The Houston Ship Channel, which borders the refinery, is periodically dredged and controlled by bank stabilization (e.g. concrete bulkheads and concrete rubble). These activities will continue throughout the life of the HWMUs. This drainage is not immediately adjacent to the HWMUs and pose no threat of meandering or undercutting.

A.1.a Growth Faults, Salt Dome and Coastal Downwarping

The following discussion was developed to address information requested in the TNRCC Part B application form. As the permitted units were in existence prior to the effective date of RCRA, the possible existence of faulting has no bearing on the siting of these units. In addition, pursuant to 40 CFR 270.14(b)(11)(i) and 40 CFR 264.18(a), the facility is not located in an area subject to the federal seismic location standard for new facilities (relating to faults having displacement in Holocene time).

According to a publication by the Bureau of Economic Geology of the University of Texas at Austin, Research Note 8, "Faulting and Land Subsidence from Ground-Water and Hydrocarbon Production Houston-Galveston, Texas" by Charles Kreitler (1978), tertiary sediments of the Texas Gulf Coast have been cut by many growth faults and by faults associated with shallow piercement and deep-seated salt domes. Many of the subsurface faults extend to land surface (either a Recent or Pleistocene surface). Most faults are either presently inactive, or the rate of movement is so slow that no obvious topographic fault escarpment has developed. The surficial evidence that these faults do extend to land surface is subtle, such as rectilinear drainage patterns which indicate structural control.

Kreitler (1978) states that the location of several streams and bayous in the Houston-Galveston area, such as Buffalo Bayou, Clear Creek, Highland Bayou, Dickinson Bayou, Brays Bayou, Cedar Bayou, Sims Bayou, and Greens Bayou, "appears" to be structurally controlled. These streams either are parallel to active faults and fault extrapolations or exhibit rectilinear drainage patterns indicating possible fault control (Figure VI.-3).

Kreitler presents a map (Figure VI.-3) which shows an extrapolated subsurface fault coincident with and parallel to sections of the Sims Bayou, which exists west and northwest of the refinery. Based on Kreitler's article, a suspected fault may exist in the vicinity of the refinery. However, no further research has been done to determine or dispute the existence of the

fault; there is no surficial expression of the supposed fault (historical or recent); and the suspected surface fault is merely an extrapolation of a subsurface fault, based on an arbitrarily decided dip angle.

In an effort to locate corroborating information concerning the exact location of the supposed fault along Sims Bayou, the following sources were consulted: Houston Public Library System, Rice University Library System, and the University of Houston Library System. Aside from the Kreitler 1978 reference, no other information was found. Geraghty & Miller personnel contacted the Houston-Galveston Coastal Subsidence District (HGCSD) via telephone to find other references for the supposed fault along Sims Bayou. Mr. Bud Holzschuh of the HGCSD said he had never heard of a "Sims Fault" and that he is not aware of any publication or detailed maps of area faults, and he suggested that Geraghty & Miller contact the United States Geological Society (USGS). Geraghty & Miller personnel contacted the USGS office in Houston, Texas via telephone and spoke to Mr. John Nobel. Mr. Nobel said that he is familiar with Mr. Kreitler's work, but is not aware of any other fault studies in the area of the Sims Bayou.

In addition, a review of twelve aerial photographs of the refinery, from the years 1965 to 1979, did not show any linear systems in any areas of the refinery. Therefore, based upon the information reviewed, no faults were found within 3000 feet of the facility that have had movement during the Holocene.

A.1.b Subsidence

Regional Subsidence. The withdrawal of large amounts of groundwater in the Houston-Galveston region, Texas, has resulted in water-level declines of as much as 250 feet (76 meters) in wells completed in the Chicot aquifer and as much as 300 feet (91 meters) in wells completed in the Evangeline aquifer during 1943-1977.

The declines in water levels have caused pronounced regional subsidence of the land surface. The center of regional subsidence is the Pasadena area, where more than 9 feet (2.7 meters) and possibly as much as 10 feet (3.0 meters) of subsidence occurred between 1906 and 1978 (Figure VI.-4). Almost 9 feet (2.7 meters) of subsidence occurred between 1943 and 1978. Localized centers of subsidence exist throughout the region, especially in the Baytown- LaPorte and Texas City areas.

Since late 1976, changes in pumping distribution resulting from efforts to control subsidence and the introduction of surface water from Lake Livingston have altered the pattern of water-level changes. In the Johnson Space Center and Baytown-LaPorte areas (Chicot aquifer), and in the Pasadena area (Evangeline aquifer), water levels rose about 20 feet (6.1 meters) during 1977-1983 (Figure VI.-5) (Garbrysch, 1982).

Subsidence in the Site Area. The area of greatest total subsidence occurred in the vicinity of the Houston Ship Channel between 1906 and 1978. Houston and industrial leadership saw the need to reduce pumpage, and in 1976, Trinity River water was delivered to Channel industries. Reduced pumping of groundwater by industry has decreased the subsidence rate dramatically.

The total subsidence at or near the refinery was about 7 feet from 1906 to 1973, an average of about 0.09 ft/yr (Figure VI.-4). Total subsidence from 1973 to 1978 was 0.75 feet (Figure VI.-5). Borehole extensometers have been placed in the Houston area in order to measure compaction (Figure VI.-6). The East End extensometer is located nearest to the refinery. Figure VI.-7 shows measured compaction in the Houston area from 1973 to 1978. When compared to other extensometer readings in the Houston area, the East End shows a relatively uniform compaction rate. Beginning late in 1978, compaction and subsidence have slowed. At the same time, water levels have increased in the area. These trends are expected to continue for both the Chicot and Evangeline aquifers and may eventually result in stabilization of subsidence in the area. Therefore, the potential for submergence beneath Gulf waters is very unlikely.

A.1.c Erosional Processes

Due to high annual rainfall (between 45" and 50") and constant tillage of the soil, the potential for wind erosion at the land treatment facility is negligible. Sediment which might erode directly from the site would be trapped by the dike that surrounds each unit. Sediment would have ample opportunity to drop out, making suspended sediment in run-off negligible. The region itself has a gradient of less than 2 percent, and each landfarm is carefully graded to ensure proper drainage.

A.2 REGIONAL PHYSIOGRAPHY AND TOPOGRAPHY

The LCR Houston Refinery lies within the Coastal Prairie portion of the Gulf Coast Physiographic Province of Texas. The Gulf Coast Physiographic Province is characterized by tall grasslands and/or bottom land or mixed hardwood/pine forest. The geology of the Texas Coastal portion of the Gulf Coast Physiographic Province is characterized by sediments deposited by fluvial and near-shore marine processes. Surface water bodies in the vicinity of the refinery are the San Jacinto River, Buffalo Bayou, Sims Bayou, and Vince Bayou.

A.2.a Surface Water Bodies

Harris County is located in the San Jacinto River Basin. The northern boundary of the LCR Refinery is on Buffalo Bayou (Houston Ship Channel), a tributary of the San Jacinto River. Buffalo Bayou joins with the San Jacinto River northwest of Burnett Bay. The San Jacinto River empties into Galveston Bay, which eventually joins with the Gulf of Mexico (Figure VI.-8). Sims Bayou runs parallel to the westernmost border of the refinery, and Vince Bayou runs parallel to the easternmost border. Both empty into Buffalo Bayou.

LCR has taken extensive precaution to ensure that the rainfall run-off which falls on the entire refinery, including the permitted HWMUs, stays on refinery property. All rain that falls on the east side of the refinery drains into the stormwater impoundment basins located on the

eastern portion of the refinery and all rain water which falls to the west of the divide is captured in the stormwater basins to the west.

The landfarms are carefully graded to drain toward the dike outlets which lead to the stormwater impoundments. Rainfall which is captured and drained to the impoundment basins is later sent to Gulf Coast Sewage Treatment Facility, where it is treated before being released under permit.

A.2.b **Site Topography** (includes information for A.2.b through A.2.e)

The topography surrounding the site is dominated by a gentle, almost flat surface slope of 5 to 10 feet per mile (0.002 to 0.001 ft/ft). Overall regional topographic gradients generally parallel the coastline and are very flat, averaging 0.001 ft/ft or less. A local surface gradient is created by the Houston Ship Channel and is, on the average, 0.002 ft/ft (Figure VI.-2).

The topography of all of the hazardous waste management units is generally flat (Figure VI.-2). Maximum and minimum elevations (feet MSL) and gradients (feet/foot) for each site are as follows:

Facility	Maximum Elevation	Minimum Elevation	Gradient
Northeast Landfarm	27	22	0.004
Southwest Landfarm	23	22	0.001
East Guard Basin	18	16	0.005
East Stormwater Impoundment Basin	27	22	0.008

Site drainage is to the east and to the west of the refinery divide. However, run-on and run-off are controlled on each side of the refinery.

A.3 REGIONAL GEOLOGY

A.3.a Surface Geology

The geology of the Texas Coastal portion of the Gulf Coast Physiographic Province is characterized by sediments deposited by fluvial and near-shore marine processes (Figure VI.-9). Surface sediments at the site are in the Beaumont Formation and are dominantly clay and mud of low permeability.

The sediments in the Texas Gulf Coastal zone were deposited by the same natural processes that are active in shaping the present coastline. The relic coastal system can be divided into three groups based on relative age: 1) natural systems that originated more than 30,000 years ago during the interglacial periods of the Pleistocene ice age; 2) natural Holocene systems that originated following the last glacial period of the Pleistocene period between 18,000 and 4,500 years ago; and, 3) natural systems (termed modern) that have been developed since about 4,500 years ago (Fisher, et al, 1972).

Figure VI.-10 shows a cross-section of the geologic and hydrologic units found in the vicinity of the site. Table VI.-1 provides a cross-correlation of geologic and hydrologic unit names commonly used in the region by county or district.

A.3.b General Stratigraphy

The major geologic formations within 2,200 feet of the surface, from oldest to youngest (and therefore bottom to top), are: 1) the upper Fleming Formation; 2) the Goliad Sand; 3) the Willis Sand; 4) the Lissie Formation; 5) the Beaumont Formation; 6) the Deweyville Formation; and 7) Barrier-Island and Alluvial deposits. Together, these formations comprise the Chicot and Evangeline aquifers, which are bounded by the Burkeville Aquiclude at a depth of 2,200 feet in the area of the refinery. The Evangeline is the lowermost unit containing fresh or slightly saline water in Harris County. It includes the Goliad Sand and sands in the upper portion of the Fleming Formation (Table VI.-1).

The Chicot aquifer includes all deposits above the Goliad--the Willis Sand, the Bentley and Montgomery Formations (here collectively referred to as the Lissie Formation), the Beaumont Clay, the Deweyville deposits and Holocene alluvium.

The physical basis for separation of the Chicot and Evangeline is the difference in lithology and permeability, but the delineation is often obscure locally. In general, the Chicot is more permeable and has a greater "formation factor" (ratio between aquifer resistivity and aquifer water resistivity). In the area of the refinery, the approximate elevation of the base of the Chicot is about 650 feet below MSL (i.e., 680' below surface).

The Upper Fleming Formation is bounded by the Burkeville Aquiclude, which is a massive clay blanket with thin interbeds of sand to silty sands. The Fleming is of Miocene age and consists of light gray to yellowish gray fine to coarse sand, silt and calcareous clay.

The Goliad Sand, considered by some to be of the same formation as the Willis Sand, overlies the Fleming and is thought to be of Pliocene age. The Goliad generally has a higher dip (40 feet per mile) than the Willis (10 feet per mile). Together with the Upper Fleming, the Goliad constitutes the Evangeline aquifer which reaches a thickness of about 1,600 feet in the area of the refinery.

The Willis Formation is a fluvial deposit consisting of clay, silt, and minor amounts of granule-to-pebble-size siliceous gravels. This formation is deeply weathered, lateritic (i.e., locally cemented by iron-oxide), and noncalcareous. The Willis Formation has a maximum thickness of about 75-100 feet.

The Lissie Formation is a Pleistocene-Age fluvial deposit which is divided into upper and lower units corresponding to the Montgomery and Bentley formations. It is referred to as the "Alta Loma Sand" by some authors (Table VI.-1). The "Lower Lissie" consists of clay, silt, sand

and minor amounts of gravel. This unit is noncalcareous and can be more than 1,000 feet thick. The "Upper Lissie" consists of clay, silt, sand and very minor amounts of granule-to-small-pebble-size siliceous gravels. This unit is locally calcareous, contains concretions of calcium carbonate, iron-oxide, and manganese oxide. The "Upper Lissie" can be more than 100 feet thick. The Lissie Formation, where exposed, exhibits little relief and is featureless.

The Beaumont Formation/Lake Charles Urban Soil Series consists mostly of clay and silt with some sand. It is composed of stream channel, point bar, natural levee, backswamp, and to a lesser extent, coastal marsh and mud flat deposits.

The landfarms are located upon soils associated with a portion of the Beaumont Formation which, in Harris County, is generally characterized by clays and muds of low permeability. The sediments have high water-holding capacity, high compressibility and high to very high shrink/swell potential. Drainage is slow because of nearly flat to depressed relief. Sediments have low shear strength and high plasticity. Geologic units include interdistributary muds, abandoned channel-fill muds and overbank fluvial muds. Lenses of sand from fluvially-reworked barrier islands and/or stream levees and distributary sands may also be locally present.

The strata in Harris County crop out roughly parallel to the coast and dip gently gulfward. The Beaumont Formation, exposed in the vicinity of the facility, was deposited during post-Sangamon Interglacial times and is at least 30,000 years old (Arnow, 1971). The Beaumont Formation consists of two units: a basal sand facies and an upper calcareous clay facies. The basal sand facies is 80 to 395 feet thick is medium to fine-grained, massive, and contains chert and limestone fragments. The upper calcareous clay is 400 to 1,500 feet thick, contains minor amounts of fine-grained sand lenses, some sandy clay, shell beds, and nodules of calcium carbonate. The Lake Charles Urban Soil Series was found to make up the majority of the soil which is present on the refinery. This soil is associated with and derived from the underlying Beaumont Formation.

The Deweyville Formation is predominately sand and silt with some clay and gravel and consists of point bar, natural levee, stream channel, and backswamp deposits. This formation can be up to 50 feet thick. Isolated areas of this formation are present near the San Jacinto River. No Deweyville deposits are known to be present on site.

The Barrier Island and Alluvial Deposits consist mostly of well-sorted, fine-grained sands with some silts and clays present in the barrier island deposits and point-bar, natural levee, stream channel, backswamp, coastal marsh, and (clayey) mud-flat deposits in alluvial materials. Barrier island deposits are not found in Harris County. Alluvial deposits are present on the north side of the Ship Channel, but are not present on the site.

The hydraulic conductivity of these formations is addressed in Section B.1 of the Geology Report.

A.4 SUBSURFACE SOILS INVESTIGATION REPORT

LCR has conducted subsurface investigations in accordance with workplans approved by the TNRCC. These subsurface investigations include the installation of soil borings and monitoring wells around each hazardous waste management unit. However, other data on the subsurface conditions have been collected in the areas of these units. These include:

- Assessment of Tract 6 Parcel 1 of the Northeast Landfarm (NELF, Plot 4)
- RCRA Facility Investigations at the EGB and EIB
- Previous geotechnical data for construction of the basins

These data are presented in this chapter to fulfill the requirements for this Part B application.

A.4.a Borings

Extensive subsurface investigations were conducted near each of the permitted hazardous waste management units. For the 65 acre northeast area of the refinery (which contains the EGB, the EIB, and the NELF) a total of 116 borings were completed to an average depth of 35 feet. For the southwest area of the refinery containing the SWLF, a total of 20 borings were completed to an average depth of 35 feet. The purpose of these borings was to:

1. explore general soil stratigraphy
2. identify the uppermost aquifer
3. collect soil samples for physical testing
4. define stratigraphy

All borings were completed using a truck-mounted rotary drilling rig with either a hollow stem auger or mud rotary drilling methods. Soil samples were collected continuously or at each 5-foot interval with a 3-inch Shelby Tube. Boring logs and the key to soil classifications are found in Appendix VI.-B. Boring locations are shown on Figures VI.-18 and VI.-25.

A.4.b Facility Cross-Sections

Five generalized cross-sections were prepared for the entire Houston Refinery. These cross-sections give a general model for the stratigraphy at the site (Figures VI.-13 through VI.-18). The datum used to prepare these cross-sections is the refinery plant datum. To obtain elevations in mean sea level, 8.2 feet must be subtracted from the elevations shown on these generalized cross-sections. Unit specific cross-sections were constructed as follows:

- East Guard Basin--Figures VI.-18 through VI.-22
- East Impoundment Basin--Figures VI.-18, VI.-21 through VI.-24

- Southwest Landfarm Area--Figures VI.-25 through VI.-29
- Northeast Landfarm Area--Figures VI.-30 through VI.-32

An additional cross-section was prepared for the northeast area of the refinery as follows:

- Area North of Basins—Figures VI.-18 and VI.-33

A.4.c Stratigraphic Descriptions

Area Geology

The majority of the soils at the surface of the refinery belong to the Lake Charles Urban Soil Series. These surface soils have high water-holding capacity, high compressibility and high to very high shrink/swell potential. Surface drainage is slow because of nearly flat or depressed relief. These soils have low shear strength and high plasticity. The thickness of these soils at the refinery range between 0 and 3 feet with an average thickness of 2 feet.

Most of the remaining surface soils at the refinery are fill material. This fill material ranges in depth from 0 to 40 feet. The fill material at the refinery can be grouped into 5 categories based on composition:

- construction debris consisting of concrete rubble, bricks, metal, and lumber;
- dredge material consisting of clays taken from the ship channel and placed hydraulically or hauled by truck to the fill areas;
- clayey material which consists of clay or clay mixed with shell or sand;
- sandy material in which sand is the major constituent; and
- industrial material composed of coke, slag, and cinders.

Fill material averages 2 to 4 feet across much of the refinery and includes surface soils of the Lake Charles Urban Soil Series. The thickest areas of fill material occur near Solid Waste Management Units (SWMUs) 7 and 9 and northeast of C-1. Topographic depressions which existed in 1918 coincide with areas where thicker fill material occurs.

Area Hydrogeology

At the refinery two main water-bearing strata exist: an upper unit and a lower unit. The depth of the upper water-bearing strata varies from 25 to 40 feet below the land surface (elevation of 0 to -15 feet mean sea level). The upper water-bearing strata is composed of a silty to fine sand layer that is continuous over a large portion of the refinery as shown on Figures VI.-13 through VI.-18. However, in the northeast portion of the refinery, the upper water-bearing strata appears to be discontinuous and consists of small lenses of sands, silty sands, and sandy silts.

The lower water-bearing strata is more continuous than the upper unit beneath the refinery as shown on Figures VI.-13 through VI.-18. Therefore, as issued in the original Part B Permit, the lower water-bearing strata has been defined as the uppermost aquifer in the area of the NELF. The lower water-bearing strata beneath the refinery is composed of a fine sand that grades into a sandy silt. This unit lies at a depth of 40 to 70 feet below the land surface (elevation of -15 to -45 feet of mean sea level).

Northeast Landfarm. Based on the logs of borings within 200 feet of the NELF, from the land surface to a known depth of 100 feet below the land surface of the unit, the following eight major soil strata have been identified.

1. A relatively impermeable surface clay unit ranging from 10 to 15 feet thick. The unit has a lab permeability of 10^{-8} cm/sec.

2. A diverse unit, consisting of a tan and gray silty clay to a red and gray clay with small discontinuous lenses of sand. The unit has a thickness of 15 feet and is found between 15 to 30 feet from the surface.

3. A gray and tan sandy to silty clay unit at a depth of 25 to 25 feet. The unit has a lab permeability of 10^{-7} cm/sec and a thickness of 10 feet.

4. A red and gray clay unit which becomes more silty toward the base. The base of this unit has an average lab permeability of 10^{-7} cm/sec. The thickness of the unit is 15 feet.

5. A hard red clay unit with lab permeability of 10^{-8} cm/sec. The unit is 20 feet thick and is found at depths from 45 to 65 feet.

6. A continuous 5-foot thick red clayey silt to sandy silt water bearing unit with a lab permeability of 10^{-5} cm/sec. This unit has been defined by the original Part B Permit as the uppermost aquifer.

7. A hard red clay unit with a lab permeability of 10^{-7} cm/sec and a thickness of 15 feet. This unit is found between 80 to 90 feet below ground surface.

8. A tan and gray clay unit with a lab permeability of 10^{-7} cm/sec.

The saturated zone consisting of lenticular sandy lenses that was found between 10 and 25 feet below ground surface was determined not to be continuous. No continuous shallow sand or silt unit was found. A five foot sand lense was found and screened at the southern end of the site. However, this unit quickly pinches out. This lens is screened by GMW-28 at the northernmost end of the Northeast Land Treatment Facility. GMW-27, also at the northernmost end of the site, screens a clay with silt partings. The amount of low permeability (10^{-7} to 10^{-8} cm/sec) clay below the surface of the site (at least 40 feet below the saturated zone) makes this site ideally suited for a Land Treatment Facility.

East Guard Basin. Based on the logs of borings within 200 feet of the EGB, the following four major soil strata have been identified from the land surface to a known depth of 55 feet below the land surface of the unit:

1. Fill composed of black to tan clay, silty sand, construction debris, and some industrial material ranging between 0 to 18 feet in thickness;

2. A red to gray sandy and silty clay unit up to 25 feet in thickness with lenses of sandy silt;

3. Fine sand that grades into silt and varies in thickness between 3 to 10 feet;

4. Gray sandy clay which grades into a red clay and is in excess of 14 feet in thickness.

At the EGB, a silty to clayey sand exists at approximately 20 feet below land surface. Monitoring wells at the EGB are completed in this sand unit. This sand unit is considered the uppermost aquifer for this unit. This aquifer thickens to the north and pinches to the south. The western end of the bottom of the basin appears to be in hydraulic connection with the uppermost aquifer.

East Impoundment Basin. Based on the logs of borings within 200 feet of the EIB, from the land surface to a known depth of 110 feet below the unit, the following five major soil strata have been identified:

1. Fill composed of black to tan clay with shell fragments, medium sand and gravel, tan silty sand and construction debris ranging between 0 to 6 feet in thickness;

2. A red to gray sandy and silty clay unit up to 25 feet in thickness with discontinuous lenses of sandy silt;

3. Gray and red hard clay with minor sandy clay lenses up to 75 feet;

4. Sandy silt unit up to 5 feet or more in thickness.

5. Gray hard clay up to 25 feet or more in thickness.

At the EIB, a fine sand exists at approximately 17 feet below land surface. Monitoring wells at the EIB are screened in this sand unit, which forms the uppermost aquifer for the basin. A second sandy silt unit at approximately 60 feet below land surface is considered to be part of

the lower water-bearing strata at this unit. The EIB is an above-grade basin and is underlain by native soils. The bottom of the basin may be hydraulically connected to discontinuous, silty sand lenses in the native clay unit; however the basin is not hydraulically connected to the uppermost aquifer.

The permeability of the clays encountered at these basins ranges from 10^{-7} to 10^{-11} cm/sec based on data collected in borings advanced for the wells monitoring the basins (GMW-60 through GMW-66) (Table VI.-2 [Application Table VI.A.4]).

The stratigraphic thickness of low permeability (10^{-7} to 10^{-11} cm/sec) clays below the surface of the northeast area of the refinery (at least 40 feet below the water-bearing zone) and the discontinuous lenses of silty sand makes this area suited for the basins and the NELF. However, previous land use makes groundwater difficult to monitor because hydrocarbons are present in the fill due to the general historical background of the site. The low permeability soils underlying the northeast area of the refinery generally prohibit movement of these old hydrocarbons.

SWLF Area. Based on the logs of borings within approximately 200 feet of the SWLF, the following four major soil strata have been identified from the land surface to a known depth of 35 feet below ground surface at the unit:

1. Stiff black to gray, tan and red clay unit up to 25 feet in thickness
2. Red to gray silty clay up to 9 feet in thickness
3. Tan, fine-grained silty sand ranging from 9.5 to 16.0 feet in thickness, with red to gray clayey silt to silty clay lenses;
4. Tan to gray sandy clay unit which grades into a red sandy clay and is known to be at least 11 feet in thickness.

A saturated zone consisting of silty sand was found between 15 and 30 feet below ground surface. This constitutes the upper water-bearing strata. Although the unit has some clay lenses, the silty sand is continuous and hydraulically connected through a large portion of the refinery.

The stratigraphic thickness of low permeability (10^{-7} to 10^{-8} cm/sec) clay separating the silty sand from the surface of the site (ranging from 15 to 30 feet thick above silty sand) makes this area suited for the SWLF.

A.4.d Geotechnical Properties of the Subsurface Soils

Laboratory physical tests have been completed for all the major strata encountered during field investigations at the hazardous waste treatment units. The following is a list of the physical tests performed and the corresponding ASTM standards:

Test	ASTM Standard
Liquid Limit	D 423-66 (1972)
Plastic Limit and Plasticity Index	D 424-59 (1971)
Definition of Terms and Symbols	D 653-81
Percent Passing No. 200	D 1140-54
Unconfined Compression	D 2166-66 (1979)
Moisture Content	D 2216-80
Description and Classification of Soils	D 2487 & 2488-69 (1975)
Falling Head Permeability	Suggested Method
Specific Gravity	Values Assumed
Void Ratio	Values Calculated
Porosity	Values Calculated
Degree of Saturation	Values Calculated

The results are summarized in Tables VI.-2 (Application Table VI.A.4) and VI.-3 and the Unified Soil Classification is provided in Appendix B. The coefficient of permeability "K_{20}"

presented in Table VI.-2 (Application Table V1.A.4) has been corrected to 20 degrees C. All laboratory results are summarized by strata in Table VI.-3.

A.4.e Surficial Soils at Land Treatment Units

As previously mentioned, the soil in both landfarm areas is from the Lake Charles (Urban complex) series which consists of deep, nearly level to gently sloping, neutral to mildly alkaline clays. When dry, the profile is characterized by deep, wide shrinkage cracks, intersecting slickensides, and blocky structure. The soils are naturally poorly drained, surface run-off is slow to medium, and permeability is very slow. The natural color of the soil is dark gray to grayish olive green; however, land treatment operations have altered the natural color in surface soils to a degree in some areas.

Northeast Landfarm

Extensive soil coring has been completed near and within both the NELF and SWLF areas. Six soil horizons have been identified in the vicinity of the NELF. Each horizon varies in extent and thickness and may not be present in all locations. A generalized soil profile representative of the NELF is described below. The information has been summarized from the Soil Pore Liquid Monitoring System Installation Report, previously submitted to the TNRCC.

A1 0-85 in. from surface, up to 32 in. thick, gray clay and silty clay with some yellowish brown mottling, angular blocky structure, firm to very firm, very hard, plastic, may contain slickensides, fine to coarse roots, and calcareous and iron-manganese nodules.

Ap 15-48 in. from surface, up to 9 in. thick, gray and brown clay and silty clay, angular blocky structure, firm to very firm, very hard to extremely hard, plastic, may contain slickensides, fine to coarse roots, and iron-manganese nodules.

A2 23-85 in. from surface, up to 32 in. thick, gray and brown clay and silty clay, angular blocky structure, very firm, very hard, may contain iron-manganese nodules.

AC1 36-72 in. from surface, up to 30 in. thick, gray and brown clay and silty clay with some yellowish brown mottling, angular blocky structure, firm to very firm, hard to extremely hard, may contain slickensides, iron-manganese and calcareous nodules, and fine roots.

AC2 56-73 in. from surface, up to 14 in. thick, grayish brown clay with yellowish brown mottling, angular blocky structure, firm to very firm, hard to very hard, may contain slickensides.

C 60-120 in. from surface, up to 30 in. thick, gray and brown clay and silty clay with gray and yellowish brown mottling, firm to very firm, hard to very hard, plastic, may contain slickensides, sand lenses, and calcareous and iron-manganese nodules.

Cores recovered in the vicinity of the NELF have also been identified as containing fill material. A description of the fill material is provided below:

Fill 0-53 in. from surface, up to 53 in. thick, gray and brown clay and silty clay, angular to sub-angular blocky structure, firm to very firm, plastic, may contain calcareous nodules, fine and coarse roots, and sand lenses.

Southwest Landfarm

Eight soil horizons have been identified in the vicinity of the SWLF. Each horizon varies in extent and thickness, and may not be present in all locations. A generalized soil profile representative of the SWLF is described below. Again, this information is summarized from reports previously submitted to the TNRCC.

Ap 0-7 in. from surface, up to 7 in. thick, gray clay, angular blocky structure, very firm, very hard, may contain fine to medium roots.

A1 (buried) 6-70 in. from surface, up to 22 in. thick, gray clay, angular blocky structure, very firm, very hard, may contain fine to medium roots.

A2 16-70 in. from surface, up to 22 in. thick, gray clay and silty clay with brown mottling, angular blocky structure, very firm, very hard, may contain slickensides, gypsum nodules, and fine to medium roots.

A3 36-59 in. from surface, up to 17 in. thick, gray and brown clay with brown mottling, angular blocky structure, very firm, very hard, may contain slickensides, and fine roots.

AC1 38-96 in. from surface, up to 18 in. thick, gray and brown clay and silty clay, angular blocky structure, very firm, very hard, may contain slickensides, gypsum nodules, and fine roots.

AC2 55-105 in. from surface, up to 25 in. thick, gray and brown clay and silty clay with gray and brown mottling, very firm, very hard, may contain slickensides, fine roots, and gypsum and iron-manganese nodules.

AC3 68-84 in. from surface, up to 16 in. thick, yellow brown clay with pink and gray mottling, angular blocky structure, very firm, very hard, may contain gypsum nodules.

C 59-115 in. from surface, up to 28 in. thick, brown clay and silty clay with gray mottling, massive, very firm, very hard, may contain slickensides and gypsum nodules.

Cores recovered in the vicinity of the SWLF have also been identified as containing fill material. A description of the fill material is provided below:

Fill 23-45 in. from surface, up to 22 in. thick, brown and gray clay, massive, very firm to extremely firm, very hard to extremely hard, may contain gravel.

B. FACILITY GROUNDWATER

B.1 REGIONAL AQUIFERS

B.1.a Aquifer Names

The Chicot aquifer is composed of the Willis Sand, Bentley Formation, Montgomery Formation, Beaumont Clay, and Quaternary alluvium (Table VI.-1). The Chicot includes all deposits from the land surface to the top of the Evangeline aquifer (Figure VI.-33).

The Burkeville confining layer underlies the Evangeline aquifer. This confining layer correlates with the upper part of the Fleming Formation of Tertiary age.

B.1.b Description of Constituent Material

The basis for separating the Chicot aquifer from the underlying Evangeline aquifer is primarily a difference in hydraulic conductivity, which in part causes the difference in the levels of the potentiometric surfaces in the two aquifers.

In most of the Houston district, the Chicot aquifer consists of discontinuous layers of sand and clay of about equal total thickness. In some parts of the district, the aquifer can be separated into an upper and lower unit. Throughout most of Galveston County and southeast Harris County, the basal part of the lower Chicot aquifer is formed by a massive sand section with high hydraulic conductivity. This sand unit, which is heavily pumped, is known locally as the Alta Loma Sand. The term Alta Loma Sand is not often used in this report because the stratigraphic relationships are not clear.

If the upper unit of the Chicot aquifer cannot be defined in a particular area, the aquifer is said to be undifferentiated. The areal extent of the upper unit roughly corresponds to the areal

extent of the Beaumont Clay. The areas in which the aquifer cannot be differentiated into units are mostly in the northern part of the district.

The Evangeline aquifer, which is the most important source of fresh groundwater in the Houston metropolitan area, consists of layers of sand and clay that are present throughout the district except where the unit is pierced by salt domes (Figure VI.-34). The aquifer is underlain at a depth of about 2500 feet near the LCR facility by the Burkeville confining layer, which is composed of mostly clay but contains some layers of sand.

B.1.c Description of Water-Bearing and Transmitting Properties

Wells that are completed in the uppermost sand layers of the Chicot aquifer and that have water levels that are distinctly higher than water levels in wells completed in the underlying sand layers are considered to produce water from the upper unit.

The transmissivity of the Chicot aquifer ranges from zero to about 20,000 ft^2/day or 1,858 m^2day. The storage coefficient ranges from 0.0004 to 0.20 (Figure VI.-35). The larger values of the storage coefficient occur in the northern part of the district where the aquifer is partly or totally under water table conditions.

The transmissivity of the Evangeline aquifer ranges from less than 5,000 ft^2/day (460 m^2/day) to about 15,000 ft^2/day (1,400 m^2/day) (Figure VI.-36). In general, the horizontal hydraulic conductivity of the Evangeline aquifer is less than the horizontal hydraulic conductivity of the Chicot aquifer, but because the Evangeline is generally thicker than the Chicot, it is generally more transmissive.

The storage coefficient of the Evangeline ranges from about 0.0005 to 0.0002 where it occurs under artesian conditions. In the outcrop area, where the aquifer is under water table conditions, the storage coefficient ranges from greater than 0.002 to 0.20.

The Burkeville restricts the flow of water except where it is pierced by salt domes and in the northeastern part of the district where it contains many water-yielding sand layers. The Burkesville is underlain by the Jasper aquifer.

B.1.d Aquifer Potentiometric Conditions

All of the major aquifer units in the refinery area are generally under artesian conditions. (However, water levels have been depressed below the top of the aquifers in areas of heavy pumping). Near the refinery, only the shallowest zones of perched water or saturated soils are under water table conditions. The relationships between the water level of the shallowest water-bearing zone and the underlying lower water-bearing zones is discussed further in Section B.2 of this report.

B.1.e Hydraulic Connections

The basis for separating the Chicot aquifer from the underlying Evangeline aquifer is primarily a difference in hydraulic conductivity. In the Houston area, evidence of vertical leakage and clay compaction is documented (Jorgensen, 1975). The analysis indicated that the leakage occurred in the part of the aquifer between ground level and the center line of the lower unit of the Chicot (depth 250 feet). The effective vertical hydraulic conductivity between the ground level and the center line is 0.00065 ft/day (Jorgensen, 1975). This implies some hydraulic conductivity exists. However, migration is extremely slow and groundwater quality would not be affected by land treatment activities.

B.1.f Potentiometric Surface of Aquifers

Figure VI.-37 shows the regional potentiometric surface of the Chicot Aquifer. Figure VI.-38 shows the regional potentiometric surface of the Evangeline Aquifer.

B.1.g Rate of Groundwater Flow

Rates of groundwater flow within the Evangeline and Chicot aquifers have been calculated from Darcy's Law using the mean aquifer permeability given by Wesselman (1971) and the gradients as defined from the Spring 1984 groundwater potentiometric level maps by Ranzau (1984). Darcy's Law can be stated as follows:

$$v = ki/n_e$$

where
v = groundwater flow velocity, (ft/yr)
k = permeability, (ft/yr)
i = regional gradient, (ft/ft)
n_e = effective porosity, (dimensionless)

Assuming an average permeability of about 500 and 300 gpd per square foot, respectively, for the Chicot and Evangeline aquifers, the estimated direction and rates of travel are:

Upper Unit of the Chicot:	600 feet per year to the south
Lower Unit of the Chicot:	111 feet per year to the west, southwest
Evangeline:	85 feet per year to the west, southwest

The rates of flow in the Lower Chicot and Evangeline may decrease as groundwater levels continue to recover in the Pasadena-Baytown area. Moreover, the direction of flow may change since the primary cones of depression are expected to shift from the Pasadena area to west Houston, approximately 15 miles away.

B.1.h Water Quality

In general, groundwater of good chemical quality can be obtained in most areas of the Houston district. However, deterioration in water quality has been noted in samples from a few wells near the freshwater-saltwater interface in both Harris and Galveston Counties. The

increase in the concentrations of chemical constituents is probably a result of updip migration of the saltwater. Water that was more highly mineralized than was expected was pumped from shallow wells, less than 100 feet (30 m) deep, in the vicinity of the Houston Ship Channel. Jorgensen (1975) concluded that the source of the highly mineralized water was the Ship Channel.

The typical water quality data as reported by Gabrysch (1974) for wells within a few miles of the site are summarized in Table VI.-4. Generally, the water from the Chicot and Evangeline aquifers is soft (hardness less than 120 mg/l), total dissolved solids are typically about 400 to 800 mg/l, and silica content is relatively high (about 20 mg/l). The predominate ionic species are sodium, bicarbonate and chloride.

B.1.i Aquifer Recharge

The principal source of fresh groundwater in the Chicot and Evangeline aquifers is infiltration of rainwater to the zone of saturation where the aquifer sands outcrop north of the site. While some downward leakage through the Beaumont Formation may occur in some areas, the presence of an upward vertical gradient in the vicinity of the site suggests that any leakage is upward from the upper unit of the Chicot to the surficial water table.

The locations of recharge areas from the Chicot and Evangeline aquifers have recently been evaluated by Gabrysch (1977). They are located 7 to 60 miles north of the refinery. The closest recharge area is north Houston (Figure VI-39).

B.1.j Present Use

The Pasadena area of the Houston Water District is east of the Houston area and mostly south and west of the San Jacinto River (Figure VI.-40), and includes a heavily industrialized zone along the Houston Ship Channel. Large groundwater withdrawals began in the Pasadena area after 1937.

The principal use of water in the Pasadena area is industrial. Of about 190 million gpd (8.3 m^3/s) of both surface water and ground- water used in 1974 for all purposes, 174.7 million gpd (7.7 m^3/s) was for industrial use.

The use of surface water in the Pasadena area has increased, and the use of groundwater has decreased. In 1970, the use of surface water from Lake Houston was 74.4 million gpd (3.3 m^3/s), while groundwater pumping was 121.2 million gpd (5.3 m^3/s). In 1974, the use of surface water was 77.7 million gpd (3.4 m^3/s), which was an increase of about 4 percent; groundwater pumping was 112.3 million pd (4.9 m^3/s), or a decrease of about 7 percent. The decrease (about 9 percent) in water usage for industrial purpose was probably due to recycling of available supplies (Jorgensen, 1975).

For the Pasadena area in which the LCR refinery is located, water levels were monitored over a period of years to determine increases and decreases in the major aquifers. The water level in well LJ-65-23-220 located in Pasadena, declined about 25 feet (8 m) between 1965 and 1968, remained almost constant between 1968 and 1972, declined about 10 feet (3.0 m) in 1972, and has remained almost constant from 1972 to 1976. The water level in well LJ-65-23-219, completed in the upper part of the Evangeline aquifer, has a similar pattern. The water level declined about 50 feet (15 m) from 1965 to 1976, declined about 5 feet (1.5 m) between 1967 and 1971, declined about 33 feet (10 m) between 1971 and 1973, and remained almost constant between 1973 and 1976.

A hydrograph was prepared for well LJ-65-23-805, which is screened in a single sand unit in the Evangeline aquifer. Although there is no groundwater development near this well, the effects of pumping elsewhere in the area are reflected in the water levels. The rate of decline as shown by the hydrograph was 10.4 feet (3.2 m) per year from 1961 to 1969, 6.2 feet (1.9 m) per year from 1969 to 1971, and 3.2 feet (1.0 m) per year from 1971 to 1976 (Jorgensen, 1975).

A decrease in the rate of decline in water levels in the late 1960's and early 1970's reflects the decrease in groundwater pumping in the Pasadena area. Figures VI.-41 and VI.-42 show approximate water level changes in the Chicot and Evangeline aquifer from 1977-1984.

Water levels in wells completed in the Chicot aquifer near the refinery increased as much as 40 feet between 1977 and 1984, while the water levels in wells in the Evangeline aquifer increased as much as 60 feet. The corresponding average rates of recovery in the Chicot and Evangeline aquifers in the refinery area for 1977 to 1984 were about 8 feet per year and about 2 feet per year, respectively.

The Houston District continues to rely heavily on groundwater because greater amounts of fresh water are available. While average daily production of groundwater in the Baytown-LaPorte area has decreased from 26.1 mgd in 1975 to 14.4 mgd in 1979, production for public supply purposes has increased from 8.5 to 10.6 mgd during the same period (Gabrysch, 1980).

Total production in Harris County decreased from 479 mgd in 1975 to 438 mgd in 1979 (Gabrysch, 1980). Total production in both Harris and Galveston Counties has been reduced to 361 mgd in 1983 (Harris-Galveston Counties has been reduced to 361 mgd in 1983 (Harris-Galveston Coastal Subsidence District, 1984)).

Table VI.-5 lists all known water wells within one mile of the refinery. Their approximate locations are shown on Figure VI.-43. Most of these wells that have not been abandoned or destroyed are used for industrial water supply.

B.2 GROUNDWATER CONDITIONS FOR LAND-BASED UNITS

Groundwater data have been compiled from investigations completed for each of the hazardous waste management units.

Northeast Refinery Area (Including the NELF, EIB, and EGB)

The description of the groundwater regime in the area of the basins and the NELF is based on 22 borings and 19 monitor wells (Table VI.-6) placed in the first and second water-bearing zone existing around the NELF, the EIB, and the EGB, over a period of time from 1984 to 1994. The locations of the borings and monitor wells are shown on Figures VI.-11 and VI.-12.

Details of well construction for the designated detection monitoring wells are listed in Table VI.-7 (Application Table VI.B.3.b). Boring logs and well construction logs for all of the borings and wells listed in Table VI.-6 are included in Appendix VI.-B.

Southwest Landfarm

The description of the groundwater regime for the SWLF is based on 7 borings and 10 monitoring wells (Table VI.-8) placed in the first water-bearing zone, over a period of time from 1981 to 1988. The locations of the borings and monitor wells are shown on Figures VI.-.25 and VI.-27.

Details of well construction for the designated detection monitoring wells are listed in Table VI.-7 (Application Table VI.B.3.b). Boring logs and well construction logs for all of the borings and wells listed in Table VI.-8 are included in Appendix VI.-B.

B.2.a **Water Levels** (includes information for B.2.b)

Northeast Area of Refinery

Water level measurements (Appendix VI.-C) have been obtained for a number of years from wells completed at the Northeast area of the refinery in the first water-bearing saturated zone (beginning depth 13 to 20 feet). Most of the RCRA groundwater monitoring wells for the

NELF and those at the other hazardous waste management units in this area are screened in the first water-bearing zone. After the initial groundwater monitoring system was installed at the NELF, a second subsurface investigation confirmed that this upper water-bearing zone is underlain by a second water-bearing zone at a depth of 75 to 85 feet deep. This lower water-bearing zone consists of a continuous sand and silty sand stratum. Because of the discontinuous nature of the upper water-bearing zone in the vicinity of the NELF, the remainder of the RCRA monitoring wells at the NELF are screened in the second, lower water-bearing zone (which was designated as the uppermost aquifer in the original Part B Permit).

The shallow zone, screened by the original 20-series monitoring wells, at the NELF is composed of discontinuous silty, sandy lenses, under semi-confined conditions. The water level contour map (Figure VI.-44) shows that the overall direction of groundwater flow is to the west-northwest. Although this contour map was generated in the mid 1980s, data collected over time from the northeast refinery area support a general gradient in this area of the facility to the north-northwest. However, it was impossible to define a continuous upper transmissive zone within the upper first water-bearing zone, and the original 20-series wells were set in the available sand or silty lenses within the upper water-bearing zone. Therefore, in the late 1980s, the 40-series wells were installed in the second water-bearing unit, at approximately 75 to 85 feet below land surface. Because the second water-bearing zone is a laterally continuous unit, it was designated as the uppermost aquifer for the NELF in the original Part B Permit. Consequent differences in lithology between the 20-series wells and the later 40-series wells may explain the difference in gradient from west-northwest to north-northeast.

Southwest Area of Refinery

As with the Northeast area of the refinery, water level measurements (Appendix VI.-C) have been obtained for a number of years from wells completed at the Southwest area of the refinery in the uppermost aquifer (beginning depth of 15 to 25 feet). RCRA monitoring wells are not completed in the second water-bearing zone in this area.

The shallow zone screened by wells at the SWLF is under semi-confined conditions. The water level contour map (Figure VI.-45) shows that the overall direction of groundwater flow is to the north-northwest. Although this contour map was generated in the mid 1980s, data over time supports a general gradient in this area of the facility to the north-northwest.

B.2.c Upper and Lower Limits of Aquifers

Figures VI.-46 and VI.-47 show the top of the upper water-bearing strata and the top of the lower water-bearing strata, respectively.

B.2.d Potentiometric Surface Maps

Potentiometric surface maps of the SWLF, NELF, the EGB, and the EIB constructed from data collected from 1994 through 1996 are presented as Figures VI.-48 through VI.-58. The water level data used to construct the potentiometric surface maps was obtained either as part of the detection monitoring program (SWLF and NELF) or as part of the RCRA Facility Investigation (EGB and EIB).

The upper water-bearing strata is composed of a silty to fine sand layer that is continuous over a large portion of the refinery as shown on Figures VI.-13 through VI.-18. However, in the vicinity of the NELF, the upper water-bearing strata appears to be discontinuous and consists of small lenses of sands, silty sands, and sandy silts. The lower water-bearing strata (a fine sand that grades into a sandy silt) is more continuous than the upper unit beneath the refinery as shown on Figures VI.-13 through VI.-18. Therefore, the upper water-bearing zone is the designated uppermost aquifer for the SWLF, EGB, and EIB; however, as issued in the original Part B Permit, the lower water-bearing strata has been defined as the uppermost aquifer in the area of the NELF.

As shown in Figures VI.-48 through VI.-58, the general direction of groundwater flow at each of the HWMUs is to the north-northwest, toward the Houston Ship Channel. Figure VI.-59 shows a facility-wide potentiometric surface map for groundwater level data collected in April 1996, and the proposed facility, perimeter monitoring system. A notable exception to the predominant north-northwest groundwater flow direction occurs at the EGB. Figures VI.-58 and VI.-59 show a groundwater trough along the northern edge of the EGB, where groundwater infiltrates the basin when the water level in this below-grade unit is lower than the potentiometric elevation of the groundwater. Because the potentiometric elevation of the groundwater is greater than that of the water within the EGB a majority of the time (greater than 90% of the time, based on basin water storage procedures), a progressive release from the basin to the environment is not possible. Any water that infiltrates to groundwater from the basin will be returned to the basin when the pressure gradients reverse.

The average groundwater flow velocities for each of the units varies from approximately 20 ft/year to 167 ft/year (Table VI.-9).

B.2.e Hydraulic Gradients

Since 1984, numerous in-situ hydraulic conductivity tests have been performed on monitoring wells selected by LCR personnel, as part of assessment activities. The results of the study show that the hydraulic conductivities vary across the refinery, because of the variability of the depositional sequences over the site. Using the hydraulic conductivity data gathered from the in-situ hydraulic conductivity tests, and assuming an effective porosity for the water-bearing unit, maximum, minimum, and average groundwater flow velocities were calculated as described below and in Table VI.-9.

Based on water level data recorded in November 1994, in the wells at the EGB, the average hydraulic gradient was 0.0145 feet/foot. Using an average hydraulic conductivity of 1.83×10^{-3} cm/sec, and using an assumed porosity of 35 percent, the horizontal groundwater flow velocity in

the area is approximately 7.58 x 10^{-5} cm/sec (0.215 feet/day or 78.44 feet/year). In August 1996, the average horizontal groundwater flow velocity was calculated in the shallow aquifer in the vicinity of the EGB to be 0.0053 feet/day (1.93 feet/year).

Based on water level data recorded in November 1994, in the wells at the EIB, the average hydraulic gradient was 0.0120 feet/foot. Using an average hydraulic conductivity of 5.87 x 10^{-4} cm/sec, and using an assumed porosity of 35 percent, the horizontal groundwater flow velocity in the area of the basin is approximately 2.01 x 10^{-5} cm/sec (0.057 feet/day or 20.82 feet/year). In August 1996, the average groundwater flow velocity was calculated in the shallow aquifer in the vicinity of the EIB to be 0.0053 feet/day (1.93 feet/year).

Based on water level data recorded in August 1996, in wells around the NELF, the average gradient of the shallow aquifer was 0.0120 feet/foot. Using a hydraulic conductivity of 5.83 x 10^{-5} cm/sec, and using an assumed porosity of 35 percent, the groundwater flow velocity in the shallow aquifer is approximately 1.87 x 10^{-6} cm/sec (5.30 x 10^{-3} feet/day or 1.935 feet/year). The average gradient of the deeper aquifer was 0.0004 feet/foot. Using a hydraulic conductivity of 4.34 x 10^{-4} cm/sec, and using an assumed porosity of 35 percent, the groundwater flow velocity in the deeper aquifer is approximately 7.06 x 10^{-8} cm/sec (2.00 x 10^{-4} feet/day or 7.3 x 10^{-2} feet/year).

Based on water level data recorded in August 1994, in wells around the SWLF and the adjacent WSB, the average gradient was 0.0028 feet/foot. Using a hydraulic conductivity of 1.02 x 10^{-4} cm/sec, and using an assumed porosity of 35 percent, the groundwater flow velocity in the area is approximately 8.16 x 10^{-7} cm/sec (2.31 x 10^{-3} feet/day or 0.844 feet/year). In August 1996, the average groundwater flow velocity was measured in the vicinity of the SWLF and the WSB to be 4.70 x 10^{-6} cm/sec (1.13 x 10^{-2} feet/day or 4.125 feet/year).

Vertical gradient calculations were made for the refinery site using GMW-29 and U.S.G.S. Well #65-23-238 (Gabrysch, 1979). The gradient of 0.16 is downward from the shallow monitoring zone at a velocity of 0.008 ft/yr.

When maximum horizontal velocities (14 ft/yr) are compared with vertical velocities (.008/ft/yr), it can be seen that the horizontal flow component is much greater than the vertical. Typically, horizontal flow in this shallow region (depth 10-25 feet) is relatively slow (2 ft/yr) when compared to the horizontal velocities of 111 to 600 feet per year found in the deeper Chicot and Evangeline Aquifers.

B.2.f Potential Migration Pathway

In the event that constituent migration would occur, affected groundwater would move at a slow rate towards the Houston Ship Channel (maximum of 2 ft/yr) in the upper water-bearing zone. Constituents reaching the uppermost aquifer would probably follow this same path. At this rate of movement, detection of ground- water constituents by the proposed well monitoring system would occur before any constituents reaches the Ship Channel. In the event that constituents would appear in the groundwater monitoring network, appropriate actions would be taken.

The regional geology, topography and physiographic setting associated with the landfarms and the basins are suitable for a hazardous waste storage and treatment units. The proximity of the basins to the Ship Channel and the prevailing groundwater gradients are such that any constituent migration can be readily controlled without significant impact to public health or the environment. In summary, the SWLF, NELF, EGB, and EIB are suitable for hazardous waste storage and treatment.

B.3 DETECTION MONITORING SYSTEM

The existing groundwater monitoring systems for each of the hazardous waste management units were partially installed during the summer of 1984 pursuant to a groundwater assessment plan submitted to the TNRCC on June 25, 1984 and as a result of the Interim Status regulations. Over time, additional modifications have been made to the systems. The current systems are discussed below. The existing groundwater monitoring network for each of the hazardous waste management units is described in Table VI.-7 (Application Table VI.B.3.b). Typical well construction details for the existing RCRA monitoring wells are shown on Figure VI.-60.

Northeast Landfarm (NELF)

As discussed in Section B.2.b, the original (20-series) RCRA groundwater monitoring wells for the NELF were screened in the first water-bearing zone, at approximately 13 to 20 feet below land surface. The shallow water-bearing zone is composed of discontinuous silty, sandy lenses, under semi-confined conditions. After the initial groundwater monitoring system was installed at the NELF, a second subsurface investigation confirmed that this upper water-bearing zone is underlain by a second water-bearing zone at a depth of 75 to 85 feet deep, which consists of a continuous sand and silty sand stratum. Because of the discontinuous nature of the upper water-bearing zone in the vicinity of the NELF, the remainder of the RCRA monitoring wells (the 40-series wells) at the NELF were screened in the second, lower water-bearing zone, which was designated as the "uppermost aquifer" in the original Part B Permit.

In the late 1980s, the 40-series wells were installed in the second water-bearing unit, at approximately 75 to 85 feet below land surface, to serve as the detection monitoring wells for the NELF (Table VI.-7 [Application Table VI.B.3.b]). Figures VI.-53 through VI.-56 show water level contours from the mid 1980s to 1996 of the NELF. Completion details for the four monitoring wells are shown in Table VI.-7 (Application Table VI.B.2.b).

East Guard Basin (EGB) and East Impoundment Basin (EIB)

The detection monitoring systems for the two basins consists of seven wells (GMW-60, GMW-61, GMW-62, GMW-63, GMW-64, GMW-65, and GMW-66) installed at the boundaries of each waste management area in the uppermost water-bearing unit. Figure VI.-58 shows the locations of the monitoring wells in relation to the basins. The depth and screen intervals for each well are shown on Table VI.-7 (Application Table VI.B.3.b).

Hydraulic gradients and groundwater flow velocities have been determined, and are discussed in Section B.2.e. Water level measurements taken from the uppermost aquifer in the northeast refinery area indicate that the general direction of groundwater flow is to the north-northwest. However, a groundwater flow divide exists along the center of the Northeast Landfill, with flow from the "mound" toward the north, west, and south, and a groundwater "trough" exists at the EGB, reflecting potential groundwater discharge into the basin.

The EGB is currently monitored using background (upgradient) well GMW-61, and detection (downgradient) wells GMW-64, GMW-65, and GMW-66. The EIB is currently monitored using background (upgradient) well GMW-60, and detection (downgradient) wells GMW-61, GMW-62, and GMW-63. Previously measured water levels in the wells and the basin show that the EGB is acting as an area of groundwater discharge (that is, the groundwater tends to flow toward the EGB from the surrounding area.) The EGB is the first basin emptied of rainfall surge. Barring unforeseen circumstances, the EGB is not expected to contain wastewater for any extended time period in the future.

Southwest Landfarm (SWLF)

Eight RCRA monitoring wells are in place around the SWLF. The background (upgradient) wells are GMW-2 and GMW-29. The detection (downgradient) wells are GMW-

32, GMW-33, GMW-48, GMW-49, GMW-50, GMW-51. The groundwater monitoring wells are screened in the uppermost aquifer. Completion details for the eight monitoring wells are shown in Table VI.-7 (Application Table VI.B.2.b). Typical well construction details for the existing RCRA monitoring wells are shown on Figure VI.-60.

One well (GMW-30) that was previously monitored as a RCRA well has been removed from the RCRA detection system. GMW-30 will not be used to detect contamination from the SWLF, because it was contaminated by an old xylene pipeline leak. The leak has been well documented in a report entitled "Determination of the Extent of Contamination Related to a Leak Near Recovery Well 30A [GMW-30], SWLF Area, Lyondell Petrochemical Company - Houston Refinery" (1992, Geo Associates.).

GMW-30 has been contaminated by a source unrelated to landfarming activity. Since it contains elevated levels of hydrocarbons in aqueous phase due to the plume of contamination, it is of no use in detection monitoring for the landfarm. In practice, GMW-30 has been monitored, analyzed for the landfarm hazardous constituents and reported with the results for the landfarm groundwater, but this reporting has not been used for several years to determine contamination for the landfarm. GMW-30 will no longer be included in the monitoring, analysis and reporting for the SWLF.

GMW-30 is in an Agreed Order area. The Executive Director may determine whether there would be value in using data from the well for assessing hydrocarbon recovery activity under the Agreed Order.

Removing GMW-30 from the monitoring network for the SWLF leaves six downgradient monitoring wells for this facility. The remaining wells are spatially distributed, giving environmentally protective monitoring downgradient of the SWLF.

B.3.a.1 Waste Characteristics and Proposed Detection Monitoring Program

The detection monitoring program for the hazardous waste management units consists of sampling monitoring wells located at the point of compliance and analyzing the samples for unit-specific waste constituents that provide a reliable indication of the presence of hazardous waste constituents in the groundwater. Results of detection monitoring analyses at the point of compliance are compared statistically to identify changes in groundwater. Selection of the detection monitoring parameters and frequency of monitoring is discussed below. Sampling and analysis frequencies are shown on Table VI-14.

Land Treatment Units

The existing RCRA permit for the LCR facility, as issued 15 November 1990, identifies analytical parameters to be used in the routine detection monitoring program for the land treatment units. These parameters consist of the following: pH, specific conductance, total dissolved solids (TDS), total organic carbon (TOC), lead, chromium, barium, ethylbenzene, toluene, phenol, naphthalene, and 1-methylnaphthalene. LCR proposes to retain the following waste constituents as detection monitoring parameters: lead, chromium, ethylbenzene, toluene, phenol, naphthalene, and 1-methylnaphthalene. The field parameters pH and specific conductance will continue to be measured at each sampling event for informational purposes; however, they will not be detection monitoring parameters since they do not provide a reliable indication of the presence of hazardous constituents in groundwater.

Monitoring of TDS and TOC will be discontinued, as these parameters are not reliable for early detection of contaminants. They are typically used as indicators of gross contamination which do not reflect low level contamination. The chemical-specific monitoring parameters will adequately detect any low level contamination associated with the land treatment units.

Barium will be removed as a monitoring parameter due to frequent false positive indications of contamination. Due to the natural and varying concentrations of barium in

groundwater in the Gulf Coast region, appropriate statistical analysis can not be performed with any confidence on this constituent. Moreover, barium is not a significant constituent of concern in the waste materials that were applied to the landfarms. Based on historical sampling events of refinery waste, the maximum barium concentration observed in the waste was only 210 mg/kg whereas lead and chromium concentrations were as high as 410 mg/kg and 1,100 mg/kg, respectively. Further, barium is not listed as a potential refinery contaminant on the EPA's Skinners List.

LCR's existing RCRA permit requires semi-annual groundwater monitoring for the landfarm areas. Semi-annual monitoring will be continued, with a single sample collected from each well for each monitoring event. Four independent aliquots can not be collected in a six month period due to the extremely slow movement of groundwater in the uppermost aquifer. As discussed in Section B.2.e of this report, the groundwater velocities in the uppermost aquifer in the vicinity of the SWLF range between 0.844 feet/year (0.07 feet/month) and 4.125 feet/year (0.34 feet/month). Assuming a reasonable radius of influence of six inches (1-foot total travel distance), the time to obtain an independent groundwater sample from these wells ranges between three and 14 months. The groundwater velocity in the uppermost aquifer in the vicinity of the NELF was determined to be even less (0.073 feet/year or 0.006 feet/month). Therefore, LCR believes semi-annual monitoring provides a reasonable approach to obtaining representative and independent samples for each sampling event for the land treatment units.

Surface Impoundments

In September 1990, the East Guard Basin (EGB) and the East Impoundment Basin (EIB) became interim status due to the management of wastewaters containing characteristically hazardous concentrations of benzene. These units ceased acceptance of the hazardous wastewaters in March 1994. At that time, all wastewaters and sludges were removed from the impoundments. The basins have been used as non-hazardous stormwater management units since that time under the Delay of Closure regulations. Since benzene was the only hazardous

constituent managed in these surface impoundments, LCR proposes benzene as the detection monitoring parameter to these units. Field measurements of pH and specific conductance will be recorded at each sampling event for informational purposes.

In accordance with the existing RCRA permit, LCR monitors the groundwater wells for the surface impoundments on a semi-annual basis. Semi-annual sampling will be continued, with a single sample collected from each well for each monitoring event. Four independent aliquots cannot be collected in a six month period due to the extremely slow movement of groundwater in the uppermost aquifer. As discussed in Section B.2.e of this report, the average groundwater velocity measured in August 1996 in the vicinity of the EGB and EIB was 1.93 feet/year (0.16 feet/month). Assuming a reasonable radius of influence of six inches (1-foot total travel distance), the total time required to obtain an independent groundwater sample from these wells would be six months. Therefore, LCR believes semi-annual monitoring provides a reasonable approach to obtaining representative and independent samples for each sampling event for the basins.

B.3.a.2 Groundwater Sample Collection and Preservation

All equipment, water level sensors, samplers, bailers, etc. that enter the wells will be decontaminated prior to being placed or lowered into the well. Care will be taken to avoid any contamination or cross-contamination of wells due to field investigation and sampling procedures.

Each well will be purged prior to sampling by discharging a minimum of three casing volumes of water or sufficient water to produce steady state conditions based on temperature, conductivity and pH as stated in the Technical Enforcement Guidance Document (TEGD), dated November 1992. A hand bailer, peristaltic pump, gas displacement dedicated pump system, hand-operated diaphragm pump or centrifugal pump will be used to evacuate wells, depending on depth and yield of each well.

Samples will be collected using a PVC, Teflon, stainless steel, or disposable bailer, a peristaltic pump equipped with a one-time use Teflon tube, or a dedicated pump system. Samples will be collected and containerized in accordance with the TEGD general guidelines for the indicator parameters. In addition, temperature, pH, and specific conductance measurements will be made in the field as the wells are purged as a check on the stability of the water before sample collection.

Upon collection, samples will be contained, preserved, stored, shipped or otherwise handled, in accordance with EPA SW-846 and follow proper chain-of-custody procedures. Samples obtained for volatile organic compounds analyses will be immediately sealed in a laboratory prepared, Teflon and glass VOC vial with zero air space.

B.3.a.3 Analytical Parameters

The analytical parameters for the detection monitoring program are shown in Table VI.-14. Laboratory analysis of these parameters will be conducted in accordance with the appropriate methods provided in EPA SW-846 or other TNRCC-accepted methods. Standard QA/QC procedures will be maintained for all groundwater samples in accordance with standard laboratory protocols. Minimum detection limits are provided in Table VI.-14. Detection limits may vary in the event that a sample must be diluted to be analyzed.

Groundwater samples will be analyzed for dissolved metals by filtration of the samples in the field. The turbidity of the samples will be observed and noted in the field. Specific conductance and pH are measured and recorded in the field.

B.3.a.4 Statistical Comparisons

Statistical comparisons will be conducted to determine if there is statistically significantly evidence of contamination in the groundwater at the wells located downgradient of the waste management units. This will be accomplished by comparing the analytical results of the downgradient well samples to statistically established background concentrations (concentration limits) for the selected monitoring parameters.

Groundwater quality can change with changes in flow patterns due to seasonal fluctuations in the water level of the Houston Ship Channel. These groundwater quality changes may occur without influence or releases from the overlying HWMUs. Therefore, upgradient groundwater quality will be monitored at least as frequently as the downgradient monitoring wells and changes in the upgradient conditions will be considered in evaluation of the statistical comparison results.

LCR has reviewed the background dataset for the upgradient wells at the permited HWMUs, and has re-established concentration limits for the selected monitoring parameters using currently accepted statistical procedures. The background datasets for the SWLF ,NWLF, EGB, and EIB are summarized in Table VI.-12, and the revised concentration limits are shown in Table VI.-14. LCR used non-parametric prediction limits to establish concentration limits for the detection monitoring parameters, due to the lack of detected values in the background datasets. The non-parametric prediction limit is determined as described in Appendix VI-E.

To offset the false positive error rate produced by the statistical test, the currently permitted resample for verification becomes part of the statistical test. Thus it is a two-phase testing strategy. If the original sample result equals or exceeds the concentration limit for a particular parameter, then one resample is collected from the sample point in question and analyzed for that specific parameter. If the resample result also equals or exceeds the concentration limit for that parameter, there is statistically significant evidence of contamination.

TNRCC would be notified within seven days of the failure of the resample, and Appendix IX testing would be initiated for the area of concern. If a potential release from any of the HWMUs is detected, additional investigations will be conducted in accordance with the LCR Agreed Order to accomplish three objectives.

1. Verify the presence of a release of waste constituents.
2. Characterize the release.
3. Determine the vertical and horizontal extent of waste constituents.

Based on the initial sampling results, selected parameters will be used to determine the extent of waste constituents and to define the areas of greatest concentrations of waste constituents. After the areas of greatest concentration are identified, additional samples will be obtained for analysis to define the source of the release. Based on the results of the investigation, corrective action may be initiated in accordance with the requirements of the LCR Agreed Order.

C. EXEMPTION FROM GROUND-WATER MONITORING

In accordance with 30 TAC 335.156, a waste management facility may be exempt from ground-water monitoring if the owner or operator can demonstrate that there is no potential for migration of liquid from any regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and post-closure care period. This demonstration must be submitted with the permit application, and must be certified by a qualified geologist or geotechnical engineer.

Based on the previously discussed information, it does not appear that the LCR facility is exempt from ground-water monitoring.

D. UNSATURATED ZONE MONITORING

This section describes the methodology and procedures to be used for soil core monitoring at the landfarm treatment units (LTUs) as required by 40 CFR 264.278. In accordance with 40 CFR 264.280(a)(7), soil-pore liquid monitoring is no longer required at the landfarms since it has been more than 90 days after the last application of waste to the treatment units.

D.1 SOIL CORE MONITORING

D.1.a Sample Number, Frequency, And Depths

Soil cores samples will be collected from random locations within each plot of the NELF and SWLF, as discussed below in Section D.1.b. Two soil core locations will be selected per plot, with one sample being collected per location. The soil sample will be collected at the depth of the nearest lysimeter in the respective plot, which represents the required sample from below the treatment zone. The analytical protocol for the collected samples is discussed below in Section D.1.c. Soil core sampling will be conducted on a quarterly basis.

At the laboratory, each sample is homogenized by laboratory personnel prior to analysis, and the remaining portion of each sample is saved. In the event that an apparent anomoly is noted, individual samples are available for re-analysis to evaluate the situation.

D.1.b Random Selection of Locations for Soil Core Monitoring

For hazardous waste facilities, RCRA guidance suggests that a standard procedure be followed in selecting sample locations. The following discussion outlines the random sampling protocol (derived from RCRA guidance) and includes an easy-to-follow procedure for selecting random numbers (see Appendix VI.-D).

If "n" units are to be selected from the population, a simple random sample is defined as a sample obtained so that each possible combination of "n" units has an equal chance of being selected. In practice, each unit is selected separately, randomly, and independently of any units previously drawn.

It is convenient to spot the field location for soil coring by selecting random distances on a Cartesian coordinate system and by using the intersection of the two random distances as the location at which a soil core should be taken. This system works well for fields of both regular and irregular shape, since the points outside the area of interest are merely discarded, and only the points inside the area are used in the sample.

The location within a given uniform area of a land treatment unit (i.e., active portion monitoring) at which a soil core should be taken may be determined by the following procedure:

1. Divide the land treatment unit into uniform areas. For the LCR refinery facility, a uniform area will be defined as a single plot since run-on and runoff structures currently exist to define the boundaries of each plot.

2. Map each uniform area by establishing two base lines at right angles to each other which intersect at an arbitrarily selected origin, for example, the southwest corner. Each baseline should extend to the boundary of the uniform area.

3. Establish a scale interval along each base line. The units of this scale may be feet, yards, miles, or other depending on the size of the uniform area. Both baselines must have the same scale. In this case, the scale is in feet.

4. Draw two random numbers from the table located at the end of this section. Use these numbers to locate one point along each of the base lines.

5. Locate the intersection of two lines drawn perpendicular to these two baseline points. This intersection represents one randomly selected location for collection of one soil core. If this location is outside the uniform area, disregard it and repeat the above procedure.

6. For soil core monitoring, repeat the above procedure as many times as necessary to obtain two soil coring locations within each uniform area of the land treatment unit. (If the same location is selected twice, disregard the second selection and repeat as necessary to obtain different locations.)

A specific random sample location selection procedure is specified in the existing permit. The locations of the background soil cores for the NELF and SWLF are provided in Figures VI.-63 and VI.-64.

D.1.c Analytical Protocol

The analytical protocol for soil core samples has historically consisted of lead, chromium, barium, phenol, naphthalene, 1-methylnaphthalene, toluene, ethylbenzene, pH, total organic carbon (TOC), and specific conductance. LCR proposes to retain all of these parameters, except barium, in the soil core monitoring program. TOC, pH and specific conductance will continue to be analyzed for informational purposes but will not be evaluated statistically.

Barium is not a significant constituent of concern in the waste materials that were applied to the landfarms. Based on historical sampling events of refinery waste, the maximum barium concentration observed in the waste was only 210 mg/kg whereas lead and chromium concentrations were as high as 410 mg/kg and 1,100 mg/kg, respectively. Further, barium is not listed as a potential refinery contaminant on the EPA's Skinners List. As such, barium has been removed as a soil core monitoring constituent.

The analytical protocol and sampling frequencies for the soil core samples is shown on Table VI.-15.

D.1.d Statistical Comparisons

Statistical comparisons will be conducted on soil core samples to determine if there is statistically significantly evidence of contamination in soils underlying the treatment zone of the land treatment units. This will be accomplished by comparing the analytical results of the soil core samples to statistically established background concentrations (concentration limits) of the selected monitoring parameters.

LCR has reviewed the soil core background data and has re-established concentration limits for the selected monitoring parameters using currently accepted statistical procedures. The background data are shown in Table VI.16, and the revised concentration limits are shown in Table VI.17. LCR used non-parametric prediction limits to establish concentration limits for the organic monitoring parameters (phenol, napthalene, 1-methylnapththalene, ethylbenzene, and toluene), due to the lack of detected values in the background datasets. The concentration limit for lead was also established using a non-parametric prediction limit due to the large number of non-detect values and non-normality of the background dataset. Non-parametric prediction limits are determined as described in Appendix VI-E. LCR used a parametric tolerance limit to establish the concentration limit for chromium since the background dataset for this parameter exhibits log-transformed normality. The chromium tolerance limit was determined as described in Appendix VI-E.

If the original sample result equals or exceeds the concentration limit for a particular parameter, then one resample is collected and re-analyzed for that specific parameter. This re-sample event will offset the false positive error rate produced by the statistical test. Thus, it becomes a two-phase testing strategy. If the resample result also equals or exceeds the concentration limit for that parameter, there is statistically significant evidence of contamination below the treatment zone.

TABLES

Geologic and Hydrologic Units Used in This Report and In Recent Reports on Nearby Areas

This report				Wood and Gabrysch (1965)	Sandeen and Wesselman (1969)	Wilson (1967)	Popkin (1971)	Lang, Winslow, and White (1950)	Pettit and Winslow (1957)	Wesselman (1971)	Anders and others (1968)	Wesselman (1972)
System	Series	Stratigraphic unit	Aquifer	Houston district	Brazoria County	Austin and Waller Counties	Montgomery County	Houston district	Galveston County	Chambers and Jefferson Counties	Liberty County	Fort Bend County
Quaternary	Holocene	Quaternary alluvium	Chicot aquifer: Upper unit	Confining layer and Alta Loma Sand of Rose (1943)	Chicot aquifer: Upper unit	Alluvium of the Brazos River	Chicot aquifer	Alluvial deposits	Beach and dune sand	Chicot aquifer: Upper unit	Chicot aquifer	Chicot aquifer: Upper unit
		Beaumont Clay				Evangeline aquifer (May contain unidentifiable parts of basal Chicot aquifer along the edges of Brazos River flood plain or along southern part of both counties)		Beaumont Clay	Beaumont Clay			
		Montgomery Formation						"Alta Loma Sand"	"Alta Loma Sand"			
		Bentley Formation	Chicot aquifer: Lower unit		Chicot aquifer: Lower unit			Zone 7	Lissie Formation	Chicot aquifer: Lower unit		Chicot aquifer: Lower unit
		Willis Sand						Zone 6				
Tertiary	Pliocene	Goliad Sand	Evangeline aquifer	Heavily pumped layer	Evangeline aquifer		Evangeline aquifer	Zone 5		Evangeline aquifer	Evangeline aquifer	Evangeline aquifer
	Miocene	Fleming Formation	Burkeville confining layer	Zone 2		Burkeville aquiclude	Burkeville aquiclude			Burkeville aquiclude	Burkeville aquiclude	Burkeville aquiclude
			Jasper aquifer: Upper unit			Jasper aquifer	Jasper aquifer: Upper part of Jasper	Zone 4		Jasper aquifer	Jasper aquifer	Jasper aquifer
								Zone 3				
			Jasper aquifer: Lower unit				Jasper aquifer: Lower part of Jasper	Zone 2				
								Zone 1				

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HOUSTON, TEXAS

TABLE VI.-1

REGIONAL CROSS CORRELATION OF GEOLOGIC AND HYDROLOGIC UNITS

DATE 12/11/84 | DR. NO. HT 0190 | SH. NO. DB

TABLE VI.-2 WASTE MANAGEMENT AREA SUBSURFACE CONDITIONS - **WSB AND SWLF AREA** (Application Table VI.A.4)

Boring Number	*Depth Below Grade*	*Stratum*	*USC Symbol*	*Liquid Limit*	*Plasticity Index*	*Percent Passing #200 Sieve*	*Permeability Coef. K_{20} (cm/sec)*	*Percent Porosity*
84-1 (620)	2.5-5	Very stiff clay	CH	98	66	97.7	1.9×10^{-8}	49.9
	17.5-20	Very silty fine sand	SM	22	2	45.6	1.3×10^{-5}	38.3
	22.5-25	Hard clay	CH	51	28	99.7	8.0×10^{-9}	38.8
	27.5-30	Silty fine sand	SM	23	3	32.3	1.8×10^{-5}	36.6
	32.5-35	Sandy clay	CL	45	28	83.5	2.6×10^{-8}	35.2
84-2 (618)	2.5-5	Stiff clay	CH	83	57	92.2	1.9×10^{-8}	43.4
	22.5-25	Silty clay to clayey silt	ML-CL	31	14	99.0	2.5×10^{-5}	37.6
	27.5-30	Silty clay with calcareous content	CL	36	19	83.4	7.2×10^{-8}	30.4
	30-32.5	Clayey silt	ML	27	12	77.2	2.3×10^{-7}	35.7
	32.5-35	Sandy clay	CL	38	22	80.6	4.4×10^{-7}	32.6
84-3 (619)	2.5-5	Plastic clay - Fill	CH	61	42	92.7	5.2×10^{-8}	43.1
	17.5-20	Silty fine sand	SM	35	37	76.9	1.1×10^{-5}	44.2
	27.5-30	Sandy clay	CL	42	26	82.7	5.7×10^{-6}	35.2
84-4 (617)	2.5-5	Stiff clay - Fill	CH	75	50	89.6	1.3×10^{-6}	46.4
	17.5-20	Very silty fine sand	SM	23	4	49.3	4.9×10^{-5}	36.3
	27.5-30	Sandy clay	CL	36	19	79.4	4.6×10^{-7}	35.5

Maximum depth: 35 feet below grade

~ -25 feet above MSL

TABLE VI.-2 WASTE MANAGEMENT AREA SUBSURFACE CONDITIONS - **WSB AND SWLF AREA** (Application Table VI.A.4)

Boring Number	*Depth Below Grade*	*Stratum*	*USC Symbol*	*Liquid Limit*	*Plasticity Index*	*Percent Passing #200 Sieve*	*Permeability Coef. K_{10} (cm/sec)*	*Percent Porosity*
84-5	2.5-5	Hard clay	CH	77	53	96.9	4.5×10^{-8}	46.4
	27.5-30	Silty fine sand	SM	23	3	49.3	1.6×10^{-4}	42.9
	33-35	Sandy clay	CL	37	21	68.4	4.2×10^{-8}	35.3
84-6A	2.5-5	Very stiff clay	CH	92	63	96.4	4.7×10^{-8}	50.5
	20-22.5	Silty fine sand	SM	22	1	40.2	1.1×10^{-4}	35.8
	30-32	Sandy clay	CL	36	21	87.6	5.8×10^{-8}	32.9
	50-52.5	Slightly silty clay	CL	47	29	91.5	4.5×10^{-8}	33.4
	70-72.5	Clayey silt	SC-ML	32	15	91.4	1.9×10^{-6}	39.8
	80-82.5	Fine sandy silt	SM	24	4	51.2	2.7×10^{-5}	36.6
	97.5-100	Hard clay - Laminated	CL	42	25	95.9	1.7×10^{-7}	37.9
84-10A	2.5-5	Hard clay	CH	52	33	87.9	6.2×10^{-8}	40.7
	27.5-30	Silty clay	CL	39	21	91.2	5.8×10^{-7}	35.9
	42.5-45	Silty fine sandy clay	SM-CL	31	16	63.7	6.2×10^{-6}	35.4
	57.5-60	Hard clay	CH	53	32	99.3	4.0×10^{-8}	37.0
	68.5-70	Fine sandy silt	SM	29	13	93.6	2.2×10^{-5}	40.2
	82.5-85	Hard clay	CH	70	42	99.4	1.3×10^{-7}	43.6
	97.5-100	Silty clay & fine sand	SC-CL	44	22	92.0	1.4×10^{-7}	45.0
84-11	2.5-5	Silty clay	ML-CL	36	17	82.3	2.4×10^{-7}	42.2
	17.5-20	Silty clay to clayey silt	ML	29	10	85.5	6.3×10^{-6}	36.6
	32.5-35	Silty clay	CL	49	29	92.0	6.2×10^{-7}	33.2

Maximum depth: 100 feet below grade

~ -90 feet above MSL

TABLE VI.-2 WASTE MANAGEMENT AREA SUBSURFACE CONDITIONS - EGB, EIB, AND NELF
(Application Table VI.A.4)

Boring Number	*Depth Below Grade*	*Stratum*	*USC Symbol*	*Liquid Limit*	*Plasticity Index*	*Percent Passing #200 Sieve*	*Permeability Coef. K_{20} (cm/sec)*	*Percent Porosity*
615	2.5-5	Very stiff clay	CH	92	63	96.4	4.7×10^{-8}	50.5
	20-22.5	Silty fine sand	SM	22	1	40.2	1.1×10^{-4}	35.8
	30-32.5	Sandy clay	CL	36	21	87.6	5.8×10^{-8}	32.9
	50-52.5	Slightly silty clay	CL	47	29	91.5	4.5×10^{-8}	33.4
	70-72.5	Clayey silt	SC-ML	32	15	91.4	1.9×10^{-6}	39.8
	80-82.5	Fine sandy silt	SM	24	4	51.2	2.7×10^{-5}	33.6
	97.5-100	Hard clay - Laminated	CL	42	25	95.9	1.7×10^{-7}	37.9
621	2.5-5	Hard clay	CH	52	33	87.9	6.2×10^{-8}	40.7
	27.5-30	Silty clay	CL	39	21	91.2	5.8×10^{-7}	35.9
	42.5-45	Silty fine sandy clay	SM-CL	31	16	63.7	6.2×10^{-6}	35.4
	57.5-60	Hard clay	CH	53	32	99.3	4.0×10^{-8}	37.0
	68.5-70	Fine sandy silt	SM	29	13	93.6	2.2×10^{-5}	40.2
	82.5-85	Hard clay	CH	70	42	99.4	1.3×10^{-7}	43.6
	97.5-100	Silty clay & fine sand	SC-CL	44	22	92.0	1.4×10^{-7}	45.0
611	2.5-5	Silty clay	ML-CL	36	17	82.3	2.4×10^{-7}	42.2
	17.5-20	Silty clay to clayey silt	ML	29	10	85.5	6.3×10^{-6}	36.6
	32.5-35	Silty clay	CL	46	29	92.0	6.2×10^{-7}	33.2

Maximum depth: 100 feet below grade

~ -90 feet above MSL

TABLE VI.-2 WASTE MANAGEMENT AREA SUBSURFACE CONDITIONS - EGB, EIB, AND NELF (Application Table VI.A.4)

Boring Number	*Depth Below Grade*	*Stratum*	*USC Symbol*	*Liquid Limit*	*Plasticity Index*	*Percent Passing #200 Sieve*	*Permeability Coef. K_{20} (cm/sec)*	*Percent Porosity*
GMW-60	4-6	Clay	CH	84	59	NR	1.0×10^{-9}	NR
	6-8	Clay with silt	CL	84	59	NR	1.6×10^{-9}	NR
	10-12	Sandy clay	CL	84	62	NR	9.2×10^{-9}	NR
	14-16	Clay	CH	44	30	NR	5.1×10^{-9}	NR
	16-18	Fine sandy silt	SM	79	56	70	NR	NR
	18-20	Fine sandy silt	SM	NR	NR	94	NR	NR
	20-22	Clay with silty sand pockets	CL	65	46	NR	4.7×10^{-9}	NR
	22-24	Clay with calcareous nodules and deposits	CH	66	46	NR	1.2×10^{-8}	NR
	26-28	Silty clay	CL	NR	NR	78	NR	NR
GMW-61	1-2	Clay with silt pockets and iron nodules	CL	60	44	NR	5.4×10^{-9}	NR
	16-18	Silty clay	CL	32	18	NR	4.6×10^{-8}	NR
	24-26	Silty clay	CL	NR	NR	52	NR	NR
	32-34	Silty fine sand	SM	NR	NR	25	NR	NR
	35-36	Clay	CH	72	47	NR	3.2×10^{-9}	NR
GMW-64	6-8	Silty sand	SM	NR	NR	24	NR	NR
	26-28	Fine sandy silt	SM	NR		71	NR	NR
	28-30	Clay with silt pockets and iron nodules	CL	46	33	NR	1.7×10^{-8}	NR
GMW-66	9-11	Silty fine sand	SM	NR	NR	21	NR	NR
	24-26	Fine sandy silt	SM	NR	NR	57	NR	NR
	28-30	Fine sandy silt	SM	NR	NR	47	NR	NR

NR: Not Requested

Maximum depth: 36 feet below grade

~ -26 feet above MSL

TABLE VI.-2 WASTE MANAGEMENT AREA SUBSURFACE CONDITIONS - EGB, EIB, AND NELF
(Application Table VI.A.4)

Boring Number	*Depth Below Grade*	*Stratum*	*USC Symbol*	*Liquid Limit*	*Plasticity Index*	*Percent Passing #200 Sieve*	*Permeability Coef. K_{20} (cm/sec)*	*Percent Porosity*
GMW-66	31-32	Clay	CH	37	20	NR	1.9×10^{-11}	NR
GMW-67	12-14	Silty fine sand	SM	NR	NR	58	NR	NR
GMW-68	16-18	Fine sandy silt	SM	NR	NR	50	NR	NR
GMW-69	20-22	Silty fine sand	SM	NR	NR	31	NR	NR
RFI GMW-56	2.0	Fat clay with sand	CH	NR	NR	78	1.2×10^{-7}	NR
RFI GMW-58C	6.0	Silt with sand	ML	NR	NR	83	1.81×10^{-7}	NR
	10.0	Lean clay	CL	NR	NR	88	7.06×10^{-8}	NR
RFI GMW-64	21.0	Lean clay with sand	CL	NR	NR	78	1.34×10^{-7}	NR
RFI GMW-67	4.5	Lean clay with sand	CL	NR	NR	85	1.4×10^{-7}	NR
	7.0	Silty lean clay with sand	CL-ML	NR	NR	81	1.7×10^{-7}	NR
RFI GMW-68	3.5	Lean clay	CL	NR	NR	91	2.3×10^{-7}	NR
RFI GMW-74	30.0	Fat clay	CH	NR	NR	91	3.3×10^{-9}	NR

NR: Not Requested
Maximum depth: 32 feet below grade

~ -22 feet above MSL

TABLE VI.-3
SUMMARY OF GEOTECHNICAL DATA BY STRATA
LCR NORTHEAST LANDFARM, EAST GUARD BASIN, EAST IMPOUNDMENT BASIN, HOUSTON, TEXAS

Approx. Depth	Primary Universal Soil Classification	Moisture Content	Percent Passing #200 Sieve	Dry Density	Liquid Limit	Plastic Limit	Plasticity Index	Permeability(a) X 10^{-7} cm/sec	Field Cohesive Strength(tsf)	Compressive Strength (tsf)	Porosity	
0-14	ML, CH	26	88.87	94.3	60	22.3	37.7	1.16	2.5	2.30	0.445	Mean
		22-34	82.3-96.4	85-101	36-92	19-29	17-63	0.45-2.4	1-4.5	0.81-4.85	.407-.505	(Range)
		3	3	3	3	3	3	3	3	3	3	n
14-26	ML	19.5	62.75	105.5	25.5	20	5.5	581.5	1.1	0.55	0.362	Mean
		18-21	40.2-85.5	105-106	22-29	19-21	1-10	63-1100	0.2-1.7	0.55	.358-3.66	(Range)
		2	2	2	2	2	2	2	2	1	2	n
25-35	CL	16.5	89.4	113	37.5	16.5	25	3.19	3.1	2.89	0.331	Mean
		16-18	87.6-92	113	36-39	15-18	21-29	0.58-5.8	2.5-3.7	2.8-2.98	.329-.332	(Range)
		2	2	2	2	2	2	2	2	2	2	n
35-45	SM, CL	16.5	77.6	110.5	39	16.5	22.5	31.23	4.0	2.19	0.344	Mean
		16-18	63.7-91.5	108-113	31-47	15-18	16-2	0.45-62	4.0	1.41-2.98	.334-.354	(Range)
		2	2	3	2	2	2	2	2	2	2	n
45-70	CH	22	99.3	107	53	21	32	0.40	4.5	4.04	0.370	Mean
		22	99.3	107	53	21	32	0.40	4.5	4.04	0.370	(Range)
		1	1	1	1	1	1	1	1	1	1	n
70-74	SM, ML	21	92.5	99.5	30.5	16.5	14	119.5	2.1	---	0.4	Mean
		20/22	91.4-93.6	98-101	29-32	16-17	13-15	190-2200	1.0-3.2	---	.398-.402	(Range)
		2	2	2	2	2	2	2	2	---	2	n
74-86	CL	27	99.4	96	70	28	32	1.3	4.5	2.52	0.436	Mean
		27	99.4	96	70	28	32	1.3	4.5	2.52	0.436	(Range)
		1	1	1	1	1	1	1	1	1	1	n
86-±100	SM, CH	23.5	93.9	99	43	19.5	23.5	1.55	3.5	2.29	0.414	Mean
		20-27	92-95.9	93-105	42-44	17-22	22-25	1.4-1.7	3.0-4.0	2.29	.379-.450	(Range)
		2	2	2	2	2	2	2	2	2	2	n

n = number of samples
a = laboratory vertical permeability
CH = inorganic clay, high plasticity
CL = inorganic clay, low to medium plasticity
tsf = tons/ft

Mean = average value
b = field horizontal permeability
ML = inorganic silts and very fine sands
SM = silty sands, sand-silt mixtures

Revised August 1997

TABLE VI.-3
SUMMARY OF GEOTECHNICAL DATA BY STRATA
LCR SOUTHWEST LAND TREATMENT FACILITY AND WEST STAGING BUILDING
HOUSTON, TEXAS

Approx. Depth	Primary Universal Soil Classification	Moisture Content	Percent Passing #200 Sieve	Dry Density	Liquid Limit	Plastic Limit	Plasticity Index	Permeability(a) X 10^{-7} cm/sec	Field Cohesive Strength(tsf)	Compressive Strength (tsf)	Porosity	
0-20	CH	2.92 26-34 5	93.8 97.6-89.6 5	92.2 85-97 5	78.8 61-98 5	25.2 19-32 5	53.6 42-66 5	2.87 0.19-13 5	2.2 1.0-4.5 5	2.13 0.96-4.97 5	Not Obtained	Mean (Range) n
20-26	CL, CH	19 16-22 2	91.5 83.4-99.7 2	110.5 105-116 2	43.5 36-51 2	20 17-23 2	23.5 19-28 2	0.4 0.08-0.72 2	4.5 4.5 2	4.22 2.86-5.57 2	Not Obtained	Mean (Range) n
20-30	SM, ML	22.2 20-26 6	55.1 32.3-77.2 6	100.5 92-106 6	25.5 23-35 6	20.3 15-28 6	5.2 3-12 6	418.7 2.3-1600 6	0.45 0.3-1.0 6	--	Not Obtained	Mean (Range) n
30-35	CL	17 15-18 5	78.9 68.4-83.5 5	110.5 109-114 5	39.6 36-45 5	16.4 16-17 5	32.2 19-28 5	13.3 0.26-57 5	2.2 0.5-4.5 5	3.78 3.78 1	Not Obtained	Mean (Range) n

n = number of samples
a = laboratory vertical permeability
CH = inorganic clay, high plasticity
CL = inorganic clay, low to medium plasticity
tsf = tons/ft

Mean = average value
b = field horizontal permeability
ML = inorganic silts and very fine sands
SM = silty sands, sand-silt mixtures

Revised August 1997

TABLE VI.-4

Chemical Analysis of Water From Wells in Harris County

Well	Owner	Well depth or producing interval (ft.)	Water bearing unit	Date of collection	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium Na	Sodium and potassium K	Bicarbonate (HCO_3) 1/	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Phosphate (PO_4)	Boron (B)	Dissolved solids	Hardness as $CaCO_3$	Percent sodium	Sodium adsorption ratio (SAR)	Residual sodium carbonate (RSC)	Specific conductance (micromhos at 25°C)	pH	Temperature °C	Temperature °F
111	Signal Oil & Gas Co. well 1	915-1,145	E	Sept. 7, 1940	9.0	.1	--	6.1	1.7	120	--	268	9.7	36	1.1	--	--	--	306	22	--	--	--	515	7.9	27.0	81
115	Signal Oil & Gas Co. well 1	970-1,145	E	Mar. 21, 1941	15	<.05	--	3.7	1	114	--	266	4	30	--	--	--	--	312	20	--	--	--	540	8.0	26.5	80
611	Standard-Vacuum Chemical Co. well 1	1,085-1,305	E	Oct. 25, 1960	17	.12	--	3.5	1	132	--	260	22	41	--	--	--	--	349	15	--	--	--	565	8.0	--	--
612	Standard-Vacuum Chemical Co. well 2	849-1,155	E	Jan. 9, 1961	18	.10	--	5	1.6	130	--	283	12	41	--	--	--	--	348	19	--	--	--	560	8.4	--	--
107	Atlantic Richfield Co. well 10	904-1,224	E	Sept. 10, 1943	16	.07	--	5.8	1.8	130	--	301	11	41	.0	.0	--	--	362	18	--	--	--	613	8.4	--	--
107	do	do	E	Apr. 18, 1963	--	--	--	--	--	--	--	316	--	42	--	--	--	--	--	16	--	--	--	635	8.1	28.0	82
107	do	do	E	Mar. 18, 1964	--	--	--	--	--	--	--	334	--	38	--	--	--	--	--	17	--	--	5.16	663	8.5	26.5	80
107	do	do	E	May 6, 1970	--	--	--	--	--	--	--	394	--	43	--	--	--	--	--	24	--	--	4.34	620	8.1	27.5	82
107	do	do	E	Apr. 7, 1971	--	--	--	--	--	--	--	318	--	46	--	--	--	--	--	19	--	--	4.83	666	8.1	28.0	82
108	Atlantic Richfield Co. well 11	331-1,039	E	Feb. 8, 1949	18	--	--	3.0	.5	237	--	496	2.0	84	--	--	--	--	584	12	98	--	--	988	--	--	--
	do	do	E	Mar. 14, 1951	--	--	--	--	--	--	--	440	--	80	--	--	--	--	--	19	--	--	--	946	8.4	--	--
108	do	do	E	Jan. 28, 1957	--	--	--	--	--	--	--	460	--	81	--	--	--	--	--	16	--	--	--	929	8.1	--	--
108	do	do	E	Feb. 6, 1951	--	--	--	--	--	--	--	463	--	83	--	--	--	--	--	15	--	--	--	915	8.0	30.0	86
108	do	do	E	Mar. 13, 1954	--	--	--	--	--	--	--	440	--	76	--	--	--	--	--	14	--	--	--	884	8.7	--	--
108	do	do	E	Mar. 3, 1955	--	--	--	--	--	--	--	--	--	86	--	--	--	--	--	--	--	--	--	973	--	--	--
108	do	do	E	Mar. 5, 1956	--	--	--	--	--	--	--	463	--	79	--	--	--	--	--	15	--	--	--	927	8.4	--	--
108	do	do	E	Mar. 14, 1957	--	--	--	--	--	--	--	485	--	86	--	--	--	--	--	17	--	--	--	942	8.6	--	--
108	do	do	E	Mar. 21, 1958	--	--	--	--	--	--	--	489	--	83	--	--	--	--	--	19	--	--	--	961	8.9	--	--
108	do	do	E	Apr. 27, 1959	--	--	--	--	--	--	--	456	--	79	--	--	--	--	--	14	--	--	--	945	8.3	--	--
108	do	do	E	Mar. 23, 1960	--	--	--	--	--	--	--	470	--	75	--	--	--	--	--	14	--	--	--	930	8.1	--	--
108	do	do	E	Mar. 2, 1962	--	--	--	--	--	--	--	462	--	76	--	--	--	--	--	13	--	--	--	907	7.8	31.0	88
108	do	do	E	Apr. 1, 1963	--	--	--	--	--	--	--	464	--	76	--	--	--	--	--	15	--	--	7.30	917	8.3	--	--
108	do	do	E	Mar. 18, 1964	--	--	--	--	--	--	--	460	--	74	--	--	--	--	--	14	--	--	7.27	918	8.5	--	--
108	do	do	E	Apr. 5, 1965	--	--	--	--	--	--	--	466	--	74	--	--	--	--	--	14	--	--	7.37	893	8.5	31.5	89
108	do	do	E	Mar. 29, 1966	--	--	--	--	--	--	--	467	--	71	--	--	--	--	--	14	--	--	7.39	911	7.8	31.0	88
108	do	do	E	Apr. 3, 1967	--	--	--	--	--	--	--	450	--	67	--	--	--	--	--	14	--	--	7.23	896	8.0	29.0	84
108	do	do	E	Apr. 3, 1968	--	--	--	--	--	--	--	454	--	72	--	--	--	--	--	16	--	--	7.13	900	8.4	31.0	88
108	do	do	E	Apr. 7, 1969	--	--	--	--	--	--	--	448	--	77	--	--	--	--	--	18	--	--	6.90	891	7.8	--	--
144	Atlantic Richfield Co. well 7	893-1,216	E	Jan. 30, 1946	--	--	--	--	--	--	--	332	9	50	--	--	--	--	--	24	--	--	--	--	--	--	--
144	do	do	E	Feb. 10, 1947	--	--	--	--	--	--	--	--	--	64	--	--	--	--	--	--	--	--	--	--	--	--	--
144	do	do	E	Feb. 8, 1949	--	--	--	--	--	--	--	340	--	65	--	--	--	--	--	19	--	--	--	737	--	--	--
144	do	do	E	Feb. 24, 1950	--	--	--	--	--	--	--	341	--	65	--	--	--	--	--	16	--	--	--	734	8.4	--	--
144	do	do	E	Mar. 14, 1951	--	--	--	--	--	--	--	370	--	67	--	--	--	--	--	21	--	--	--	717	8.1	--	--
144	do	do	E	Feb. 6, 1953	--	--	--	--	--	--	--	339	--	64	--	--	--	--	--	18	--	--	--	704	8.6	28.0	82
144	do	do	E	Mar. 11, 1954	--	--	--	--	--	--	--	309	--	46	--	--	--	--	--	16	--	--	--	610	8.6	--	--
144	do	do	E	Mar. 3, 1955	--	--	--	--	--	--	--	--	--	56	--	--	--	--	--	--	--	--	--	734	--	--	--
144	do	do	E	Mar. 14, 1957	--	--	--	--	--	--	--	303	--	67	--	--	--	--	--	17	--	--	--	780	8.5	--	--
144	do	do	E	July 29, 1962	--	--	--	--	--	--	--	370	--	60	--	--	--	--	--	15	--	--	--	740	7.7	28.0	82
144	do	do	E	Mar. 18, 1964	--	--	--	--	--	--	--	464	--	76	--	--	--	--	--	14	--	--	7.27	910	8.5	--	--

TABLE VI.-5

Water Wells Within One Mile of LCR Facility

No.	Owner	Driller	Date completed	Depth of well (ft.)	Casing Diameter (in.)	Casing Depth (ft.)	Water bearing unit	Altitude of land surface (ft.)	Water level: Above (+) below land surface Jetson (ft.)	Water level: Date of measurement	Method of lift	Use of water	Remarks
65-23-138	Houston Lighting and Power Co. Deepwater Plant Well 2	Layne Texas Co.	1924	823	12 10	310 823	E	18	--	--	N	N	115 ft. of screen between 824 and 803 ft. Reported yield 500 gpm in 1937. Well destroyed. 2/
139	Houston Lighting and Power Co. Deepwater Plant Well 3	do	1929	838	16 10	145 838	E	18	54.8 377	Feb. 25, 1931 Mar. 1971	T,E	Ind	119 ft. of screen between 812 and 811 ft. Reported yield 500 gpm in 1939. 1/ 2/
140	General American Storage	J. A. Walling	1935	701	8 6	200 701	E	18	--	--	N	N	Screen from 685 to 701 ft.
142	City of Galena Park Well 1	do	1936	880	15 8	402 880	E,CL	30	87.0 306.0	Jan. 13, 1937 Feb. 15, 1963	T,E 30	P	Screen from 593 to 877 ft. Reported yield 475 gpm when drilled. 2/
145	Gulf Oil Co.	Layne Bowler Co.	1922	752	24 8	93 752	E,CL	27	12 61.5	1922 Mar. 27, 1931	N	N	153 ft. of screen between 499 and 747 ft. 2/
146	Atlantic Richfield Co Well 7	Layne Texas Co.	1931	1,260	24 12	193 1,260	E	25	--	--	T,E 150	Ind	163 ft. of screen between 893 and 1,256 ft. Reported yield 1,350 gpm in 1942. Test hole drilled to 1,301 ft Formerly Sinclair Refining Co. 2/
148	Texaco Inc. Well 6	do	1930	802	24 12	250 802	CL,E	19	43.1 107.9	Mar. 25, 1931 Feb. 19, 1971	T,E	N	127 ft. of screen between 428 and 791 ft. 1/ 2/
151	City of Pasadena Well 1	do	1930	834	10	834	E	27	111.7 280.9	Sept. 23, 1937 June 7, 1951	N	N	80 ft. of screen between 700 and 834 ft. Reported yield 365 gpm in 1941. Well destroyed. 2/ 3/
152	City of Galena Park Well 2	Layne Texas Co.	1942	740	12 8	495 740	E,CL	34	121 275.7	June 24, 1942 Feb. 13, 1953	T,E	P	110 ft. of screen between 584 and 729 ft. Reported yield 460 gpm with 55 ft. drawdown when drilled. 2/
65-23-311	Shell Oil Co. Refinery Well 4	McMasters and Pomeroy	1928	1,284	16 12	-- 1,284	E,CL	35	81 167.5	1928 Dec. 29, 1947	N	N	397 ft. of screen between 348 and 1,283 ft. Well deepened from 850 to 1,284 ft. in 1934. Well destroyed. 2/ 3/
312	Shell Oil Co. Refinery Well 5	Layne Texas Co.	1935	1,329	16 10	-- 1,329	E	31	108 381	Dec. 1940 Mar. 8, 1970	N	N	202 ft. of screen between 648 and 1,318 ft. Reported yield 1,690 gpm with 43 ft. drawdown when drilled. 1/
313	Shell Oil Co. Refinery Well 1	do	1928	488	12 8	182 488	CL	31	91	Aug. 1938	N	N	101 ft. of screen between 247 and 478 ft. Well destroyed. 2/
314	Shell Oil Co. Refinery Well 2	McMasters and Pomeroy	1929	790	16 12	202 790	CL,E	26	41 373	1929 Aug. 1, 1967	T,E 150	Ind	238 ft. of screen between 294 and 784 ft. Reported yield 700 gpm July 18, 1941. 2/ 3/
315	Shell Oil Co. Refinery Well 3	do	1929	860	16 12	199 860	E,CL	33	41 196	1929 Nov. 1951	N	N	256 ft. of screen between 374 and 860 ft. Reported yield 930 gpm July 16, 1941. 2/ 3/
316	T. Jones	do	1927	823	12	823	E,CL	36	38 58.7	Jan. 4, 1928 Apr. 1, 1931	N	N	180 ft. of screen between 465 and 823 ft. Reported yield 1,150 gpm with 30 ft. drawdown Jan. 4, 1928. Well destroyed.
404	R. F. Harris	McMasters and Pomeroy	1941	645	8 4	318 645	CL	33	111	June 9, 1941	N	N	Screen from 603 to 645 ft. Formerly supplied Allendale Subdivision.

TABLE VI.-5 (Continued)

Water Wells Within One Mile of LCR Facility

No.	Owner	Driller	Date completed	Depth of well (ft.)	Casing Diameter (in.)	Casing Depth (ft.)	Water bearing unit	Altitude of land surface (ft.)	Water Level Above (+) below land surface datum (ft.)	Water Level Date of Measurement	Method of lift	Use of Water	Remarks
105	City of Houston Southeast Well 5	do	1948	1,401	24 12	303 1,401	E	69	83 310.0	May 23, 1913 Mar. 4, 1970	T,E	P	393 ft. of screen between 853 and 1,378 ft. Reported yield 3,490 gpm with 82 ft. drawdown when drilled. 1/ 2/
303	Dickson Gun Plant Well 1	do	1943	788	12 8	488 738	E	37	137	Apr. 29, 1962	T,E	Ind	127 ft. of screen between 578 and 753 ft. Reported yield 530 gpm with 74 ft. drawdown when drilled.
314	Alpnal Oil and Gas Co. Well 4	do	1957	1,182	16 10	895 1,182	E	20	321	Oct. 28, 1957	T, Steam	Ind	146 ft. of screen between 990 and 1,170 ft. Reported yield 1,153 gpm with 24 ft. drawdown when drilled.
606	Petro-Tex Corp. Well 1	do	1942	1,710	20 10	1,215 1,710	E	34	132 359	Nov. 11, 1942 Oct. 20, 1970	T,E 300	Ind	213 ft. of slotted casing between 1,375 and 1,698 ft. Reported yield 918 gpm with 54 ft. drawdown when drilled. 1/ 2/
607	Petro-Tex Corp. Well 2	do	1942	1,222	20 10	840 1,222	E	34	302.8	Apr. 29, 1963	T,E 300	Ind	221 ft. of slotted casing between 858 and 1,205 ft. 2/
608	Petro-Tex Corp. Well 3	do	1953	1,712	20 12	1,200 1,712	E	34	313 360	July 10, 1953 June 19, 1970	T,E 300	Ind	242 ft. of screen between 1,220 and 1,692 ft. Reported yield 1,800 gpm with 35 ft. drawdown when drilled. Test hole drilled to 1,796 ft. 1/ 2/
809	Goodyear Tire and Rubber Co. Well 3	Texas Water Wells, Inc.	1958	1,205	14 8	710 1,205	E	35	289	Feb. 14, 1958	T,E	Ind	110 ft. of screen between 848 and 1,200 ft. Reported yield 810 gpm with 46 ft. drawdown when drilled.
810	Goodyear Tire and Rubber Co.	do	1958	1,190	14 8	710 1,190	E	35	298	Sept. 1958	T,E	Ind	110 ft. of screen between 830 and 1,185 ft. Reported yield 580 gpm with 48 ft. drawdown when drilled.
811	Sinclair-Koppers Chemical Co. Well 1	Layne Texas Co.	1960	1,212	16 10	800 1,212	E	32	307	Nov. 1960	T,E 200	Ind	161 ft. of screen between 812 and 1,193 ft. Reported yield 1,065 gpm with 50 ft. drawdown when drilled.
812	Sinclair-Koppers Chemical Co. Well 2	do	1960	1,215	16 10	805 1,215	E	32	--	--	T	Ind	156 ft. of screen between 809 and 1,195 ft. Reported yield 1,100 gpm with 45 ft. drawdown Feb. 1962.
813	Goodyear Tire and Rubber Co. Well 1	McMasters and Pomeroy	1913	1,055	8	1,055	E,CL	33	205.6	Dec. 6, 1919	N	N	146 ft. of screen between 800 and 1,055 ft. 2/
814	Goodyear Tire and Rubber Co. Well 2	do	1919	1,039	8 7	-- 1,039	E	33	222	Dec. 3, 1918	N	N	Screen from 859 to 1,039 ft. 2/
819	Sinclair-Koppers Chemical Co.	Texas Water Wells, Inc.	1965	1,213	16 10	852 1,213	E	32	345	Oct. 9, 1965	T,E 200	Ind	185 ft. of screen between 862 and 1,207 ft. Reported yield 1,001 gpm with 80 ft. drawdown when drilled. 2
820	do	do	1965	1,203	16 10	830 1,203	E	32	355	Oct. 6, 1965	T,E	Ind	190 ft. of screen between 836 and 1,151 ft. Reported yield 1,001 gpm with 39 ft. drawdown when drilled. 2/
65-22-621	Occidental Chemical Co.	R. J. Schnehart Co.	1970	674	4 2½	648 674	CL	25	343	Apr. 15, 1970	Sub,E	Ind	Screen from 652 to 672 ft. 2/
15-23-101	City of Pasadena Well 8	McMasters and Pomeroy	1950	1,262	12 8	834 1,262	E	37	238 380.8	Nov. 1950 Jan. 24, 1969	T,E 150	P	260 ft. of screen between 667 and 1,242 ft.
102	Texaco Inc. Well 7	Layne Texas Co.	1948	1,410	18 10	600 1,410	E	15	198 364.0	Dec. 1947 Feb. 19, 1971	T,E 150	Ind	230 ft. of screen between 897 and 1,371 ft. Reported yield 1,084 gpm with 33 ft. drawdown when drilled. 1/
103	City of Galena Park Well 3	do	1949	1,201	18 10	-- 1,201	E	34	236.7 392.0	June 8, 1950 Mar. 3, 1971	T,E	P	157 ft. of screen between 935 and 1,183 ft. Reported yield 1,013 gpm with 42 ft. drawdown when drilled. 1/

TABLE VI.-5 (Continued)

Water Wells Within One Mile of LCR Facility

No.	Owner	Driller	Date completed	Depth of well (ft.)	Casing Diameter (in.)	Casing Depth (ft.)	Water bearing unit	Altitude of land surface (ft.)	Water Level: Above (+) below land surface datum (ft.)	Water Level: Date of measurement	Method of lift	Use of Water	Remarks
107	Atlantic Richfield Co. Well 10	do	1942	1,227	20 10	898 1,227	E	28	242	Jan. 1950	T,E 200	Ind	87 ft. of screen between 804 and 1,224 ft. Formerly Sinclair Refining Co.
108	Atlantic Richfield Co. Well 11	do	1947	1,814	30 20 12	40 1,240 1,814	E	25	233 318	Oct. 11, 1948 Mar. 18, 1964	T, Steam	Ind	213 ft. of screen between 1,211 and 1,829 ft. Reported yield 1,680 gpm with 45 ft. drawdown Oct. 1948. Formerly Sinclair Refining Co.
109	Manchester Terminal Well 2	do	1950	782	18 12 8	38 589 782	E	20	216.6	July 27, 1950	T,E 40	Ind.	83 ft. of screen between 602 and 750 ft.
111	Ideal Cement Co. Well 3	do	1956	1,084	16 8	600 1,084	E	33	280 200	May 1956 Aug. 28, 1959	T,E 125	Ind	168 ft. of screen between 811 and 1,072 ft. Reported yield 812 gpm with 41 ft. drawdown when drilled. 2/
115	Crown Central Petroleum Co. Well 4	McMasters and Pomeroy	1944	922	10 8	-- 922	E	27	298	May 1961	T,E 75	Ind	170 ft. of screen between 651 and 811 ft. 2/
117	Velsicol Chemical Co. Well 1	A. E. Fawcett, Sr.	1941	311	4	311	CL	26	--	--	N	N	Screen from 281 to 311 ft.
118	Velsicol Chemical Co. Well 2	McMasters and Pomeroy	1950	311	6	311	CL	26	155	Feb. 9, 1962	T,R 20	Ind	Screen from 284 to 311 ft.
120	City of Pasadena Well 2	McMasters and Pomeroy	1935	834	10	834	E	27	109.8 128.8	Aug. 19, 1937 Mar. 15, 1941	N	N	60 ft. of screen between 700 and 834 ft. Well destroyed. 2/ 3/
121	City of Pasadena Well 3	do	1941	350	8	350	CL	27	81	July 18, 1941	N	N	Screen from 300 to 350 ft. Reported yield 250 gpm when drilled. Well destroyed.
122	Champion Papers Well A-1	Layne Texas Co.	1937	974	18 10	-- 974	E	31	63	Jan. 20, 1937	T,E 180	Ind	219 ft. of screen between 612 and 870 ft. Reported yield 1,730 gpm with 72 ft. drawdown when drilled. Test hole drilled to 978 ft. 2/
123	Champion Papers Well A-2	do	1937	1,275	20 12	-- 1,276	E	29	56	Jan. 18, 1937	T,E 250	Ind	217 ft. of screen between 998 and 1,251 ft. Reported yield 2,870 gpm with 116 ft. drawdown when drilled. Test hole drilled to 1,317 ft. 2/
124	Champion Papers Well A-3	do	1937	1,927	20 12	-- 1,927	E	28	43	Jan. 17, 1937	T,E 250	Ind	343 ft. of screen between 1,393 and 1,933 ft. Reported yield 3,030 gpm with 119 ft. drawdown when drilled. Test hole drilled to 1,939 ft. 2/
126	Houston Pipe Line Co.	A. E. Fawcett, Sr.	1937	310	4	310	CL	24	52	1937	N	N	Screen from 290 to 310 ft. Reported yield 50 gpm when drilled. Well destroyed.
127	Atlantic Richfield Co. Well 9	Layne Texas Co.	1940	1,192	20 10	783 1,192	E	33	124	June 2, 1940	T,E 200	Ind	178 ft. of screen between 849 and 1,188 ft. Reported yield 1,785 gpm with 84 ft. drawdown when drilled. Formerly Sinclair Refining Co.
128	Atlantic Richfield Co. Well 8	do	1934	1,701	24 12	215 1,701	E	20	53 108	Sept. 1934 Jan. 29, 1940	T,E 150	Ind	232 ft. of screen between 1,358 and 1,697 ft. Reported yield 1,525 gpm Feb. 1940. Test hole drilled to 1,705 ft. Formerly Sinclair Refining Co. 2/
133	Atlantic Richfield Co. Well 5	do	1924	1,223	24 12 8	182 1,113 1,223	E	25	--	--	N	N	183 ft. of screen between 858 and 1,223 ft. Formerly Sinclair Refining Co. Well destroyed. 2/
134	Manchester Terminal	do	1932	858	10 8	-- 658	CL	20	81 140 153	May 1932 Oct. 16, 1943 June 8, 1944	N	N	Screen from 815 to 858 ft. Reported yield 200 gpm with 38 ft. drawdown when drilled.
135	Atlantic Richfield Co. Well 6	do	1924	1,228	24 12 8	156 1,118 1,228	E	33	30 246.7	Oct. 1924 Dec. 8, 1959	N	N	190 ft. of screen between 711 and 1,228 ft. Formerly Sinclair Refining Co. Well destroyed. 2/ 3/

TABLE VI.-6

NORTHEAST REFINERY AREA WELLS AND BORINGS

Monitor Wells	Borings
GMW -15	RFI GMW-58C
GMW -23	RFI GMW-60
GMW -26	RFI GMW-61
GMW -27	RFI GMW-62
GMW -28	RFI GMW-63
GMW -40	RFI GMW-64
GMW -42	RFI GMW-65
GMW -44	RFI GMW-66
GMW -45	163
GMW -46A	164
GMW -47A	294
GMW -58C	297
GMW -60	298
GMW -61	299
GMW -62	325
GMW -63	326
GMW -64	327
GMW -65	525
GMW -66	544
	545
	589
	613
	615
	616
	617
	618
	619
	620
	621

TABLE VI.7 UNIT GROUNDWATER DETECTION MONITORING SYSTEM (Application Table VI.B.3.b)

Waste Management Unit/Area Name[1] **Southwest Landfarm**						
Well Number(s)	GMW-02	GMW-29	GMW-32	GMW-33	GMW-48	GMW-49
Hydrogeologic Unit Monitored	The first shallow water-bearing saturated zone					
Type (e.g.,. point of compliance, background, observation, etc.)	BG	BG	DET	DET	DET	DET
Up or Down Gradient	Up	Up	Down	Down	Down	Down
Casing Diameter and Material	4□, Steel	4□, PVC	4□, PVC	4□, PVC	4□, PVC	4□, PVC
Screen Diameter and Material	4□, Steel	4□, PVC	4□, PVC	4□, PVC	4□, PVC	4□, PVC
Screen Slot Size (in.)	0.015	0.020	0.020	0.020	0.010	0.010
Top of Casing Elevation (ft, MSL/ ft, Plant Datum)	29.51/37.71	30.33/38.53	27.73/35.93	29.36/37.56	32.92/41.12	24.78/32.98
Grade or Surface Elevation (ft, MSL/ ft, Plant Datum)	27.3/35.5	27.3/35.5	25.1/33.3	27.0/35.2	22.6/30.8	22.5/30.7
Well Depth (ft, BGS)	23.5	32.0	21.0	30.0	42.5	24.5
Screen Interval, From(ft, BGS) To(ft, BGS)	18.5-23.5	27.0-32.0	16.0-21.0	25.0-30.0	NA	NA
Facility Coordinates (company coordinates) North	-249.09	-228.70	559.30	413.30	432.81	488.53
West*	6720.57	6356.30	6574.30	6293.20	6092.53	6678.53
Sampling Frequency	Semi-annual	Semi-annual	Semi-annual	Semi-annual	Semi-annual	Semi-annual

[1]From Tables in Section V.

* Surveyors measure LCR□s facility coordinates from North and East. East-West coordinates are now given as negative numbers.

TABLE VI.7 UNIT GROUNDWATER DETECTION MONITORING SYSTEM (Application Table VI.B.3.b)

Waste Management Unit/Area Name[1] **Southwest Landfarm**						
Well Number(s)	GMW-50	GMW-51				
Hydrogeologic Unit Monitored	The first shallow water-bearing saturated zone					
Type (e.g.,. point of compliance, background, observation, etc.)	DET	DET				
Up or Down Gradient	Down	Down				
Casing Diameter and Material	4", PVC	4", PVC				
Screen Diameter and Material	4", PVC	4", PVC				
Screen Slot Size (in.)	0.010	0.010				
Top of Casing Elevation (ft, MSL/ ft, Plant Datum)	29.30/37.50	28.38/36.58				
Grade or Surface Elevation (ft, MSL/ ft, Plant Datum)	27.3/35.5	26.6/34.8				
Well Depth (ft, BGS)	30.0	32.0				
Screen Interval, From (ft, BGS) To (ft, BGS)	NA	NA				
Facility Coordinates (company coordinates) North	353.70	380.82				
West*	7182.19	7493.65				
Sampling Frequency	Semi-annual	Semi-annual				

[1]From Tables in Section V.

* Surveyors measure LCR□s facility coordinates from North and East. East-West coordinates are now given as negative numbers.

TABLE VI.7 UNIT GROUNDWATER DETECTION MONITORING SYSTEM (Application Table VI.B.3.b)

Waste Management Unit/Area Name[1] **Northeast Landfarm**						
Well Number(s)	GMW-40	GMW-42	GMW-44	GMW-45	GMW-46A	GMW-47A
Hydrogeologic Unit Monitored	Uppermost Aquifer					
Type (e.g.,. point of compliance, background, observation, etc.)	BG	DET	BG	DET	DET	DET
Up or Down Gradient	Up	Down	Up	Down	Down	Down
Casing Diameter and Material	2□, PVC	4□, PVC	4□ PVC	4□, PVC	4□, PVC	4□, PVC
Screen Diameter and Material	2□, PVC	4□, PVC	4□ PVC	4□, PVC	4□, PVC	4□, PVC
Screen Slot Size (in.)	0.010	0.010	0.010	0.01	0.01	0.01
Top of Casing Elevation (ft, MSL/ ft, Plant Datum or ft MSL)	~ 35.1	26.08	26.17/34.37	26.74/34.94	28.12/36.32	21.46/29.66
Grade or Surface Elevation (ft, MSL/ ft, Plant Datum)	24.3/32.5	17.8/26.0	24.9/33.1	24.9/33.1	26.7/34.9	29.66/19.70
Well Depth (ft, BGS)	90	72	84.0	84.5	85.0	77.0
Screen Interval, From(ft, BGS) To(ft, BGS)	73-78	65-70	72.5 - 82.4	72.7 - 81.6	73.4 - 82.4	64.4 - 74.4
Facility Coordinates (company coordinates) North	1130		3341.00	3419.30	3535.53	3847.01
West*	4500		381.37	672.96	-598.44	-698.11
Sampling Frequency	Semi-annual	Semi-annual	Semi-annual	Semi-annual	Semi-annual	Semi-annual

[1]From Tables in Section V.

* Surveyors measure LCR□s facility coordinates from North and East. East-West coordinates are now given as negative numbers.

TABLE VI.7 UNIT GROUNDWATER DETECTION MONITORING SYSTEM (Application Table VI.B.3.b)

Waste Management Unit/Area Name[1] **EGB**						
Well Number(s)	GMW-61	GMW-64	GMW-65	GMW-66		
Hydrogeologic Unit Monitored	The first shallow water-bearing saturated zone					
Type (e.g.,. point of compliance, background, observation, etc.)	BG	DET	DET	DET		
Up or Down Gradient	Up	Down	Down	Down		
Casing Diameter and Material	4□, PVC	4□, PVC	4□, PVC	4□, PVC		
Screen Diameter and Material	4□, PVC	4□, PVC	4□, PVC	4□, PVC		
Screen Slot Size (in.)	0.010	0.010	0.010	0.010		
Top of Casing Elevation (ft, MSL/ ft, Plant Datum)	20.31/28.51	20.99/29.19	19.98/28.18	20.23/28.43		
Grade or Surface Elevation (ft, MSL/ ft, Plant Datum)	17.64/25.84	17.91/26.11	17.93/26.13	17.99/26.91		
Well Depth (ft, BGS)	36	35	32.5	32.0		
Screen Interval, From(ft, BGS) To(ft, BGS)	20.5-30.5	23.5-33.5	22.5-32.5	21.0-31.5		
Facility Coordinates (company coordinates) North						
West*						
Sampling Frequency	Semi-annual	Semi-annual	Semi-annual	Semi-annual		

[1]From Tables in Section V.

* Surveyors measure LCR□s facility coordinates from North and East. East-West coordinates are now given as negative numbers.

TABLE VI.7 UNIT GROUNDWATER DETECTION MONITORING SYSTEM (Application Table VI.B.3.b)

Waste Management Unit/Area Name[1] **EIB**						
Well Number(s)	GMW-60	GMW-61	GMW-62	GMW-63		
Hydrogeologic Unit Monitored	The first shallow water-bearing saturated zone					
Type (e.g.,. point of compliance, background, observation, etc.)	BG	DET	DET	DET		
Up or Down Gradient	Up	Down	Down	Down		
Casing Diameter and Material	4□, PVC	4□, PVC	4□, PVC	4□, PVC		
Screen Diameter and Material	4□, PVC	4□, PVC	4□, PVC	4□, PVC		
Screen Slot Size (in.)	0.010	0.010	0.010	0.010		
Top of Casing Elevation (ft, MSL/ ft, Plant Datum)	25.84/34.04	20.31/28.51	18.05/26.25	16.97/25.17		
Grade or Surface Elevation (ft, MSL/ ft, Plant Datum)	23.54/31.74	17.64/25.84	15.91/24.11	14.95/23.15		
Well Depth (ft, BGS)	34	36	26	24		
Screen Interval, From(ft, BGS) To(ft, BGS)	26.5-32	20.5-30.5	16-23.5	15.75-23.25		
Facility Coordinates (company coordinates) North						
West*						
Sampling Frequency	Semi-annual	Semi-annual	Semi-annual	Semi-annual		

[1]From Tables in Section V.

* Surveyors measure LCR□s facility coordinates from North and East. East-West coordinates are now given as negative numbers.

TABLE VI.-8

SOUTHWEST REFINERY AREA WELLS AND BORINGS

Monitor Wells	Borings
GMW -2	316
GMW -29	461
GMW -30	540
GMW -31	617
GMW -32	618
GMW -33	652
GMW -48	653
GMW -49	620 (84-1)
GMW -50	618 (84-2)
GMW -51	619 (84-3)
	617 (84-4)
	84-5
	84-6A
	84-10A
	84-11

TABLE VI.-9
HYDRAULIC CONDUCTIVITIES AND GROUNDWATER FLOW VELOCITIES

WELLS	DATE	n (estimated)	K Min., cm/sec	K Max., cm/sec	K Avg., cm/sec	V Min., ft/yr	V Max., ft/yr	V Avg., ft/yr
EGB 61, 64, 65, 66	11/94	0.35	4.32×10^{-4}	3.23×10^{-3}	1.83×10^{-3}	18.52	138.45	78.44
East Impoundment Basin 60, 61, 62, 63	11/94	0.35	7.41×10^{-4}	4.32×10^{-4}	5.87×10^{-4}	26.29	15.32	20.82
Northeast Refinery Area 57, 60, 61, 64, 69, 71, 72	11/94	0.35	5.98×10^{-5}	8.66×10^{-4}	4.63×10^{-4}	2.12	30.72	16.42
Northeast Landfill 56, 57, 64, 65, 66, 71, 72, HRW-3, HRW-38	11/94	0.35	8.66×10^{-4}	3.23×10^{-3}	2.05×10^{-3}	70.66	263.53	167.26
West Staging Building Area 54, 55	8/94	0.35	NA	1.02×10^{-4}	NA	NA	0.844	NA
Southwest Landfill 50, 52, 53, 54, 55	8/94	0.35	1.02×10^{-4}	1.02×10^{-3}	5.61×10^{-4}	1.21	12.06	6.63
Southwest Land Treatment Unit 2, 29, 30, 31, 32	1984	0.35	6.2×10^{-6}	1.6×10^{-4}	4.35×10^{-4}	NA	37.00	NA

n = porosity
k = hydraulic conductivity
v = velocity

TABLE VI.10

RESERVED

TABLE VI.11

RESERVED

TABLE VI.-12
BACKGROUND CONCENTRATIONS
OF GROUNDWATER MONITORING PARAMETERS

Constituent	Maximum Limit of Detection	Maximum Detected Background Concentration	Number of Background Samples
Northeast Landfarm			
Toluene	5 ug/l	All ND	16
Ethylbenzene	5 ug/l	All ND	16
1-Methyl-naphthalene	20 ug/l	All ND	16
Naphthalene	20 ug/l	All ND	16
Phenol	20 ug/l	All ND	16
Chromium	0.05 mg/l	All ND	16
Lead	0.1 mg/l	All ND	16
Southwest Landfarm			
Toluene	5 ug/l	All ND	16
Ethylbenzene	5 ug/l	All ND	16
1-Methyl-naphthalene	20 ug/l	All ND	16
Naphthalene	20 ug/l	All ND	16
Phenol	20 ug/l	All ND	16
Chromium	0.05 mg/l	1 Detect @ 0.06 mg/l	16
Lead	0.1 mg/l	All ND	16

East Impoundment Basin			
Benzene	5 ug/L	All ND	16
East Guard Basin			
Benzene	5 ug/L	All ND	16

TABLE VI.13

RESERVED

TABLE VI.14 GROUNDWATER SAMPLE ANALYSIS (Application Table VI.B.3.c)

For each well or group of wells, specify the suite of parameters for which groundwater samples will be analyzed.

Well Nos. **(SWLF)** GMW-02, GMW-29, GMW-32, GMW-33, GMW-48, GMW-49, GMW-50, GMW-51

Parameter	**Sampling Frequency**	**Detection Limits**	**Concentration Limit[1]**
Toluene	Semi-Annual	5 ug/L	5 ug/L
Ethylbenzene	Semi-Annual	5 ug/L	5 ug/L
Phenol	Semi-Annual	10 ug/L	20 ug/L
Naphthalene	Semi-Annual	10 ug/L	20 ug/L
1-Methylnaphthlene	Semi-Annual	10 ug/L	20 ug/L
lead	Semi-Annual	0.1 mg/L	0.1 mg/L
chromium	Semi-Annual	0.05 mg/L	0.06 mg/L

(1) The concentration limit is the basis for determining whether a release has occurred from the waste management unit/area.

TABLE VI.14 GROUNDWATER SAMPLE ANALYSIS (Application Table VI.B.3.c)

For each well or group of wells, specify the suite of parameters for which groundwater samples will be analyzed.

Well Nos. **(NELF)** GMW-40, GMW-42, GMW-44, GMW-45, GMW-46A, GMW-47A

Parameter	**Sampling Frequency**	**Detection Limits**	**Concentration Limit[1]**
Toluene	Semi-Annual	5 ug/L	5 ug/L
Ethylbenzene	Semi-Annual	5 ug/L	5 ug/L
Phenol	Semi-Annual	10 ug/L	20 ug/L
Naphthalene	Semi-Annual	10 ug/L	20 ug/L
1-Methylnaphthlene	Semi-Annual	10 ug/L	20 ug/L
lead	Semi-Annual	0.1 mg/L	0.1 mg/L
chromium	Semi-Annual	0.05 mg/L	0.05 mg/L

(1) The concentration limit is the basis for determining whether a release has occurred from the waste management unit/area.

TABLE VI.14 GROUNDWATER SAMPLE ANALYSIS (Application Table VI.B.3.c)

For each well or group of wells, specify the suite of parameters for which groundwater samples will be analyzed.

Well Nos. **(EGB)** GMW-64, GMW-65, GMW-66

Parameter	**Sampling Frequency**	**Detection Limits**	**Concentration Limit[1]**
Benzene	Semi-Annual	5 ug/L	5 ug/L

(1) The concentration limit is the basis for determining whether a release has occurred from the waste management unit/area.

TABLE VI.14 GROUNDWATER SAMPLE ANALYSIS (Application Table VI.B.3.c)

For each well or group of wells, specify the suite of parameters for which groundwater samples will be analyzed.

Well Nos. **(EIB)** GMW-60, GMW-61, GMW-63

Parameter	**Sampling Frequency**	**Detection Limits**	**Concentration Limit**[1]
Benzene	Semi-Annual	5 ug/L	5 ug/L

(1) The concentration limit is the basis for determining whether a release has occurred from the waste management unit/area.

TABLE VI.-15
SAMPLING AND ANALYSIS FREQUENCIES
FOR SOIL CORE MONITORING
SOUTHWEST LANDFARM PLOTS 612, 613, 614, 615, 616 AND 617
NORTHEAST LANDFARM PLOTS 2 AND 4

Quarter	1	2	3	4
pH	A	A	A	A
Specific Conductance	A	A	A	A
Total Organic Carbon	A	A	A	A
Lead	AS	AS	AS	AS
Chromium	AS	AS	AS	AS
Ethyl Benzene	AS	AS	AS	AS
Toluene	AS	AS	AS	AS
Phenol	AS	AS	AS	AS
Naphthalene	AS	AS	AS	AS
1-Methyl-Naphthalene	AS	AS	AS	AS

A = Laboratory analysis performed.
S = Statistical analysis

TABLE VI.16
BACKGROUND SAMPLE CONCENTRATIONS FOR SOIL CORE MONITORING

Boring No./Depth	Concentration						
	Chromium (mg/kg)	Lead (mg/kg)	Phenol (ug/kg)	Ethylbenzene (ug/kg)	Toluene (ug/kg)	1-Methyl Naphthalene (ug/kg)	Naphthalene (ug/kg)
1 (0-15")	52.3	106.0	<360	<6.0	<6.0	<55	<360
2 (0-15")	39.5	38.0	<430	<7.0	<7.0	<430	<430
3 (0-15")	28.1	41.9	<460	<7.0	<7.0	<460	<460
4 (0-15")	31.6	77.8	<430	<5.0	<5.0	<430	<99
5 (0-15")	31..2	<2.0	<430	<7.0	<7.0	<430	<430
6 (0-15")	34.0	27.4	<450	<7.0	<7.0	<450	<450
7 (0-15")	28.1	19.5	<460	<7.0	<7.0	<460	<460
8 (0-15")	25.3	22.7	<420	<6.0	<6.0	<420	<420
1 (15-30")	28.3	21.3	<450	<7.0	<7.0	<450	<450
2 (15-30")	30.5	24.3	<1300	<7.0	<7.0	<1300	<1300
3 (15-30")	23.8	19.7	<460	<7.0	<7.0	<460	<460
4 (15-30")	37.6	44.2	<460	<7.0	<7.0	<460	<460

TABLE VI.16
BACKGROUND SAMPLE CONCENTRATIONS FOR SOIL CORE MONITORING

Boring No./Depth	Concentration						
	Chromium (mg/kg)	Lead (mg/kg)	Phenol (ug/kg)	Ethylbenzene (ug/kg)	Toluene (ug/kg)	1-Methyl Naphthalene (ug/kg)	Naphthalene (ug/kg)
5 (15-30")	21.2	18.2	<440	<7.0	<7.0	<440	<440
6 (15-30")	31.0	<2.0	<420	<6.0	<6.0	<420	<420
7 (15-30")	35.4	<2.0	<460	<7.0	<7.0	<460	<460
8 (15-30")	42.3	13.7	<450	<7.0	<7.0	<450	<450
1 (30-45")	25.6	27.3	<450	<7.0	<7.0	<450	<450
2 (30-45")	20.8	20.8	<450	<7.0	<7.0	<450	<450
3 (30-45")	48.9	17.3	<460	<6.0	<6.0	<460	<460
4 (30-45")	40.8	21.0	<470	<7.0	<7.0	<470	<470
5 (30-45")	24.9	21.1	<460	<7.0	<7.0	<460	<460
6 (30-45")	31.7	<2.0	<430	<7.0	<7.0	<430	<430
7 (30-45")	52.2	<2.0	<450	<7.0	<7.0	<450	<450
8 (30-45")	41.1	14.9	<470	<7.0	<7.0	<470	<470

TABLE VI.16
BACKGROUND SAMPLE CONCENTRATIONS FOR SOIL CORE MONITORING

Boring No./Depth	Concentration						
	Chromium (mg/kg)	Lead (mg/kg)	Phenol (ug/kg)	Ethylbenzene (ug/kg)	Toluene (ug/kg)	1-Methyl Naphthalene (ug/kg)	Naphthalene (ug/kg)
1 (45-60")	16.2	27.0	<450	<7.0	<7.0	<<450	<450
2 (45-60")	31.4	12.7	<430	<7.0	<7.0	<430	<430
3 (45-60")	45.2	10.0	<460	<7.0	<7.0	<460	<460
4 (45-60")	33.5	17.3	<430	<6.0	<6.0	<430	<430
5 (45-60")	29.7	17.1	<1300	<7.0	<7.0	<1300	<1300
6 (45-60")	19.5	22.4	<430	<7.0	<7.0	<430	<430
7 (45-60")	49.3	11.5	<450	<7.0	<7.0	<450	<450
8 (45-60")	31.2	9.5	<440	<7.0	<7.0	<440	<440
1 (60-66")	28.1	29.5	<440	<7.0	<7.0	<440	<440
2 (60-66")	20.0	29.1	<430	<7.0	<7.0	<430	<430
3 (60-66")	24.9	<2.0	<460	<7.0	<5.0	<460	<460
4 (60-66")	42.2	21.0	<410	<6.0	<6.0	<410	<410

TABLE VI.16
BACKGROUND SAMPLE CONCENTRATIONS FOR SOIL CORE MONITORING

Boring No./Depth	Concentration						
	Chromium (mg/kg)	Lead (mg/kg)	Phenol (ug/kg)	Ethylbenzene (ug/kg)	Toluene (ug/kg)	1-Methyl Naphthalene (ug/kg)	Naphthalene (ug/kg)
5 (60-66")	19.5	18.2	<1300	<7.0	<7.0	<1300	<1300
6 (60-66")	22.5	13.2	<430	<7.0	<7.0	<430	<430
7 (60-66")	35.7	<2.0	<430	<7.0	<7.0	<430	<430
8 (60-66")	27.4	<2.0	<460	<7.0	<7.0	<460	<460

TABLE VI.17

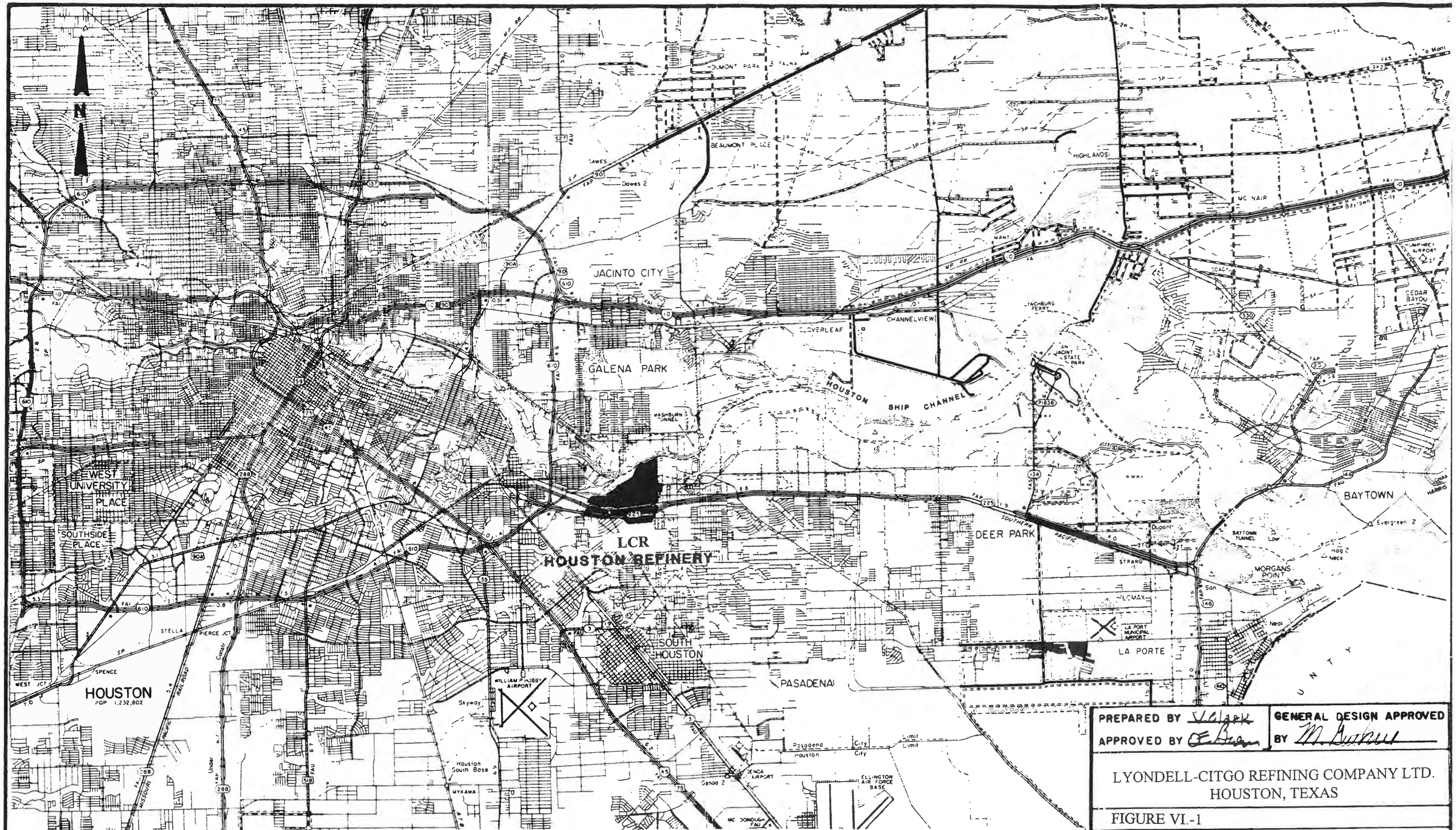
CONCENTRATION LIMITS FOR SOIL CORE MONITORING PARAMETERS

Parameter	Concentration Limit[1]
Toluene	7.0 ug/kg
Ethylbenzene	7.0 ug/kg
Phenol	1,300 ug/kg
Naphthalene	1,300 ug/kg
1-Methyl Naphthalene	1,300 ug/kg
Lead	106.0 mg/kg
Chromium	57.4 mg/kg
TOC[2]	NA
pH[2]	NA
Specific Conductance[2]	NA

(1) The concentration limit is the basis for determining whether a release has occurred from the waste management unit area.

(2) This parameter will not be analyzed statistically to determine if a release has occurred from the waste management unit/area.

FIGURES



FROM TEXAS HIGHWAY MAP
(HARRIS COUNTY) JULY 1979

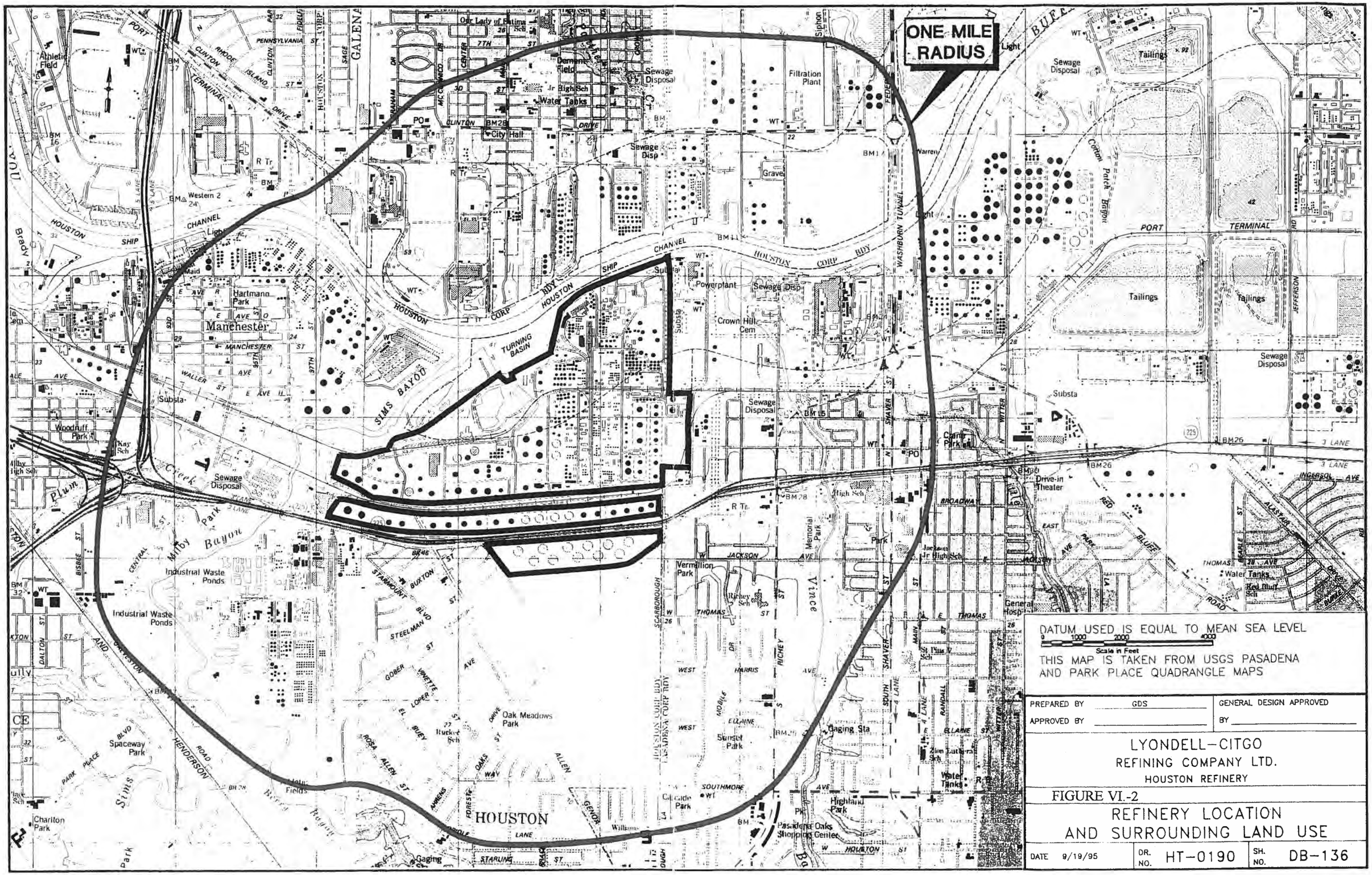
PREPARED BY V. Clark	GENERAL DESIGN APPROVED
APPROVED BY E. Brown	BY M. Burnell

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-1

REGIONAL SETTING
LCR REFINERY LOCATION

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



DATUM USED IS EQUAL TO MEAN SEA LEVEL

THIS MAP IS TAKEN FROM USGS PASADENA AND PARK PLACE QUADRANGLE MAPS

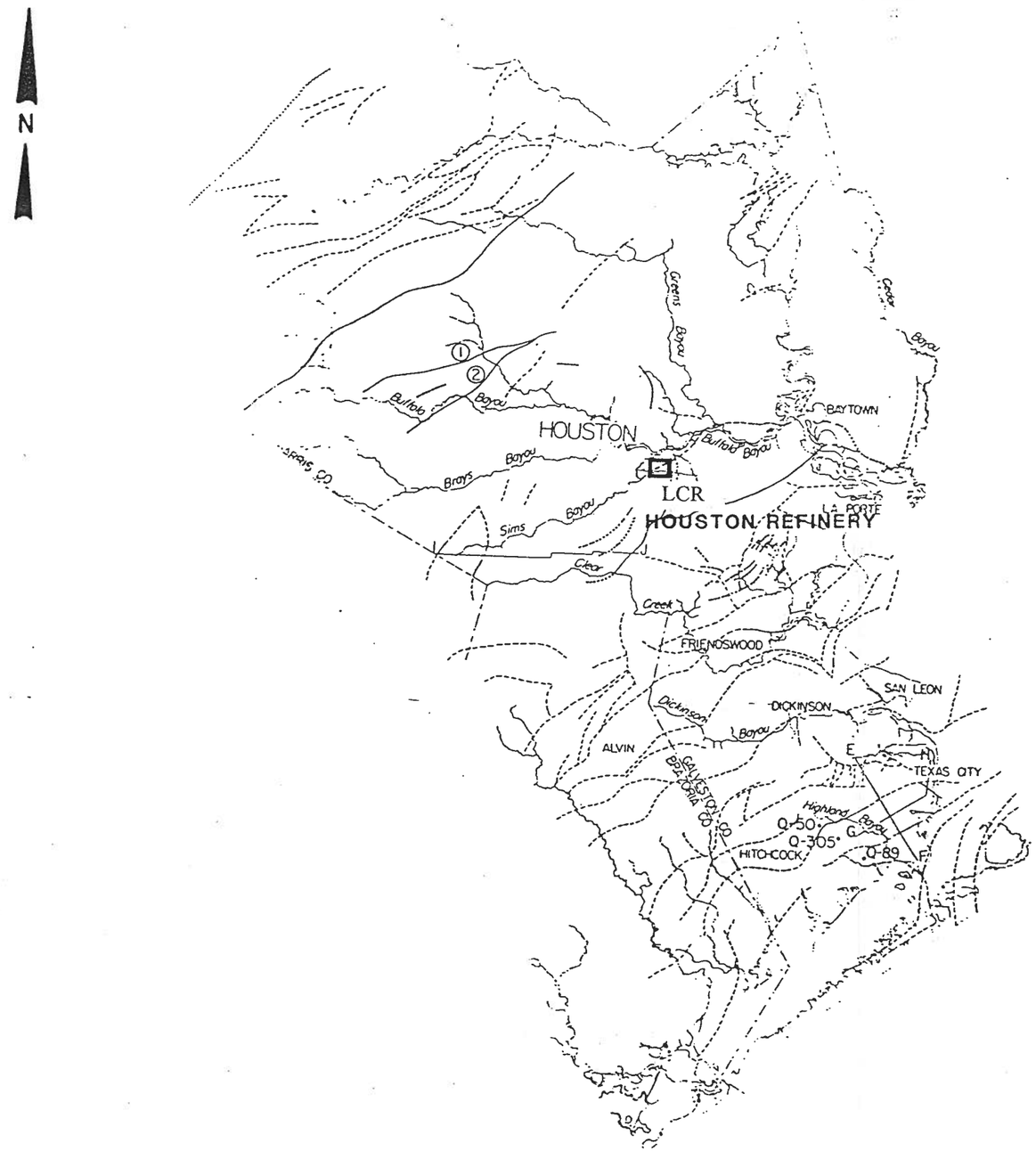
PREPARED BY GDS	GENERAL DESIGN APPROVED
APPROVED BY	BY

LYONDELL–CITGO
REFINING COMPANY LTD.
HOUSTON REFINERY

FIGURE VI.-2

REFINERY LOCATION AND SURROUNDING LAND USE

DATE	DR. NO.	SH. NO.
9/19/95	HT–0190	DB–136



LEGEND

- SURFACE TRACE OF EXTRAPOLATED FAULT
- SURFACE FAULT COINCIDENT WITH EXTRAPOLATED FAULT
- SURFACE FAULT NOT COINCIDNT WITH EXTRAPOLATED FAULT

FROM KREITLER, 1978

0 10 20
MILES

Active surface faults and surface traces of extrapolated subsurface faults, Harris and Galveston Counties, Texas. Surface traces were determined by extrapolating subsurface faults based on subsurface maps of Geomap Co. A fault plane of 45 or the dip calculated between two datum surfaces was used for the extrapolations.(Kreitler, 1978)

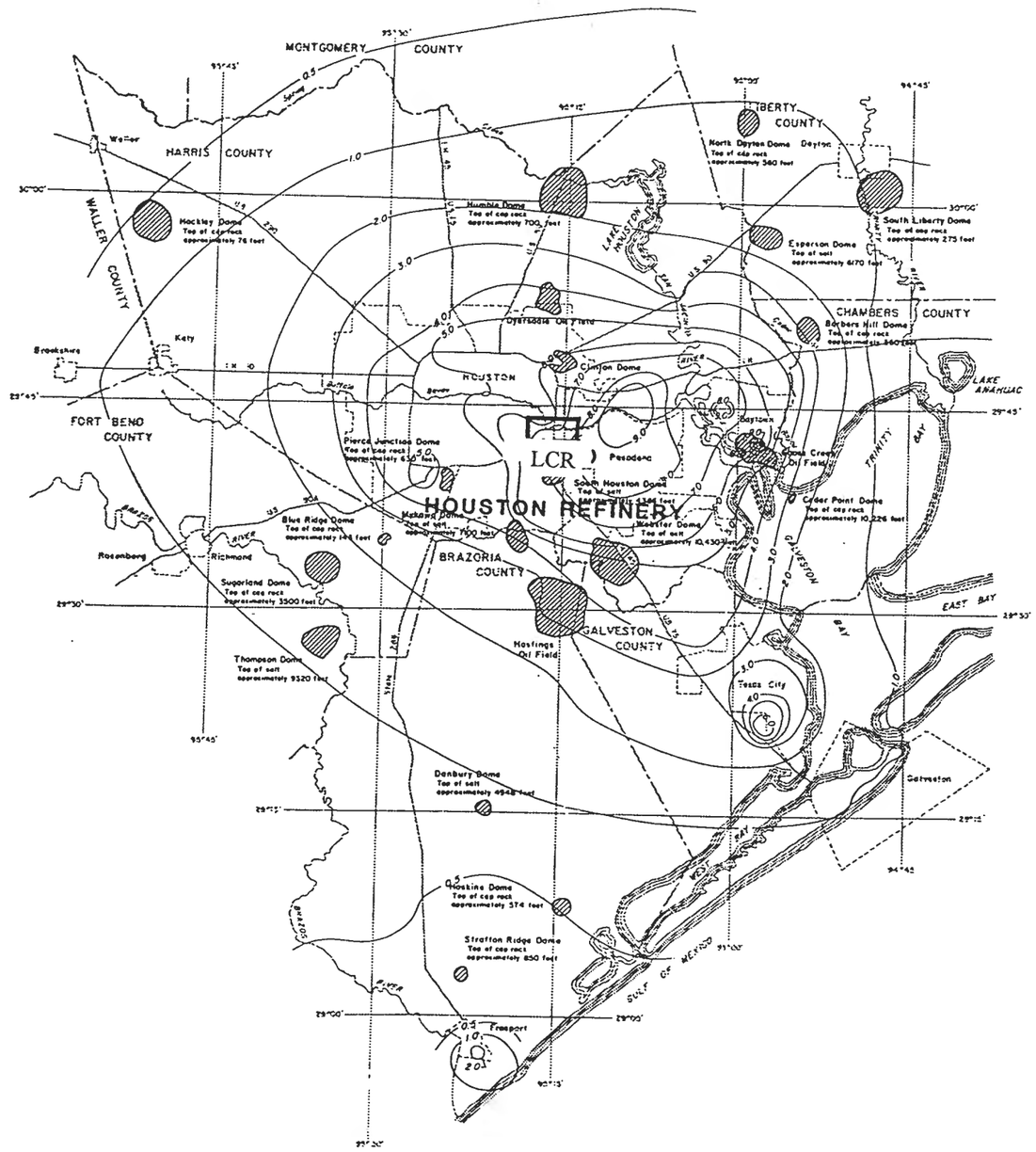
PREPARED BY V. Clark APPROVED BY O.E. Brown	GENERAL DESIGN APPROVED BY M. Kothari

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-3

ACTIVE SURFACE FAULTS

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

—2.0— LINE OF EQUAL LAND-SURFACE SUBSIDENCE Intervals 1.0 and 0.5 foot. Contours based on limited amount of data.

GENERAL LOCATION OF SELECTED SALT DOME OR OIL FIELD. Depth to top of cap rock or salt are referenced to land surface.

DATUM USED IS EQUAL TO MEAN SEA LEVEL

FROM OPEN FILE REPORT 82-571

0 10 20
MILES

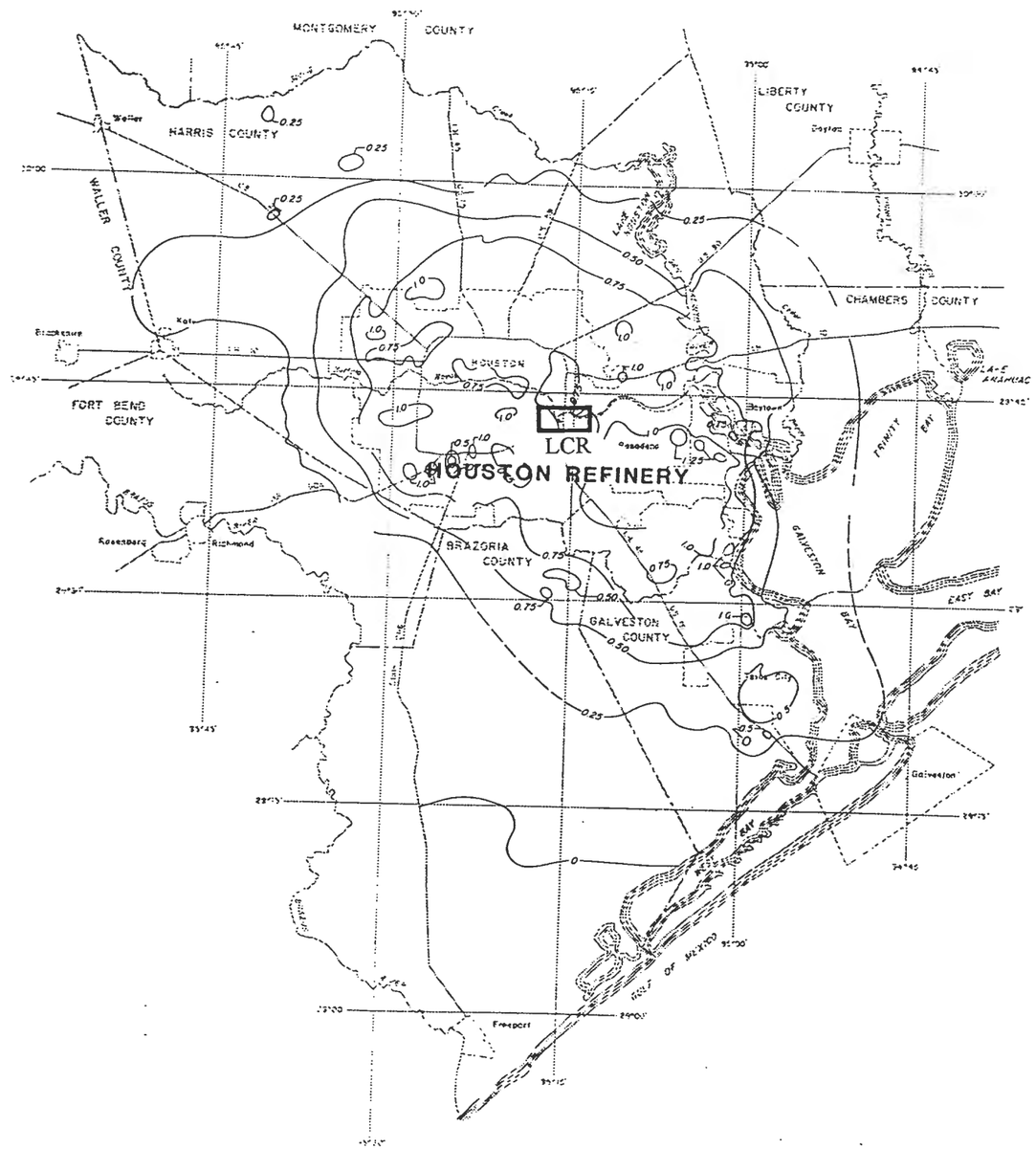
PREPARED BY V. Clark APPROVED BY [illegible]	GENERAL DESIGN APPROVED BY M. Gahrn

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-4

APPROXIMATE LAND SURFACE SUBSIDENCE 1906- 1978

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

—0.5— LINE OF EQUAL LAND-SURFACE SUBSIDENCE Dashed where approximately located. Intervals 0.25 foot

FROM OPEN FILE REPORT 82-571

0 10 20
MILES

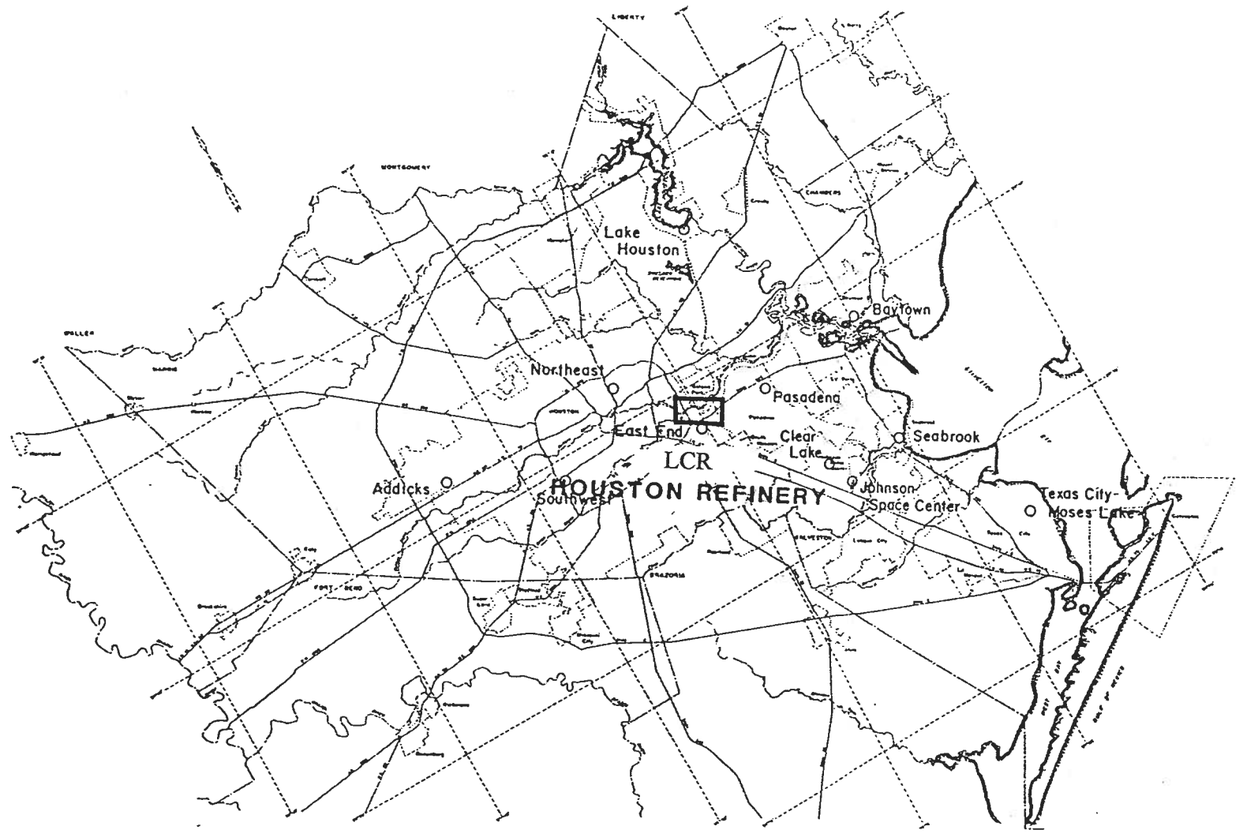
PREPARED BY V. Clark APPROVED BY DE Brown	GENERAL DESIGN APPROVED BY M Grothus

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-5

APPROXIMATE LAND SURFACE SUBSIDENCE 1973-1978

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



FROM USGS OPEN FILE REPORT 84-140

0 10 20
MILES

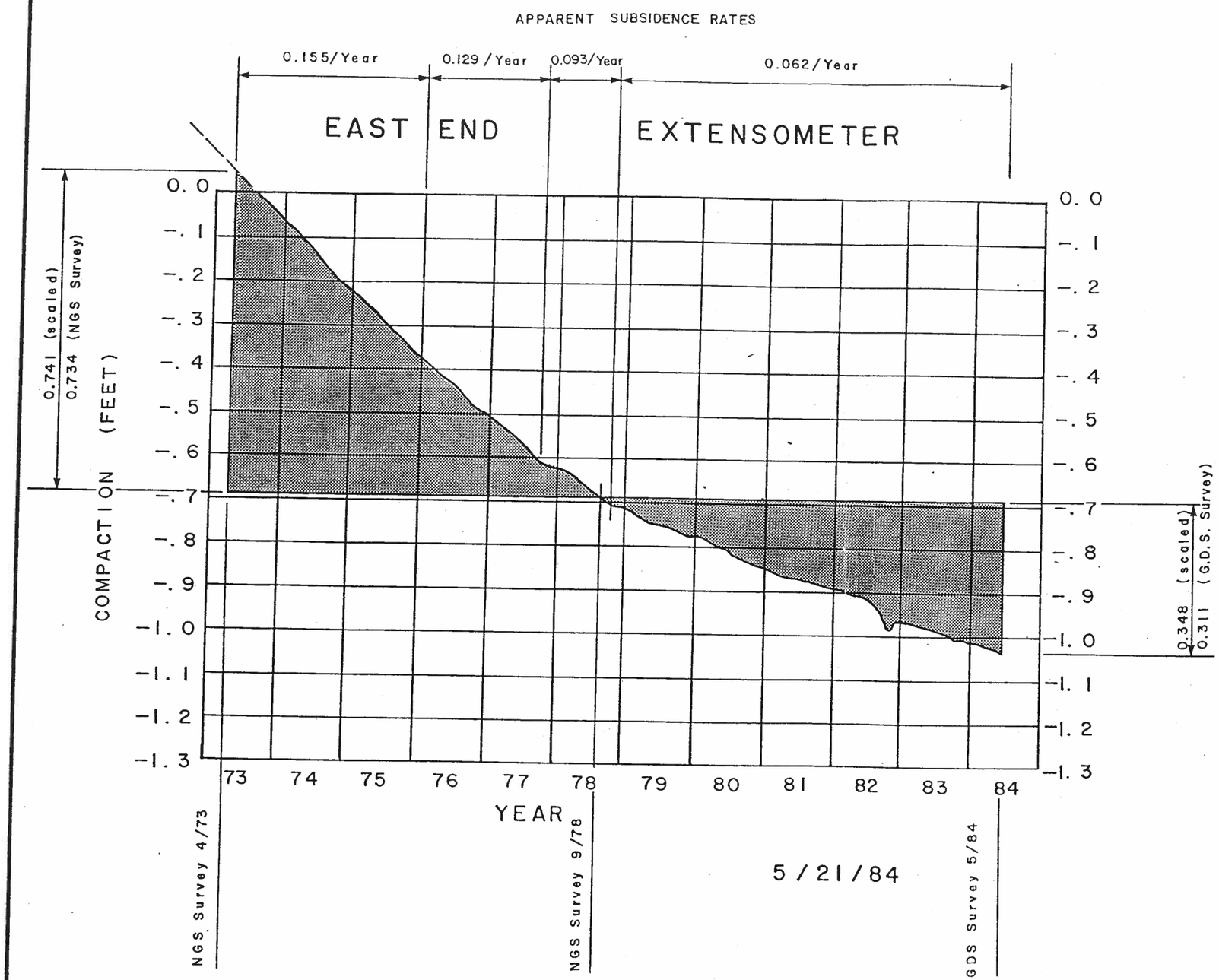
PREPARED BY V. Clark APPROVED BY OE Brown	GENERAL DESIGN APPROVED BY M. Rutwil

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-6

LOCATION OF BOREHOLE EXTENSOMETERS

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



BASE CHART FROM HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT

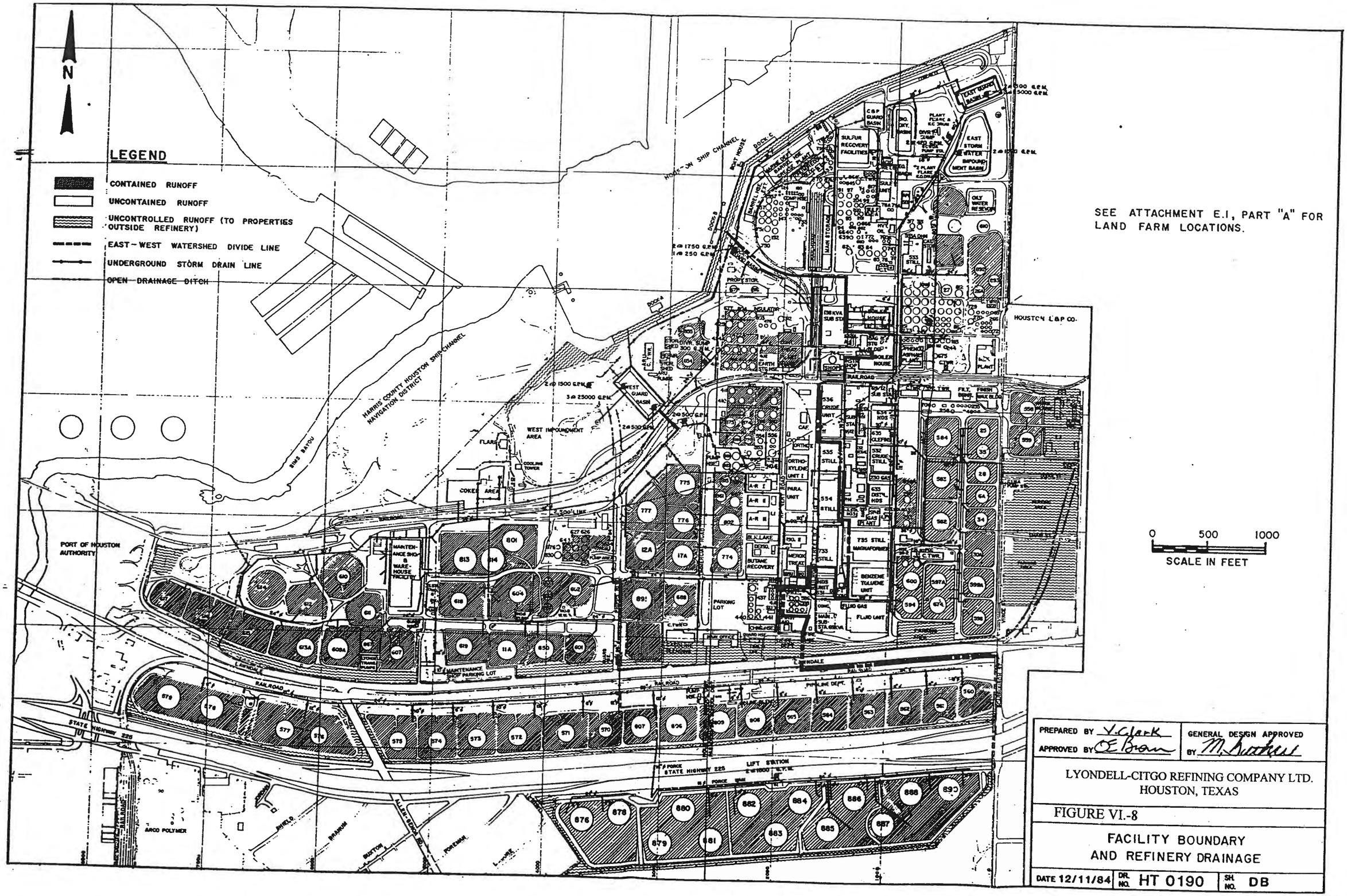
PREPARED BY V. Clark APPROVED BY O.E. Brown	GENERAL DESIGN APPROVED BY M. Duthie

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-7

EAST END EXTENSOMETER
ACCUMLATIVE SUBSIDENCE DATA

DATE 12/11/84	DR. NO.	HT 0190	SH. NO.	DB


N
LEGEND
CONTAINED RUNOFF
UNCONTAINED RUNOFF
UNCONTROLLED RUNOFF (TO PROPERTIES OUTSIDE REFINERY)
EAST-WEST WATERSHED DIVIDE LINE
UNDERGROUND STORM DRAIN LINE
OPEN DRAINAGE DITCH
SEE ATTACHMENT E.I, PART "A" FOR LAND FARM LOCATIONS.
0 500 1000
SCALE IN FEET
HOUSTON SHIP CHANNEL
HARRIS COUNTY HOUSTON SHIP CHANNEL NAVIGATION DISTRICT
SIMS BAYOU
PORT OF HOUSTON AUTHORITY
HOUSTON L&P CO.
WEST IMPOUNDMENT AREA
COKER AREA
FLARE
COOLING TOWER
SULFUR RECOVERY FACILITIES
EAST STORM WATER IMPOUNDMENT BASIN
OILY WATER RESERVOIR
MAIN STORAGE
BOILER HOUSE
CRUDE UNIT
ORTHO-XYLENE UNIT
PARA. UNIT
BENZENE TOLUENE UNIT
FLUID GAS
FLUID UNIT
PARKING LOT
MAINTENANCE SHOP & WAREHOUSE FACILITY
MAINTENANCE SHOP PARKING LOT
RAILROAD
STATE HIGHWAY 225
LIFT STATION
ARCO POLYMER
PREPARED BY
APPROVED BY
GENERAL DESIGN APPROVED BY
LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS
FIGURE VI.-8
FACILITY BOUNDARY AND REFINERY DRAINAGE
DATE 12/11/84
DR. NO. HT 0190
SH. NO. DB

LEGEND

FS	FILL AND SPOILS
Qal	ALLUVIUM
Qbi	BARRIER-ISLAND DEPOSITS
Qd / Qdi	DEWEYVILLE FORMATION
Ql	LISSIE FORMATION
Qbb / Qb / Qbt	BEAUMONT FORMATION
U / D	FAULT

DATUM USED IS EQUAL TO MEAN SEA LEVEL

FROM GEOLOGIC ATLAS OF TEXAS, HOUSTON SHEET

0 5 10
MILES

PREPARED BY V. Clark
APPROVED BY C.E. Brown

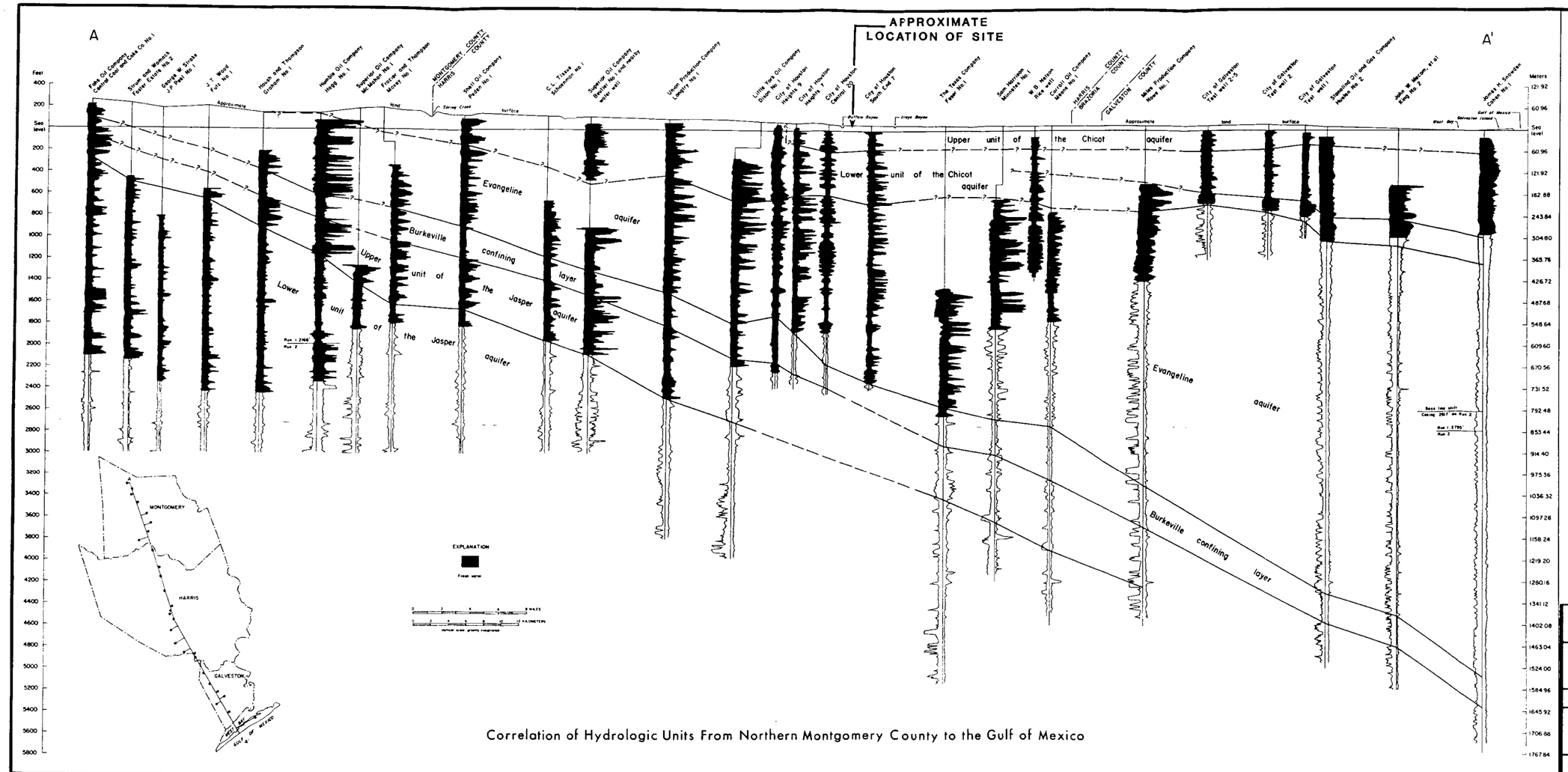
GENERAL DESIGN APPROVED BY M. Gotti

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-9

REGIONAL GEOLOGY MAP

DATE 12/11/84 | DR. NO. HT 0190 | SH. NO. DB



Correlation of Hydrologic Units From Northern Montgomery County to the Gulf of Mexico

FROM JORGENSEN, 1975

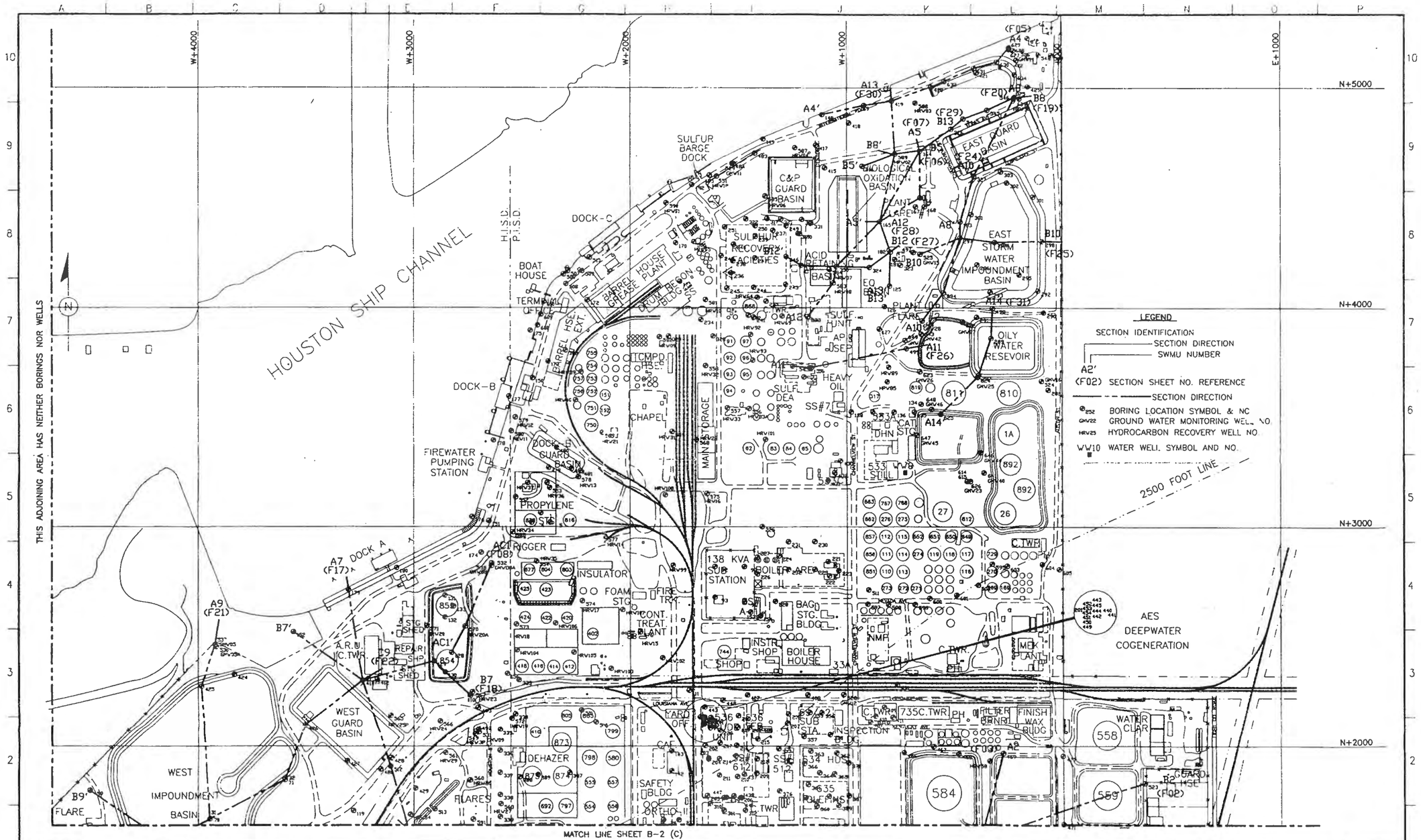
PREPARED BY Y. Clark
APPROVED BY C.E. Brown
GENERAL DESIGN APPROVED BY M. Buttrill

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-10

REGIONAL STRATIGRAPHIC AND HYDROGEOLOGIC CROSS SECTIONS

DATE 12/11/84 | DR. NO. HT 0190 | SH. NO. DB



Brown and Caldwell Consultants
DALLAS-HOUSTON, TEXAS

SUBMITTED STEVEN A. MELLON (PROJECT MANAGER) DATE 8-14-93
APPROVED DONALD R. FUNDERLIC, V.P. (BROWN AND CALDWELL) DATE
APPROVED DATE

0 50 100 200 400
SCALE: 1" = 200'
LINE IS 2 INCHES AT FULL SIZE

FILE 5175
DRAWN DHD
DESIGNED DG
CHECKED WC

N/A	SHEET A
SHEET B	SHEET C

SHEET ORIENTATION PLAN

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

LCR

HOUSTON REFINERY

BORING AND WELL LOCATION MAP
NORTHEAST REFINERY AREA

BASE MAPS DEVELOPED BY GDS ENGINEERS, INC.

FIGURE VI.-11
SHEET NUMBER A

THIS ADJOINING AREA HAS NEITHER BORINGS NOR WELLS.

N+1000

+000

S+1000

S+2000

W+8000

W+7000

W+6000

W+5000

N

2500 CONTOUR LINE

A1'

A2'

A3'

A1 (F01)

AC2 (F09)

AC3 (F11)

AC4' (E13)

AC5 (F13)

A3 (F04)

BC2

BC2 (F10)

COKER UNIT

MAINT SHOP AND STORE HOUSE

SS #8

PH PUMP

GUARD HSE

MAIN. SHOP PKG.

TOWNDELL TRANSFER PUMPS

PUMPS

LAWNDALE

STATE HIGHWAY 225

SHIELD

BRANUM

BUXTON

ALLEN-GENOA RD.

FOREMAN

613A

609

607

619

618

579

578

577

576

575

574

MATCH LINE B-2 (C)

LEGEND

SECTION IDENTIFICATION

SECTION DIRECTION

SWMU NUMBER

A2'

(F02) SECTION SHEET NO. REFERENCE

SECTION DIRECTION

BORING LOCATION SYMBOL & NO.

GRV22 GROUND WATER MONITORING WELL NO.

HRV23 HYDROCARBON RECOVERY WELL NO.

WW10 WATER WELL SYMBOL AND NO.

Brown and Caldwell Consultants
DALLAS-HOUSTON, TEXAS

SUBMITTED STEVEN A. MELLON (PROJECT MANAGER) DATE 8-14-90
APPROVED DONALD R. FUNDERLIC, V.P. (BROWN AND CALDWELL) DATE
APPROVED DATE

0 50 100 200 400
SCALE: 1" = 200'
LINE IS 2 INCHES AT FULL SIZE
FILE 5175
DRAWN DHD
DESIGNED DG
CHECKED WC

N/A	SHEET A
SHEET B	SHEET C

SHEET ORIENTATION PLAN

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

LCR

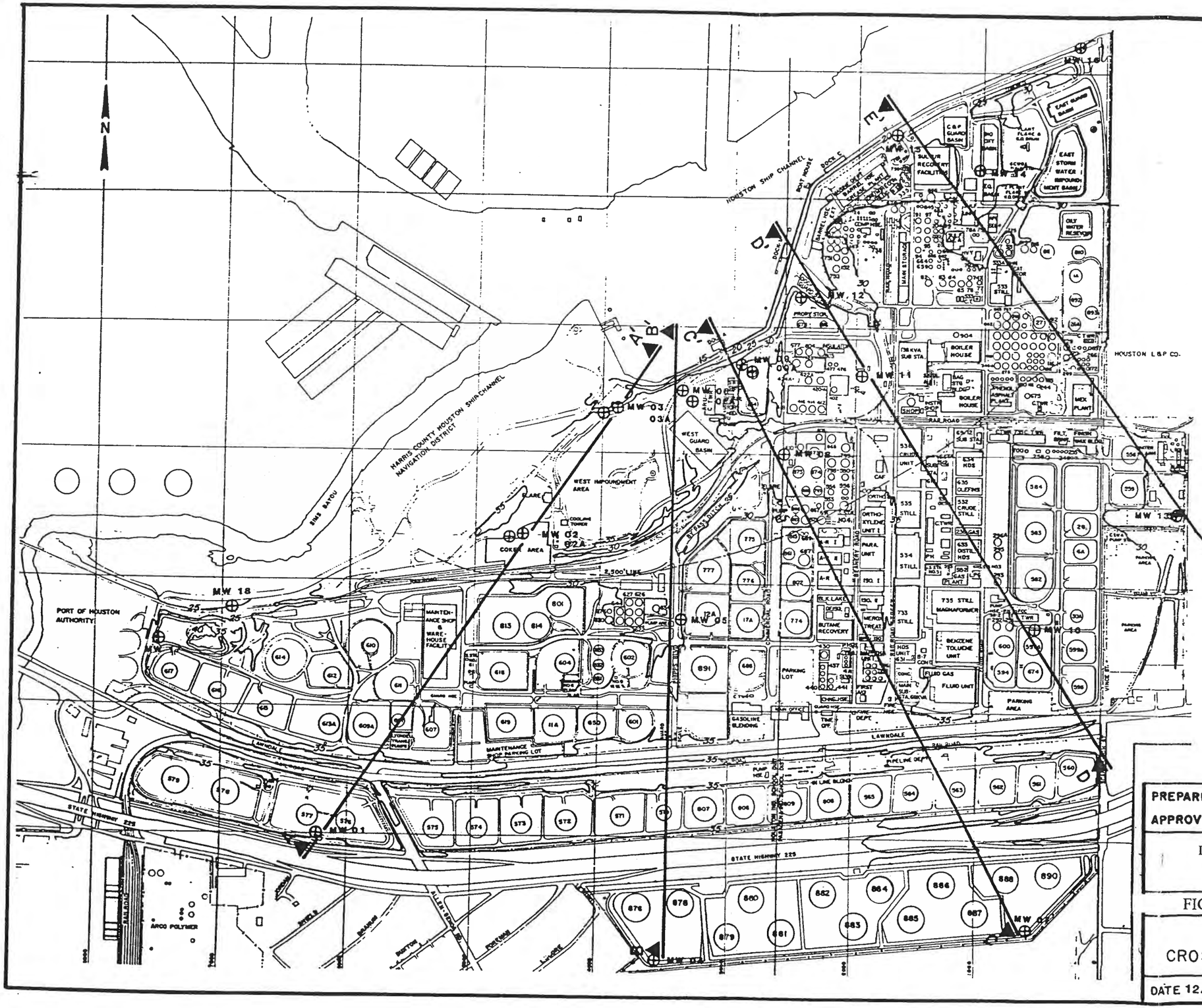
HOUSTON REFINERY

BORING AND WELL LOCATION MAP
SOUTHWEST REFINERY AREA

BASE MAPS DEVELOPED BY GDS ENGINEERS, INC.

FIGURE VI.-12

SHEET NUMBER B



LEGEND

⊕ PROPOSED GROUND WATER MONITORING WELL LOCATIONS

STATE OF TEXAS
WILLIE C. DODD
9374
REGISTERED PROFESSIONAL ENGINEER

WILLIE C. DODD
GEOTECHNICAL ENGINEER
DODD GEOTECHNICAL ENGINEERING CO.
11302 Craighead - Houston, Texas - 77025

0 200 400 600 800
SCALE IN FEET

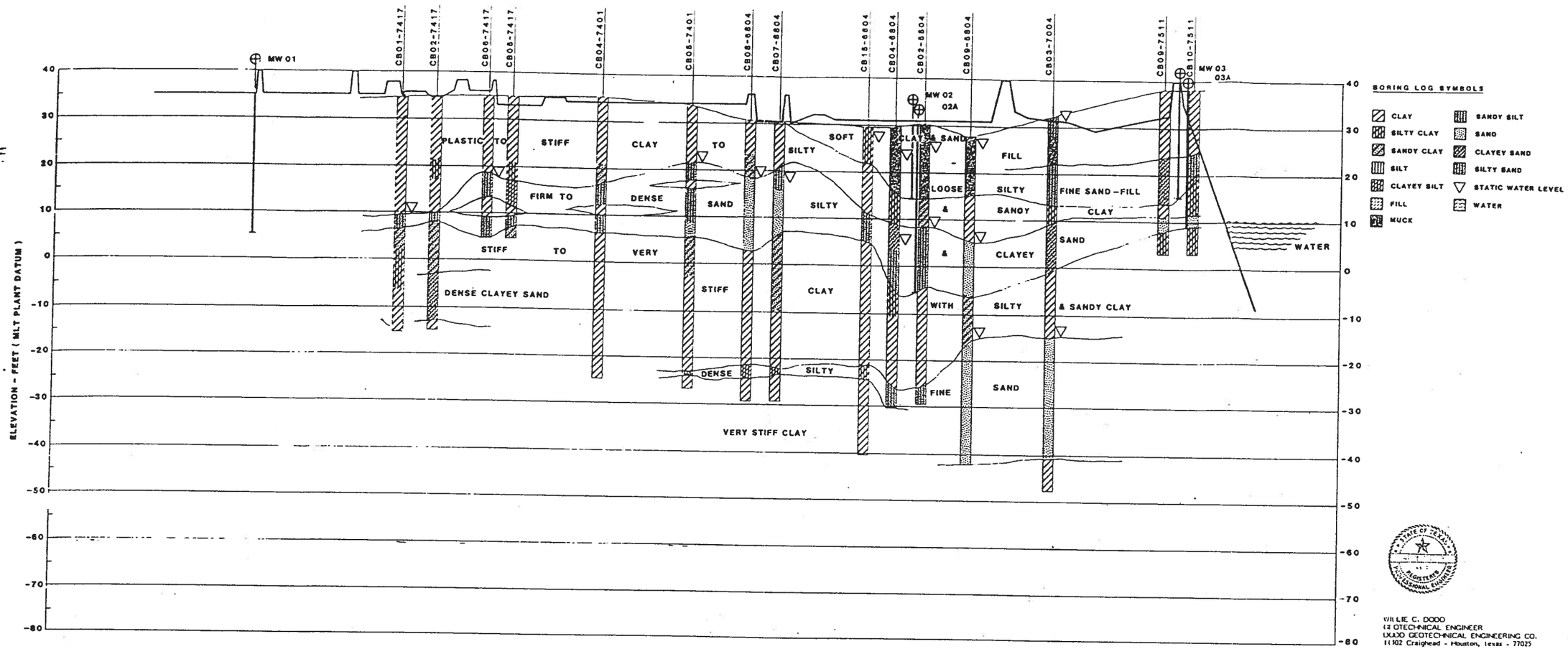
PREPARED BY V. Clark	GENERAL DESIGN APPROVED
APPROVED BY _____	BY _____

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-13

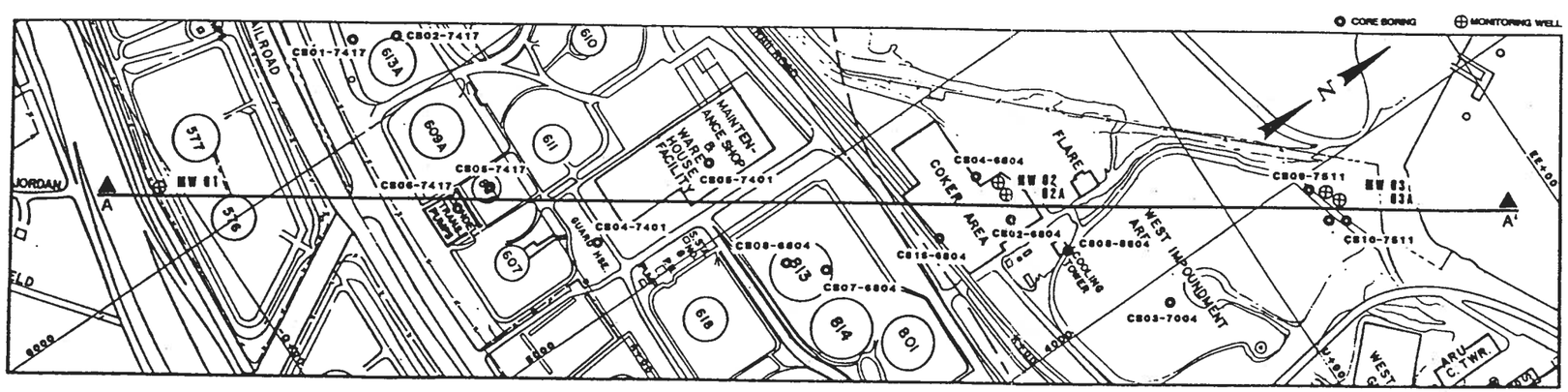
LOCATIONS OF GENERALIZED CROSS-SECTION OF APPCO REFINERY

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



PROFILE A-A'

WILLIE C. DODD
GEOTECHNICAL ENGINEER
DODD GEOTECHNICAL ENGINEERING CO.
11902 Craighead - Houston, Texas - 77025



PLAN A-A

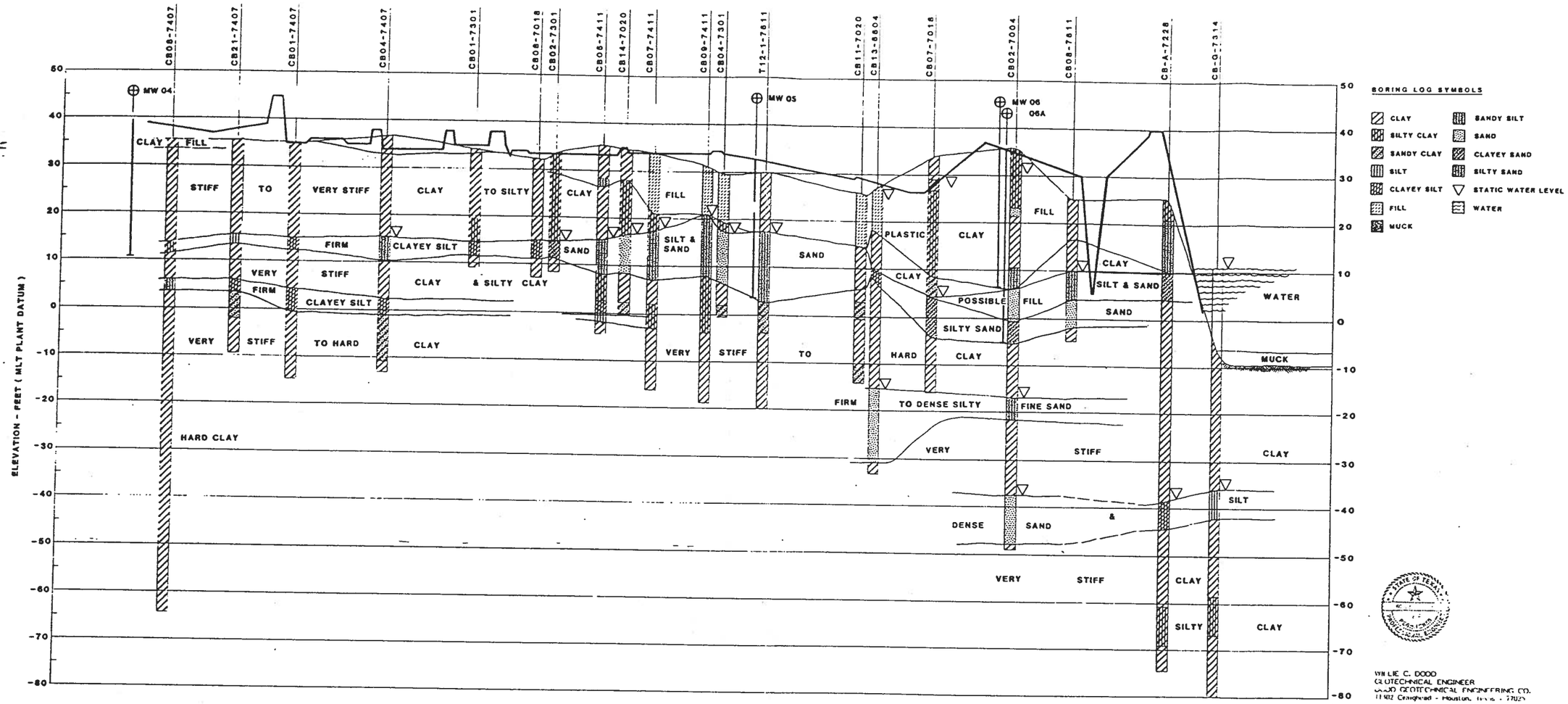
PREPARED BY V. Clark	GENERAL DESIGN APPROVED
APPROVED BY _____	BY _____

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-14

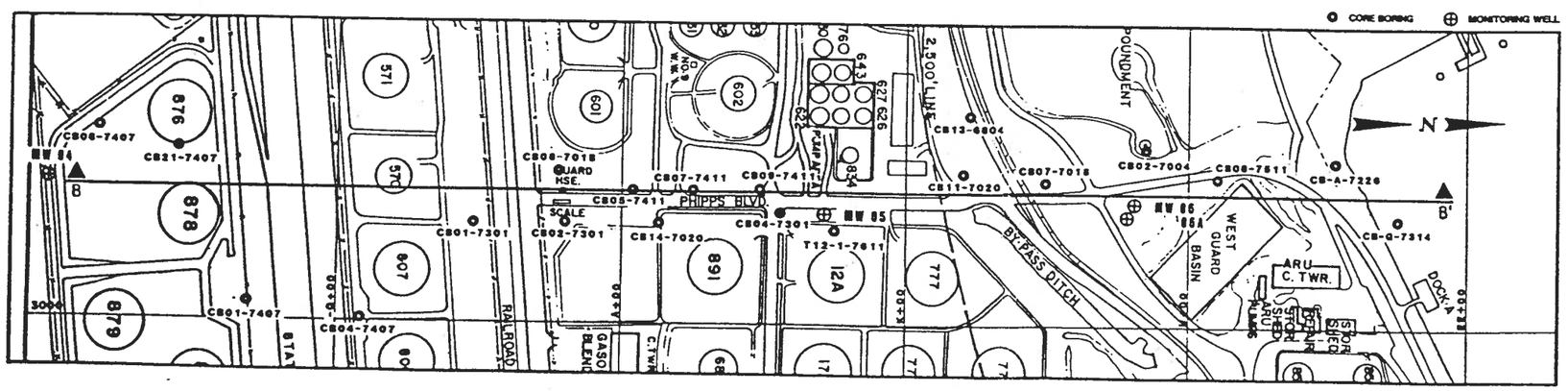
CROSS-SECTION PLAN AND PROFILE A-A'
APPCO REFINERY

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



PROFILE B-B'

WILLIE C. DODD
GEOTECHNICAL ENGINEER
DODD GEOTECHNICAL ENGINEERING CO.
11402 Greenhead - Houston, Texas - 77024



PLAN B-B

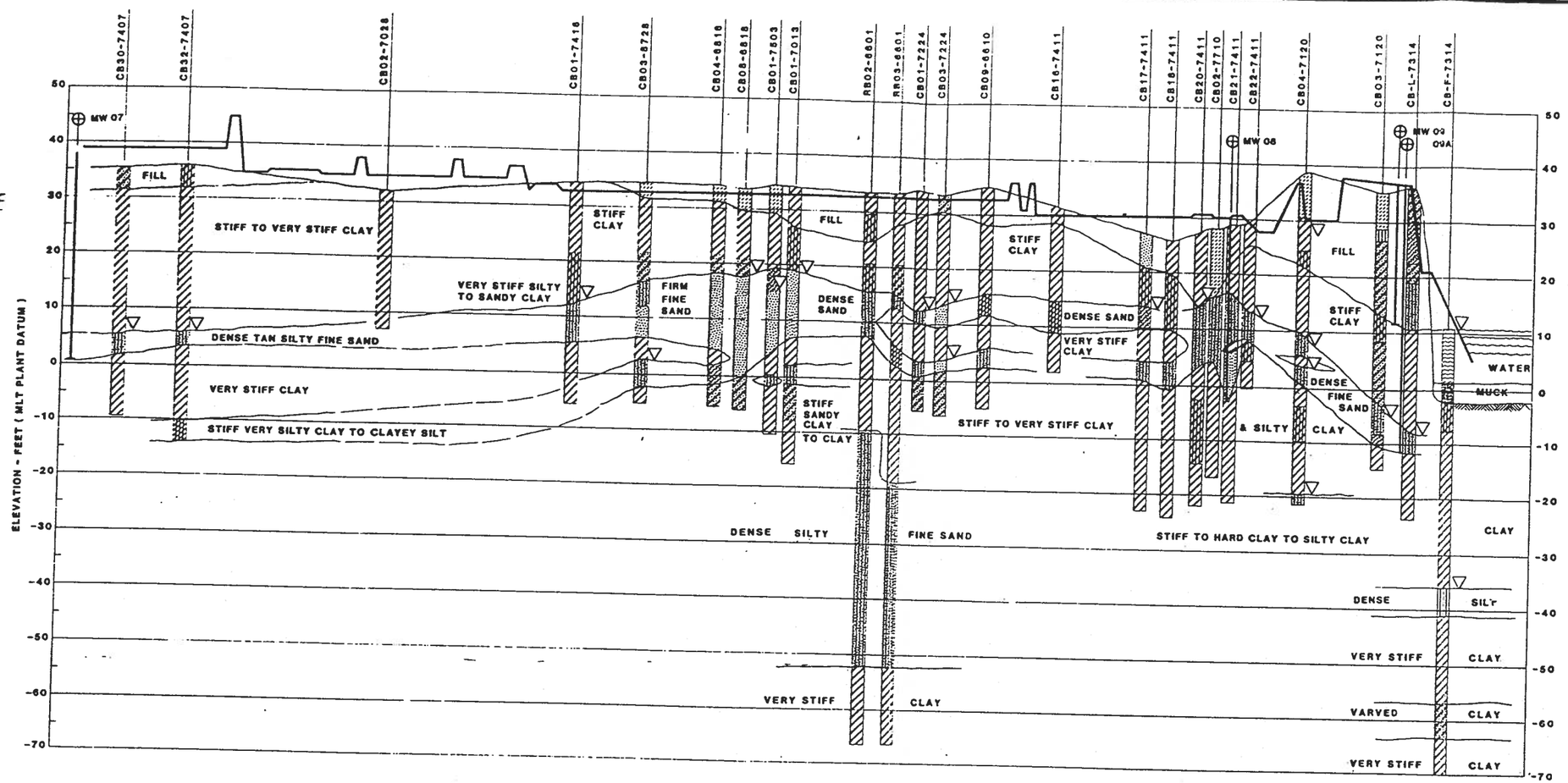
PREPARED BY V. Clark	GENERAL DESIGN APPROVED
APPROVED BY _____	BY _____

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-15

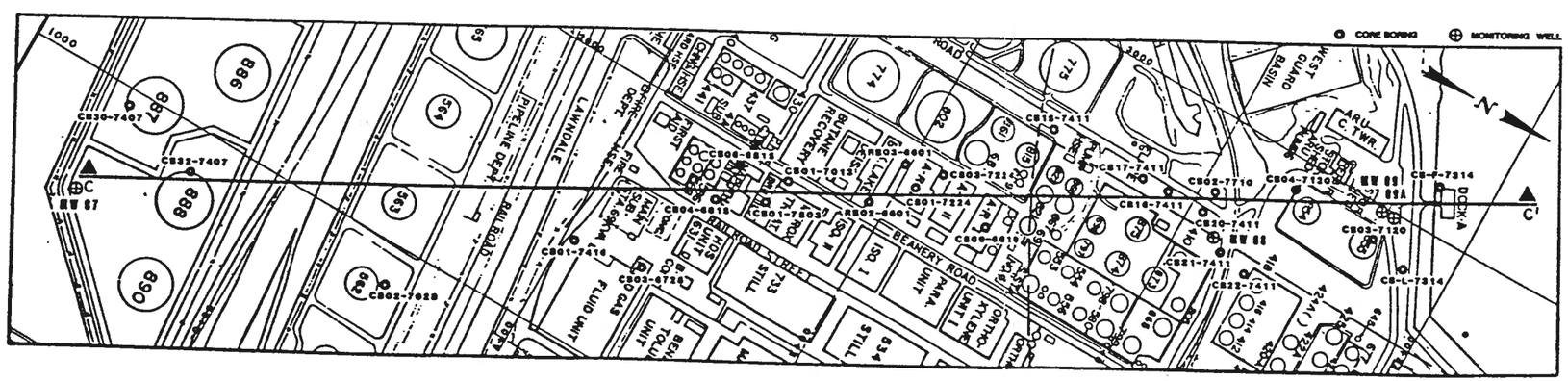
CROSS-SECTION PLAN AND PROFILE B-B'
APPCO REFINERY

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



PROFILE C-C'

WILLIE C. DOOD
GEOTECHNICAL ENGINEER
DOOD GEOTECHNICAL ENGINEERING CO.
11902 Craighead - Houston, Texas - 77025



PLAN C-C

0 200 400 600 800
SCALE IN FEET

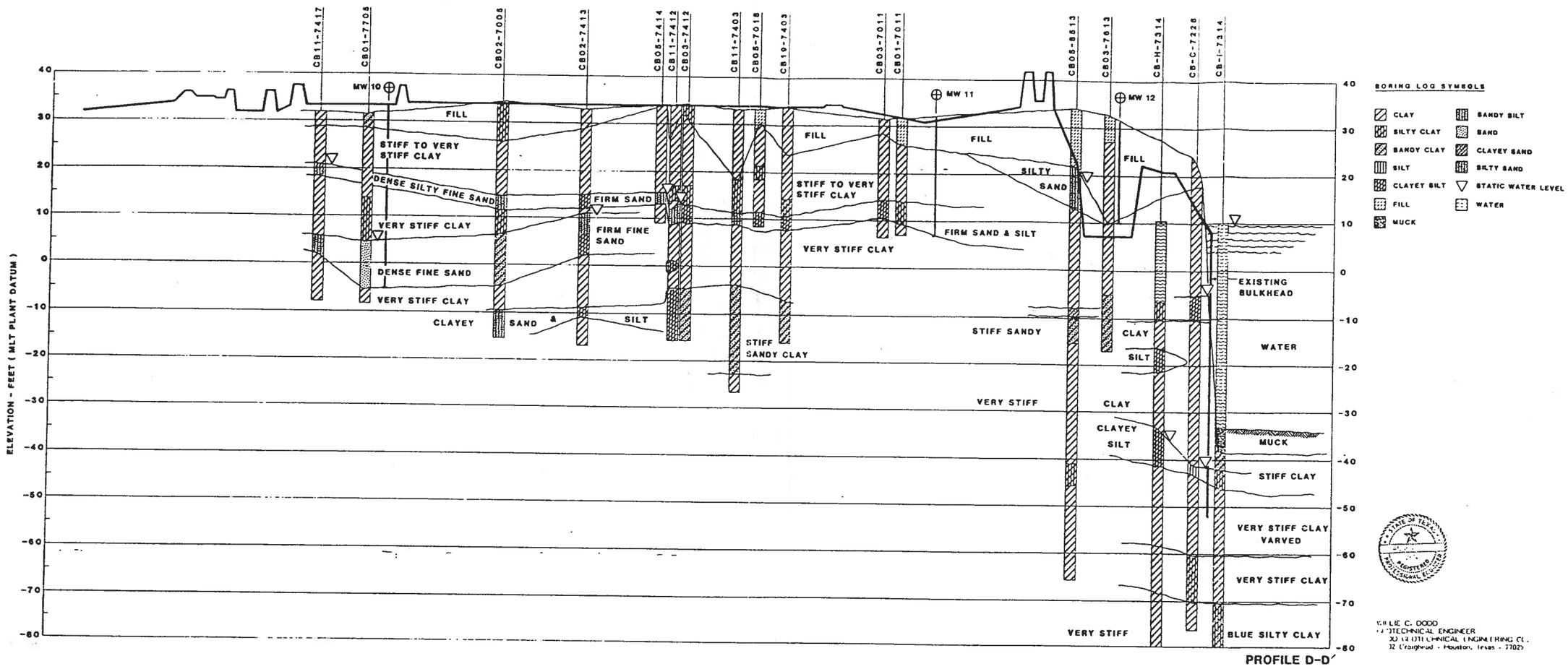
PREPARED BY Clark	GENERAL DESIGN APPROVED
APPROVED BY _____	BY _____

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-16

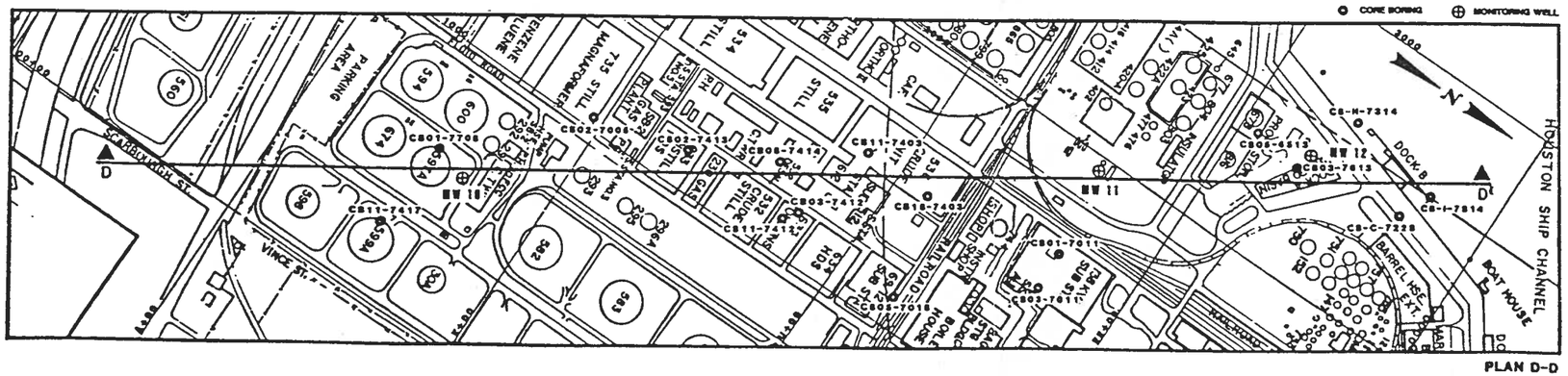
CROSS-SECTION PLAN AND PROFILE C-C'
APPCO REFINERY

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



WILLIE C. DODD
GEOTECHNICAL ENGINEER
DODD GEOTECHNICAL ENGINEERING CO.
32 Craighead - Houston, Texas - 77025

PROFILE D-D'



PLAN D-D

0 200 400 600 800
SCALE IN FEET

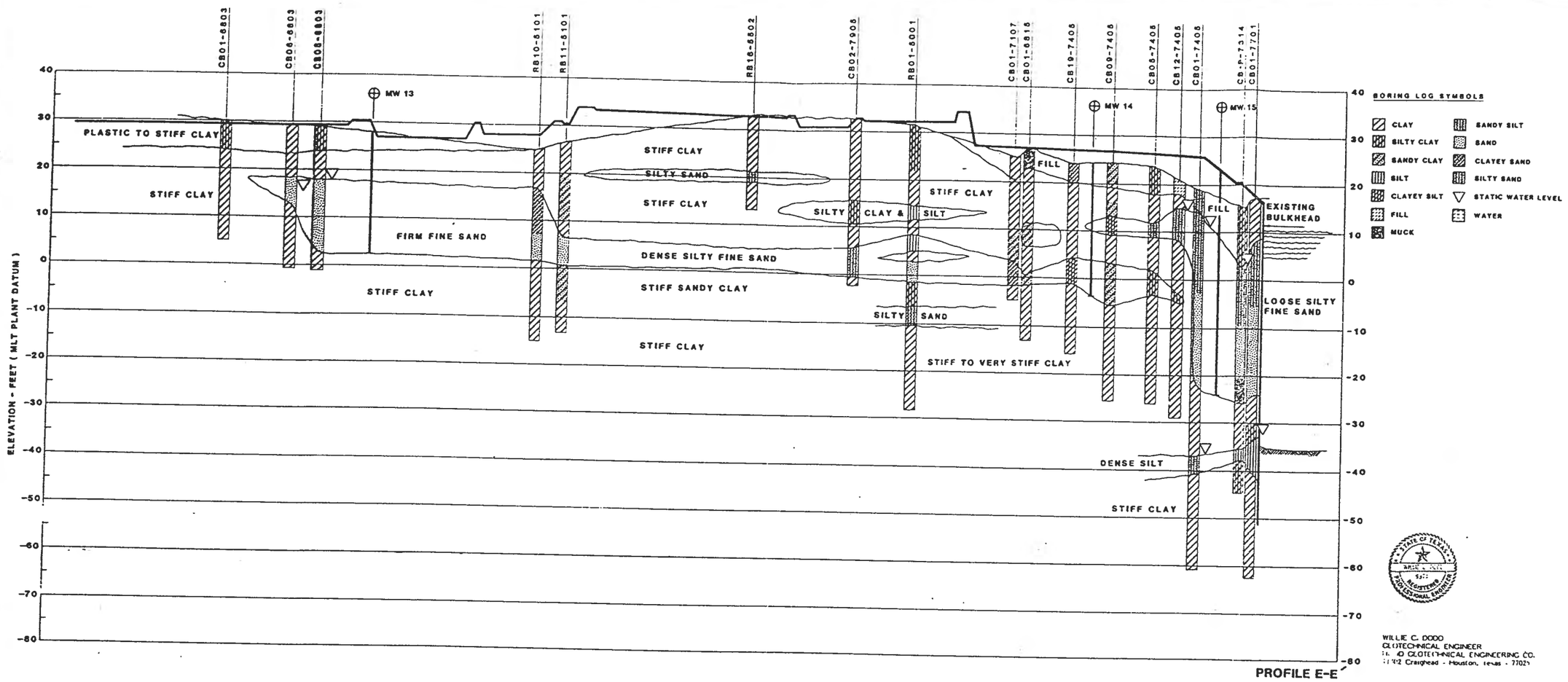
PREPARED BY V. Clark
APPROVED BY
GENERAL DESIGN APPROVED BY

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-17

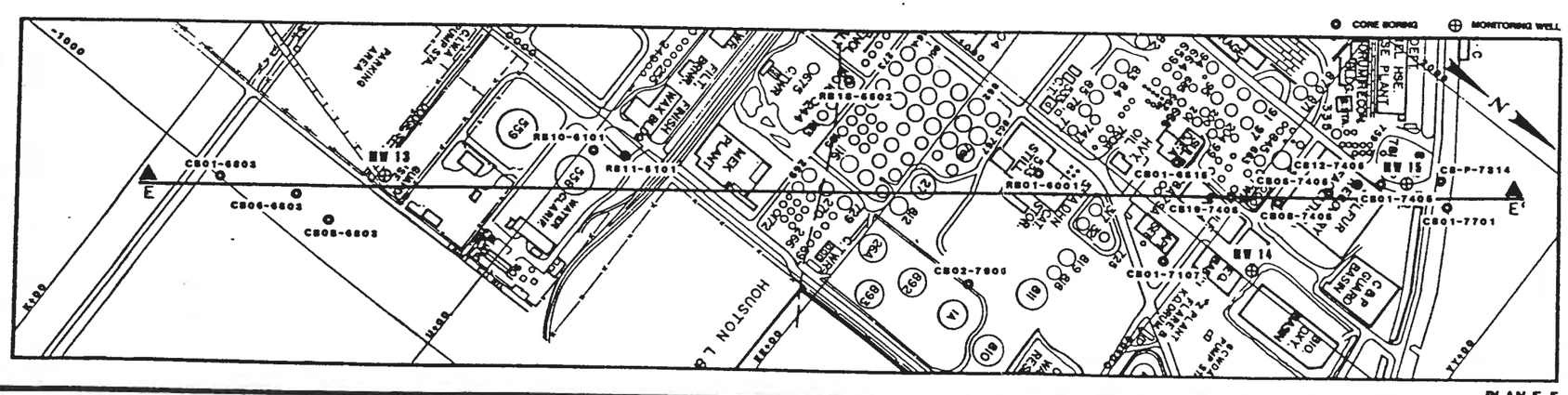
CROSS-SECTION PLAN AND PROFILE D-D'
APPCO REFINERY

DATE 12/11/84
DR. NO. HT 0190
SH. NO. DB



PROFILE E-E'

WILLIE C. DODD
GEOTECHNICAL ENGINEER
[illegible] GEOTECHNICAL ENGINEERING CO.
[illegible] Craighead - Houston, Texas - 7702[illegible]



PLAN E-E

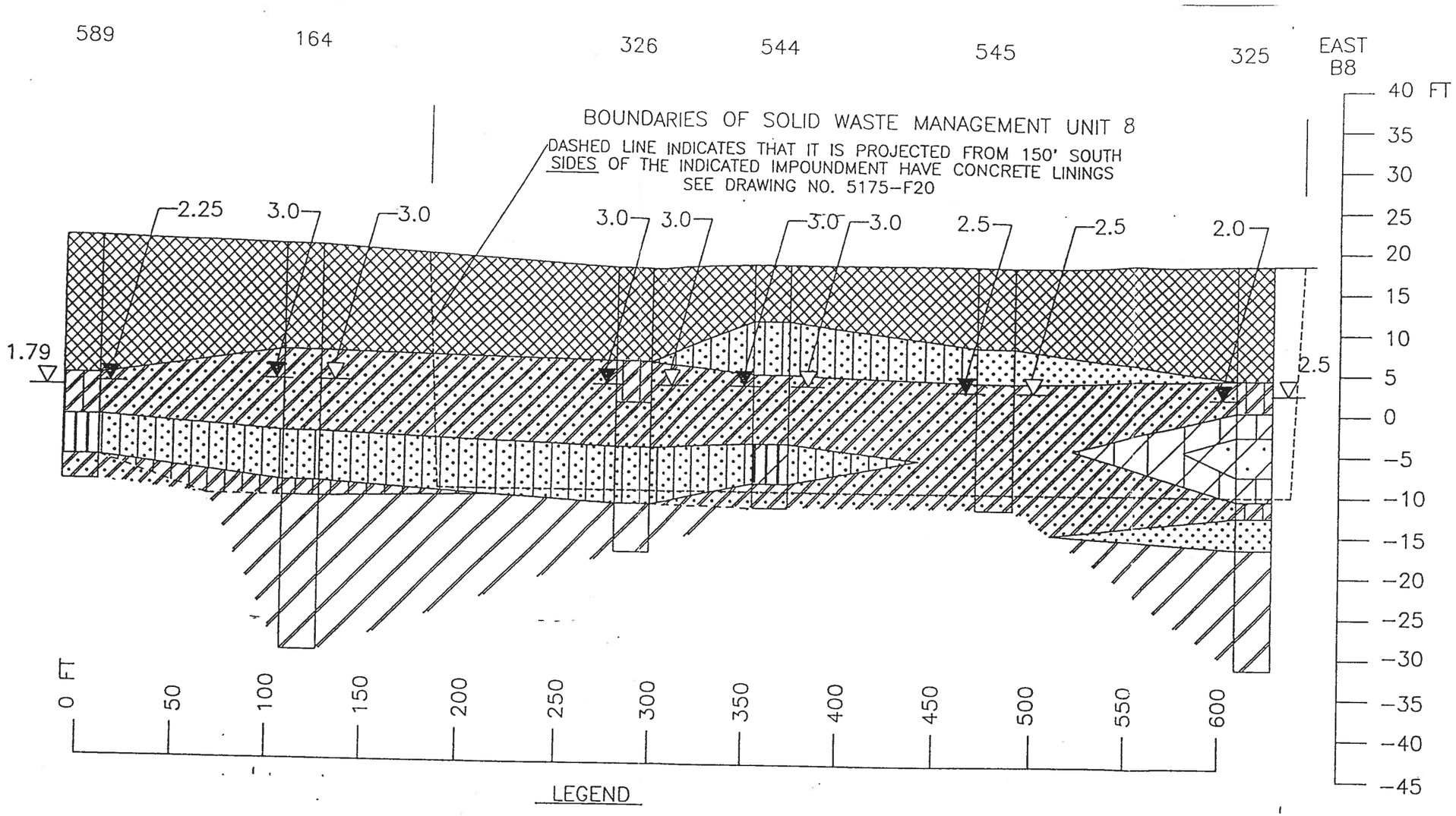
PREPARED BY V. Clark	GENERAL DESIGN APPROVED
APPROVED BY	BY

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-18

CROSS-SECTION PLAN AND PROFILE E-E'
APPCO REFINERY

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

9.58 STATIC WATER LEVEL, JUNE 1990

9.58 STATIC WATER LEVEL, MARCH 1988

CLAY (CH)

SILTY CLAY (CL)

SILTY SAND (SM)

CLAYEY SILT

SILTY CLAY–CLAYEY SILT

SANDY CLAY (CL)

FINE SAND (SP)

SILT (ML)

FILL

SANDY CLAY–CLAYEY SAND

Brown and Caldwell Consultants
DALLAS–HOUSTON, TEXAS

SUBMITTED STEVEN A. MELLON (PROJECT MANAGER) DATE 6-28-90
APPROVED DONALD R. FUNDERLIC, REP. (BROWN AND CALDWELL) DATE
APPROVED DATE

SCALE: AS SHOWN
LINE IS 2 INCHES AT FULL SIZE

FILE 5175
DRAWN DHD
DESIGNED DG
CHECKED WC

NOTE:
STATIC WATER LEVELS FOR BORINGS ARE PROJECTED FROM WATER LEVEL CONTOUR MAPS

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

SOLID WASTE MANAGEMENT UNITS
HOUSTON REFINERY

GEOLOGIC CROSS-SECTION 589 – 325

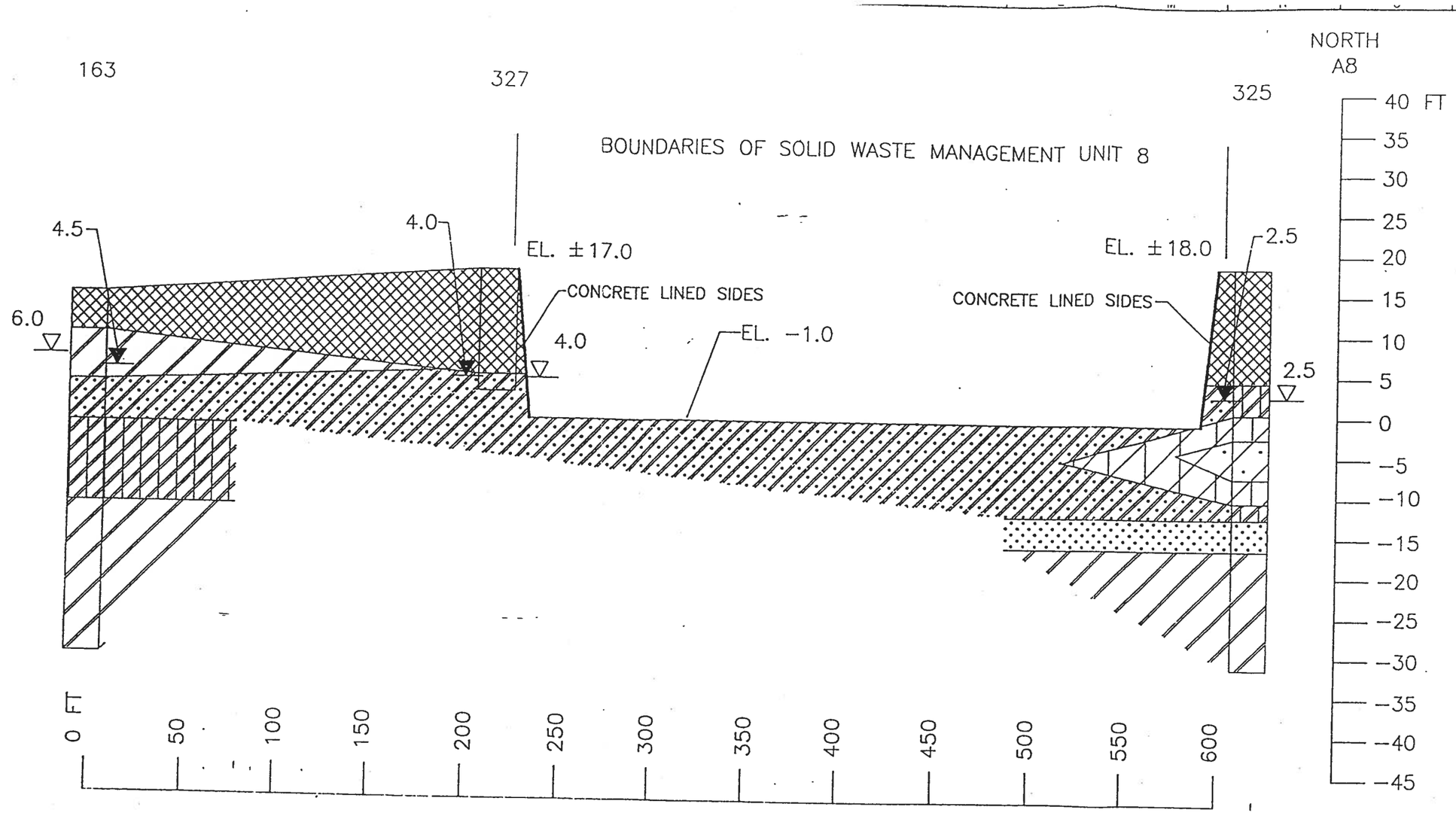
SWMU 8
EAST GUARD BASIN

ELEVATIONS IN MEAN SEA LEVEL (PD -8.2)

IV

FIGURE NUMBER
VI.-19

SHEET NUMBER



LEGEND

9.58 STATIC WATER LEVEL, JUNE 1990

9.58 STATIC WATER LEVEL, MARCH 1988

CLAY (CH)

SANDY CLAY (CL)

SILTY CLAY (CL)

FINE SAND (SP)

FILL

Brown and Caldwell Consultants
DALLAS–HOUSTON, TEXAS

SUBMITTED STEVEN A. MELLON (PROJECT MANAGER) DATE 6-28-90
APPROVED DONALD R. FUNDERLIC, V.P. (ENGINEER AND SUPERVISOR) DATE
APPROVED DATE

SCALE: AS SHOWN
LINE IS 2 INCHES AT FULL SIZE

FILE 5175
DRAWN DHD
DESIGNED DG
CHECKED WC

NOTE:
STATIC WATER LEVELS FOR BORINGS ARE PROJECTED FROM WATER LEVEL CONTOUR MAPS

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

SOLID WASTE MANAGEMENT UNITS
HOUSTON REFINERY

GEOLOGIC CROSS-SECTION 163 – 325
SWMU 8
EAST GUARD BASIN

ELEVATIONS IN MEAN SEA LEVEL (PD −8.2)

IV
FIGURE NUMBER
VI.-20
SHEET NUMBER

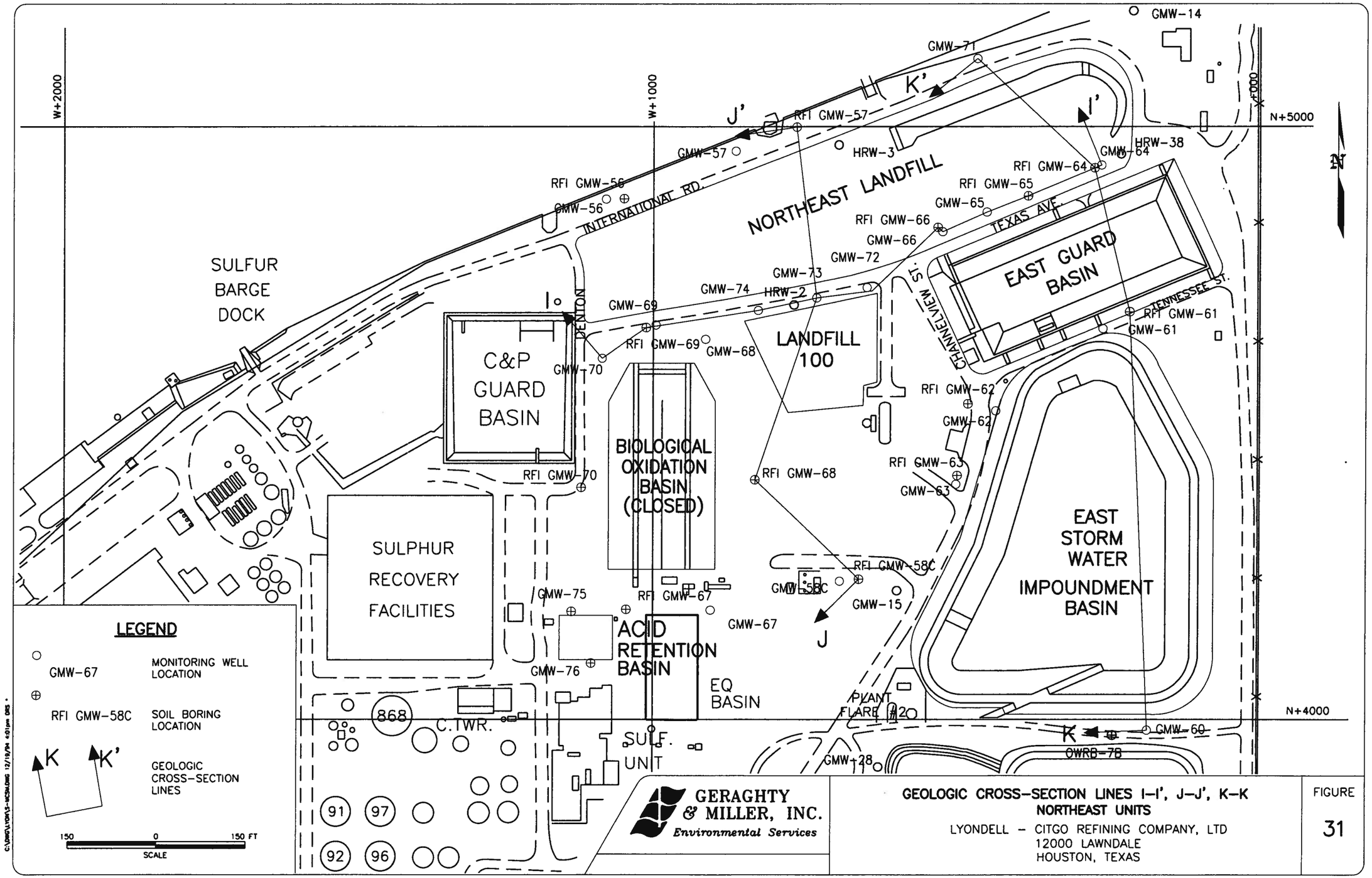
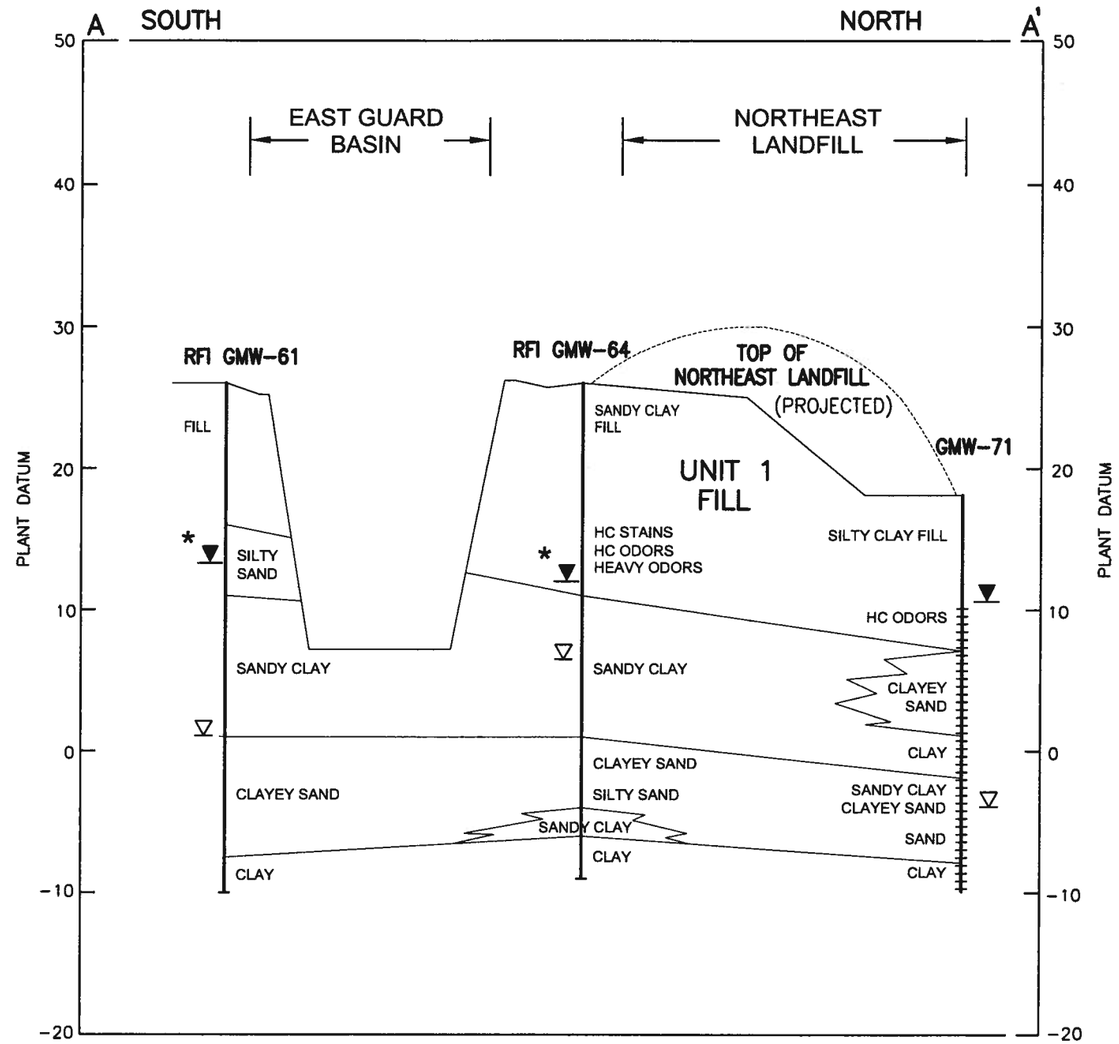

W+2000
W+1000
N+5000
N+4000
N
GMW-14
GMW-71
K'
J'
I'
RFI GMW-57
GMW-57
HRW-3
HRW-38
GMW-64
RFI GMW-64
RFI GMW-56
GMW-56
INTERNATIONAL RD.
NORTHEAST LANDFILL
RFI GMW-65
GMW-65
RFI GMW-66
GMW-66
TEXAS AVE.
GMW-72
GMW-73
GMW-74
HRW-2
SULFUR
BARGE
DOCK
I
DENTON
GMW-69
RFI GMW-69
GMW-68
GMW-70
C&P
GUARD
BASIN
LANDFILL
100
CHANNELVIEW ST.
EAST GUARD
BASIN
TENNESSEE ST.
RFI GMW-61
GMW-61
RFI GMW-62
GMW-62
RFI GMW-63
GMW-63
RFI GMW-68
BIOLOGICAL
OXIDATION
BASIN
(CLOSED)
RFI GMW-70
SULPHUR
RECOVERY
FACILITIES
EAST
STORM
WATER
IMPOUNDMENT
BASIN
RFI GMW-58C
GMW-58C
GMW-15
GMW-75
RFI GMW-67
GMW-67
J
ACID
RETENTION
BASIN
GMW-76
EQ
BASIN
PLANT
FLARE #2
868
C.TWR.
SULF.
UNIT
K
GMW-60
OWRB-7B
GMW-28
91
97
92
96
LEGEND
GMW-67
MONITORING WELL LOCATION
RFI GMW-58C
SOIL BORING LOCATION
K
K'
GEOLOGIC CROSS-SECTION LINES
150
0
150 FT
SCALE
GERAGHTY & MILLER, INC.
Environmental Services
GEOLOGIC CROSS-SECTION LINES I-I', J-J', K-K
NORTHEAST UNITS
LYONDELL - CITGO REFINING COMPANY, LTD
12000 LAWNDALE
HOUSTON, TEXAS
FIGURE
31

FIGURE VI.-21



LEGEND

▽ GROUNDWATER ELEVATION DURING DRILLING

▼ GROUNDWATER ELEVATION AFTER WELL INSTALLATION

* THE STATIC WATER LEVEL ELEVATIONS ( ) ▼ INDICATED FOR THE BORINGS RFI GMW-61 AND RFI GMW-64 ARE ACTUALLY THE NOVEMBER 1994 DATA FOR THEIR RESPECTIVE WELLS.

NOTE: ELEVATION OF NORTHEAST LANDFILL IS NOT TO SCALE

100 0 100 FT
HORIZONTAL SCALE

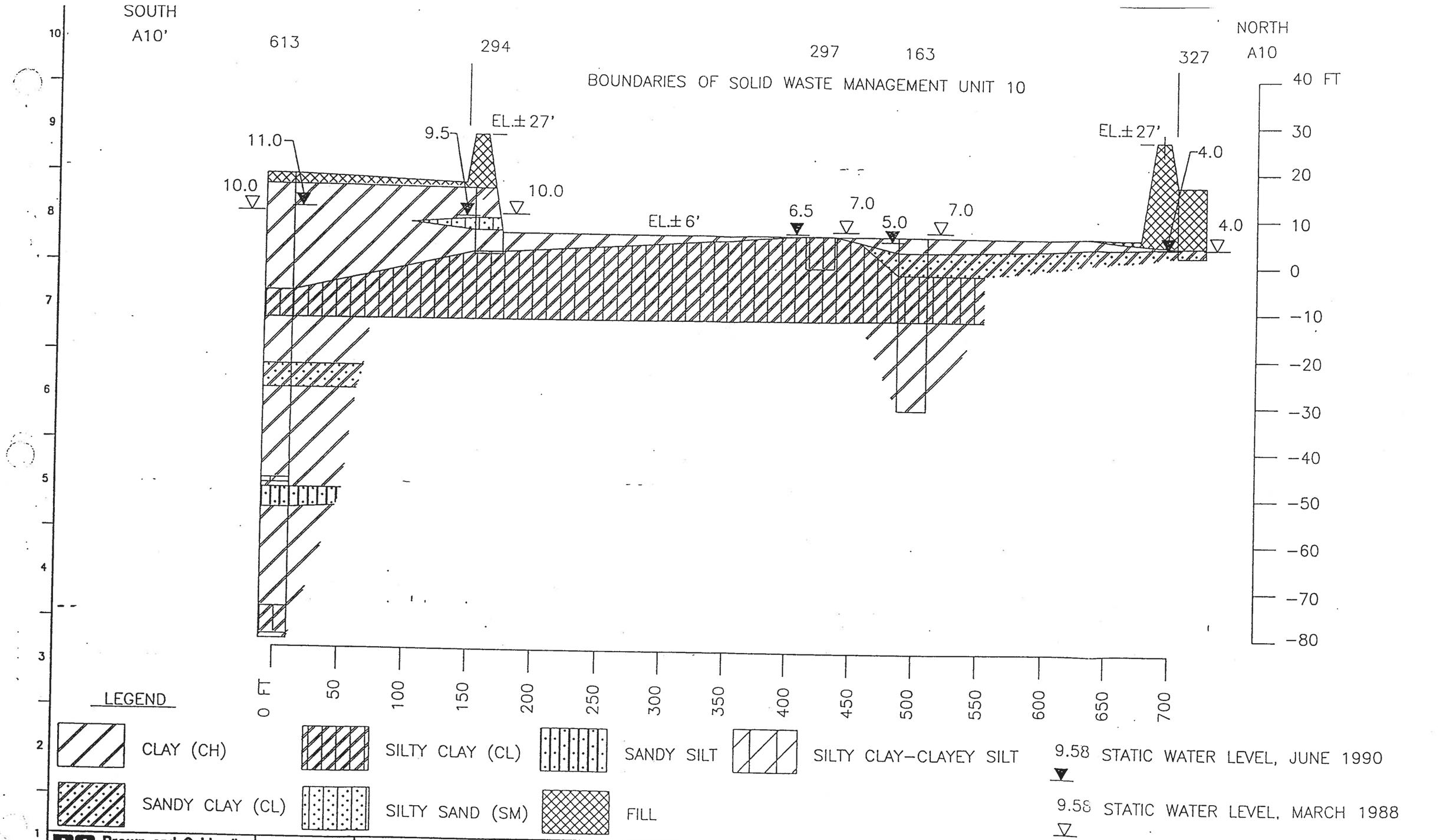
ARCADIS GERAGHTY&MILLER
11000 RICHMOND AVENUE, SUITE 350
HOUSTON, TEXAS 77042
Tel: 713/266-6867 Fax: 713/266-8652

GEOLOGIC CROSS-SECTION A[1] – A
LYONDELL – CITGO REFINING COMPANY, LTD
12000 LAWNDALE
HOUSTON, TEXAS

FIGURE
5

C:\DWG\LYON\S-MCS1.DWG 12/19/94 8:33pm DRS

FIGURE VI.-22



Brown and Caldwell Consultants
DALLAS–HOUSTON, TEXAS

SUBMITTED STEVEN A. MELLON (PROJECT MANAGER) DATE 6-28-90
APPROVED DONALD R. FUNDERLIC, V.P. (BROWN AND CALDWELL) DATE
APPROVED DATE

SCALE: AS SHOWN
LINE IS 2 INCHES AT FULL SIZE
FILE 5175
DRAWN DHD
DESIGNED DG
CHECKED WC

NOTE:
STATIC WATER LEVELS FOR BORINGS ARE PROJECTED FROM WATER LEVEL CONTOUR MAPS

REVISIONS

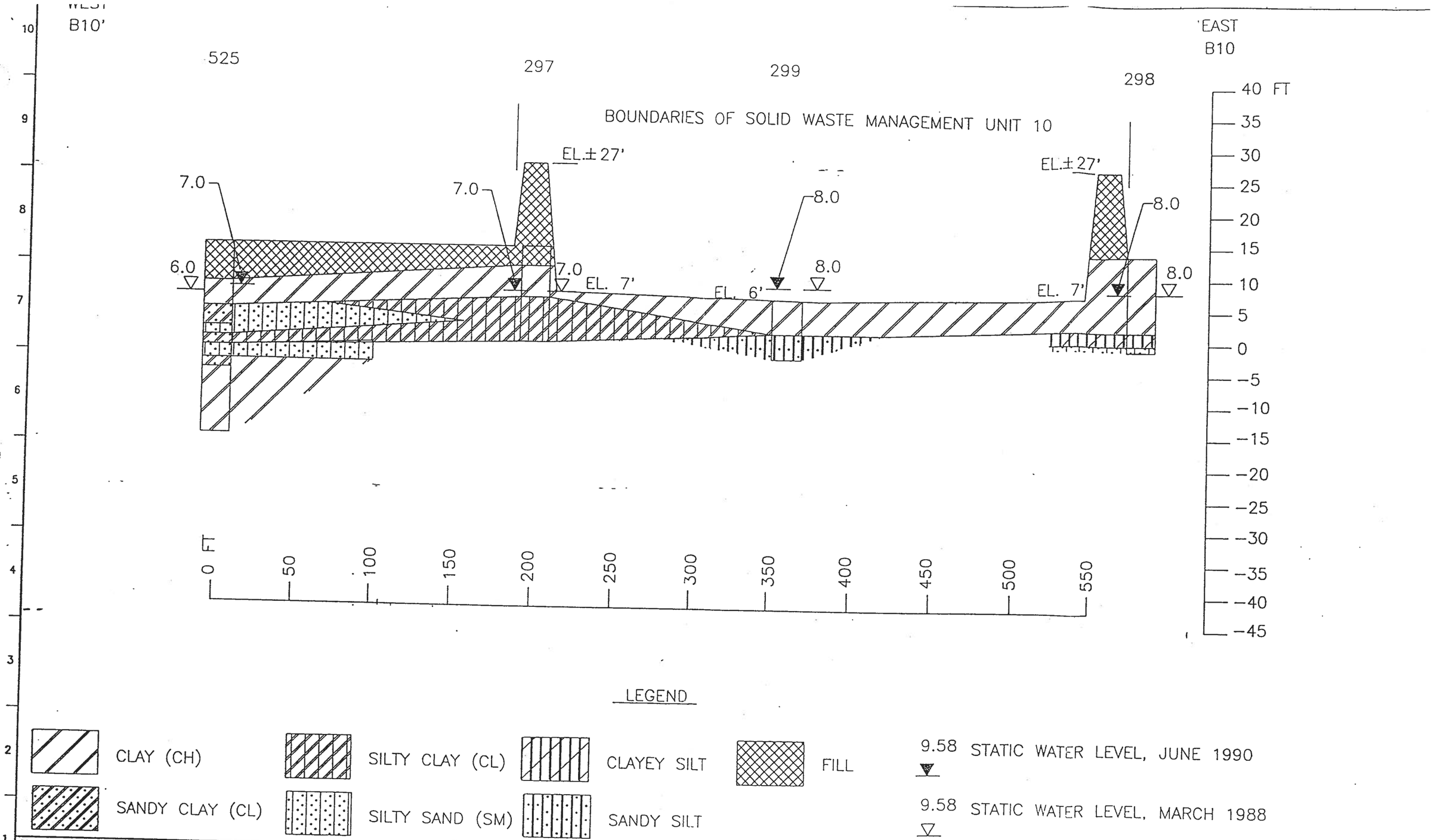
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

SOLID WASTE MANAGEMENT UNITS
HOUSTON REFINERY

GEOLOGIC CROSS-SECTION 613 – 327
SWMU 10
EAST IMPOUNDMENT BASIN
ELEVATIONS IN MEAN SEA LEVEL (PD -8.2)

IV
FIGURE NUMBER
VI.-23
SHEET NUMBER



Brown and Caldwell Consultants
DALLAS–HOUSTON, TEXAS

SUBMITTED STEVEN A. WELLON (PROJECT MANAGER) DATE 6-28-90
APPROVED DONALD R. FUNDERLIC, V.P. (BROWN AND CALDWELL) DATE
APPROVED DATE

SCALE: AS SHOWN
LINE IS 2 INCHES AT FULL SIZE
FILE 5175
DRAWN DHD
DESIGNED DG

NOTE:
STATIC WATER LEVELS FOR BORINGS ARE PROJECTED FROM WATER LEVEL CONTOUR MAPS

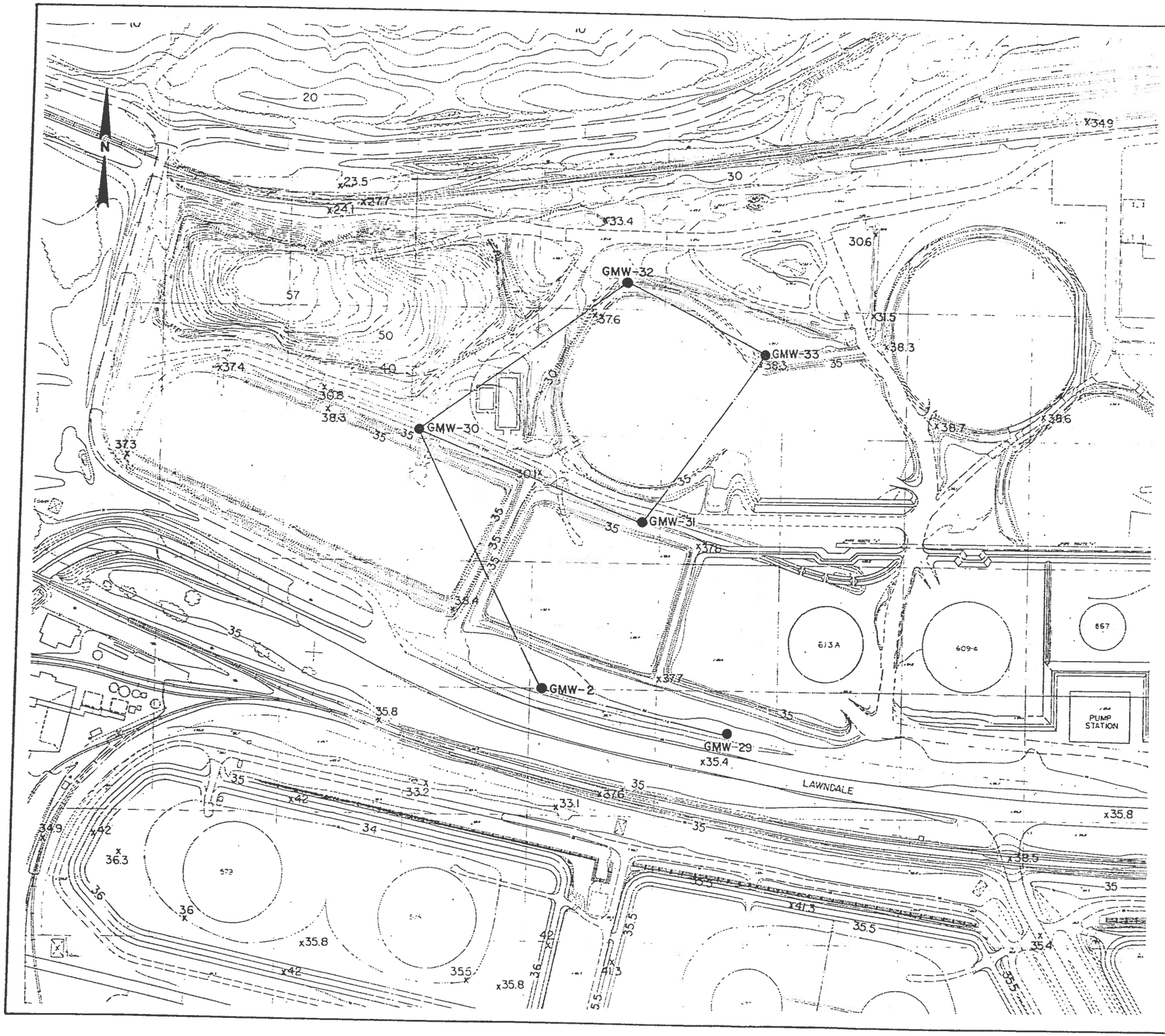
REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

SOLID WASTE MANAGEMENT UNITS
HOUSTON REFINERY

GEOLOGIC CROSS-SECTION 525 – 298
SWMU 10
EAST IMPOUNDMENT BASIN
ELEVATIONS IN MEAN SEA LEVEL (PD −8.2)

IV
FIGURE NUMBER
VI.-24
SHEET NUMBER



0 100 200 400
SCALE IN FEET

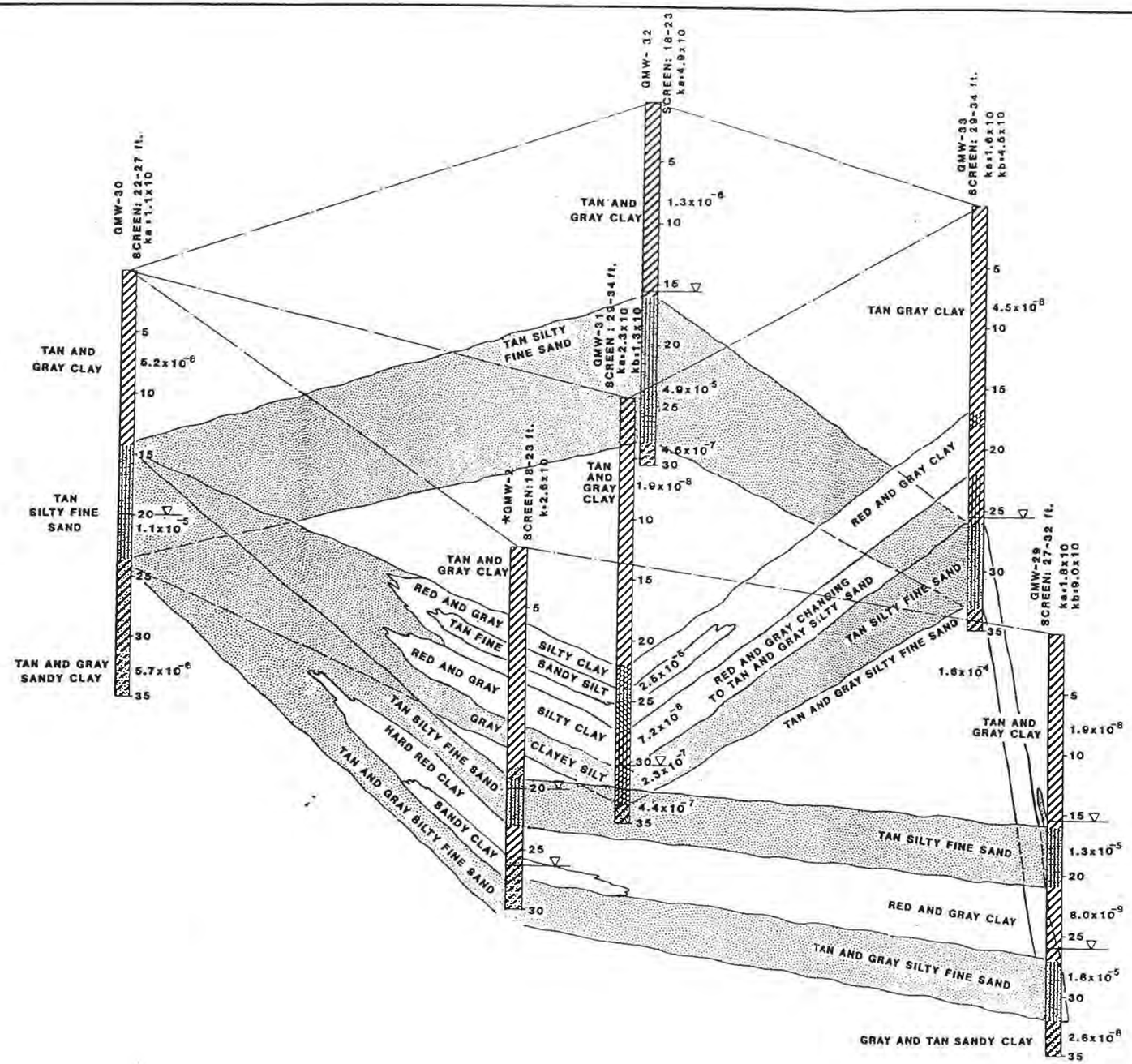
PREPARED BY V. Clark APPROVED BY O. Brown	GENERAL DESIGN APPROVED BY M. Bachin

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-25

SOUTHWEST WASTE MANAGEMENT AREA
BORING PLAN

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



BORING LOG SYMBOLS

- CLAY
- SILTY CLAY
- SANDY CLAY
- SILT
- CLAYEY SILT
- SANDY SILT
- SAND
- CLAYEY SAND
- SILTY SAND
- STATIC WATER LEVEL
- * WELL COMPLETED DURING A PREVIOUS PROJECT

BORINGS ARE NOT PLOTTED TO A VERTICAL ELEVATION

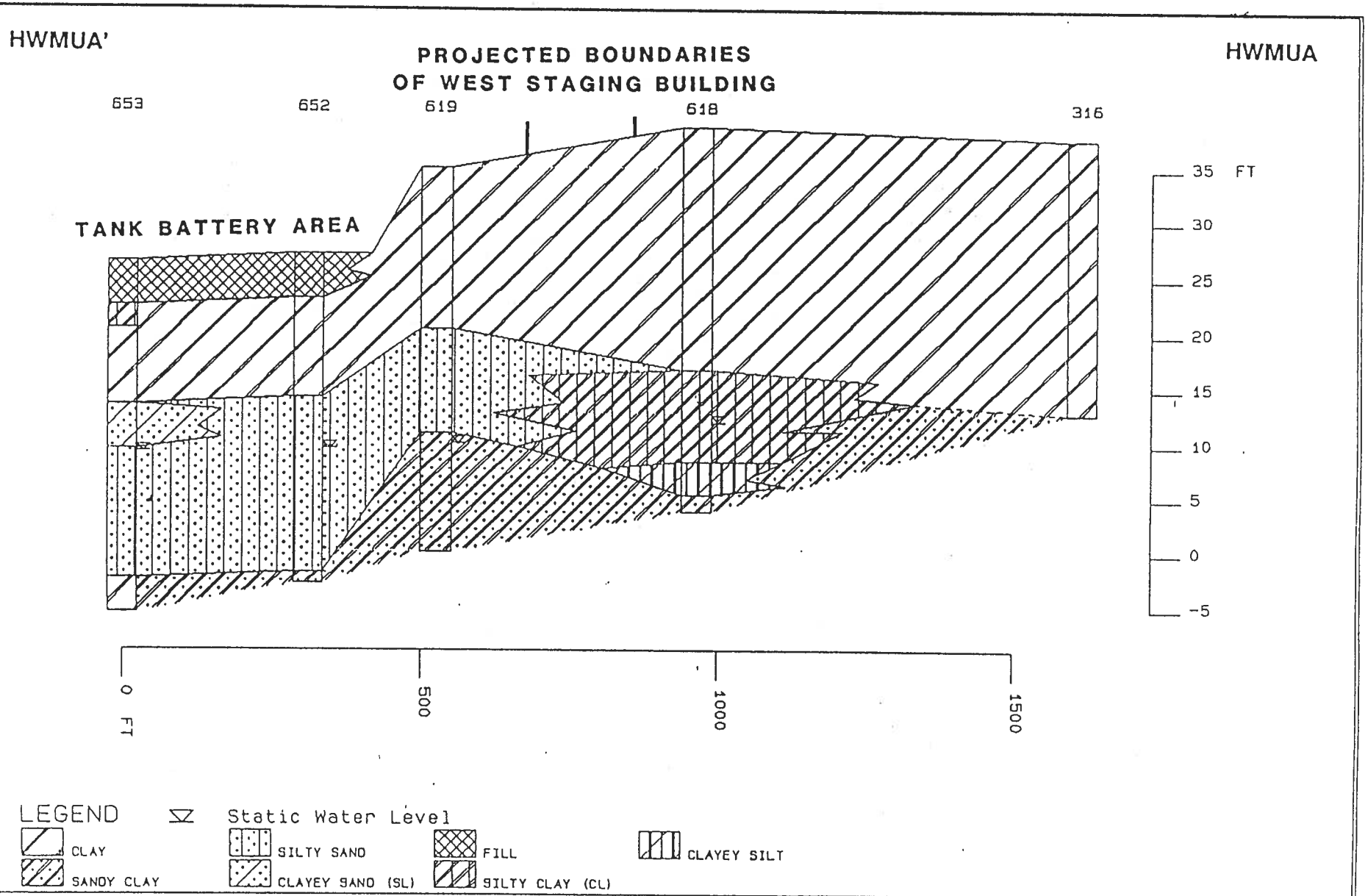
PREPARED BY V. Clark	GENERAL DESIGN APPROVED
APPROVED BY O E Brown	BY M. Guthrie

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-26

SOUTHWEST WASTE MANAGEMENT AREA
FENCE DIAGRAM

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB	

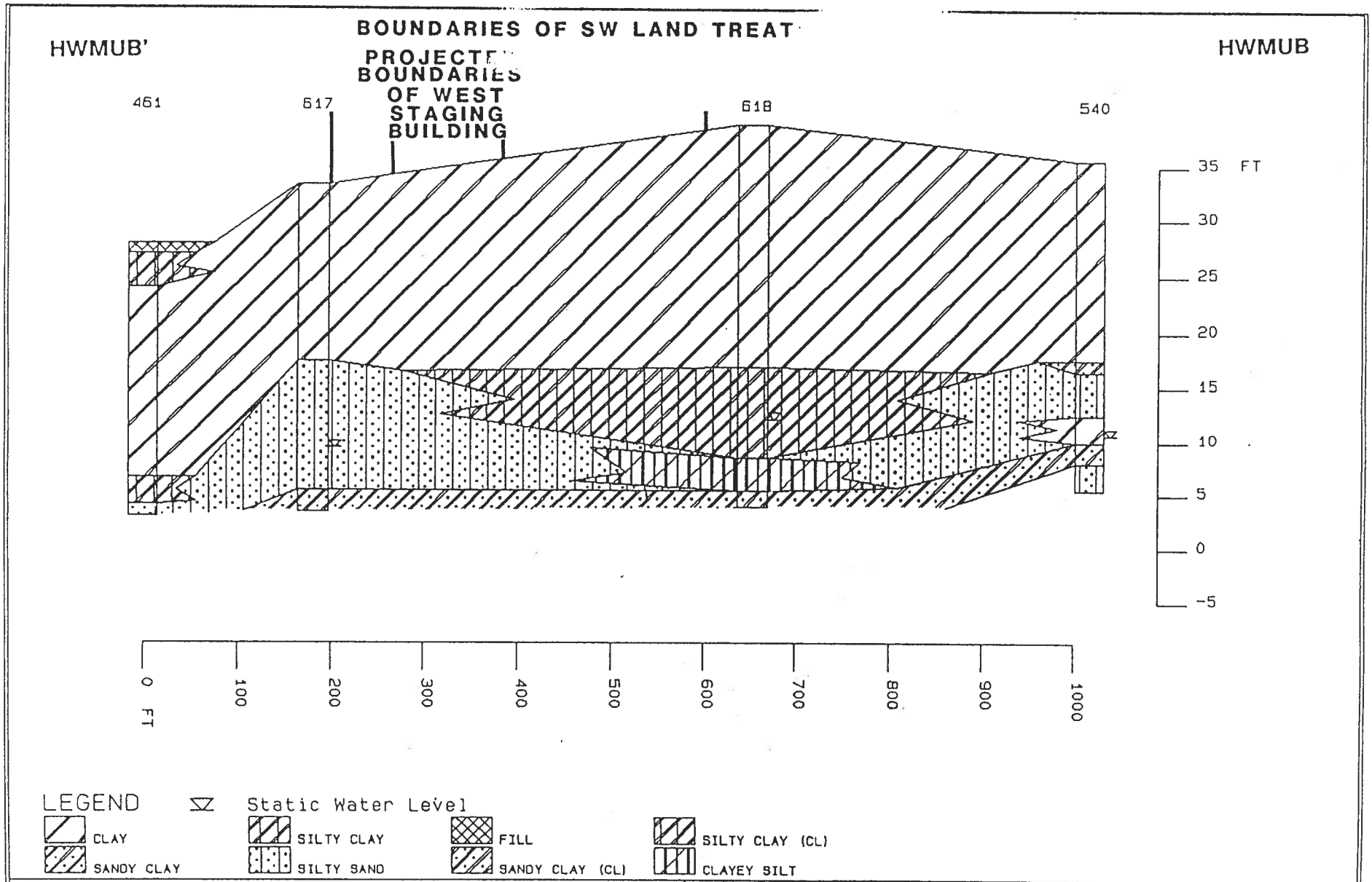


LYONDELL PETROCHEMICAL COMPANY
GEOLOGIC CROSS-SECTION 653 - 316

ELEVATION IN MEAN SEA LEVEL (PD -8.2)
STATIC WATER LEVEL, JUNE 1990

BROWN AND CALDWELL

FIGURE VI.-27

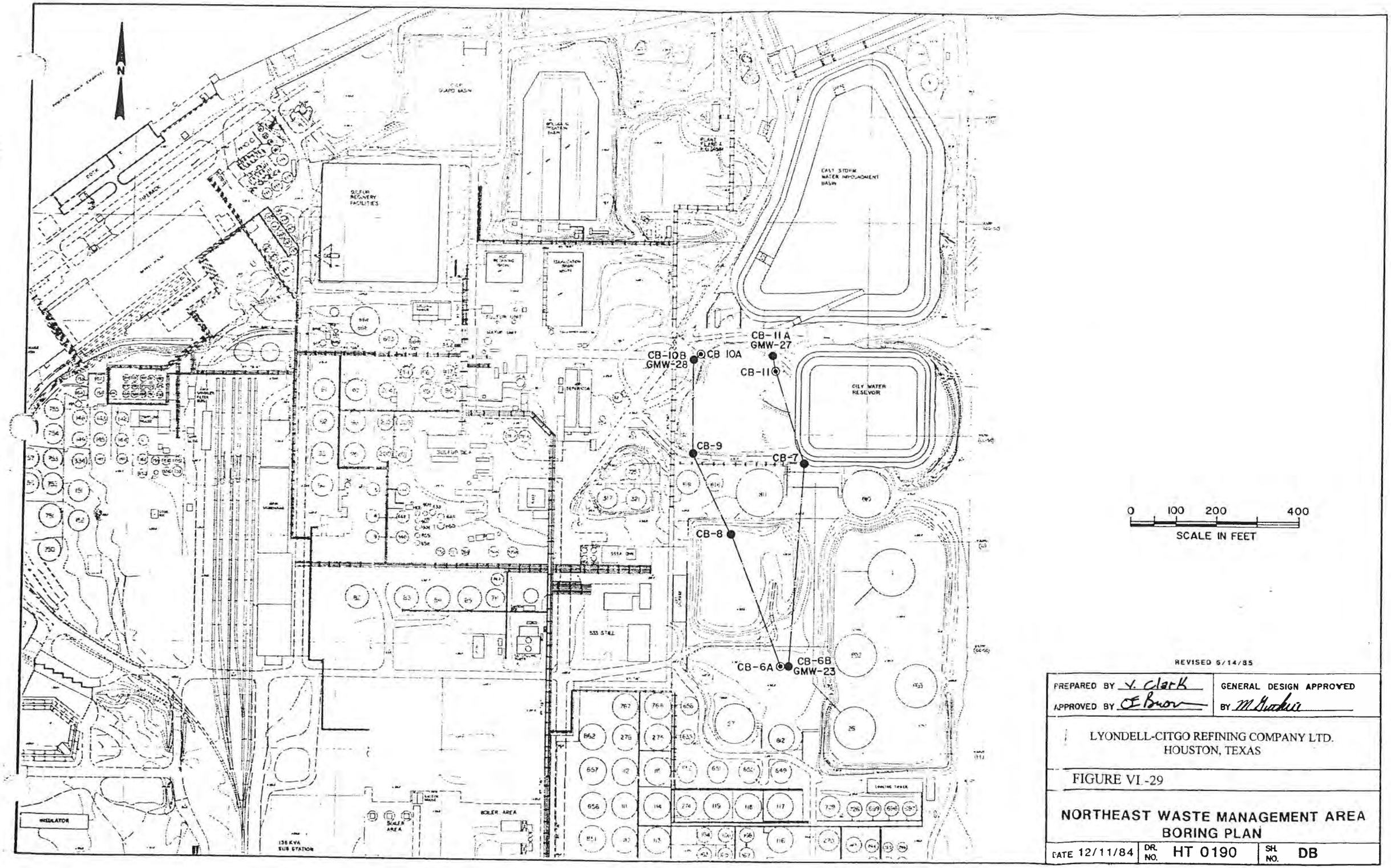


LYONDELL PETROCHEMICAL COMPANY
GEOLOGIC CROSS-SECTION 461 - 540

ELEVATION IN MEAN SEA LEVEL (PD -8.2)
STATIC WATER LEVEL, JUNE 1990

BROWN AND CALDWELL

FIGURE VI.-28



REVISED 6/14/85

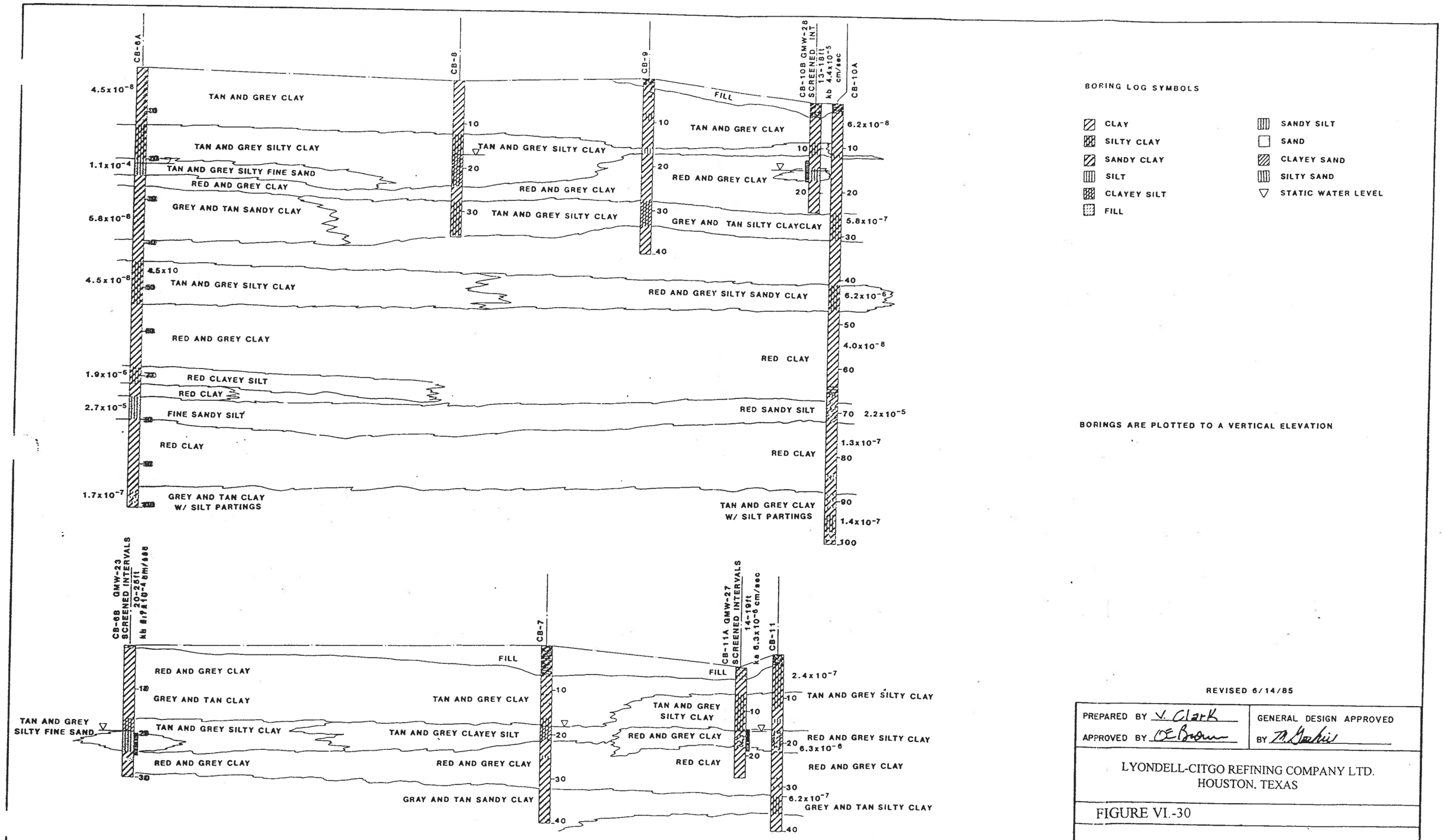
PREPARED BY Y. Clark APPROVED BY C. Brown	GENERAL DESIGN APPROVED BY M. Gardner

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI-29

NORTHEAST WASTE MANAGEMENT AREA BORING PLAN

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



REVISED 6/14/85

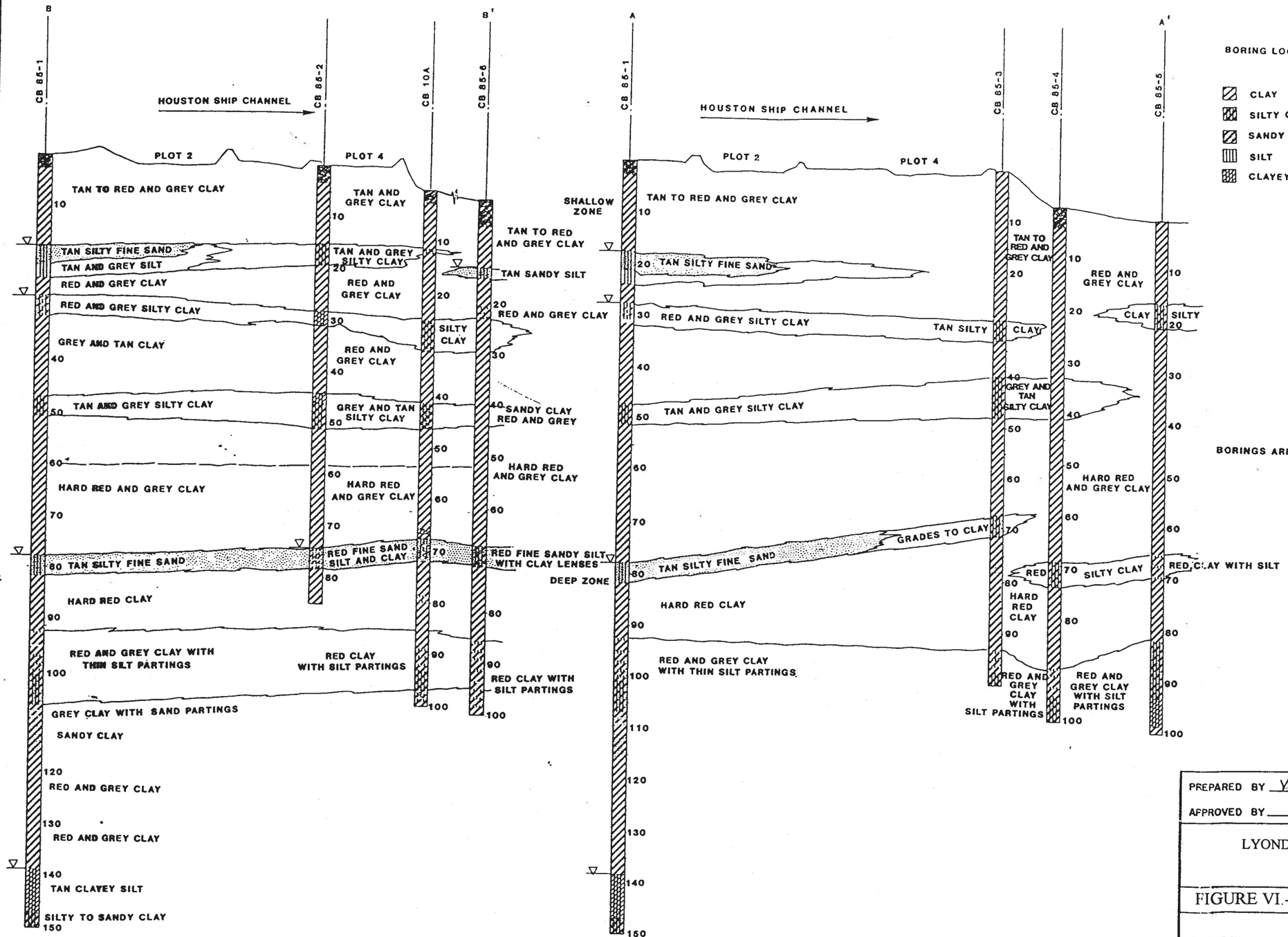
PREPARED BY V. Clark APPROVED BY D.E. Brown	GENERAL DESIGN APPROVED BY M. Gokis

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-30

NORTHEAST WASTE MANAGEMENT AREA CROSS SECTION

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



BORING LOG SYMBOLS

- CLAY
- SILTY CLAY
- SANDY CLAY
- SILT
- CLAYEY SILT
- SANDY SILT
- SAND
- CLAYEY SAND
- SILTY SAND
- STATIC WATER LEVEL

BORINGS ARE PLOTTED TO A VERTICAL ELEVATION

REVISED 6/14/85

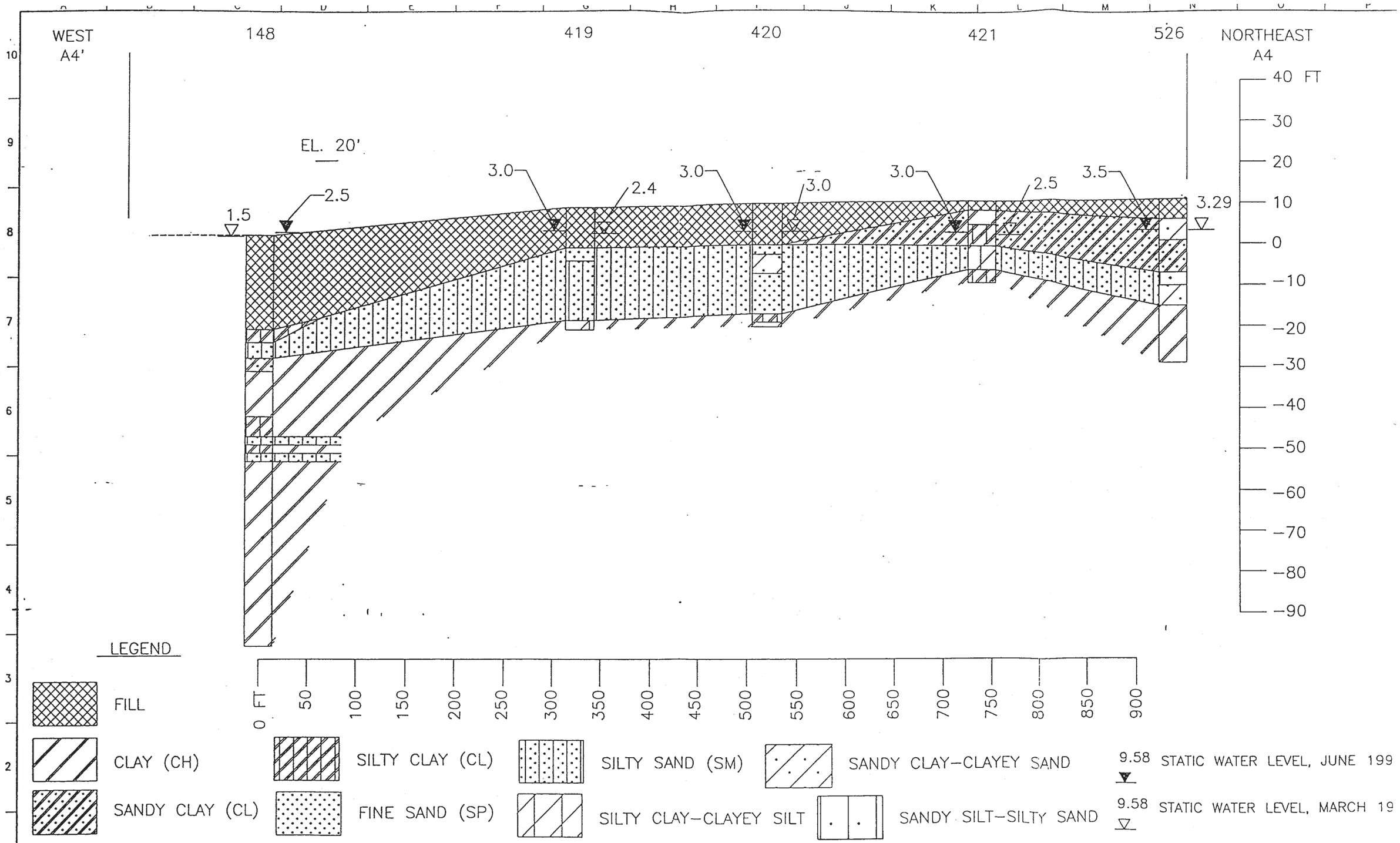
PREPARED BY Y. Clark	GENERAL DESIGN APPROVED
APPROVED BY	BY M. Guthrie

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-31

NORTHEAST WASTE MANAGEMENT AREA
CROSS SECTIONS

DATE 6/14/85	DR. NO. HT 0190	SH. NO. DB



Brown and Caldwell Consultants
DALLAS–HOUSTON, TEXAS

SUBMITTED STEVEN A. WELLON (PROJECT MANAGER) DATE 6-28-90
APPROVED DONALD R. FUNDERLIC, V.P. (BROWN AND CALDWELL) DATE

SCALE: AS SHOWN
LINE IS 2 INCHES AT FULL SIZE

FILE 5175
DRAWN DHD
DESIGNED DG

NOTE:
STATIC WATER LEVELS FOR BORINGS ARE PROJECTED FROM WATER LEVEL CONTOUR MAPS

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

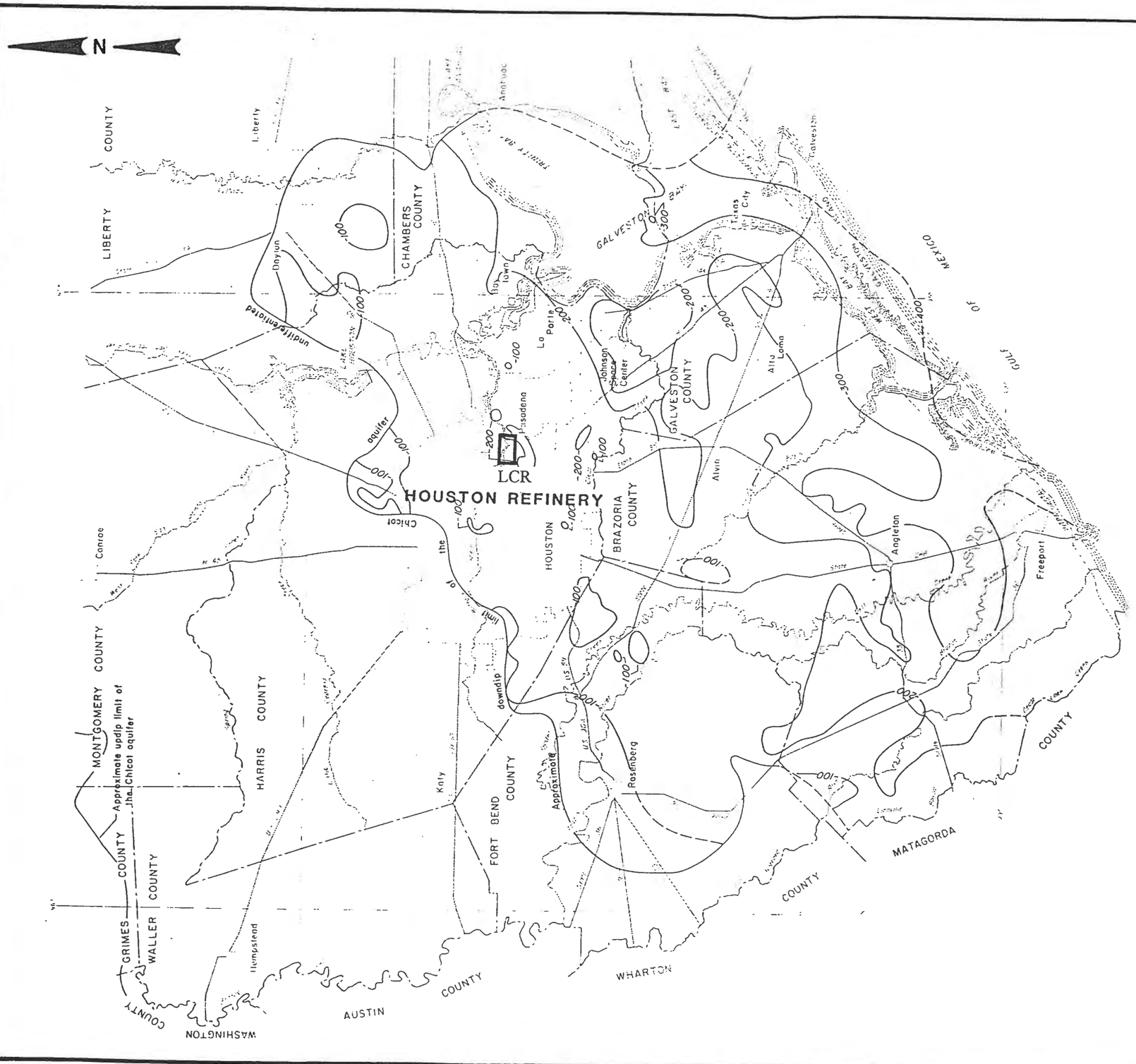
LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

SOLID WASTE MANAGEMENT UNITS
HOUSTON REFINERY

GEOLOGIC CROSS-SECTION 148 – 526
NORTH OF BASINS

ELEVATIONS IN MEAN SEA LEVEL (PD -8.2)

IV
FIGURE NUM
VI.-32
SHEET NUM



LEGEND

—200--- STRUCTURE CONTOURS, SHOWS APPROXIMATE ALTITUDE OF BASE OF UPPER UNIT OF THE CHICOT AQUIFER. DASHED WHERE INFERRED. CONTOURS INTERVAL 100 FT. DATUM IS MEAN SEA LEVEL.

FROM U S GEOLOGIC SURVEY

0 5 10 20
MILES

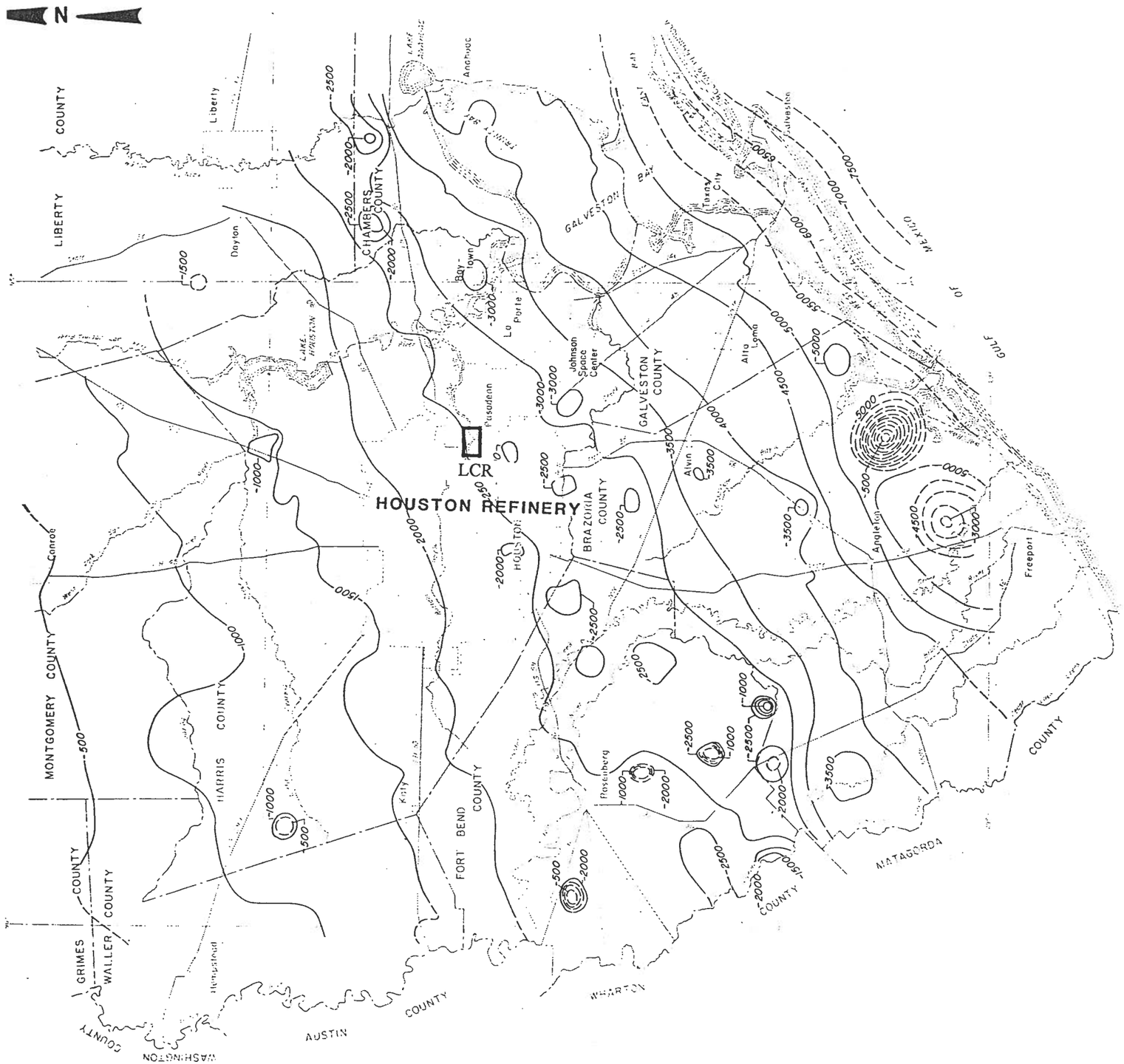
PREPARED BY J. Clark APPROVED BY O.E. Brown	GENERAL DESIGN APPROVED BY M. Gaches

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-33

APPROXIMATE ALTIDUDE OF THE BASE OF THE UPPER UNIT OF THE CHICOT AQUIFER

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

—2000--- STRUCTURE CONTOURS, SHOWS APPROXIMATE ALTITUDE OF BASE OF EVANGELENE AQUIFER. DASHED WHERE INFERRED. CONTOUR INTERVAL 500 FT. DATUM IS MEAN SEA LEVEL.

FROM US GEOLOGIC SURVEY

0 5 10 20
MILES

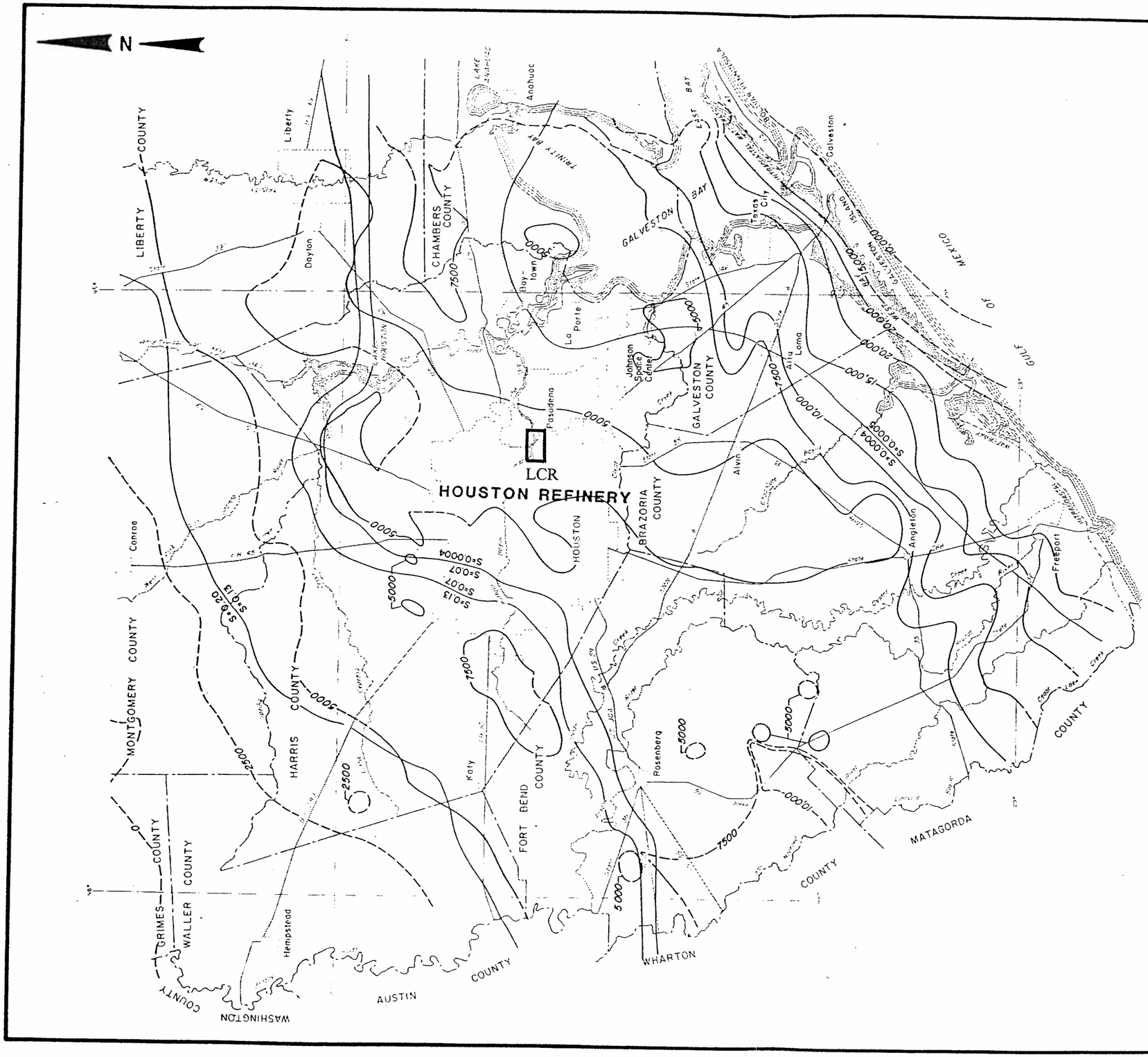
PREPARED BY Y. Li / APPROVED BY O.E. Brown	GENERAL DESIGN APPROVED BY M. Graham

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-34

APPROXIMATE ALTITUDE OF THE BASE OF THE EVANGELENE AQUIFER

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

—10,000-- LINE OF EQUAL TRANSMISSIVITY, DASHED WHERE INFERRED. INTERVAL 5000 FEET SQUARED PER DAY WITH SUPPLEMENTARY INTERVAL OF 2600 FT. SQUARED PER DAY.

S=0.07 / S=0.0004 BOUNDARY BETWEEN AREAS HAVING DIFFERENT AVERAGE VALUES OF STORAGE COEFFICIENT.

FROM U S GEOLOGIC SURVEY

0 5 10 20
MILES

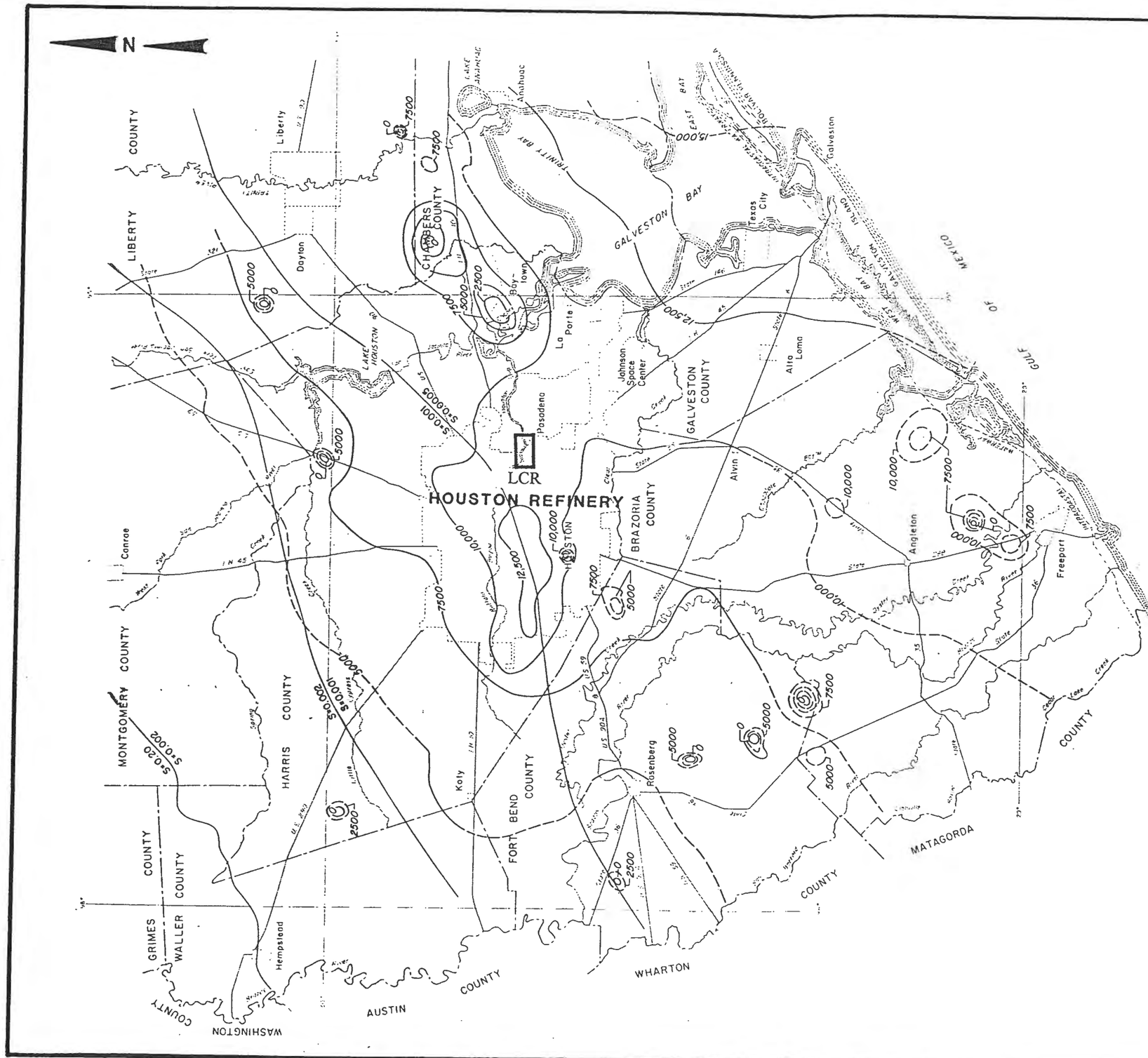
PREPARED BY V. Clark APPROVED BY O.E. Brown	GENERAL DESIGN APPROVED BY M. Guthrie

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-35

ESTIMATED TRANSMISSIVITY AND STORAGE COEFFICIENT OF THE LOWER UNIT OF THE CHICOT AQUIFER AND THE CHICOT AQUIFER UNDIFFERENTIATED

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

10,000 — LINE OF EQUAL TRANSMISSIVITY. DASHED WHERE INFERRED. INTERVAL 2500 FT. SQUARED PER DAY.

S=0.002 / S=0.001 — BOUNDARY BETWEEN AREAS HAVING DIFFERENT VALUES OF STORAGE COEFFICIENT.

FROM U S GEOLOGIC SURVEY

0 5 10 20
MILES

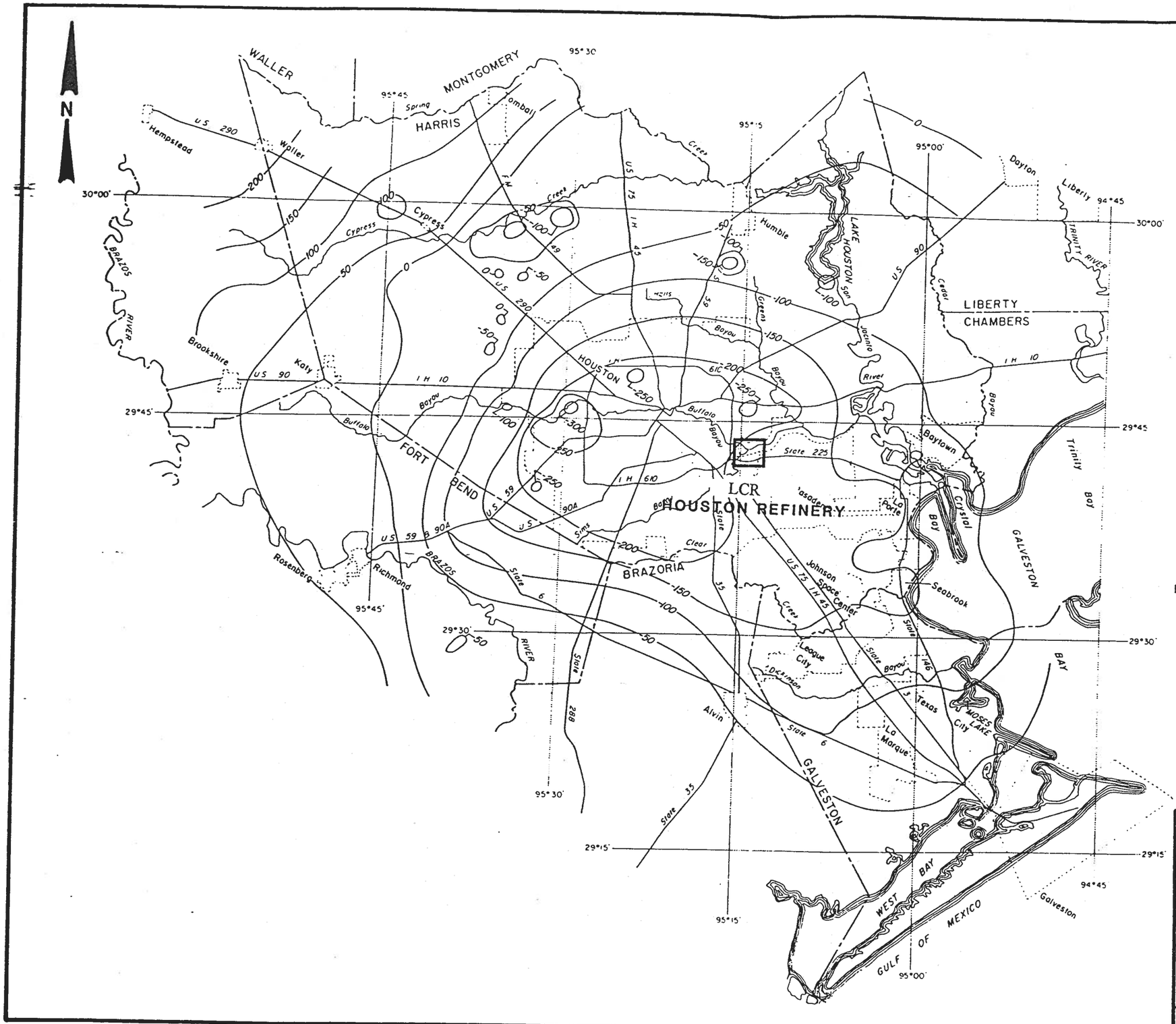
PREPARED BY V. Clark APPROVED BY O.E. Brown	GENERAL DESIGN APPROVED BY M. Goshui

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-36

ESTIMATED TRANSMISSIVITY AND STORAGE COEFFICIENT OF THE EVANGELENE AQUIFER

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

—100— WATER-LEVEL CONTOUR·· Shows altitude at which water level would have stood in tightly cased wells. Contour interval 50'. Datum is National Geodetic Vertical Datum of 1929

FROM OPEN FILE REPORT 84-436, RANZAU 1984

0 5 10 20
MILES

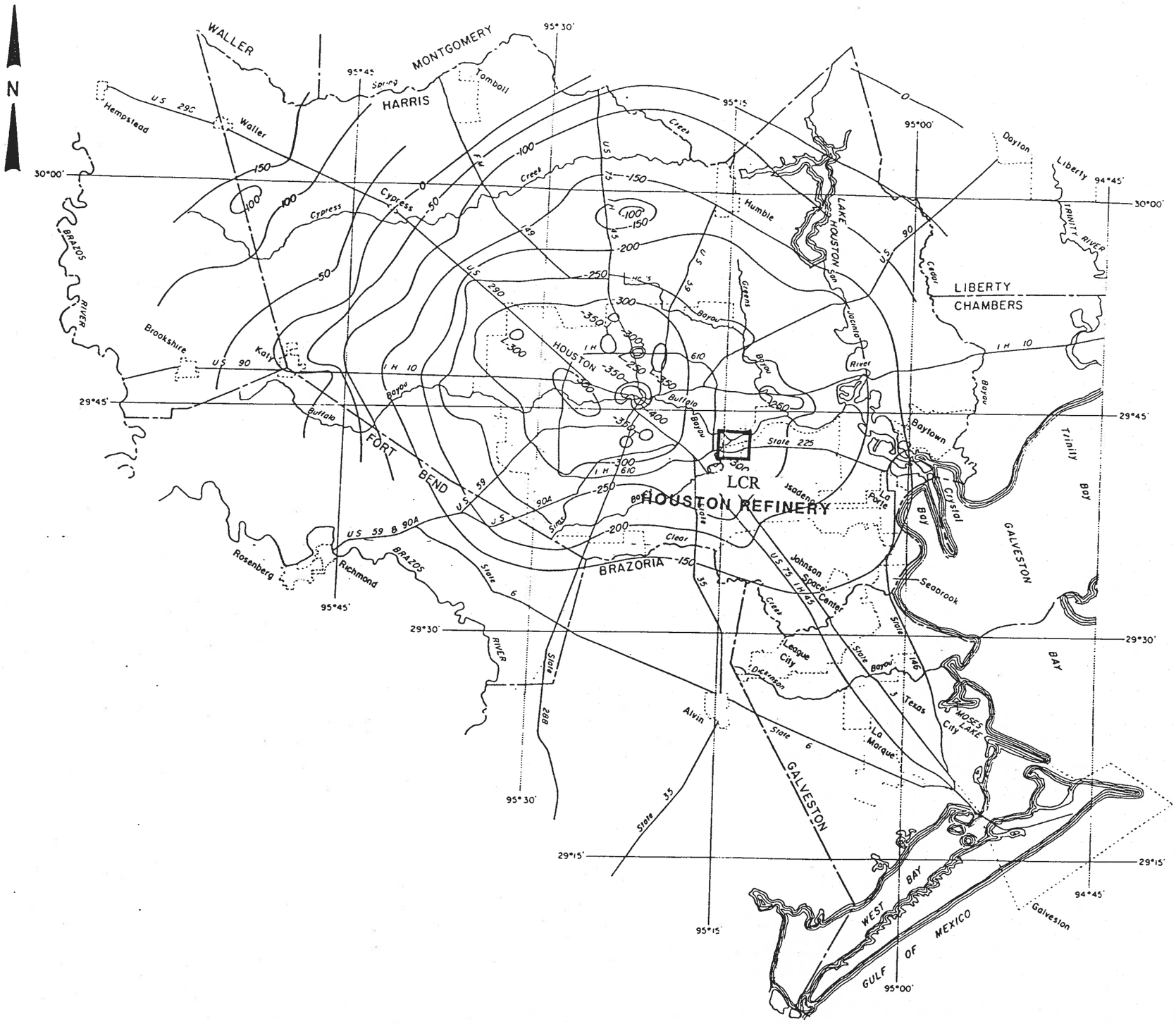
PREPARED BY V. Clark APPROVED BY C.E. Brown	GENERAL DESIGN APPROVED BY M. Gukins

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-37

APPROXIMATE ALTITUDE OF WATER LEVELS IN WELLS IN THE CHICOT AQUIFER SPRING 1984

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

—100— WATER-LEVEL CONTOUR-- Shows altitude at which water level would have stood in tightly cased wells. Contour interval 50'. Datum is National Geodetic Vertical Datum of 1929

FROM OPEN FILE REPORT 84-436, RANZAU 1984

0 5 10 20
MILES

PREPARED BY V. Clark	GENERAL DESIGN APPROVED
APPROVED BY E. Brown	BY M. Buchwi

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-38

APPROXIMATE ALTITUDE OF WATER LEVELS IN WELLS IN THE EVANGELENE AQUIFER SPRING 1984

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB

N

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELINE AQUIFER SYSTEMS IN THE HOUSTON-GALVESTON AREA, TEXAS

The purpose of this report is to show the general geographic areas of recharge to the Chicot and Evangeline aquifers in the Houston area, (see fig. 1). The areas of recharge shown on the map were determined by interpretations of subsurface hydrology, soil surveys of Harris County, and surface and subsurface geology. Correlations of the hydrologic units and geologic units are based on reports by Turcan and others (1966) and Gabrysch (1977). The subsurface hydrology is discussed in reports by Wood and Gabrysch (1965) and Jorgensen (1975). The surface geology used in determining the areas of recharge is shown on the Geologic Atlas of Texas (University of Texas, Bureau of Economic Geology, 1966a, 1966b, 1974a, 1974b, 1975). The Harris County soil surveys were made by the Soil Conservation Service of the U.S. Department of Agriculture (Croat and Wheeler, 1974; Hatcher, 1974).

Generally, the areas of recharge for the Evangeline and Chicot aquifers are between the outcrops of the Beaumont Clay of Pleistocene age and the updip part of the Fleming Formation of Miocene age, as delineated on the Geologic Atlas of Texas. The area of recharge for the Evangeline aquifer includes the most landward outcrop of the Willis Formation of Pleistocene age and, in places, the seaward outcrop of the Fleming Formation.

The area of recharge for the Chicot aquifer includes the outcrops of the Montgomery and Bentley Formations of Pleistocene age and the seaward outcrop of the Willis Formation. In the river valleys that are incised into the Beaumont Clay, the floodplain terrace deposits and alluvium are included in the recharge area of the Chicot aquifer. The approximate seaward extent of complete incision of the Beaumont Clay in the Brazos and Trinity River Valleys is shown by dashed lines on figure 1.

Because of the complexity of the geology in this area, the presentation of a geologic map showing the correlation of the outcrops of the stratigraphic and hydrologic units is beyond the scope of this paper. Figure 1, however, has been prepared at a reduced scale to the Geologic Atlas of Texas (see references), and the reader should examine appropriate sheets of these maps for additional information with regard to stratigraphic and hydrologic correlations.

Hatcher (1974) classified most of the soils in the recharge areas as moderately permeable. Croat and Wheeler (1974, p. 66) give a rate of movement of water through a moderately permeable soil that ranges from 0.06 to 2.0 inches per hour (5 to 50 gallons per day per square foot). The surface of the Beaumont Clay is described as being very slowly permeable, with the rate of movement of water being less than 0.06 inch per hour (less than 0.5 gallon per day per square foot).

REFERENCES CITED

Croat, J. E., and Wheeler, G. L., 1974, Soil survey report, Harris County, Texas: U.S. Dept. Agr., Soil Conserv. Service, 66 p.

Hatcher, C. F., 1974, Soils of Harris County: U.S. Dept. Agr., Soil Conserv. Service, map.

Jorgensen, D. G., 1975, Analog-model studies of ground-water hydrology in the Houston district, Texas: Texas Water Devel. Board Rept. 190, 94 p., 40 figs.

Turcan, A. N., Jr., Oversteen, J. E., and Allburn, Chabot, 1966, Interstate correlation of aquifers, southwestern Louisiana and southeastern Texas: U.S. Geol. Survey Prof. Paper 550-D, p. D231-D236.

University of Texas, Bureau of Economic Geology, 1966a, Geologic atlas of Texas, Beaumont sheet; Bur. Econ. Geology map.

_____1966b, Geologic atlas of Texas, Houston sheet: Bur. Econ. Geology map.

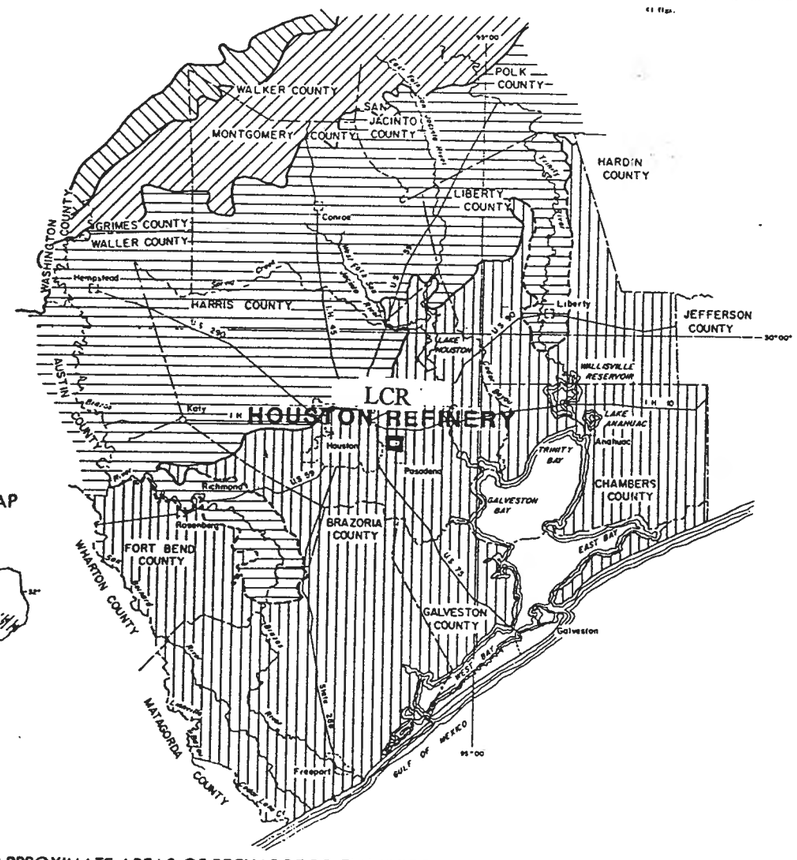
_____1974a, Geologic atlas of Texas, Austin sheet: Bur. Econ. Geology map.

_____1974b, Geologic atlas of Texas, Seguin sheet: Bur. Econ. Geology map.

_____1975, Geologic atlas of Texas, Beeville-Bay City sheet: Bur. Econ. Geology map.

Wesselman, J. B., 1971, Ground-water resources of Chambers and Jefferson Counties, Texas: Texas Water Devel. Board Rept. 133, 101 p.

Wood, L. A., and Gabrysch, R. K., 1965, Analog model study of ground-water in the Houston district, Texas: Texas Water Comm. Bull. 6506, 103 p., 41 figs.



LOCATION MAP

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELINE AQUIFER SYSTEMS

LEGEND

- BURKEVILLE CONFINING SYSTEM (BASAL PART OF FLEMING FORMATION, AREA OF LITTLE OR NO RECHARGE)
- RECHARGE AREA OF THE EVANGELENE AQUIFER SYSTEM (INCLUDES THE LANDWARD WILLIS FORMATION AND COASTWARD PART OF FLEMING FOUNDATION)
- RECHARGE AREA OF THE CHICOT AQUIFER SYSTEM (INCLUDES MONTGOMERY AND BENTLEY FORMATIONS AND COASTWARD WILLIS FORMATION)
- BEAUMONT CLAY (AREA OF LITTLE OR NO RECHARGE)
- COASTWARD EXTEND OF INCISION IN THE BEAUMONT CLAY

FROM USGS OPEN FILE REPORT 77-754

0 10 20
MILES

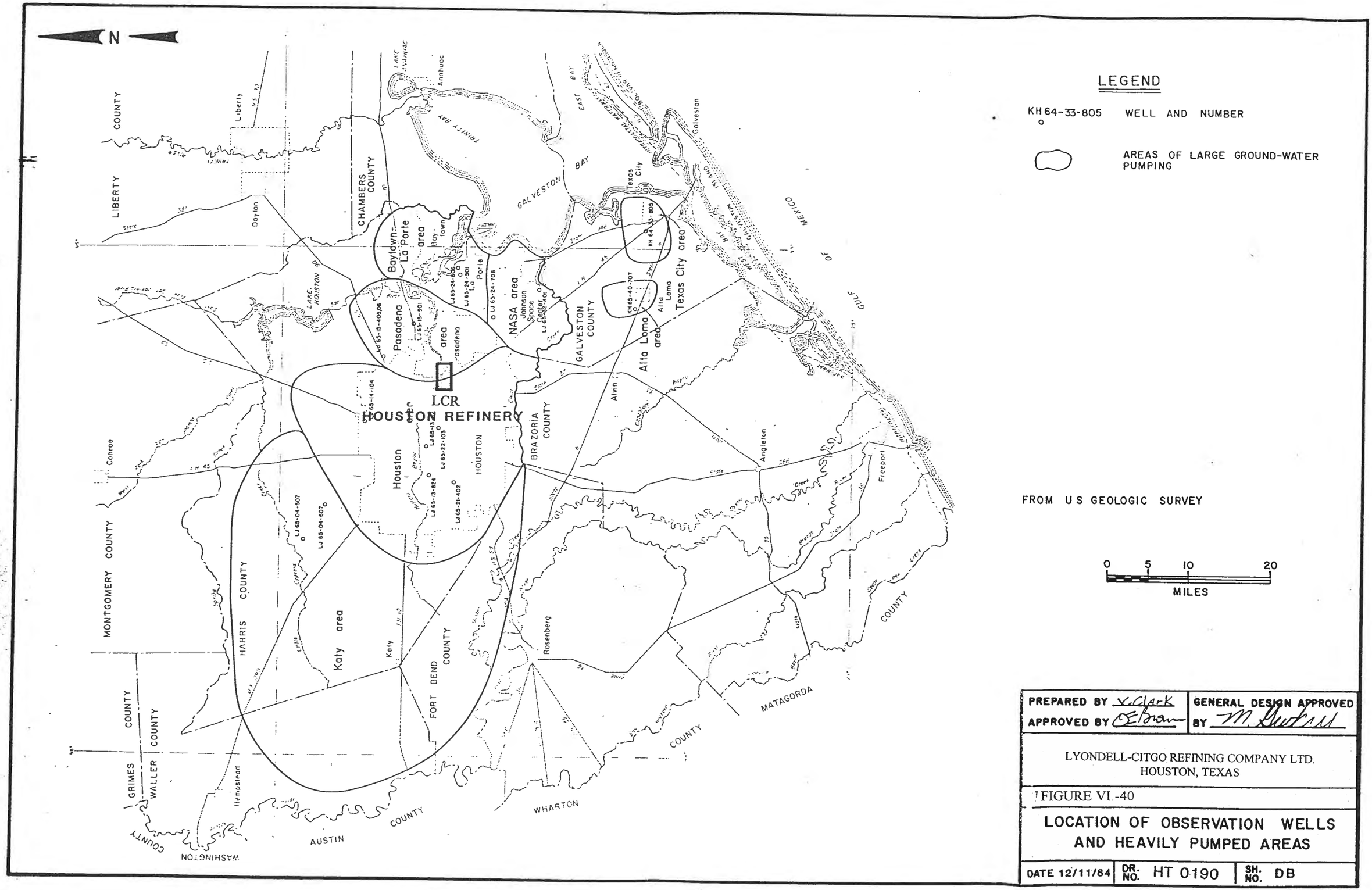
PREPARED BY V. Clark	GENERAL DESIGN APPROVED
APPROVED BY O. Brown	BY M. Dietrich

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-39

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELENE AQUIFER SYSTEMS IN THE HOUSTON GALVESTON AREA, TEX.

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



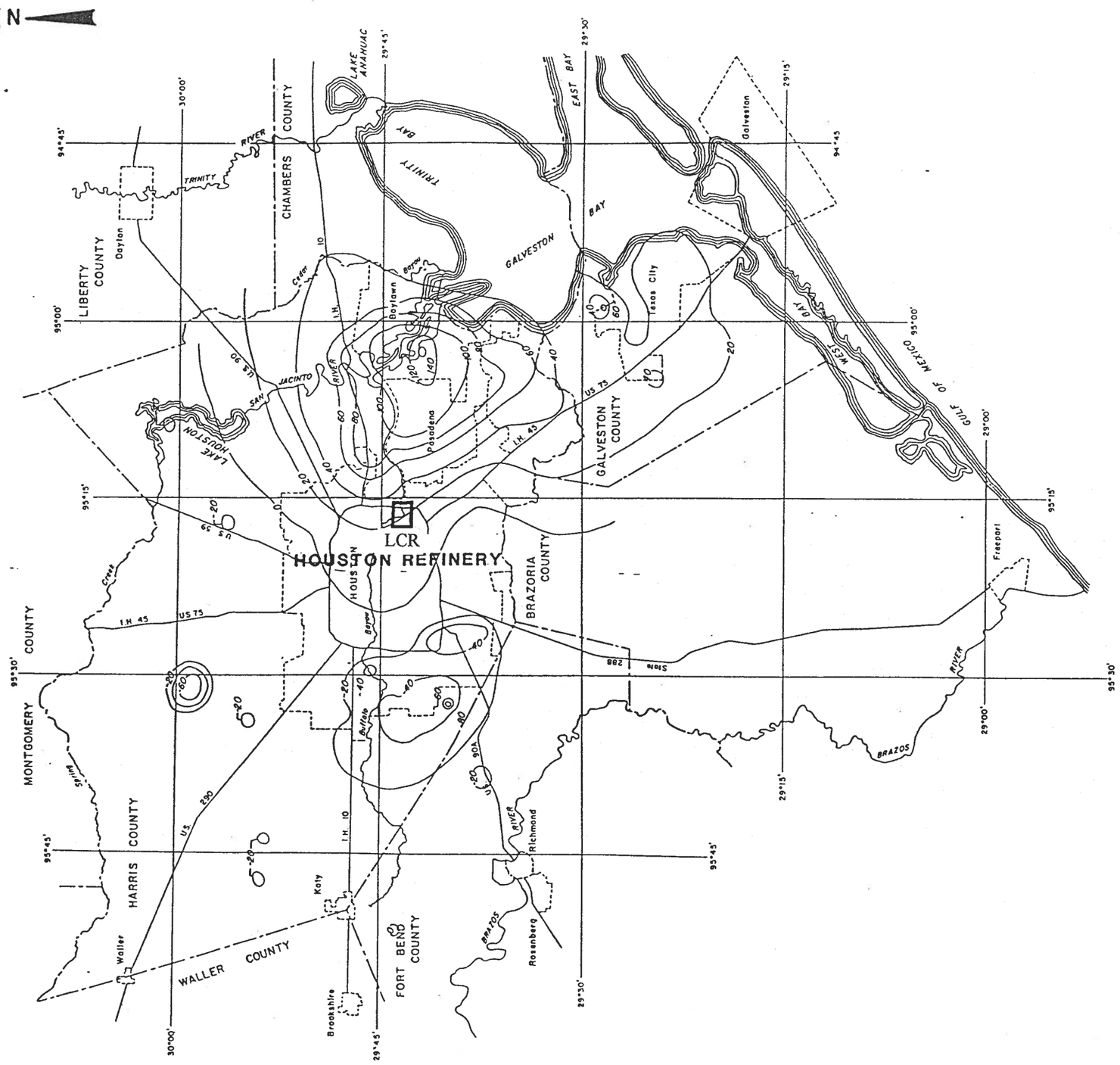
PREPARED BY V. Clark APPROVED BY E. Brown	GENERAL DESIGN APPROVED BY M. Duckett

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-40

LOCATION OF OBSERVATION WELLS AND HEAVILY PUMPED AREAS

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



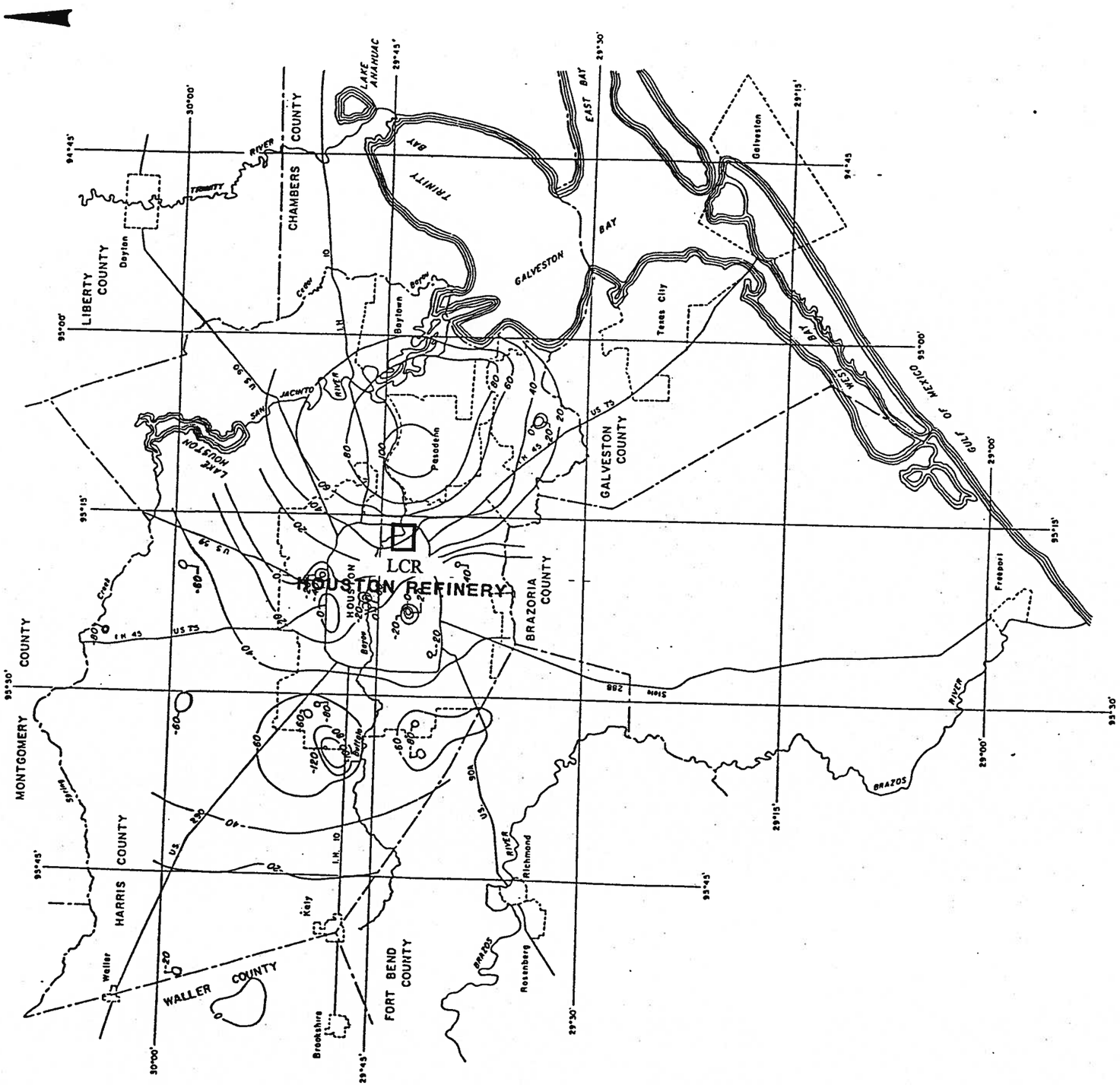
PREPARED BY Y. Clark APPROVED BY O.E. Brown	GENERAL DESIGN APPROVED BY M. Gurkin

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-41

APPROXIMATE WATER LEVEL CHANGES IN WELLS IN THE CHICOT AQUIFER 1977-84

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB



LEGEND

— 2 — LINE OF EQUAL WATER-LEVEL

-- 2 -- CHANGE -- INTERVAL VARIABLE

FROM USGS OPEN FILE 84-140

0 5 10 20

SCALE IN MILES

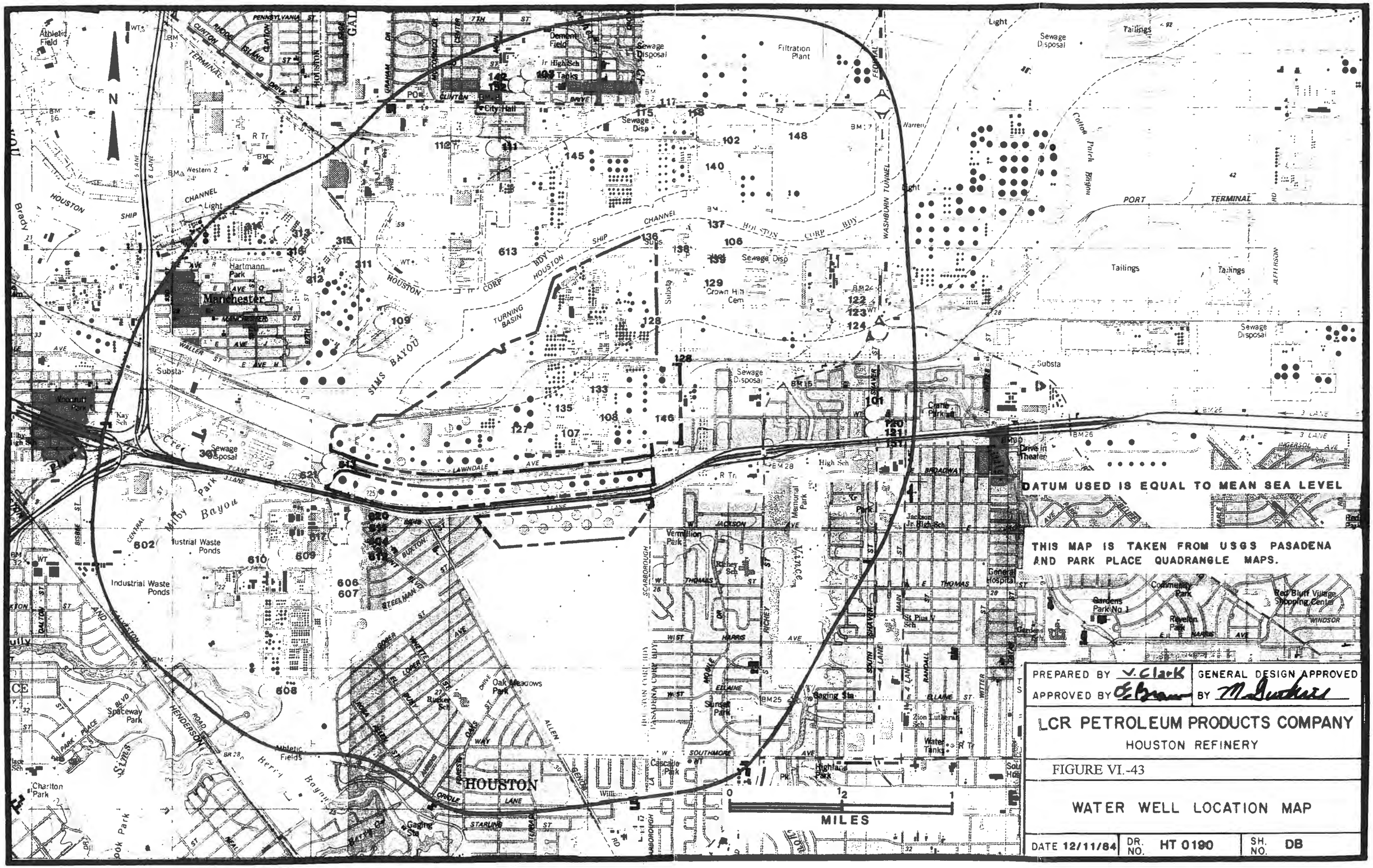
PREPARED BY Y. Clark	GENERAL DESIGN APPROVED
APPROVED BY O.E. Brown	BY M. Duchesne

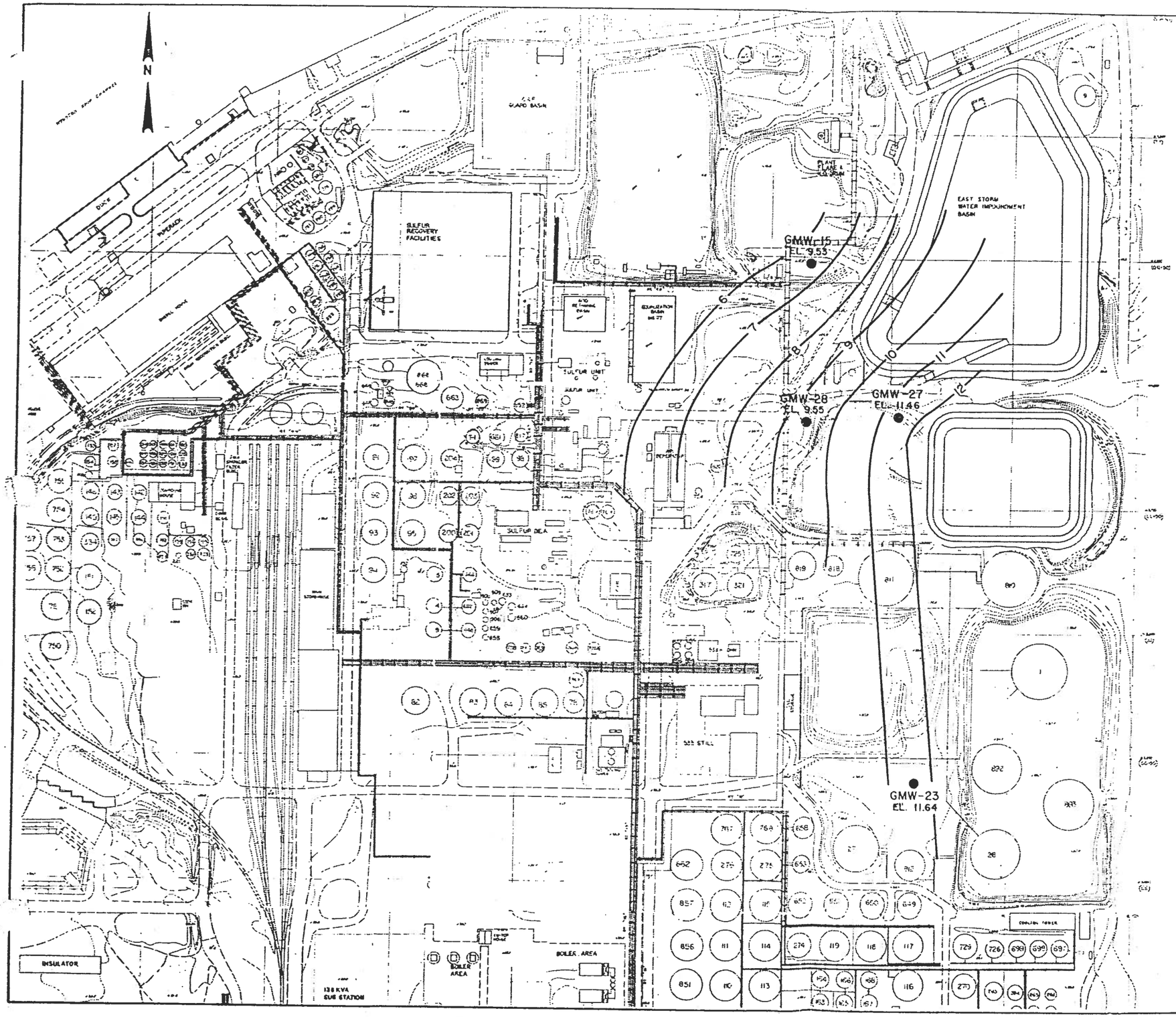
LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-42

APPROXIMATE WATER LEVEL CHANGES IN WELLS IN THE EVANGELENE AQUIFER 1977-84 IN THE HOUSTON GALVESTON AREA, TEX.

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB


DATUM USED IS EQUAL TO MEAN SEA LEVEL
THIS MAP IS TAKEN FROM USGS PASADENA AND PARK PLACE QUADRANGLE MAPS.
PREPARED BY V. Clark
APPROVED BY
GENERAL DESIGN APPROVED BY
LCR PETROLEUM PRODUCTS COMPANY
HOUSTON REFINERY
FIGURE VI.-43
WATER WELL LOCATION MAP
DATE 12/11/84
DR. NO. HT 0190
SH. NO. DB
MILES
HOUSTON
Manchester
Hartmann Park
Sims Bayou
Turning Basin
Houston Ship Channel
Filtration Plant
Sewage Disposal
Tailings
Industrial Waste Ponds
Crown Hill Cem
Oak Meadows Park
Spaceway Park
Charlton Park
Athletic Fields
Memorial Park
Vermilion Park
Jackson Jr. High Sch
General Hospital
Drive-in Theater
Crane Parking
Water Tanks
Highland Park
Cascade Park
Sunset Park
Gaging Sta
Port Terminal Rd
Washburn Tunnel
Cotton Patch Bayou
Milby Park
Herrin Bayou
Brady
Lawndale Ave
Broadway
Jackson
Thomas
Harris
Southmore
Ellaine
Scarborough
Richey
Beaver
Randall
Wetter
Jefferson
Windsor
Commerce Park
Red Bluff Village Shopping Center
Gardens Park No 1
Revelon Park
St Pius V Sch
Zion Lutheran Sch
Jr High Sch
High Sch
City Hall
Demon Field
Athletic Field
Western 2
Hiway 3
Hiway 5



NOTE:

GROUNDWATER CONTOURS FROM SHALLOW GROUNDWATER WELLS. NOT UPPERMOST AQUIFER

ELEVATIONS IN MEAN SEA LEVEL. REFINERY DATUM ELEVATION 8.2±0.00 MEAN SEA LEVEL AS ADJUSTED IN 1978

0 100 200 400

SCALE IN FEET

REVISED 6/14/85

PREPARED BY _____	GENERAL DESIGN APPROVED
APPROVED BY _____	BY _____

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

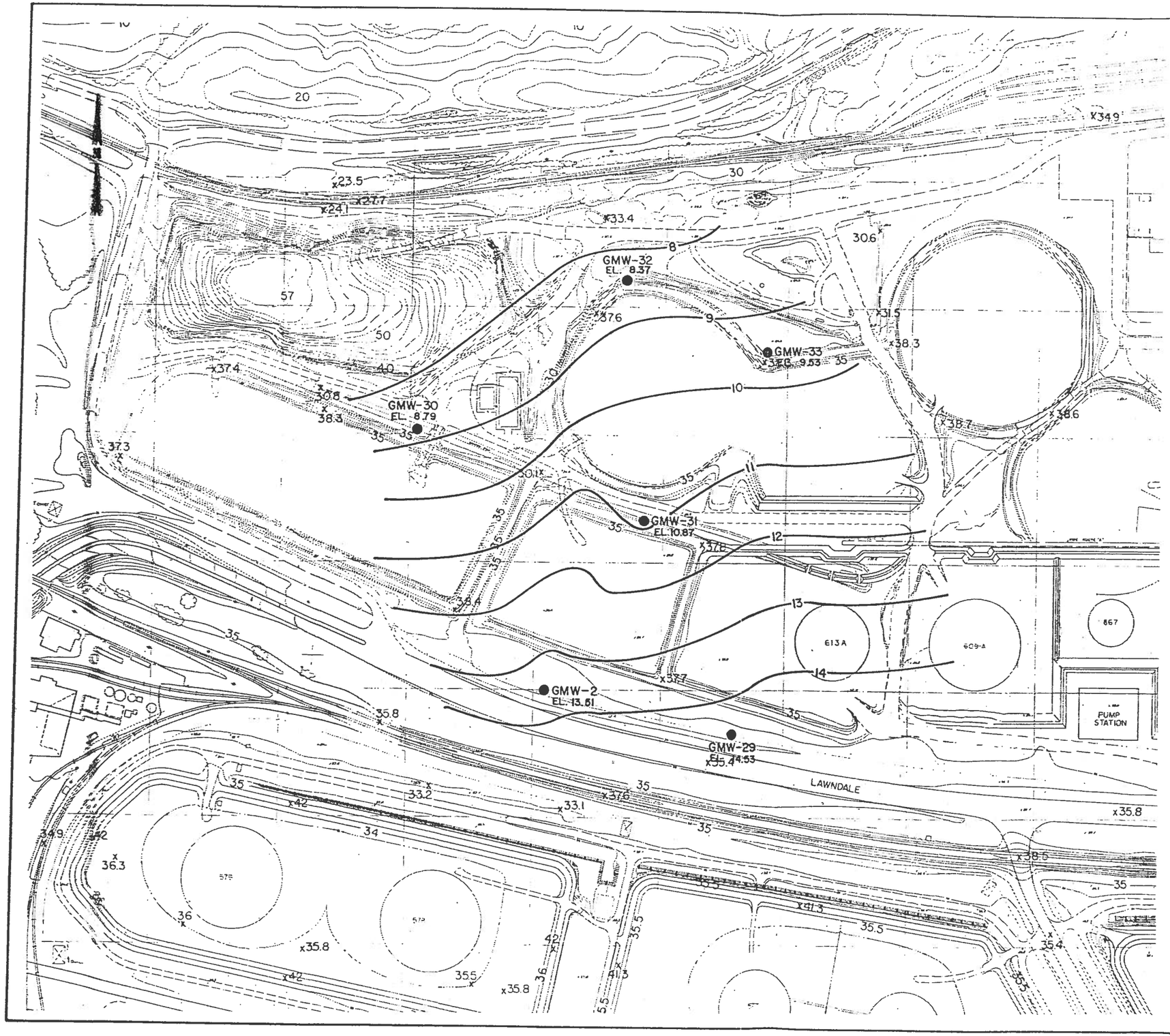
FIGURE VI.-44

NORTHEAST LANDFARM

EXISTING GROUNDWATER MONITORING NETWORK

LCR HOUSTON REFINERY

DATE 12/11/84	DR. NO.	SH. NO.



ELEVATIONS IN MEAN SEA LEVEL. REFINERY DATUM ELEVATION 3.2 = 0.00 MEAN SEA LEVEL AS ADJUSTED IN 1978

0 100 200 400
SCALE IN FEET

PREPARED BY V. Clark APPROVED BY O. Brown	GENERAL DESIGN APPROVED BY M. Austin

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS

FIGURE VI.-45

SOUTHWEST LANDFARM - EXISTING GROUNDWATER MONITOR ING NETWORK

DATE 12/11/84	DR. NO. HT 0190	SH. NO. DB

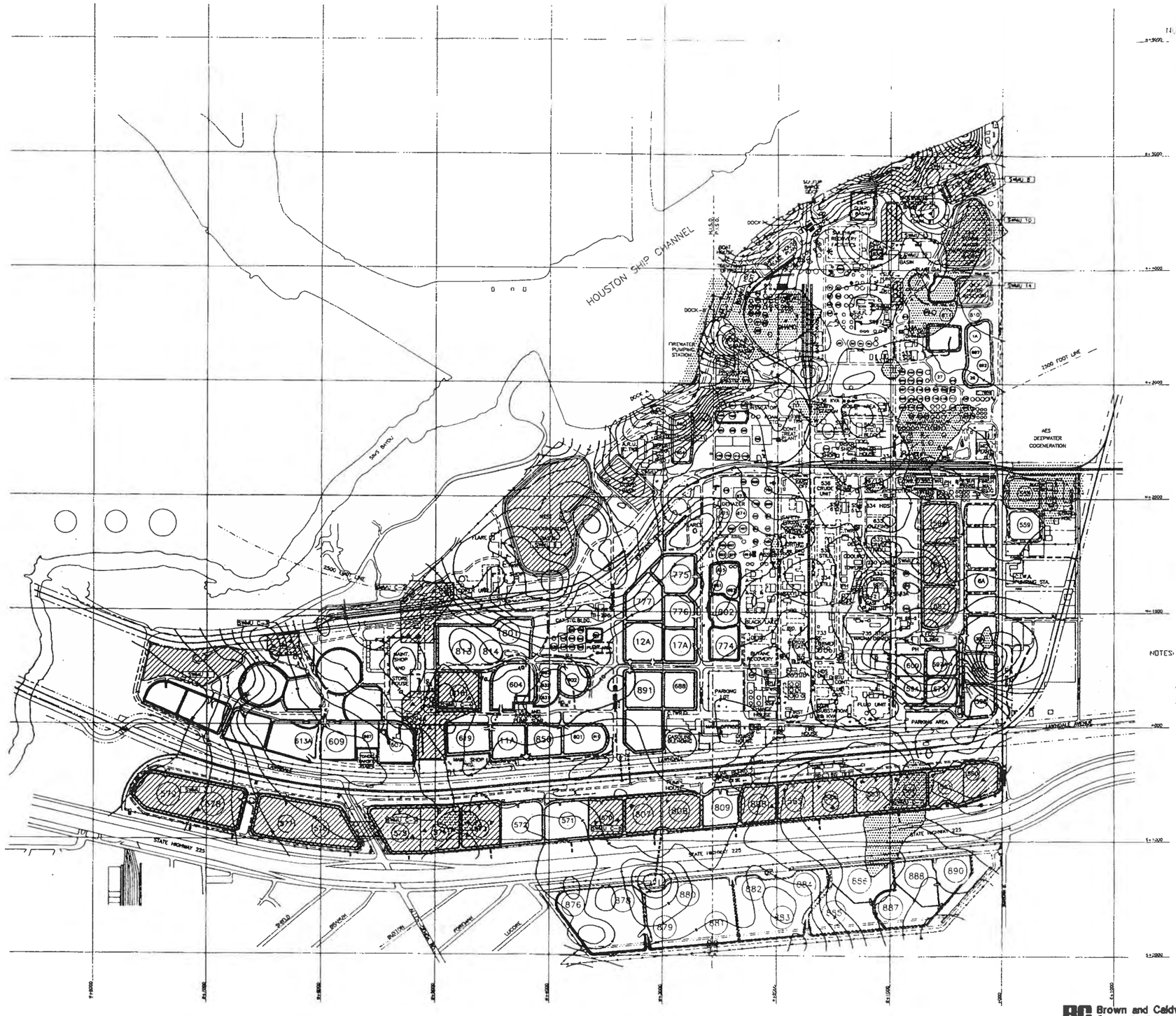


TABLE 1

NUMBER	SOLID WASTE MANAGEMENT UNIT
1.	RFA UNIT 02 - SOUTHWEST LANDFILL
2	RFA UNIT 23 - LAND TREATMENT UNITS 584, 583, 582
3	RFA UNIT 24 - LAND TREATMENT UNIT 579
4.	RFA UNIT A - NORTHEAST LANDFILL
5.	RFA UNIT B - LANDFILL 100
C-1.	RFA UNIT C-1 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - #425
C-2.	RFA UNIT C-2 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - COKER AREA
C-3.	RFA UNIT C-3 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - ALONG RAILROAD TRACKS
C-4.	RFA UNIT C-4 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - MAINTANCE SHOP
C-5.	RFA UNIT C-5 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - #575, #573
C-6.	RFA UNIT C-6 -PITS FOR BURIAL OF LEADED TANK BOTTOMS -#570, #807, #806
C-7.	RFA UNIT C-7 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - #565, #564, #563 #562, #561, #560
7.	RFA UNIT D - WEST GUARD BASIN
8.	RFA UNIT E - EAST GUARD BASIN
9.	RFA UNIT F - WEST IMPOUNDMENT BASIN
10.	RFA UNIT G - EAST IMPOUNDMENT BASIN
11.	RFA UNIT H - API SEPARATOR
12.	RFA UNIT I - ACID RETENTION BASIN
13.	RFA UNIT J - BIOXIDATION BASIN
14.	RFA UNIT K - OILY WATER RETENTION BASIN

GENERAL NOTE:

BASE DRAWING IS THE UP-DATED VERSION OF THE HOUSTON REFINERY DATED MARCH 1988.

LEGEND

▨	SOLID WASTE MANAGEMENT UNIT
▲	PIT FOR BURIAL OF LEADED TANK BOTTOMS
▩	LIMIT OF WATER-BEARING STRATA

NOTES:

1. CONTOUR INTERVAL IS 2 FEET.
2. CONTOURS ARE IN FEET MSL (1978).
3. ALL RAW DATA ELEVATIONS WERE REFERENCED TO PLANT BENCH MARKS AND DATUM. DUE TO REGIONAL LAND SUBSIDENCE, AN ADJUSTMENT OF -8.20 FEET WAS APPLIED TO FIELD DATA TO OBTAIN 1978 MSL ELEVATIONS. THE -8.20 FEET ADJUSTMENT TO 1978 MSL IS THE MOST RECENT SUBSIDENCE ADJUSTMENT WHICH CAN BE SUBSTANTIATED BY NGS PUBLISHED DATA.

DRAWING MODIFICATIONS BY: Brown and Caldwell Consultants

△		DATE			
SYM.	REVISIONS	DATE	REV. BY	CHK. BY	APP. BY

REVISED

BASIC MAP BY [illegible] Engineers Inc
DRAWN BY MODIFIED BY [illegible]
CHECKED BY S. MELLON [illegible]
APPROVED BY S. MELLON [illegible]
GENERAL DESIGN APPROVED BY
OPERATING DEPARTMENT BY
AUTHORIZATION NO.
JOB NO.
ACCT. NO.

LYONDELL-CITGO REFINING
COMPANY LTD.
HOUSTON REFINERY

UNIT

FACILITY PLAN
STRUCTURAL CONTOUR MAP
TOP OF UPPER WATER-BEARING STRATA

SCALE 1"=400'
DATE 8-10-90

FIGURE VI.-46

REV. 0

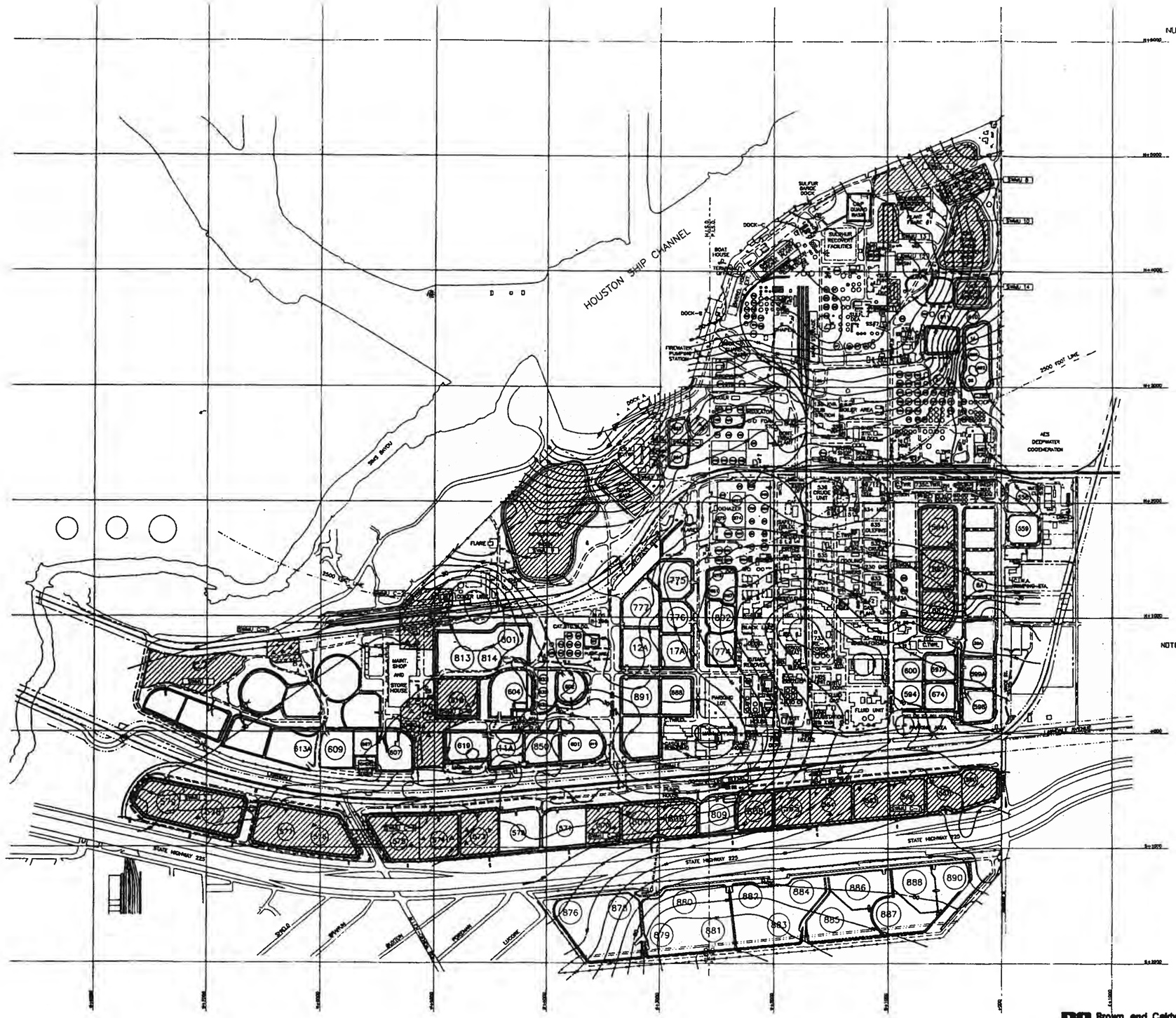


TABLE 1

NUMBER	SOLID WASTE MANAGEMENT UNIT
1	RFA UNIT 02 - SOUTHWEST LANDFILL
2	RFA UNIT 23 - LAND TREATMENT UNITS 584, 583, 582
3	RFA UNIT 24 - LAND TREATMENT UNIT 579
4	RFA UNIT A - NORTHEAST LANDFILL
5.	RFA UNIT B - LANDFILL 100
C-1	RFA UNIT C-1 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - #425
C-2	RFA UNIT C-2 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - COKER AREA
C-3.	RFA UNIT C-3 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - ALONG RAILROAD TRACKS
C-4	RFA UNIT C-4 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - MAINTANCE SHOP
C-5.	RFA UNIT C-5 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - #575, #573
C-6.	RFA UNIT C-6 -PITS FOR BURIAL OF LEADED TANK BOTTOMS -#570, #807, #806
C-7.	RFA UNIT C-7 -PITS FOR BURIAL OF LEADED TANK BOTTOMS - #565, #564, #563 #562, #561, #560
7.	RFA UNIT D - WEST GUARD BASIN
8.	RFA UNIT E - EAST GUARD BASIN
9.	RFA UNIT F - WEST IMPOUNDMENT BASIN
10.	RFA UNIT G - EAST IMPOUNDMENT BASIN
11.	RFA UNIT H - API SEPARATOR
12	RFA UNIT I - ACID RETENTION BASIN
13.	RFA UNIT J - BIOXIDATION BASIN
14	RFA UNIT K - OILY WATER RETENTION BASIN

GENERAL NOTE:
BASE DRAWING IS THE UP-DATED VERSION OF THE HOUSTON REFINERY DATED MARCH 1988.

LEGEND

SOLID WASTE MANAGEMENT UNIT

PIT FOR BURIAL OF LEADED TANK BOTTOMS

NOTES:

1. CONTOUR INTERVAL IS 2 FEET.
2. CONTOURS ARE IN FEET MSL (1978).
3. ALL RAW DATA ELEVATIONS WERE REFERENCED TO PLANT BENCH MARKS AND DATUM. DUE TO REGIONAL LAND SUBSIDENCE, AN ADJUSTMENT OF -8.20 FEET WAS APPLIED TO FIELD DATA TO OBTAIN 1978 MSL ELEVATIONS. THE -8.20 FEET ADJUSTMENT TO 1978 MSL IS THE MOST RECENT SUBSIDENCE ADJUSTMENT WHICH CAN BE SUBSTANTIATED BY NGS PUBLISHED DATA.

SYM.	REVISIONS	DATE	REV. BY	CHK. BY	APP. BY
△		DATE			

REVISED

BASE MAP BY BDE Engineers, Inc.
DRAWN BY WEBSTER BY DHR JULY 88
CHECKED BY S. HOLLON 2 DEC 87
APPROVED BY J. HOLLON PROJ. MGR.
GENERAL DESIGN APPROVED BY
OPERATING DEPARTMENT BY
AUTHORIZATION NO.
JOB NO. ACCT. NO.

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON REFINERY

UNIT

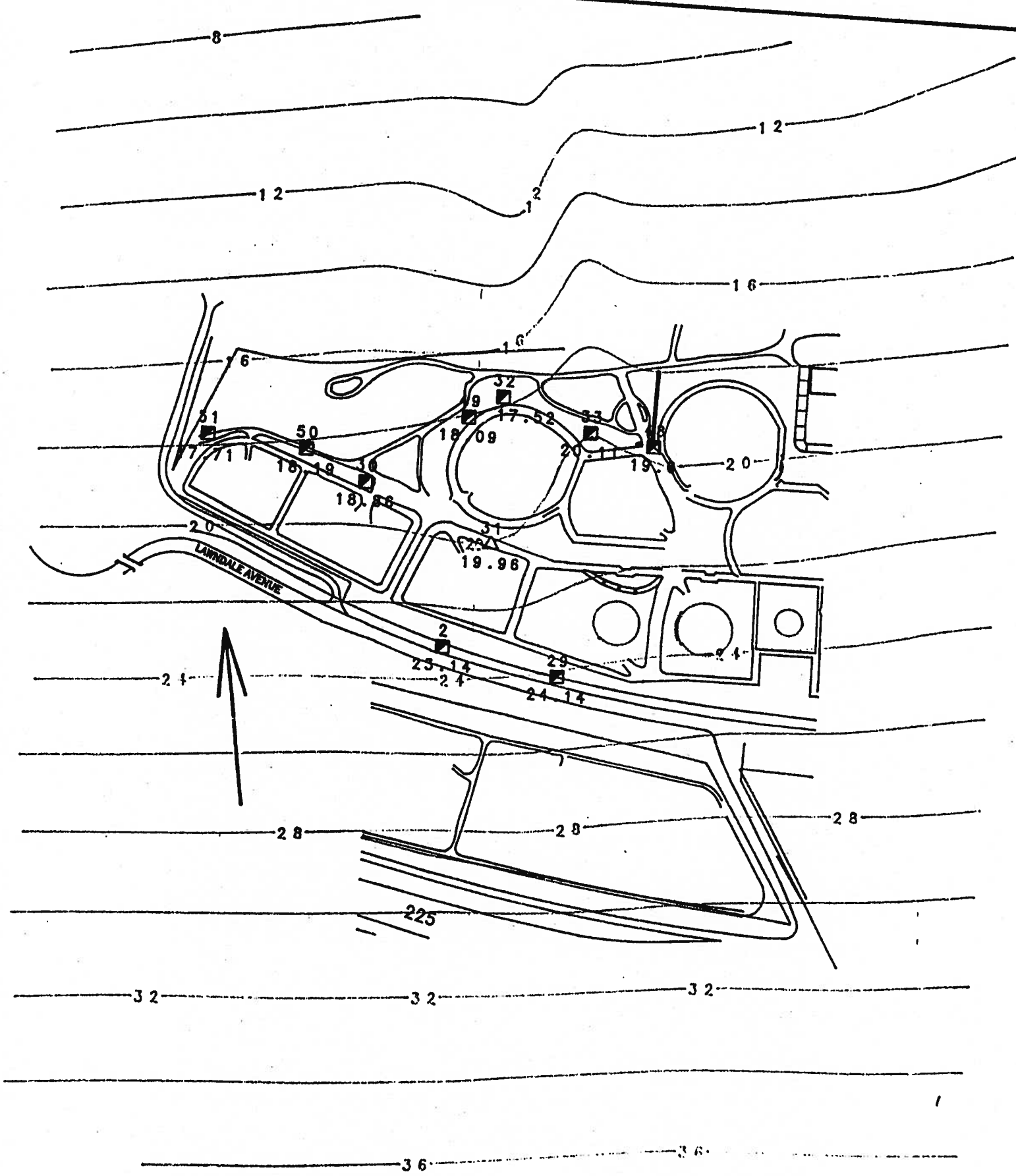
FACILITY PLAN
STRUCTURAL CONTOUR MAP
TOP OF LOWER WATER-BEARING STRATA

SCALE 1"=400'
DATE 8-10-90

FIGURE VI.-47

REV. 0

DRAWING MODIFICATIONS BY: Brown and Caldwell Consultants



LEGEND

51 ■ MONITORING WELL

31 △ PIEZOMETER

16.93 DATA VALUE

← FLOW DIRECTION

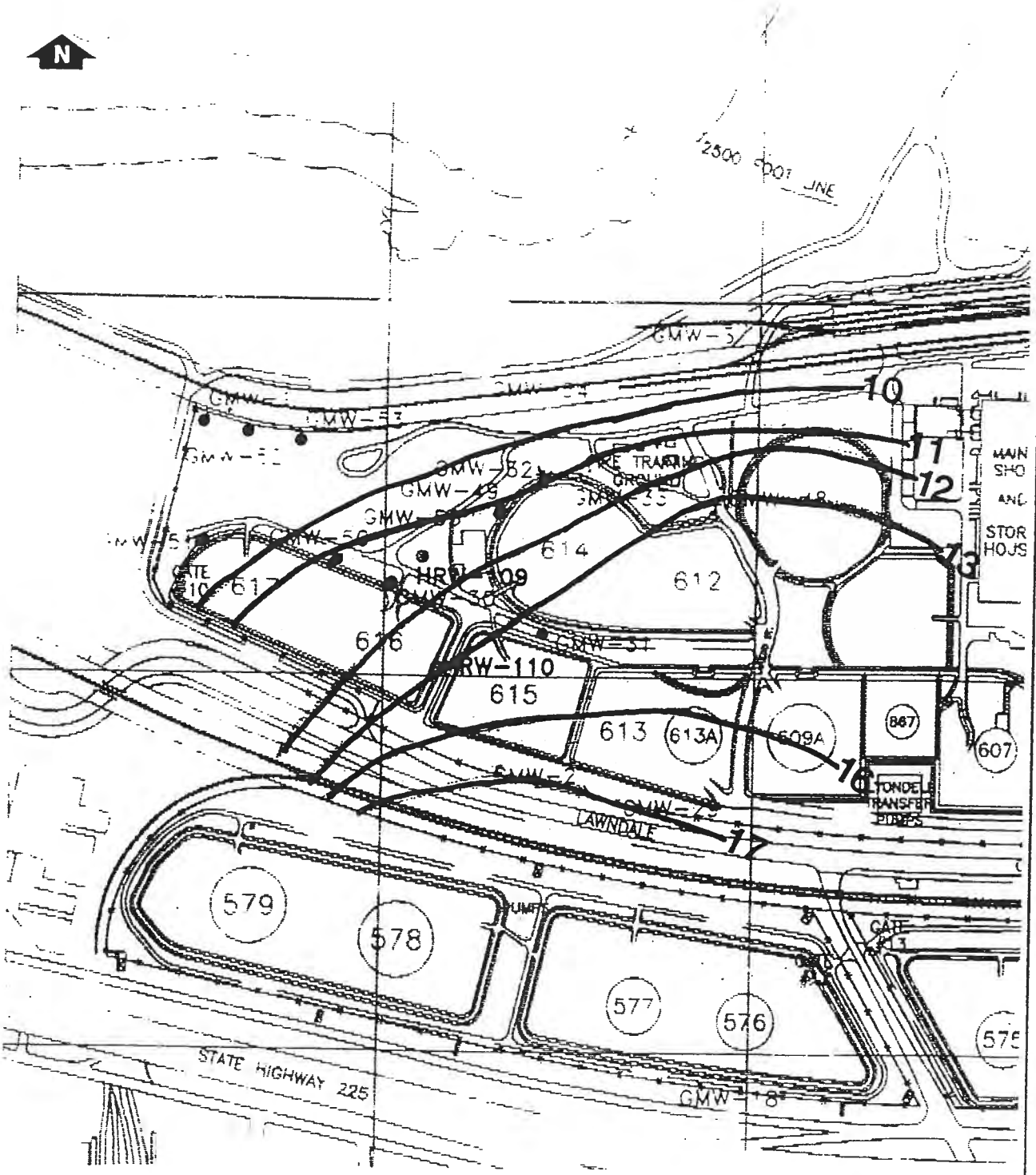
WATER LEVEL CONTOUR MAP
SOUTHWEST LANDFARM
(FEET: PLANT ELEVATION)
SCALE: 1 IN = 400 FT
DATE MEASURED: 3/01/94

GEO ASSOCIATES

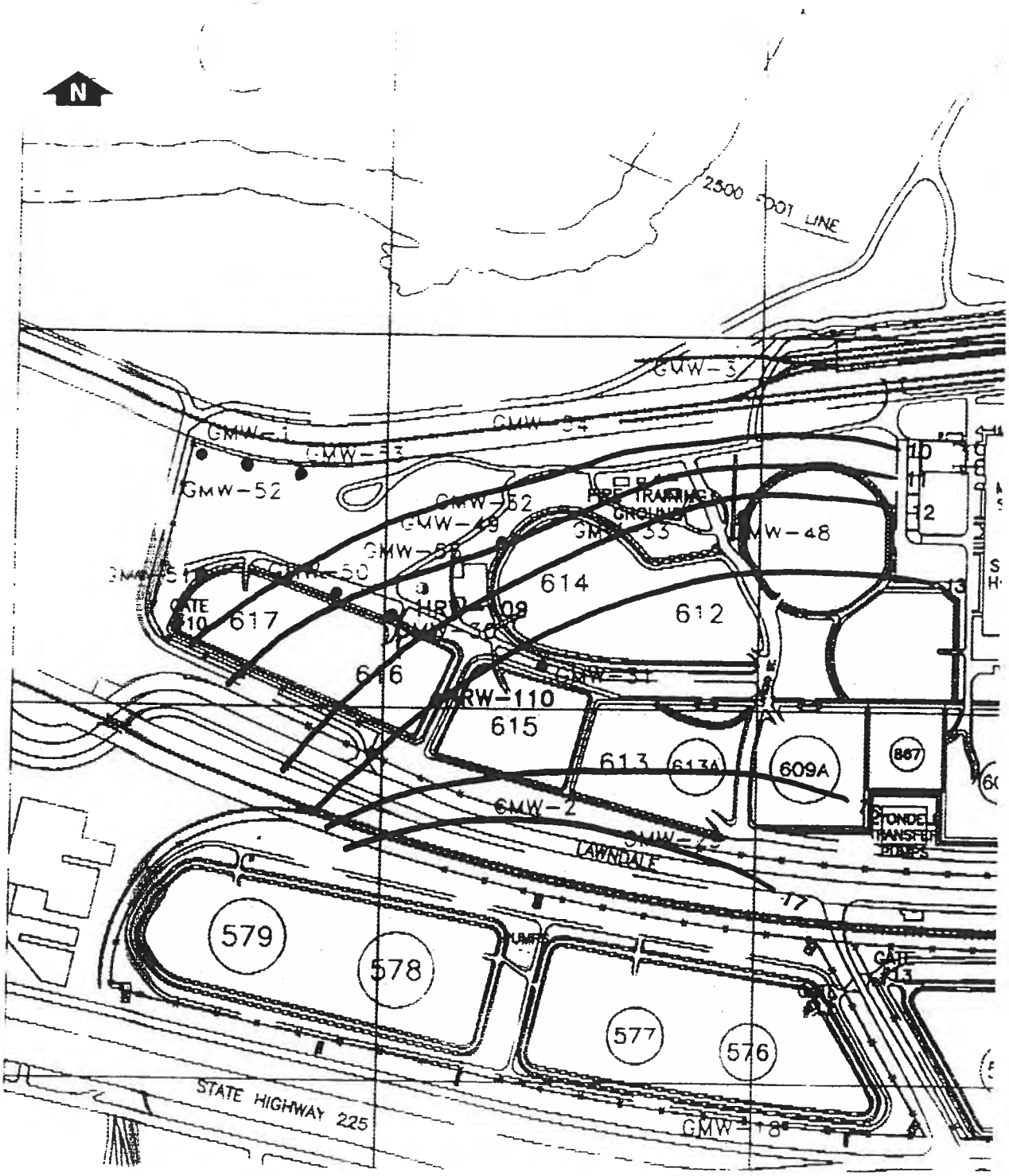
ANNUAL REPORT
FOR THE
CALENDAR YEAR 1994

LYONDELL–CITGO REFINING COMPANY LTD.

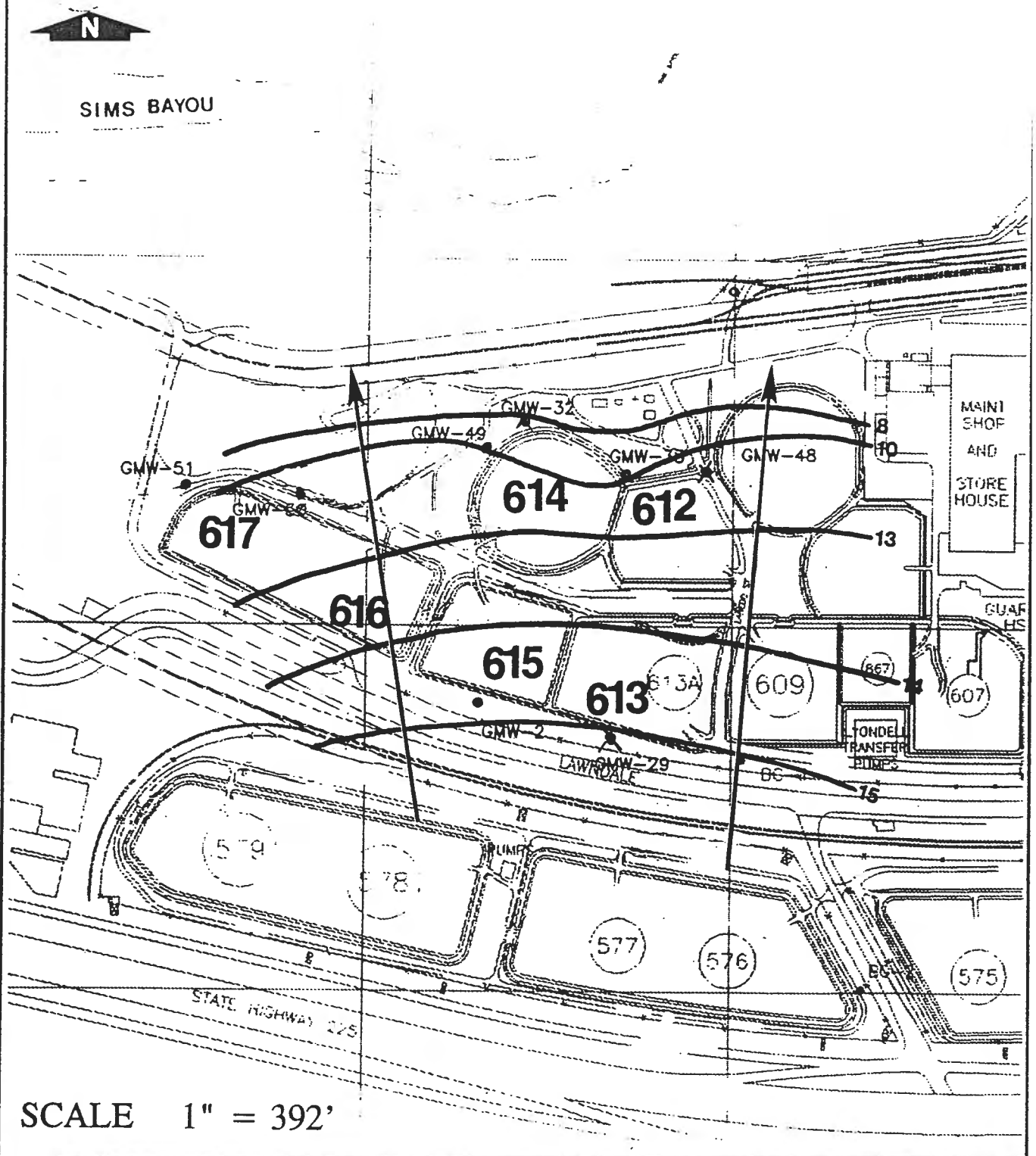
FIGURE VI.-48



POTENTIOMETRIC MAP, W. Plant	FIGURE VI.-49
SOUTHWEST LANDFARM	March 1995
LYONDELL-CITGO Refining Company Ltd. Houston, Texas	

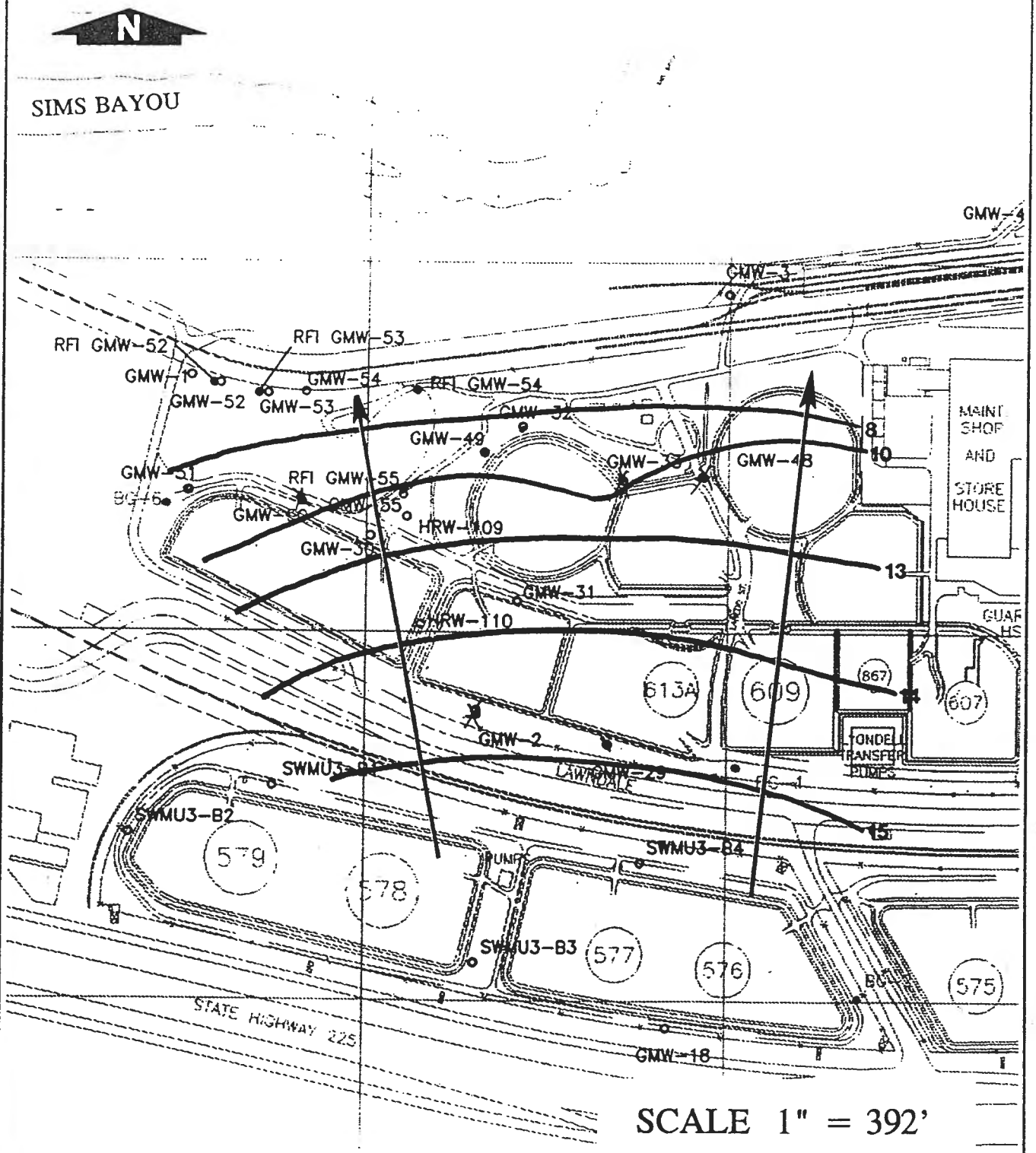


POTENTIOMETRIC MAP, W. Plant	FIGURE VI.-50
SOUTHWEST LANDFARM	**August 1995**
LYONDELL-CITGO Refining Company Ltd. **Houston, Texas**	

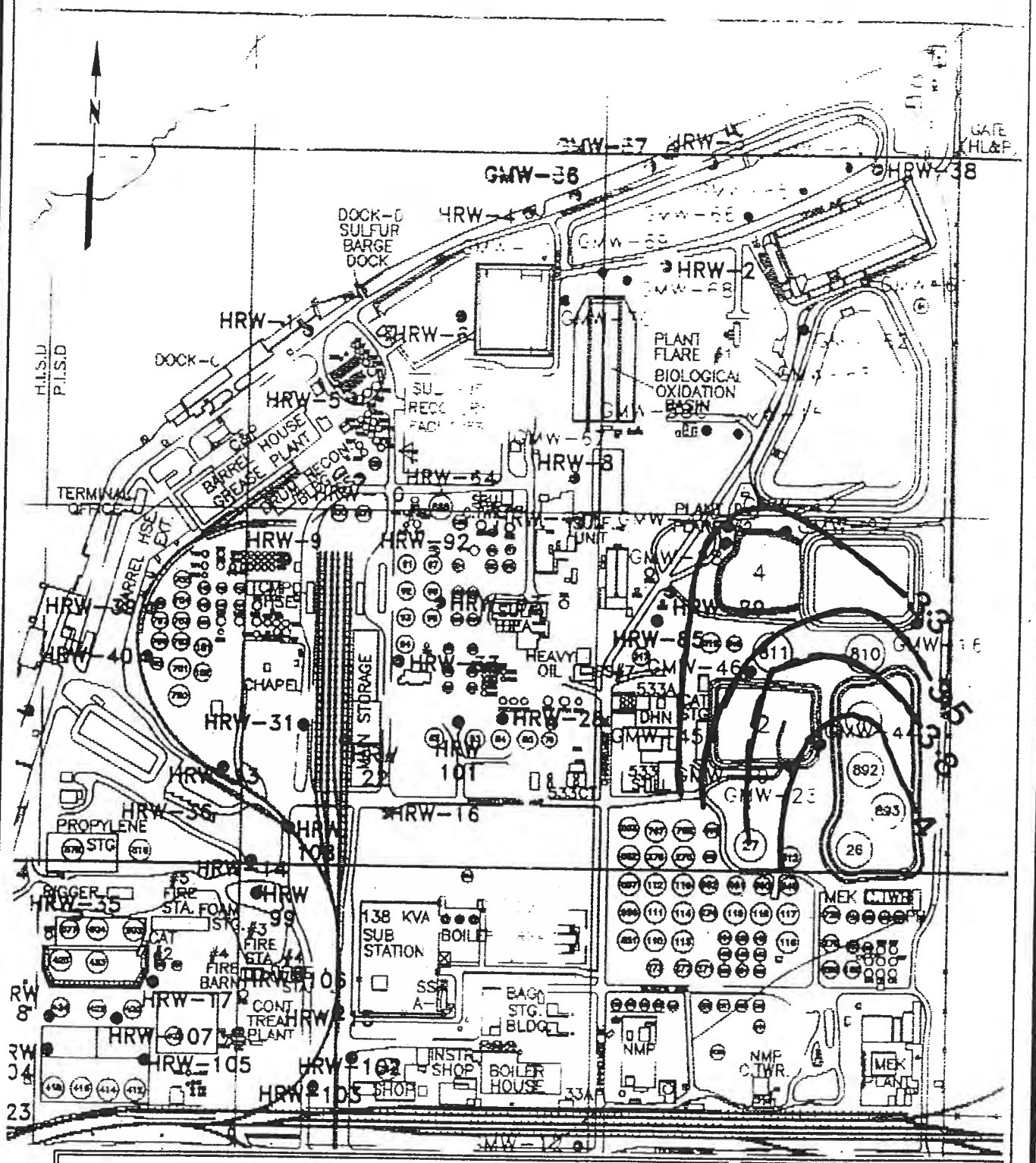


SCALE 1" = 392'

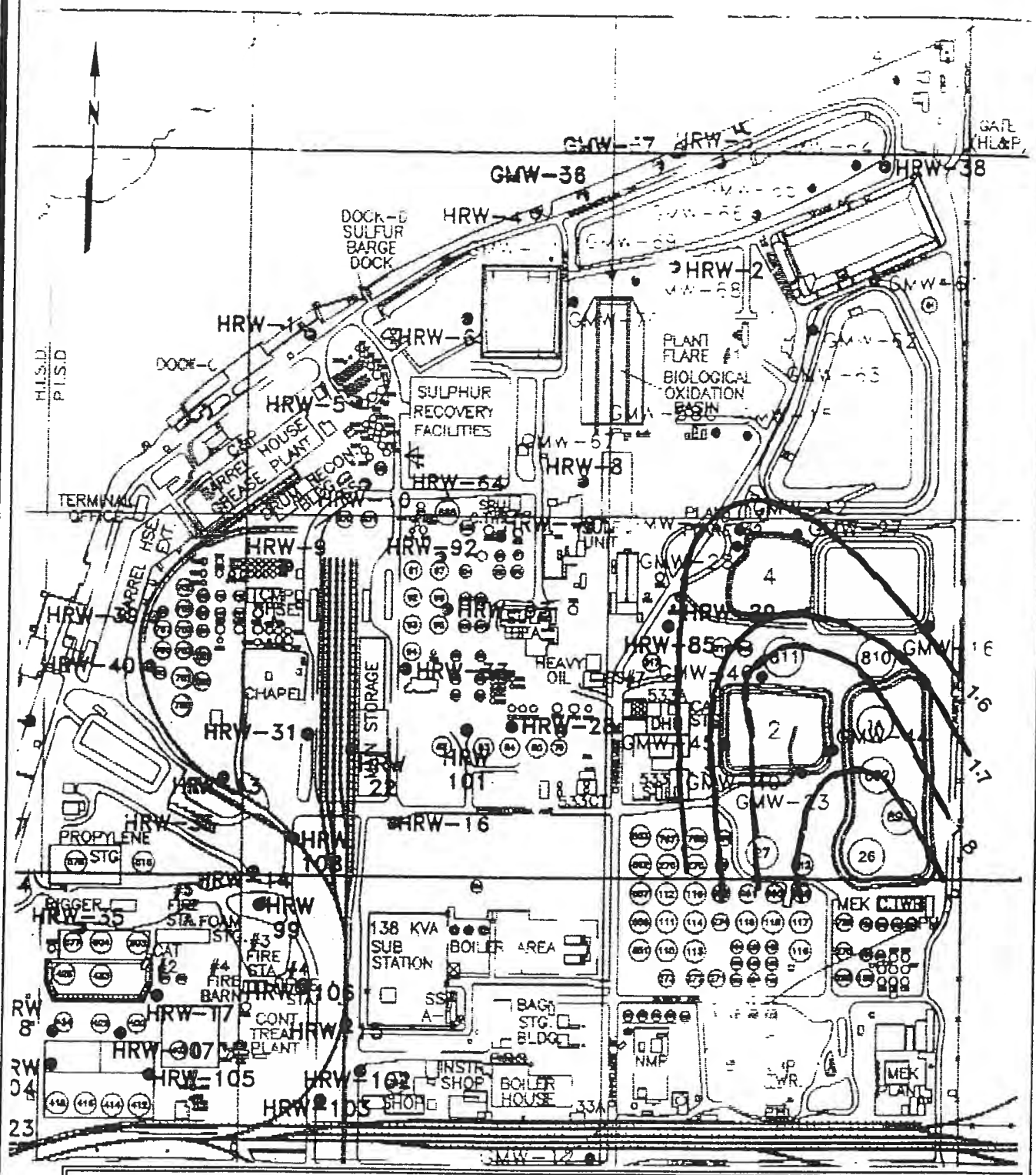
POTENTIOMETRIC MAP, W. Plant (Landfarm)	FIGURE VI.-51
GeoMonitoring Services	
LYONDELL-CITGO Refining Company Ltd. Houston, Texas	FEBRUARY 1996



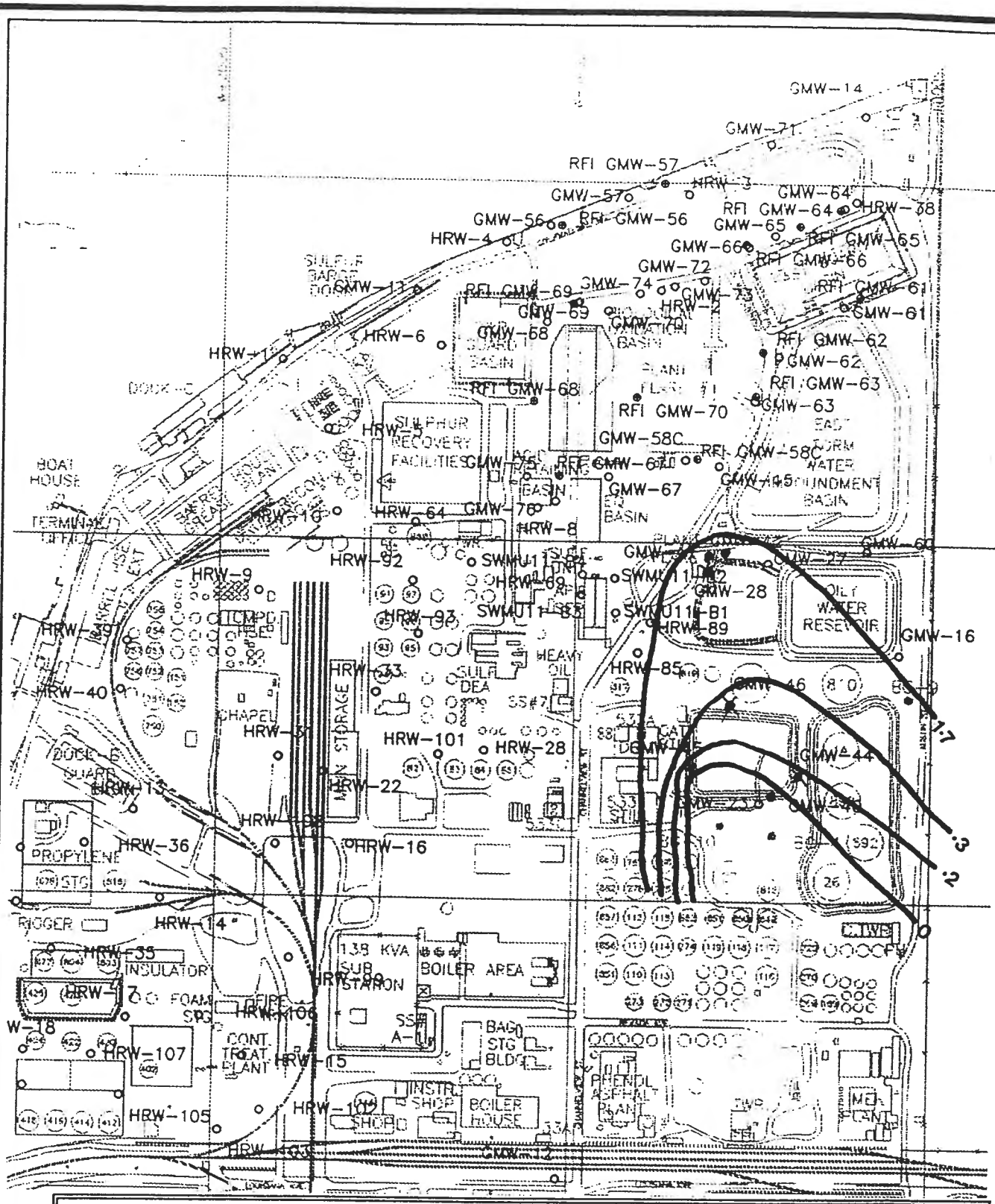
POTENTIOMETRIC MAP, W. Plant (Landfarm)	FIGURE VI.-52
GeoMonitoring Services	
LYONDELL-CITGO Refining Company Ltd. Houston, Texas	JULY 1996



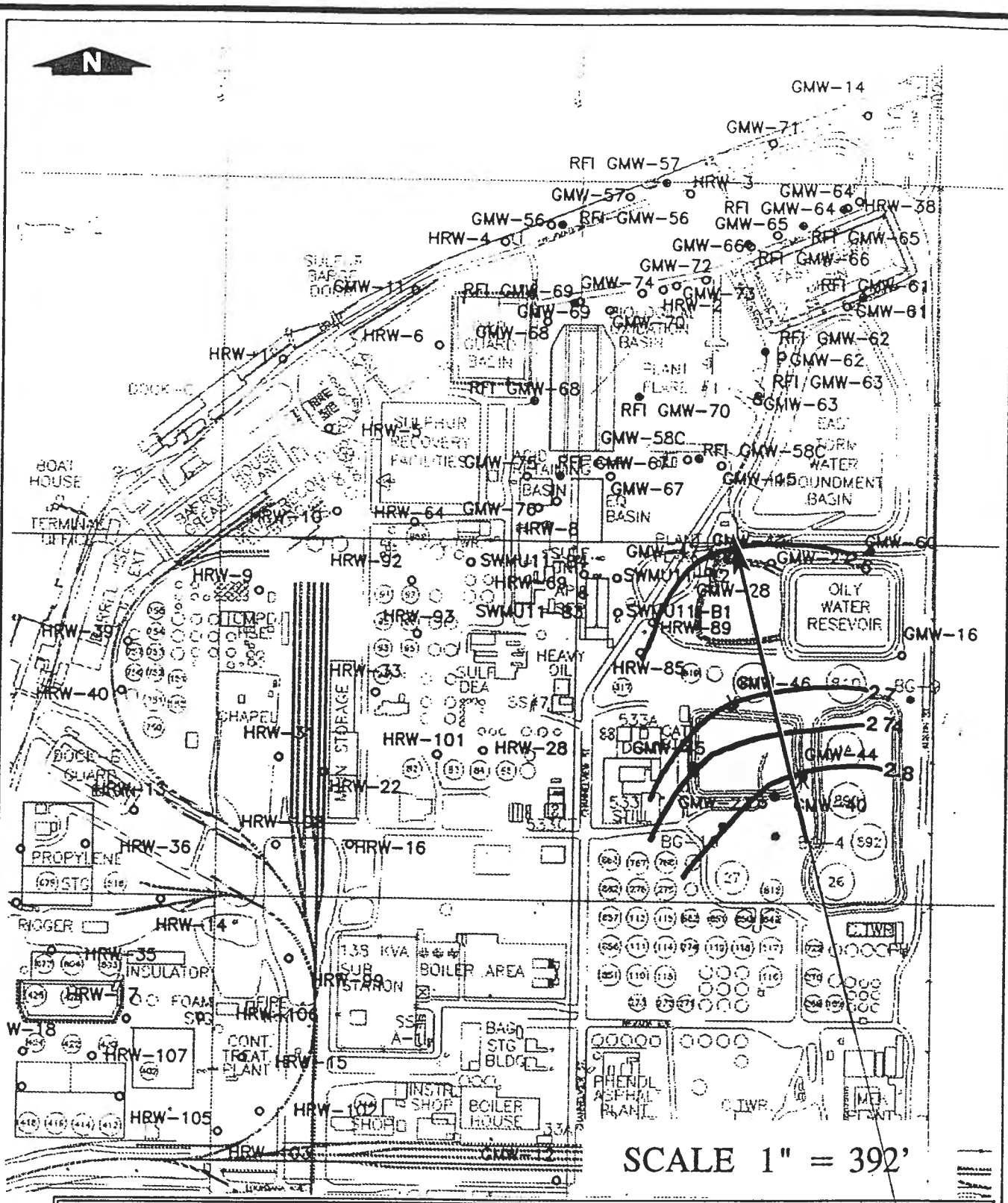
POTENTIOMETRIC MAP, NE. Plant (Landfarm)	FIGURE VI.-53
	March 1995
LYONDELL-CITGO Refining Company Ltd. Houston, Texas	



POTENTIOMETRIC MAP, NE. Plant (Landfarm)	FIGURE VI.-54
	August 1995
LYONDELL-CITGO Refining Company Ltd. Houston, Texas	



POTENTIOMETRIC MAP, NE. Plant (Landfarm)	FIGURE VI.-55
GeoMonitoring Services	
LYONDELL-CITGO Refining Company Ltd. Houston, Texas	FEBRUARY 1996



POTENTIOMETRIC MAP, NE. Plant (Landfarm)	FIGURE VI.-56
GeoMonitoring Services	
LYONDELL-CITGO Refining Company Ltd. Houston, Texas	JULY 1996

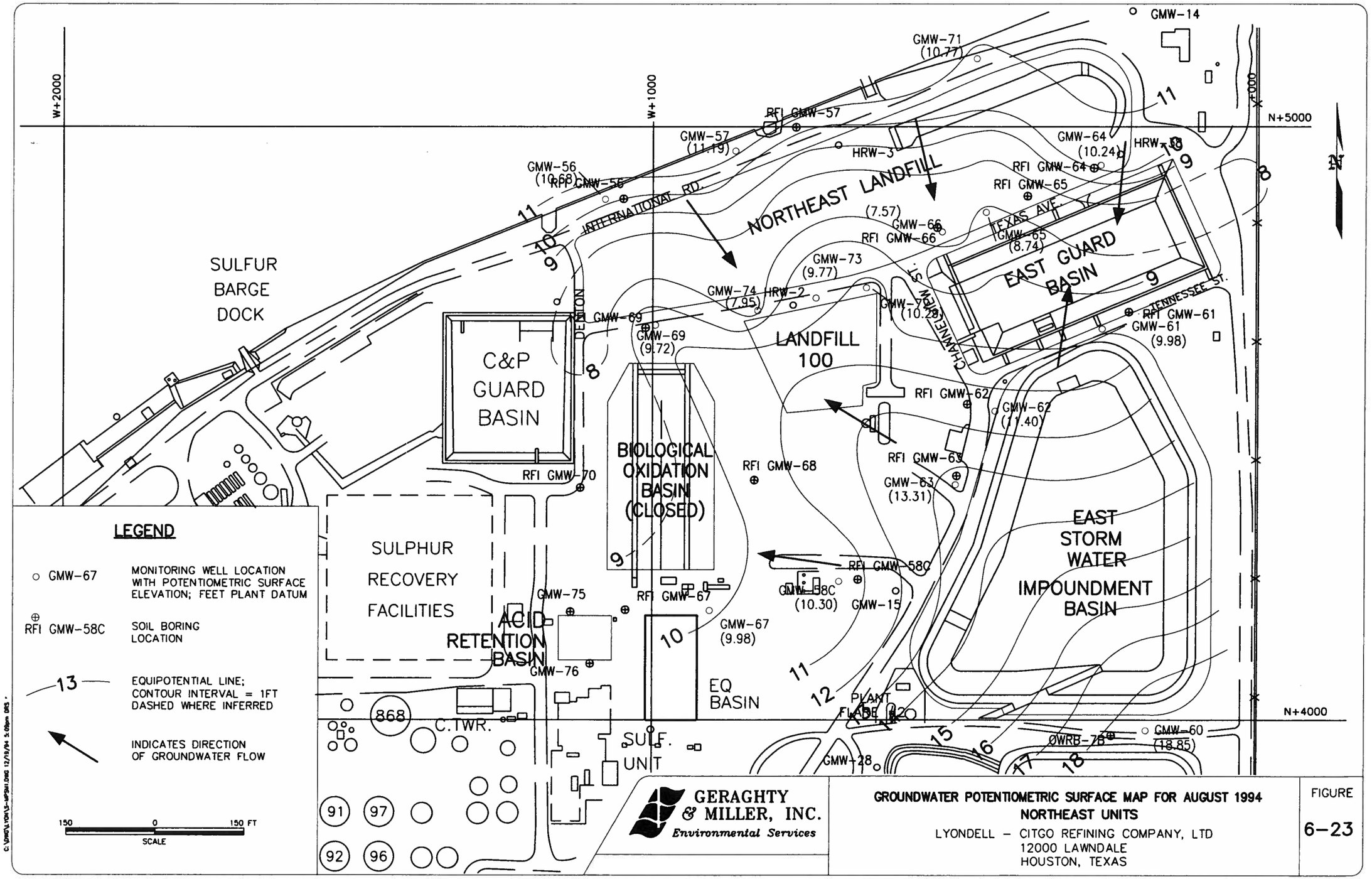

W+2000
W+1000
N+5000
N+4000
GMW-14
GMW-71
(10.77)
RFI GMW-57
GMW-57
(11.19)
HRW-3
GMW-56
(10.68)
RFI GMW-56
INTERNATIONAL RD.
NORTHEAST LANDFILL
GMW-64
(10.24)
HRW-1
RFI GMW-64
RFI GMW-65
TEXAS AVE.
(7.57)
GMW-66
RFI GMW-66
GMW-65
(8.74)
EAST GUARD BASIN
GMW-73
(9.77)
GMW-74
(7.95)
HRW-2
GMW-72
(10.28)
CHANNEL ST.
TENNESSEE ST.
RFI GMW-61
GMW-61
(9.98)
SULFUR BARGE DOCK
DEN TON
GMW-69
GMW-69
(9.72)
LANDFILL 100
C&P GUARD BASIN
RFI GMW-62
GMW-62
(11.40)
BIOLOGICAL OXIDATION BASIN (CLOSED)
RFI GMW-68
RFI GMW-63
GMW-63
(13.31)
RFI GMW-70
EAST STORM WATER IMPOUNDMENT BASIN
SULPHUR RECOVERY FACILITIES
RFI GMW-58C
GMW-58C
(10.30)
GMW-15
GMW-75
RFI GMW-67
ACID RETENTION BASIN
GMW-67
(9.98)
GMW-76
EQ BASIN
PLANT FLARE
868
C.TWR.
SULF. UNIT
GMW-60
(18.85)
OWRB-78
GMW-28
91
97
92
96
LEGEND
GMW-67 MONITORING WELL LOCATION WITH POTENTIOMETRIC SURFACE ELEVATION; FEET PLANT DATUM
RFI GMW-58C SOIL BORING LOCATION
13 EQUIPOTENTIAL LINE; CONTOUR INTERVAL = 1FT DASHED WHERE INFERRED
INDICATES DIRECTION OF GROUNDWATER FLOW
150 0 150 FT
SCALE
GERAGHTY & MILLER, INC.
Environmental Services
GROUNDWATER POTENTIOMETRIC SURFACE MAP FOR AUGUST 1994
NORTHEAST UNITS
LYONDELL – CITGO REFINING COMPANY, LTD
12000 LAWNDALE
HOUSTON, TEXAS
FIGURE
6–23

FIGURE VI.-57

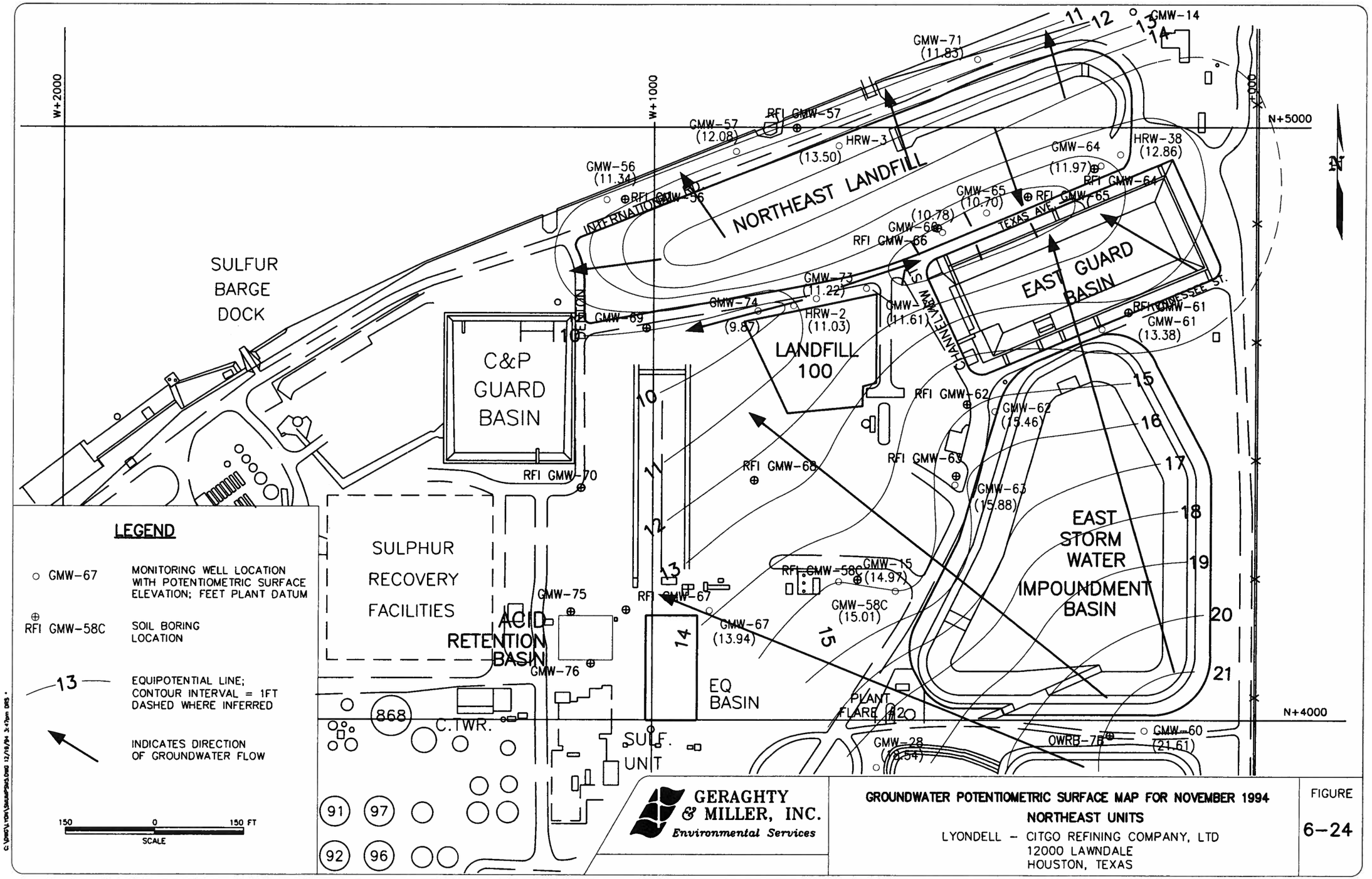
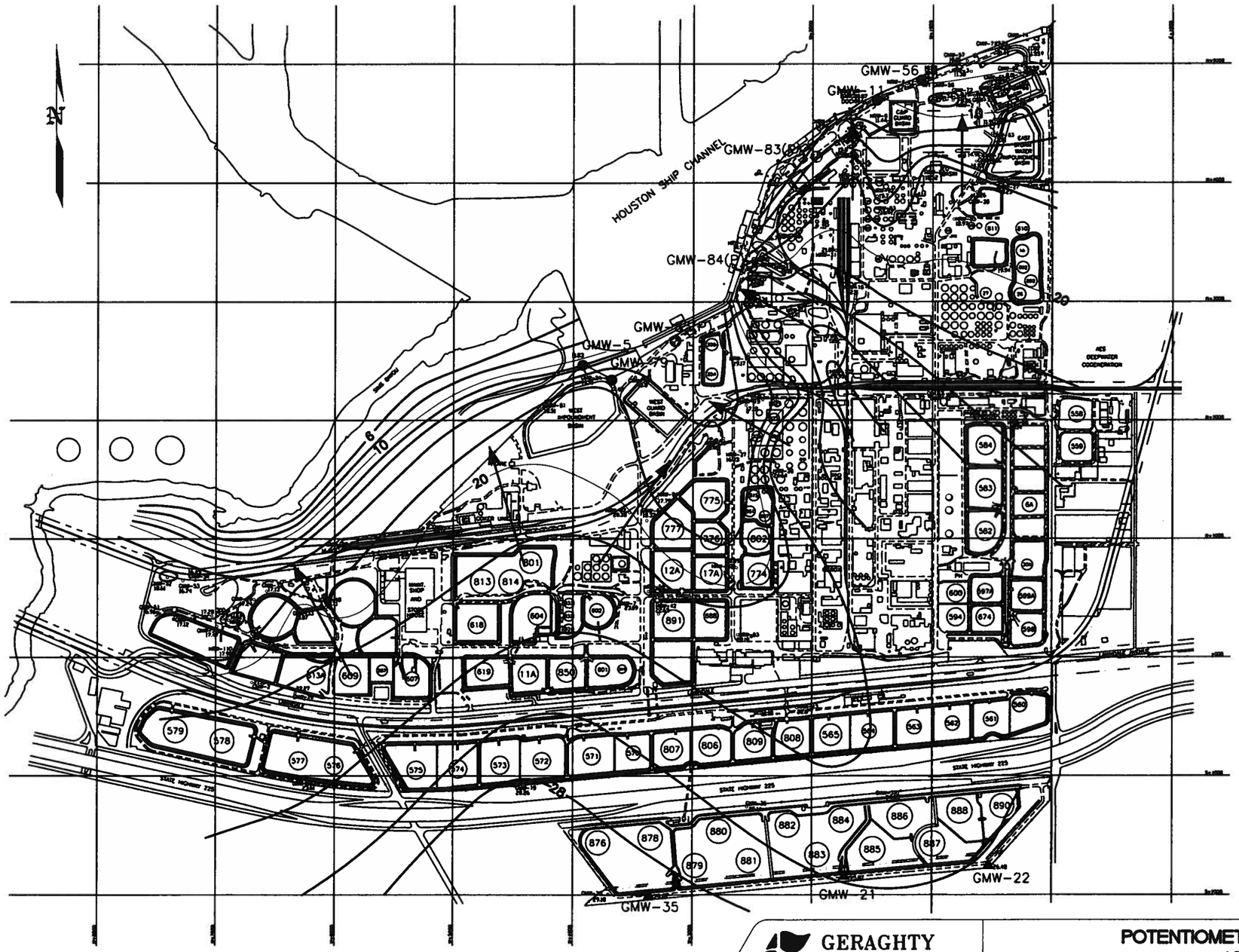

W+2000
W+1000
N+5000
N+4000
N
SULFUR BARGE DOCK
C&P GUARD BASIN
NORTHEAST LANDFILL
LANDFILL 100
EAST GUARD BASIN
EAST STORM WATER IMPOUNDMENT BASIN
SULPHUR RECOVERY FACILITIES
ACID RETENTION BASIN
EQ BASIN
C.TWR.
SULF. UNIT
PLANT FLARE
INTERNATIONAL RD.
TEXAS AVE.
TENNESSEE ST.
CHANNEL VIEW
GMW-14
GMW-71 (11.83)
GMW-57 (12.08)
RFI GMW-57
HRW-3 (13.50)
GMW-56 (11.34)
RFI GMW-56
GMW-64 (11.97)
RFI GMW-64
HRW-38 (12.86)
GMW-65 (10.70)
RFI GMW-65
GMW-66 (10.78)
RFI GMW-66
GMW-73 (11.22)
GMW-74 (9.87)
GMW-69
HRW-2 (11.03)
GMW-61 (11.61)
RFI GMW-61
GMW-61 (13.38)
RFI GMW-62
GMW-62 (15.46)
RFI GMW-68
RFI GMW-63
GMW-63 (15.88)
RFI GMW-70
RFI GMW-58C
GMW-15 (14.97)
GMW-58C (15.01)
RFI GMW-67
GMW-67 (13.94)
GMW-75
GMW-76
GMW-28 (12.54)
OWRB-75
GMW-60 (21.61)
868
91
97
92
96
10
11
12
13
14
15
16
17
18
19
20
21
LEGEND
GMW-67 MONITORING WELL LOCATION WITH POTENTIOMETRIC SURFACE ELEVATION; FEET PLANT DATUM
RFI GMW-58C SOIL BORING LOCATION
13 EQUIPOTENTIAL LINE; CONTOUR INTERVAL = 1FT DASHED WHERE INFERRED
INDICATES DIRECTION OF GROUNDWATER FLOW
150 0 150 FT
SCALE
GERAGHTY & MILLER, INC.
Environmental Services
GROUNDWATER POTENTIOMETRIC SURFACE MAP FOR NOVEMBER 1994
NORTHEAST UNITS
LYONDELL - CITGO REFINING COMPANY, LTD
12000 LAWNDALE
HOUSTON, TEXAS
FIGURE
6-24

FIGURE VI.-58



BACKGROUND WELLS: GMW-21
GMW-22
GMW-35

PERIMETER WELLS: GMW-5
GMW-11
GMW-56
GMW-79
GMW-83(P)
GMW-84(P)
GMW-85(P)

LEGEND

▲ BACKGROUND MONITORING WELL LOCATIONS

PROPOSED DOWNGRADIENT MONITORING WELL LOCATIONS

● EXISTING DOWNGRADIENT MONITORING WELL LOCATIONS

GROUNDWATER FLOW DIRECTION

CONTOUR INTERVAL = 2.0 FEET

900 0 900 FT
SCALE

GERAGHTY & MILLER, INC.
Environmental Services
A Heidemij Company

POTENTIOMETRIC SURFACE MAP
APRIL 1996
LYONDELL – CITGO REFINING COMPANY LTD.
12000 LAWNDALE
HOUSTON, TEXAS

FIGURE
5

C:\DWG\LYON\LYN-PM.DWG 07/09/96 10:10am DRS *

DWG DATE: | PRJCT NO.: HT0228.001 | HARD FILE: | DRAWING: LYN-AR | CHECKED: T. WHITAKER | APPROVED: | DRAFTER: DRS

FIGURE VI.-59

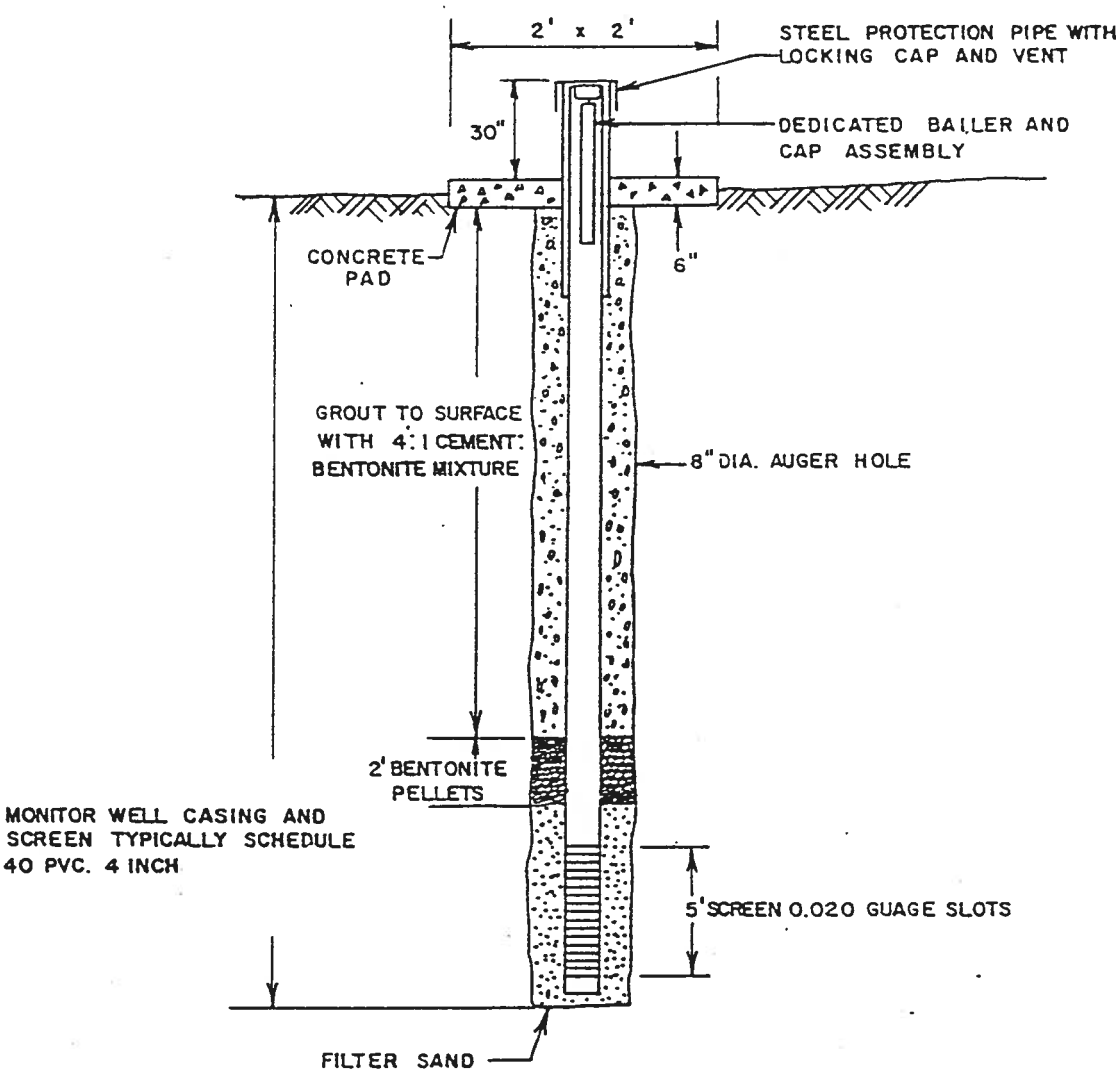
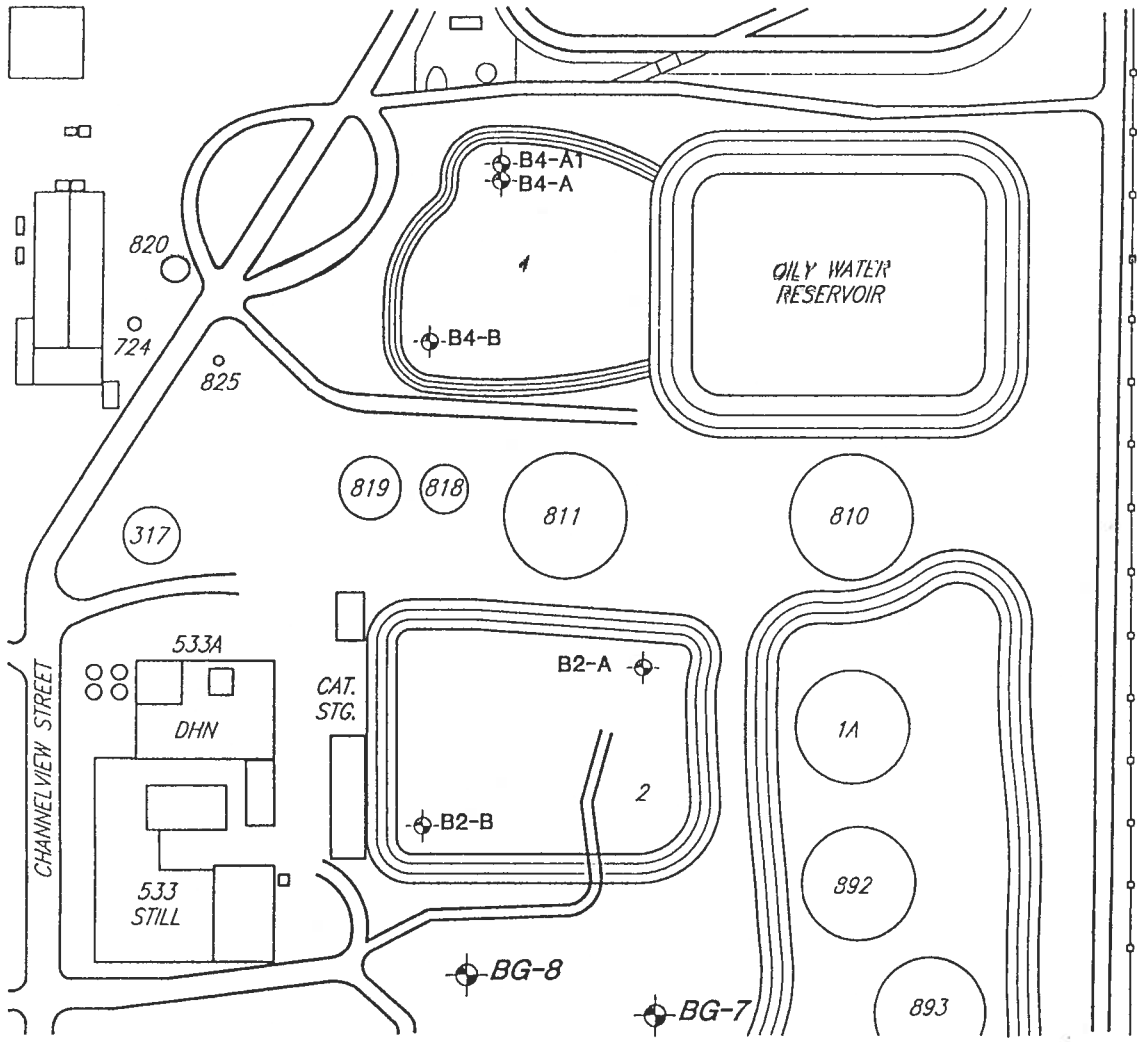


FIGURE VI.-60

MONITORING WELL CONSTRUCTION DETAILS

LYONDELL-CITGO REFINING COMPANY LTD.
HOUSTON, TEXAS



LEGEND

- Fence
- Boring Location
- *BG* Background Boring

– N –

LYONDELL - CITGO LTD

3-1492-400

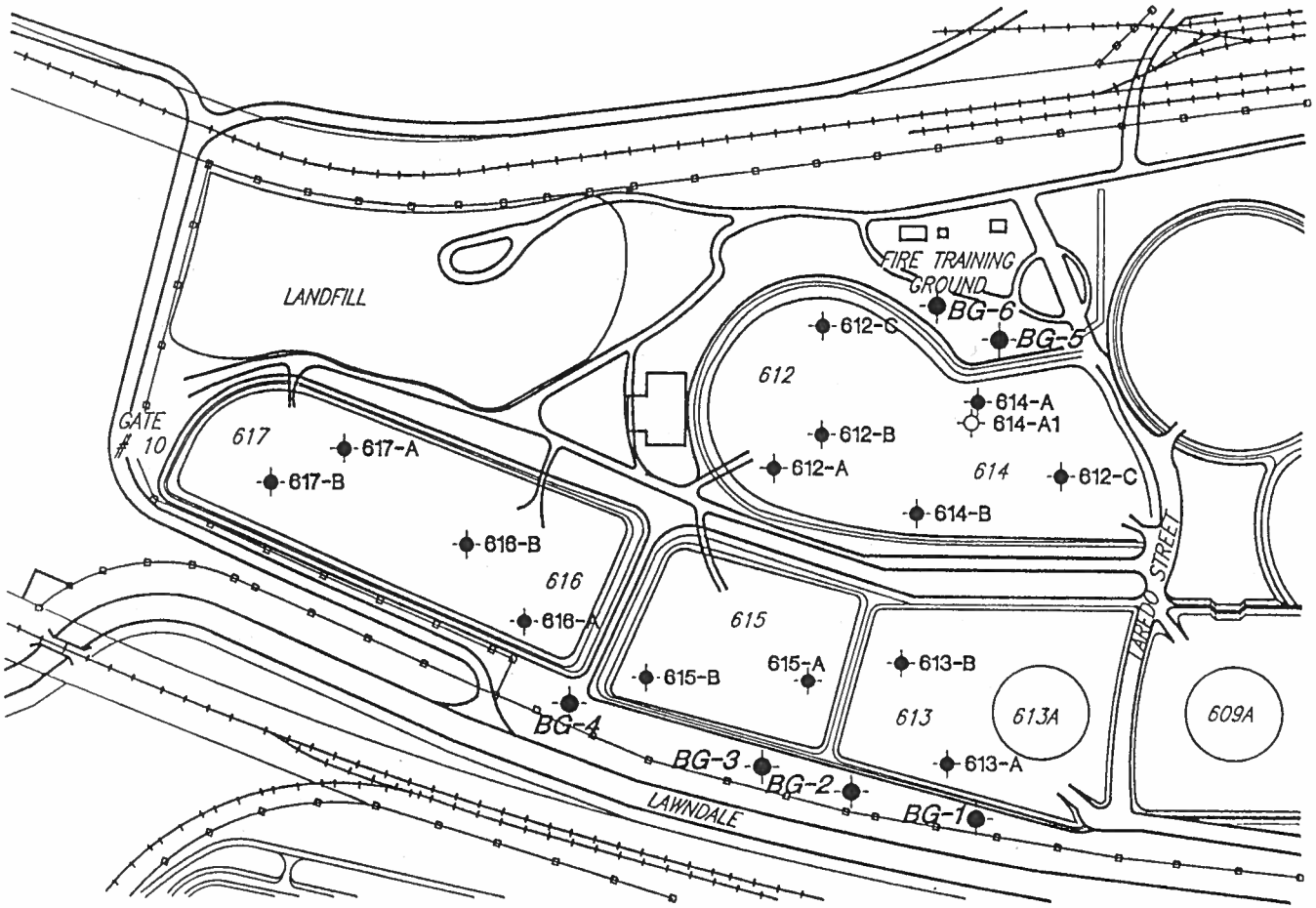
LOCATIONS OF BACKGROUND SOIL CORES AT THE NELF

Houston, Texas

REIEC REMEDIATION TECHNOLOGIES INC

FIGURE VI.-63

CURRENT DATE: 12-06-94 | CAD FILE: DWGS\LYONDELL\1492AS04



LEGEND

- Railroad Tracks
- Fence
- Boring Location
- Additional Investigation Boring Location
- *BG* Background Boring

N

LYONDELL - CITGO LTD

3-1492-400

LOCATIONS OF BACKGROUND SOIL CORES AT THE SWLF

Houston, Texas

REIEC REMEDIATION TECHNOLOGIES INC

FIGURE VI.-64

CURRENT DATE: 12-06-94 | CAD FILE: DWGS\LYONDELL\1492A501

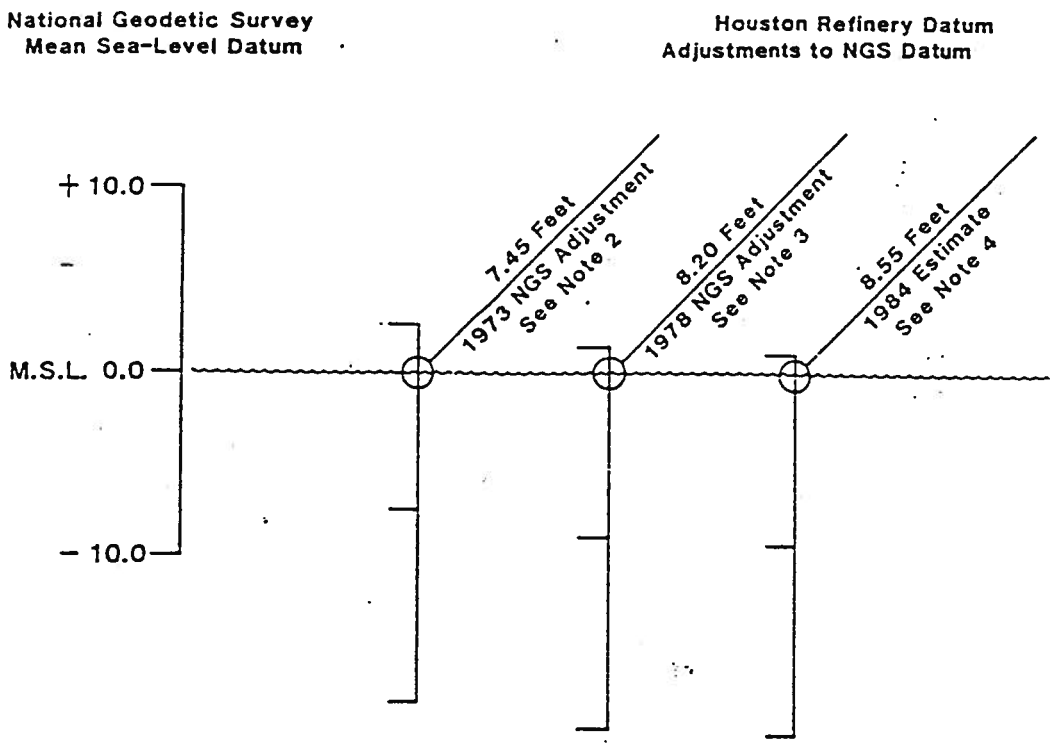
APPENDICES

APPENDIX VI.-A

EXPLANATION OF DATUM USED IN THIS REPORT

APPENDIX A

EXPLANATION OF DATUMS USED



For accumlative subsidence data see Figure 4-6, Geology Section

Notes:

1. The Houston Refinery and 225 Tank Farm lie within a subsidence area. The Refinery Datum has been tied to local NGS monumentation and a nearby extensometer. The historical data published by NGS and the Harris-Galveston Coastal Subsidence District support the adjustments shown in this illustration.

2. The 1973 adjustment of 7.45 Feet is used on the enclosed topography maps which were compiled from aerial photography exposed in 1973 and 1974.

3. The 1978 adjustment of 8.20 Feet is used in the enclosed Geology Section. This adjustment is the most recent which can be substantiated by NGS published data.

4. The 1984 estimate of 8.55 Feet is included for information only. This estimate is compiled from compaction measurements at the nearby East End Extensometer. The extensometer measurements are recorded by NGS. The accumlative measurements are published by the Harris-Galveston Coastal Subsidence District.

APPENDIX VI.-B

BORING LOGS AND THE UNIFIED SOIL CLASSIFICATION

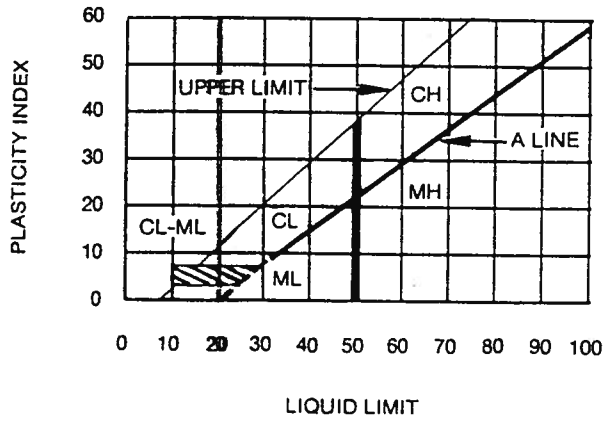
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limit Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see US Army Technical Memorandum No. 3-357 or ASTM Designation: D-2487.

MAJOR DIVISIONS				GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)		GW	Well graded gravels, gravel-sand mixtures.
				GP	Poorly graded gravels, gravel-sand mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot above "A" line & hatched zone on plasticity chart	GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot below "A" line & hatched zone on plasticity chart	GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)		SW	Well graded sands, gravelly sands.
				SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart	SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart	SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)		ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.
	CLAYS LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)		CH	Inorganic clays of high plasticity, fat clays.

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone of the plasticity chart to have dual symbol.

PLASTICITY CHART



DEGREE OF PLASTICITY OF COHESIVE SOILS

Degree of Plasticity	Plasticity Index
None to slight	0-4
Slight	5-7
Medium	8-22
High to Very High	over 22

SOIL CLASSIFICATION (CONT'.)

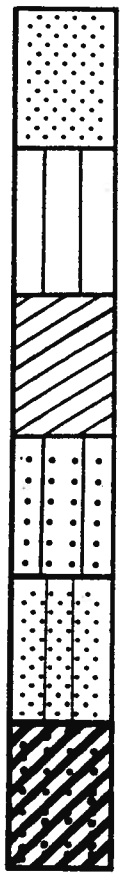
Hydrometer Analysis

Grain Size Distribution tests were performed to determine the particle size and distribution of the samples tested. Materials finer than the number 200 sieve were suspended in water and the grain size distribution computed from the time rate of settlement of the different size particles. This test was performed in accordance with ASTM D-421 and D-422.

Loss On Ignition

The amount of organics of selected soil samples was determined by performing a loss on ignition test. The soil is first saturated in hydrogen peroxide to break down the organics to gases. After a period of time the sample is heated until all the hydrogen peroxide has evaporated and the percent loss of the sample determined.

TEST BORING RECORD
LEGEND AND SYMBOLS



SAND

SILT

CLAY

SANDY SILT

SILTY SAND

SANDY CLAY

CLAYEY SAND

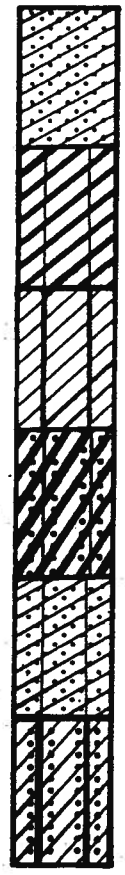
SILTY CLAY

CLAYEY SILT

SANDY SILTY CLAY
OR SILTY SANDY CLAY

SILTY CLAYEY SAND
OR CLAYEY SILTY SAND

CLAYEY SANDY SILT
OR SANDY CLAYEY SILT



CLAYSTONE

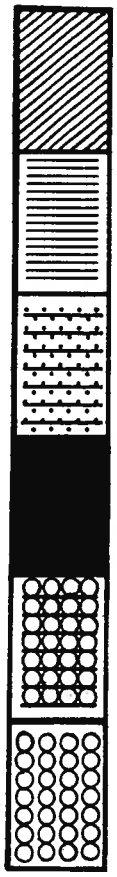
SILTSTONE

SANDSTONE

LIGNITE

LIMESTONE

GRAVEL



● Standard Penetration Resistance in Blows Per Foot (bpf)

● 50/5" Standard Penetration Resistance in Number of Blows (50) Required to Drive the Spoon a Number of Inches (5)

⊗ Pocket Penetrometer Strength

⊕ Torvane Shear Strength

△ Undrained Shear Strength

Split Spoon Sample

Undisturbed Sample Extruded in Field

Undisturbed Sample Confined in Sampling Tube

Core Sample

24 Hour Water Level

1 Hour or Less Water Level

RQD

Percent Core Recovery

Datebase for Wells and Borings

Boring No.	Well No.	Used UNI in Xsec	STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
1	1			3063.00	2421.00	34.00	-7.00	-10.00		0.00	0.00	P	-66.00	12.5	10/27/65
2	2			3200.00	2390.00	34.00	-8.00	-10.00		0.00	0.00		-16.00	12.0	10/19/65
3	3			3200.00	2482.00	32.50	-4.50	-14.00		0.00	0.00		-17.50	14.5	10/18/65
4	4			3020.00	2465.00	34.00	0.00	0.00		0.00	0.00		-16.00	14.0	10/18/65
5	5			3020.00	2375.00	34.00	0.00	0.00		0.00	0.00		-16.00	13.0	10/18/65
6	6			1350.00	2265.00	35.00	19.00	18.00		0.00	0.00		-5.00	5.0	08/15/66
7	7			1325.00	2215.00	35.00	19.00	17.33		0.00	0.00		-5.00	1.5	08/15/66
8	8			1340.00	2160.00	35.00	0.00	0.00		0.00	0.00		-5.00	6.5	08/15/66
9	9			1340.00	2090.00	35.00	0.00	0.00		0.00	0.00		-5.00	6.5	08/15/66
10	10			1360.00	2060.00	35.00	0.00	0.00		0.00	0.00		-5.00	7.5	08/16/66
11	11			1137.00	2117.00	35.00	14.00	-0.50		0.00	0.00		-5.00	4.0	02/24/67
12	12			1202.00	2269.00	35.00	14.00	12.00		0.00	0.00		-5.00	4.5	02/24/67
13	13			1202.00	2216.00	35.00	13.50	11.50		0.00	0.00		-5.00	4.5	02/24/67
14	14			1202.00	2162.00	35.00	2.00	-0.51		0.00	0.00		-5.00	6.0	02/23/67
15	15			1202.00	2092.00	35.00	11.50	9.50		0.00	0.00		-5.00	4.5	02/23/67
16	16			1202.00	2037.00	35.00	14.50	11.50		0.00	0.00		-5.00	4.0	02/23/67
17	17			196.00	3980.00	33.90	18.40	9.90		0.00	0.00		-41.10	0.0	06/01/67
18	18			196.00	4060.00	33.70	19.70	6.20		0.00	0.00		-41.30	0.0	05/25/67
19	19			346.00	4020.00	33.40	19.40	8.00		0.00	0.00		-41.60	0.0	05/26/67
20	20			496.00	3980.00	32.90	18.90	1.90		0.00	0.00	P	-42.10	0.0	05/31/67
21	21			496.00	4060.00	33.20	17.20	0.00		0.00	0.00		-36.80	0.0	05/24/67
22	22			850.00	1852.00	35.00	16.50	7.50		0.00	0.00		-5.00	8.0	06/12/67
23	23			900.00	1722.00	35.00	18.00	8.00		-36.00	-53.00		-65.00	8.0	06/12/67
24	24			150.00	1408.00	34.50	15.00	7.00		0.00	0.00		-5.50	0.0	11/17/67
25	25			310.33	1408.58	34.50	16.50	6.50		0.00	0.00		-5.50	0.0	11/17/67
26	26			1665.00	1850.00	35.00	0.00	0.00		0.00	0.00		-5.00	8.5	11/15/67
27	27			1665.00	1780.00	35.00	16.50	14.00		0.00	0.00		-15.00	11.5	11/16/67
28	28	9		1600.00	4147.00	33.50	2.50	-6.00		0.00	0.00		-17.50	2.0	03/10/70
29	29	9		1400.00	4130.00	34.40	0.00	0.00		-15.60	-50.60	T	-50.60	0.0	03/09/70
30	30	9		1300.00	3891.00	34.30	0.30	-2.83		-15.70	-47.70		-50.70	21.5	03/11/70
31	31	9		1670.00	3947.00	32.00	10.00	1.00		-15.50	-41.00		-48.00	20.0	03/12/70
32	32	9		1848.00	3600.00	36.00	-1.00	-5.50		-17.50	-47.50		-49.00	37.0	03/05/70
33	33	9		1600.00	3600.00	37.00	5.00	-3.30		-18.00	-48.00	T	-48.00	27.0	03/03/70
34	34		E	535.00	3415.00	35.00	25.50	14.50		0.00	0.00	P	-30.00	9.5	04/25/68
35	35			1088.00	4632.00	29.70	10.70	6.70		0.00	0.00		-35.30	9.0	04/26/68
36	36			1096.00	4576.00	29.50	10.50	5.00		0.00	0.00		-40.50	9.0	04/24/68
37	37	9		1495.00	3437.00	31.50	0.00	0.00		-15.50	-28.50	T	-28.50	16.0	03/18/68
38	38	Y 9		1220.00	3718.00	26.70	10.20	8.70		-15.80	-18.80		-33.30	8.5	03/15/68
39	39			1260.00	4500.00	29.50	11.00	3.00		0.00	0.00	P	-70.50	10.0	03/13/68
40	40			1130.00	4500.00	29.70	5.70	1.70		0.00	0.00		-30.30	13.0	03/14/68
41	41			1255.00	4500.00	29.50	0.00	0.00		-25.50	-30.50	T	-30.50	13.5	03/01/68
42	42	9		1450.00	4297.00	27.50	5.00	-6.50		-15.00	-42.50	T	-42.50	12.0	02/26/68

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI	STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
43	43				623.00	4800.00	30.50	18.00	2.00		0.00	0.00	P	-29.50	0.0	03/08/68
44	44				715.00	4708.00	30.50	22.00	7.00		0.00	0.00	P	-29.50	0.0	03/08/68
45	45	Y	C2		807.00	4800.00	30.50	19.50	15.50		0.00	0.00	P	-29.50	0.0	03/05/68
46	46		C2		715.00	4892.00	30.50	16.00	6.50		0.00	0.00	P	-29.50	0.0	03/08/68
47	47				1310.00	4699.25	29.50	4.50	-6.50		-26.00	-30.50	T	-30.50	15.0	03/04/68
48	48				1150.00	4699.25	29.70	0.00	0.00		0.00	0.00	P	-30.30	13.0	03/01/68
49	49				1335.00	4500.00	30.30	8.30	-4.00		-25.00	-29.70	T	-29.70	16.0	02/29/68
50	50				1175.00	4500.00	29.30	0.00	0.00		-29.50	-32.70		-45.70	11.5	02/27/68
51	51				446.00	1900.00	33.60	17.00	-0.60		0.00	0.00		-6.40	4.0	09/06/68
52	52				500.00	1850.00	34.00	18.00	5.00		0.00	0.00		-6.00	4.0	09/06/68
53	53				446.00	1763.00	34.20	18.20	4.70		0.00	0.00		-5.80	2.5	09/06/68
54	54	Y	11		3732.00	1247.00	28.20	0.00	0.00		0.00	0.00		-11.70	2.0	09/06/68
55	55		11		3683.00	1195.00	29.20	5.70	-0.30		0.00	0.00		-10.80	3.0	09/04/68
56	56		11		3725.00	1160.00	27.50	0.00	0.00	F	0.00	0.00		20.00	6.0	09/04/68
57	57	Y	11		3725.00	1169.00	27.80	0.00	0.00		0.00	0.00		-12.20	4.5	09/04/68
58	58	Y	9		1575.00	4367.00	37.70	3.20	-9.80		0.00	0.00		-27.30	9.5	01/08/69
59	59	Y	9		1800.00	4497.00	36.50	9.00	1.00		0.00	0.00		-13.50	10.5	01/08/69
60	60				1575.00	4627.00	31.00	7.00	-2.00		-12.00	-16.50	T	-16.50	16.0	01/07/69
61	61		9		1437.00	4300.00	37.60	0.00	0.00	S	0.00	0.00		12.60	9.5	02/13/69
62	62		9		1437.00	4365.00	32.30	8.30	-3.80		0.00	0.00		-13.70	17.0	02/12/69
63	63		9		1450.00	4297.00	27.50	5.00	-6.50		-15.00	-42.50	T	-42.50	12.0	02/26/68
64	64		9		1437.00	4300.00	37.60	0.00	0.00	S	0.00	0.00		12.60	9.5	02/13/69
65	65		9		1437.00	4365.00	32.30	8.30	-3.80		0.00	0.00		-13.70	17.0	02/12/69
66	66		9		1450.00	4297.00	27.50	5.00	-6.50		-15.00	-42.50	T	-42.50	12.0	02/26/68
67	67	Y	9		1600.00	4147.00	33.50	2.50	-6.00		-23.00	-49.50		-49.50	19.0	03/10/70
68	68		9		1400.00	4130.00	34.40	0.00	0.00		-15.60	-50.60	T	-50.60	12.0	03/09/70
69	69	Y	9		1300.00	3891.00	34.30	0.00	0.00		-15.70	-48.00		-50.70	21.5	03/11/70
70	70	Y	9		1670.00	3947.00	32.00	10.00	0.00		-15.50	-41.00		-41.00	19.0	03/13/70
71	71	Y	9		1848.00	3600.00	36.00	-1.00	-5.50		-17.00	-47.50		-47.50	36.0	03/05/70
72	72	Y	9		1600.00	3600.00	37.00	5.00	-3.50		-18.50	-48.00	T	-48.00	21.0	03/04/70
73	73		2		891.00	1290.50	34.20	9.70	5.70		0.00	0.00		-15.80	1.5	03/23/70
74	74				754.00	1296.00	34.00	12.00	7.00		0.00	0.00		-16.00	1.5	03/20/70
75	75		2		945.00	1055.00	34.40	14.40	11.40		0.00	0.00		-15.60	8.5	03/20/70
76	76		2		796.00	1040.00	34.40	3.40	1.60		0.00	0.00		-15.60	3.0	03/19/70
77	77		2		750.00	1045.00	34.40	0.00	0.00	S	0.00	0.00		9.40	4.0	04/23/70
78	78		2		750.00	1145.00	34.40	0.00	0.00	S	0.00	0.00		9.40	11.0	04/23/70
79	79		2		850.00	1045.00	34.40	0.00	0.00	S	0.00	0.00		9.40	3.5	04/23/70
80	80		2		850.00	1145.00	34.40	0.00	0.00	S	0.00	0.00		9.40	5.0	04/23/70
81	81		2		915.00	1065.00	34.40	0.00	0.00	F	0.00	0.00		24.40	10.0	04/20/70
82	82		2		910.00	1065.00	34.40	0.00	0.00	S	0.00	0.00		9.40	5.0	04/20/70
83	83		2		750.00	1095.00	34.40	9.90	9.40	T	0.00	0.00		9.40	12.0	04/21/70
84	84		2		850.00	1095.00	34.40	10.40	9.40	T	0.00	0.00		9.40	11.0	04/21/70
85	85		2		750.00	1175.00	34.40	0.00	0.00	S	0.00	0.00		9.40	3.0	04/21/70

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
86	86		2				825.00	1175.00	34.40	0.00	0.00	S	0.00	0.00		9.40	2.0	04/21/70
87	87		2				915.00	1175.00	34.40	10.40	9.40	T	0.00	0.00		9.40	5.0	04/20/70
88	88						775.00	1360.00	34.20	0.00	0.00	F	0.00	0.00		33.00	1.5	04/22/70
89	89						875.00	1360.00	34.20	13.20	9.20	T	0.00	0.00		9.20	4.5	04/22/70
90	90						2820.00	1475.00	31.50	0.00	0.00		0.00	0.00		6.50	0.4	05/21/70
91	91						2660.00	1475.00	31.50	14.50	11.00		0.00	0.00		6.50	3.0	05/21/70
92	92						2820.00	1610.00	32.00	0.00	0.00		0.00	0.00		7.00	6.5	05/20/70
93	93						2680.00	1610.00	32.00	0.00	0.00		0.00	0.00		7.00	6.0	05/20/70
94	94						596.00	1910.00	34.00	17.50	6.50		0.00	0.00		-16.00	8.5	06/15/70
95	95						596.00	1946.00	34.00	19.00	6.00		0.00	0.00		-16.00	2.5	06/17/70
96	96						614.00	1928.00	34.00	19.00	7.00		0.00	0.00		4.00	9.5	06/18/70
97	97						632.00	1910.00	34.00	16.50	6.00		0.00	0.00		-16.00	8.0	06/18/70
98	98						632.00	1946.00	34.00	19.00	8.00		0.00	0.00		-16.00	7.5	06/17/70
99	99						252.10	1018.50	34.50	0.00	0.00	S	0.00	0.00		9.50	3.0	07/14/70
100	100						270.10	106.50	34.50	18.00	15.50		0.00	0.00		9.50	3.0	07/14/70
101	101						252.10	994.80	34.50	18.00	13.50		0.00	0.00		-4.50	3.0	07/20/70
102	102						223.80	994.80	34.50	0.00	0.00		0.00	0.00		9.50	8.5	07/02/70
103	103						223.90	1042.10	34.50	0.00	0.00		0.00	0.00		9.50	5.5	07/01/70
104	104						252.10	1042.10	34.50	0.00	0.00		0.00	0.00		9.50	5.0	07/01/70
105	105						270.00	1018.50	34.50	0.00	0.00		0.00	0.00		9.50	3.0	07/01/70
106	106					N	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
107	107	Y	C7			E	-80.00	1490.00	34.00	14.00	6.00		0.00	0.00		4.00	0.0	07/28/70
108	108					E	-190.00	3509.00	34.00	0.00	0.00		0.00	0.00		9.00	0.0	07/28/70
109	109	Y	9				1481.00	3497.00	34.00	3.00	-4.50		0.00	0.00		-16.00	26.0	07/27/70
110	110	Y	7				2234.00	2744.00	29.60	8.60	6.60		0.00	0.00		-0.40	4.5	07/27/70
111	111					E	2255.00	1730.00	33.40	11.40	8.40	T	0.00	0.00		8.40	2.5	07/27/70
112	112					E	190.00	1775.00	33.40	16.40	-1.60		0.00	0.00		-3.60	2.0	09/10/70
113	113					E	150.00	2415.00	33.00	16.00	-4.50		0.00	0.00		-7.00	0.0	09/10/70
114	114					E	185.00	2980.00	34.30	0.00	0.00		0.00	0.00		4.30	0.0	09/10/70
115	115					E	135.00	3370.00	34.70	16.70	8.70		0.00	0.00		-0.30	6.0	09/10/70
116	116					E	315.00	3509.00	32.30	20.80	6.80		0.00	0.00	S	-7.70	11.5	09/09/70
117	117					E	615.00	3509.00	29.30	14.30	1.80		0.00	0.00		-15.70	14.0	09/08/70
118	118		9			E	1250.00	3510.00	25.50	0.00	0.00		0.00	0.00		-14.50	10.5	09/08/70
119	119		7				1708.00	3282.00	25.00	0.00	0.00		0.00	0.00		-15.00	12.0	09/11/70
120	120						5.00	2382.00	34.50	15.50	9.50	T	0.00	0.00		9.50	0.0	10/06/70
121	121						-70.00	2435.00	34.50	16.50	-3.00		-14.50	-15.50	T	-15.50	0.0	10/07/70
122	122						-94.00	2531.00	34.50	16.50	9.50	T	0.00	0.00		9.50	0.0	10/06/70
123	123		C7				-470.00	862.00	32.00	0.00	0.00		0.00	0.00		7.00	1.0	12/09/70
124	124		1	C3			660.00	6505.00	28.00	4.00	3.00	T	0.00	0.00		3.00	1.0	12/08/70
125	125	Y	11	12	13		4100.00	800.00	25.20	0.00	0.00		0.00	0.00		-4.80	9.0	03/08/71
126	126		11	12	13		4005.00	825.00	26.70	0.00	0.00		0.00	0.00		-3.30	9.5	03/08/71
127	127		11	12	14		3902.00	850.00	25.20	0.00	0.00		0.00	0.00		-4.80	5.0	03/08/71
128	128	Y	7	C1			2428.00	2826.00	37.90	10.50	2.90		0.00	0.00		-12.10	18.5	07/13/71

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL 1	DEPTH FILL FEET	DATE DRILLED
129	129	Y	7				2389.00	2906.00	38.90	10.20	2.50		0.00	0.00		-11.10	18.0	07/13/71
130	130	Y	7				2339.00	2856.00	38.90	9.90	1.00		-19.10	-21.10	T	-21.00	16.5	07/12/71
131	131		C1				2689.00	2856.00	35.10	-2.90	-10.90		0.00	0.00		-14.90	21.5	07/07/71
132	132						2589.00	2856.00	31.00	-3.00	-11.00		0.00	0.00		-19.00	18.0	07/07/71
133	133		C1				2639.00	2816.00	31.40	-3.60	-12.00		0.00	0.00		-18.60	16.5	07/06/71
134	134						3560.00	655.00	0.00	0.00	0.00	N	0.00	0.00		0.00	5.0	12/08/71
135	135						3524.00	686.00	0.00	0.00	0.00	N	0.00	0.00		0.00	0.0	12/09/71
136	136						3524.00	780.00	0.00	0.00	0.00	N	0.00	0.00		0.00	11.0	12/09/71
137	137						3524.00	880.00	0.00	0.00	0.00	N	0.00	0.00		0.00	5.0	12/09/71
138	138		11				3524.00	980.00	0.00	0.00	0.00	N	0.00	0.00		0.00	2.0	12/08/71
139	139		C2				1190.00	4852.00	32.30	15.30	13.30	T	0.00	0.00		12.30	12.0	01/03/72
140	140		C2				1214.00	4832.00	32.50	0.00	0.00	S	0.00	0.00		12.50	13.0	01/03/72
141	141		C2				1165.00	4832.00	32.50	0.00	0.00	S	0.00	0.00		12.50	11.5	01/03/72
142	142						1887.00	1812.00	0.00	0.00	0.00	N	0.00	0.00		0.00	1.5	06/22/72
143	143						1977.00	1812.00	0.00	0.00	0.00	N	0.00	0.00		0.00	1.0	06/22/72
144	144						1059.00	2253.00	33.30	14.30	9.30		0.00	0.00		-6.70	2.5	07/07/72
145	145						1106.00	2250.00	33.50	13.50	9.50		0.00	0.00		-6.50	3.0	07/07/72
146	146						1006.00	2250.00	34.00	14.00	10.00		0.00	0.00		-6.00	11.0	07/06/72
147	147						1045.00	2155.00	34.20	12.20	10.20		0.00	0.00	S	-5.80	4.8	07/06/72
148	148	Y	4				4879.00	1113.00	9.99	-14.00	-20.00		-39.00	-45.00		-90.01	23.0	08/24/72
149	149						4769.00	1385.00	10.35	0.00	0.00		-40.00	-40.50		-89.65	12.0	08/22/72
150	150						3680.00	2460.00	17.78	0.00	0.00		0.00	0.00	P	-82.22	6.0	08/28/72
151	151						3027.00	2661.00	18.82	0.00	0.00		0.00	0.00	P	-81.18	12.0	08/29/72
152	152	Y	7	9			2522.00	3561.00	19.63	0.00	0.00		-44.70	-50.10		-80.27	15.5	08/30/72
153	153						2613.00	1446.00	34.00	0.00	0.00	S	0.00	0.00		14.00	4.5	09/29/72
154	154						2595.00	1400.00	34.00	0.00	0.00	S	0.00	0.00		14.00	5.5	09/28/72
155	155						333.00	3341.00	34.40	20.00	14.40	T	0.00	0.00		14.40	4.0	01/30/73
156	156						2333.00	2577.00	30.10	0.00	0.00	S	0.00	0.00		15.10	6.0	01/29/73
157	157						1529.00	2745.00	26.80	12.80	11.80	T	0.00	0.00		11.80	3.0	01/29/73
158	158						1335.00	325.00	26.50	0.00	0.00	S	0.00	0.00		14.00	6.5	01/29/73
159	159						566.00	3375.00	29.40	17.40	6.40		0.00	0.00		-0.60	10.0	01/29/73
160	160						185.00	3345.00	34.70	16.70	8.70		0.00	0.00		-0.30	6.0	01/26/73
161	161						-197.00	3340.00	33.40	14.40	12.40		0.00	0.00		8.40	3.0	01/26/73
162	162		C6				515.00	3339.00	34.20	0.00	0.00	S	0.00	0.00		9.20	0.0	01/26/73
163	163	Y	8	10	5		4392.50	473.80	22.00	0.00	0.00		0.00	0.00		0.00	5.0	06/05/73
164	164	Y	4	8	5		4715.00	660.00	27.80	4.80	-1.20		0.00	0.00		-22.20	13.0	06/04/73
165	165	Y	13	5	12		4392.50	846.20	22.20	10.20	6.20		0.00	0.00		-22.80	5.0	06/04/73
166	166	Y	5	10			4500.00	660.00	18.00	-4.00	-6.50		0.00	0.00		-27.00	0.0	03/02/73
167	167		5	10			4460.00	680.00	18.00	3.00	1.00		0.00	0.00		-27.00	6.0	03/01/73
168	168		5	10			4460.00	640.00	18.00	3.00	-1.00		0.00	0.00		-27.00	5.5	03/02/73
169	169		4			E	4920.00	920.00	11.10	0.00	0.00		-39.90	-41.90		-48.90	13.0	06/05/73
170	170					E	4295.00	1790.00	10.20	-2.80	-15.80		-40.20	-42.80		-49.80	13.0	06/06/73
171	171					E	4120.00	1770.00	13.80	8.80	-27.20		0.00	0.00		0.00	6.0	06/06/73

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI		STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
172	172				E	4035.00	2200.00	14.90	0.00	-1.50		0.00	0.00		-15.10	4.5	06/07/73
173	173				E	3755.00	2385.00	16.00	0.00	0.00		0.00	0.00		-13.20	6.0	06/07/73
174	174		C1		E	2885.00	2695.00	30.80	-13.20	-17.20		0.00	0.00		-29.20	25.5	06/07/73
175	175				E	3895.00	2470.00	8.60	0.00	0.00		-43.40	-46.40		-81.40	0.0	06/21/73
176	176				E	3045.00	2735.00	4.50	0.00	0.00		-26.00	-32.00		-76.00	0.0	06/14/73
177	177				E	3595.00	2570.00	4.40	0.00	0.00		-44.10	-47.10		-141.10	0.0	06/15/73
178	178				E	3395.00	2640.00	5.00	0.00	0.00		-39.40	-47.40		-120.40	0.0	06/23/73
179	179	Y	7		E	2715.00	3305.00	5.00	0.00	0.00		-41.90	-47.90		-120.40	0.0	06/19/73
180	180				E	2815.00	3080.00	5.00	0.00	0.00		-41.40	-47.40		-110.40	0.0	06/20/73
181	181					4221.00	776.00	21.00	0.00	0.00		0.00	0.00		-19.00	6.0	10/17/73
182	182	Y	12	13		4255.00	796.00	21.00	11.00	8.00		0.00	0.00		-19.00	4.0	10/17/73
183	183					-58.00	2799.00	34.00	20.00	12.00		0.00	0.00		9.00	2.0	11/07/73
184	184					25.00	2821.00	34.00	17.60	12.00		0.00	0.00		9.00	2.0	11/07/73
185	185					25.00	2948.00	34.00	0.00	0.00		0.00	0.00		9.00	1.0	11/08/73
186	186					-58.00	2923.00	34.00	0.00	0.00		0.00	0.00		-16.00	1.5	11/08/73
187	187		C4			393.00	5344.00	33.50	17.00	5.50		0.00	0.00		-26.50	0.0	04/01/74
188	188		C4			354.00	5140.00	34.50	19.00	7.50		0.00	0.00		-25.50	0.0	03/28/74
189	189	Y	C2			527.00	5150.00	38.00	20.00	5.00		0.00	0.00		-22.00	5.0	03/28/74
190	190	Y	C2			720.00	5142.00	34.50	17.50	7.50		-21.00	-25.50	T	-25.50	1.5	03/28/74
191	191	Y	C2			790.00	5161.00	34.50	18.00	6.00		0.00	0.00		0.00	0.0	03/28/74
192	192	Y	C2			805.00	5315.00	35.00	14.00	-3.00		-22.00	-23.00		-25.00	8.0	04/01/74
193	193					630.00	5556.00	35.00	17.50	-7.00		0.00	0.00	P	-25.00	0.0	02/22/74
194	194					397.00	5232.00	33.50	19.50	4.50		0.00	0.00	P	-26.50	0.0	02/20/74
195	195		C2			584.00	5247.00	33.50	22.00	5.50		-23.00	-25.00		-26.50	0.0	02/20/74
196	196	Y	C4			110.00	5232.00	35.00	17.00	8.00		0.00	0.00	P	-25.00	2.0	02/07/74
197	197		C2			750.00	5245.00	33.70	20.70	4.20		0.00	0.00	P	-26.30	2.0	02/07/74
198	198		C2			728.00	5564.00	33.70	15.70	2.70		0.00	0.00	P	-26.00	2.5	02/06/74
199	199	Y	C3			727.00	5901.00	34.00	18.00	4.00		0.00	0.00	P	-26.00	2.0	02/06/74
200	200					2140.00	1505.00	33.30	11.30	8.30		0.00	0.00		-16.70	6.5	04/20/74
201	201					2134.00	1680.00	33.80	10.80	7.50		0.00	0.00		-16.20	10.0	04/19/74
202	202					2002.00	1657.00	34.00	12.00	8.00		0.00	0.00		-26.00	10.0	04/19/74
203	203					1946.00	1642.00	34.50	12.50	9.50		0.00	0.00		-25.50	9.0	04/18/74
204	204					1940.00	1642.00	34.50	0.00	0.00	S	0.00	0.00		9.50	10.0	04/18/74
205	205					1776.00	1648.00	34.50	0.00	0.00		0.00	0.00		-15.50	9.5	04/18/74
206	206					1775.00	1527.00	33.50	12.00	-2.50		0.00	0.00		-26.60	6.0	04/02/74
207	207					2106.00	1276.00	32.80	11.80	9.80		0.00	0.00		7.80	3.0	02/19/74
208	208					2148.00	1271.00	32.80	12.80	10.80		0.00	0.00		7.80	2.0	02/19/74
209	209					1878.00	1421.00	33.30	0.00	0.00		0.00	0.00		-26.70	3.0	02/18/74
210	210					1863.00	1510.00	33.20	11.20	8.70		0.00	0.00		-26.80	15.0	02/13/74
211	211					1868.00	1592.00	33.50	0.00	0.00		0.00	0.00		-26.50	14.0	02/13/74
212	212					1943.00	1419.00	33.40	0.00	0.00		0.00	0.00		-26.60	3.0	02/18/74
213	213					1956.00	1517.00	33.30	11.30	9.30		0.00	0.00		-26.70	3.5	02/11/74
214	214					1943.00	1592.00	33.60	14.60	9.60		0.00	0.00		-26.40	14.5	02/11/74

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI		STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
215	215					2032.00	1415.00	32.60	10.60	8.60		0.00	0.00		-27.40	6.5	02/15/74
216	216					2004.00	1514.00	32.50	10.50	9.50		-11.50	-20.50		-27.50	5.0	02/11/74
217	217					2015.00	1589.00	33.50	0.00	0.00		0.00	0.00		-26.50	9.5	02/08/74
218	218					2086.00	1454.00	32.50	10.50	8.50		0.00	0.00		-27.50	6.0	02/15/74
219	219					2087.00	1508.00	33.20	0.00	0.00		0.00	0.00		-26.80	7.0	02/14/74
220	220					2073.00	1589.00	33.20	0.00	0.00		0.00	0.00		-26.80	2.5	02/14/74
221	221					2843.00	1088.00	32.90	9.90	8.40		0.00	0.00		2.90	2.5	08/06/74
222	222					2778.00	1082.00	33.70	9.70	6.20		0.00	0.00		3.70	3.0	08/06/74
223	223					2802.00	1039.00	33.80	11.80	9.30		0.00	0.00		3.80	2.0	08/05/74
224	224					2869.00	1312.00	32.60	10.60	7.20		0.00	0.00		2.60	2.0	08/05/74
225	225					3001.00	1391.00	32.60	15.60	8.60		0.00	0.00		2.60	3.0	08/02/74
226	226					2787.00	1413.00	33.80	10.50	8.80		0.00	0.00		3.80	6.5	08/02/74
227	227					2863.00	1413.00	33.40	11.40	5.40		0.00	0.00		3.40	3.0	08/02/74
228	228					2662.00	1330.00	33.70	0.00	0.00		0.00	0.00		3.70	3.0	08/01/74
229	229					2808.00	1148.00	31.50	7.50	4.50		0.00	0.00		-18.50	2.0	02/26/74
230	230					2933.00	1148.00	32.50	12.50	9.00		0.00	0.00		-17.50	2.0	02/26/74
231	231					2933.00	1268.00	32.90	0.00	0.00		0.00	0.00		-17.10	0.0	02/25/74
232	232					2808.00	1268.00	31.60	4.50	-1.00		0.00	0.00		-18.40	2.0	02/25/74
233	233	Y	11	12		3959.00	1178.00	24.00	0.00	0.00		0.00	0.00		-16.00	4.0	10/21/74
234	234					3946.00	1672.00	30.70	0.00	0.00		0.00	0.00		-4.30	2.5	09/06/74
235	235					4030.00	1371.00	26.10	13.10	8.10		0.00	0.00		1.10	4.0	09/06/74
236	236					4160.00	1533.00	24.80	15.00	6.80		0.00	0.00		-20.20	2.5	09/06/74
237	237					4353.00	1339.00	20.50	5.50	3.00		0.00	0.00		-29.50	7.0	09/05/74
238	238					4214.00	1525.00	24.30	12.30	7.30		0.00	0.00		-20.70	5.0	09/05/74
239	239					4325.00	1421.00	23.20	17.80	14.20		0.00	0.00		-26.80	5.5	09/05/74
240	240					4290.00	1522.00	21.00	15.70	8.50		0.00	0.00		-29.00	3.0	09/02/74
241	241					3958.00	1429.00	29.50	10.90	7.50		0.00	0.00		-0.50	3.0	04/10/74
242	242					3967.00	1454.00	29.80	11.80	7.80		0.00	0.00		-20.20	1.5	04/06/74
243	243					4107.00	1279.00	24.30	0.00	0.00		0.00	0.00		-25.70	5.0	04/09/74
244	244					4094.00	1428.00	26.00	0.00	0.00		0.00	0.00		-19.00	1.5	04/06/74
245	245					4090.00	1552.00	25.90	13.90	3.90		0.00	0.00		-24.10	2.0	04/10/74
246	246	Y	12			4234.00	1277.00	23.70	0.00	0.00		0.00	0.00		-26.30	4.5	04/09/74
247	247					4228.00	1423.00	23.70	11.70	8.70		0.00	0.00		-26.30	6.0	04/06/74
248	248					4238.00	1578.00	22.50	10.50	4.50		0.00	0.00		-27.50	2.0	04/10/74
249	249					4374.00	1277.00	21.40	0.00	0.00		0.00	0.00		-38.60	6.0	04/08/74
250	250					4374.00	1422.00	20.90	14.90	1.90		-37.10	-42.10		-54.10	6.0	04/08/74
251	251					4368.00	1562.00	19.10	5.00	-20.50		-36.90	-40.90		-60.90	5.0	04/09/74
252	252		C7		E	-1350.00	395.00	39.00	5.00	1.50		0.00	0.00		-11.00	6.5	05/25/77
253	253				N	0.00	0.00	39.00	0.00	0.00		0.00	0.00		-6.00	5.5	05/25/77
254	254		C7		E	-1270.00	620.00	40.00	4.00	3.00		0.00	0.00		-5.00	8.0	05/25/77
255	255		C7		E	-1310.00	860.00	35.90	5.90	3.70		0.00	0.00		-14.10	4.0	10/14/75
256	256				E	-1460.00	985.00	35.20	6.20	2.50		0.00	0.00		-9.80	2.5	10/15/75
257	257				E	-1670.00	985.00	35.40	5.40	1.40		0.00	0.00		-9.60	2.5	10/17/75

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
258	258		C7			E	-1410.00	1255.00	39.80	6.80	3.80		0.00	0.00		-0.20	3.0	10/07/75
259	259					E	-1860.00	1800.00	40.00	0.00	0.00		0.00	0.00		-5.00	6.5	10/07/75
260	260	Y	C7			E	-1505.00	1490.00	35.30	8.30	-6.70		0.00	0.00		-14.70	0.0	10/06/75
261	261					E	-1725.00	1490.00	35.00	13.00	3.00		0.00	0.00		-35.00	3.0	10/06/75
262	262					E	-1735.00	2485.00	34.80	14.80	7.80		0.00	0.00		-10.20	2.5	02/12/75
263	263					E	-1445.00	2695.00	34.30	0.00	0.00		0.00	0.00		-10.70	3.0	02/13/75
264	264					E	-1800.00	3035.00	36.60	0.00	0.00		0.00	0.00		-8.40	3.0	02/12/75
265	265					E	-1505.00	3280.00	35.00	13.00	2.00		0.00	0.00		-10.00	1.5	02/12/75
266	266					E	-1525.00	3530.00	35.50	16.00	14.00		0.00	0.00		-9.50	1.0	02/11/75
267	267					E	-1560.00	3830.00	35.50	14.00	10.50		0.00	0.00		-9.50	0.0	02/10/75
268	268					E	-1420.00	3760.00	35.00	8.00	6.00		0.00	0.00		5.00	0.0	10/23/74
269	269					E	-1360.00	3370.00	34.80	13.80	13.30		0.00	0.00		4.80	0.0	10/23/74
270	270					E	-1325.00	2790.00	35.00	11.50	10.50		0.00	0.00		5.00	3.0	10/23/74
271	271		C7			E	-1435.00	2275.00	35.20	13.20	5.20	T	0.00	0.00		5.20	2.5	10/24/75
272	272		C7	C6		E	-1275.00	2210.00	34.50	14.50	4.50	T	0.00	0.00		4.50	2.0	10/23/74
273	273		C7	C6		E	-1255.00	2050.00	35.40	15.40	5.40	T	0.00	0.00		5.40	3.0	10/22/74
274	274		C7			E	-1240.00	1910.00	36.60	11.60	6.60	T	0.00	0.00		6.60	2.0	10/22/74
275	275		C7			E	-1370.00	1650.00	35.20	15.00	10.20		0.00	0.00		5.20	2.5	10/22/74
276	276					E	-1750.00	1950.00	35.50	15.50	5.50	T	0.00	0.00		5.50	2.5	10/21/74
277	277		C7			E	-1465.00	1965.00	35.50	18.50	5.50	T	0.00	0.00		5.50	3.0	10/21/74
278	278					E	-1575.00	2160.00	37.00	13.80	-2.50		-46.00	-50.00		-63.00	2.0	08/16/74
279	279					E	-1805.00	3610.00	35.50	6.00	3.50		-33.50	-37.50		-55.50	2.0	08/16/74
280	280					E	-1710.00	2875.00	35.50	13.50	1.50		-47.50	-54.50		-65.50	3.0	08/15/74
281	281	Y	C6			E	-615.00	3025.00	36.60	15.00	13.00	T	0.00	0.00		11.60	5.5	07/02/74
282	282	2	C6	C7			-750.00	3000.00	37.20	15.20	12.20	T	0.00	0.00		12.20	5.5	07/02/74
283	283	Y	C6			E	-910.00	3010.00	36.90	14.50	9.90		0.00	0.00		-13.10	4.0	07/03/74
284	284		C6			E	-1090.00	3030.00	36.00	16.50	13.00		-34.00	-39.00		-39.00	4.0	06/07/74
285	285		C6			E	-1220.00	3040.00	35.50	4.00	-0.50		0.00	0.00		-39.50	5.5	06/06/74
286	286		C6			E	-1320.00	3060.00	35.00	4.00	-1.00		0.00	0.00		-15.00	0.0	07/01/74
287	287		14				3693.00	390.00	32.30	0.00	0.00	S	0.00	0.00		17.30	1.5	06/19/75
288	288		14				3625.00	66.00	30.70	0.00	0.00	S	0.00	0.00		15.70	2.0	06/20/75
289	289	Y	14				3861.00	333.00	30.00	0.00	0.00	S	0.00	0.00		15.00	0.0	06/17/75
290	290		10	14			3977.00	87.00	30.70	0.00	0.00	S	0.00	0.00		15.70	3.0	06/20/75
291	291		10	14			3958.00	399.00	29.50	0.00	0.00	S	0.00	0.00		14.50	0.0	06/18/75
292	292		10	14			4077.00	113.00	23.00	0.00	0.00	S	0.00	0.00		8.00	0.0	06/18/75
293	293		10	14			4073.00	336.00	26.20	0.00	0.00		0.00	0.00	S	11.20	0.0	06/18/75
294	294	Y	10	13	14		4069.00	552.00	24.70	0.00	0.00	S	0.00	0.00		9.70	1.0	06/19/75
295	295		10	14			4151.00	202.00	22.70	0.00	0.00	S	0.00	0.00		7.70	0.0	06/18/75
296	296		10	14			4198.00	397.00	21.80	0.00	0.00	S	0.00	0.00		6.80	3.0	06/16/75
297	297	Y	10	8			4319.00	475.00	22.20	0.00	0.00	S	0.00	0.00		7.20	3.0	06/16/75
298	298	Y	10				4302.00	94.00	22.00	8.00	7.00	T	0.00	0.00		7.00	0.0	06/17/75
299	299	Y	10				4300.00	316.00	20.00	9.00	5.00	T	0.00	0.00		5.00	2.0	06/18/75
300	300		10	8			4426.00	424.00	22.00	0.00	0.00	S	0.00	0.00		7.00	1.0	06/16/75

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
301	301		10				4504.00	137.00	20.00	0.00	0.00		0.00	0.00		5.00	0.0	06/17/75
302	302		8	10			4570.00	260.00	19.00	0.00	0.00		0.00	0.00		4.00	0.0	06/17/75
303	303		8	10	5		4620.00	288.00	19.10	0.00	0.00	S	0.00	0.00		4.10	0.0	06/19/75
304	304						111.90	3633.90	32.30	17.30	8.80		0.00	0.00		-12.70	1.0	06/12/74
305	305						122.00	3905.10	32.60	20.60	7.60		0.00	0.00		-12.40	6.5	06/05/74
306	306						119.10	4187.50	34.90	17.90	3.50		0.00	0.00		-6.10	2.0	06/04/74
307	307						114.50	4474.50	34.10	16.60	3.50		0.00	0.00		-10.90	1.5	06/04/74
308	308	Y	C4				99.00	4724.50	33.90	15.90	12.90		0.00	0.00		-6.10	2.0	06/04/74
309	309	Y	C4				115.00	5013.50	35.00	18.00	1.60		0.00	0.00		-5.00	4.0	06/03/74
310	310						1740.00	1635.00	35.00	0.00	0.00	S	0.00	0.00		10.00	3.0	12/22/75
311	311						1710.00	1572.00	34.40	0.00	0.00	S	0.00	0.00		9.40	8.0	12/23/75
312	312						1710.00	1475.00	33.60	0.00	0.00	S	0.00	0.00		8.60	5.0	12/15/75
313	313						682.00	1370.00	33.90	12.90	-3.90	T	0.00	0.00		-3.90	6.0	12/19/75
314	314						587.00	1370.00	34.20	15.20	9.20	T	0.00	0.00		9.20	4.0	12/19/75
315	315						522.00	1392.00	34.40	14.40	9.40	T	0.00	0.00		9.40	9.0	12/18/75
316	316						35.00	5938.00	37.80	0.00	0.00	S	0.00	0.00		12.80	3.0	02/04/75
317	317						4406.00	1367.00	21.60	18.60	7.60		0.00	0.00		-18.40	3.0	02/05/75
318	318						4402.00	1205.00	22.60	15.60	1.60		0.00	0.00		-12.40	7.0	02/04/75
319	319						4338.00	1222.00	23.60	2.00	-1.40		0.00	0.00		-11.40	9.0	01/30/75
320	320						4337.00	1215.00	23.60	0.00	0.00	F	0.00	0.00		11.10	12.5	01/30/75
321	321		13				4405.00	1302.00	21.90	0.00	0.00		0.00	0.00		-13.10	9.0	01/30/74
322	322						4405.00	1466.00	20.60	0.00	0.00		-38.40	-40.40		-49.40	2.0	01/29/75
323	323						4195.00	749.00	22.00	10.00	1.00		0.00	0.00		-18.00	5.0	01/28/75
324	324	Y	12	13			4184.00	896.00	23.60	11.60	9.60		0.00	0.00		-16.40	6.5	01/28/75
325	325	Y	4	8			4957.00	225.00	26.60	5.60	0.60		0.00	0.00		-23.40	14.0	01/09/75
326	326	Y	4	8	5		4813.00	517.00	25.50	3.50	-3.50		0.00	0.00		-9.50	11.5	01/08/75
327	327	Y	8	10	5		4601.00	412.00	25.50	0.00	0.00	F	0.00	0.00		10.50	12.5	01/08/75
328	328						3870.00	1616.00	32.40	11.00	3.40		0.00	0.00		-7.60	2.0	01/07/75
329	329						3869.00	1822.00	33.30	0.00	0.00		0.00	0.00		-1.70	6.0	01/06/75
330	330	Y	12	13			4187.00	1048.00	23.30	5.30	1.30		0.00	0.00		-16.70	6.5	01/06/75
331	331						4384.00	1164.00	22.70	0.00	0.00		0.00	0.00		-17.40	8.0	12/12/74
332	332	Y	12	13			4194.00	1208.00	24.60	7.60	-0.40		0.00	0.00		-15.40	6.5	12/12/74
333	333						2304.00	2524.00	29.30	12.80	8.30		0.00	0.00		-0.70	4.0	06/22/74
334	334						2148.00	2541.00	28.60	16.60	-3.40		0.00	0.00		-21.40	6.5	06/21/74
335	335						2077.50	2611.50	28.00	14.00	3.00		0.00	0.00		-22.00	14.0	06/21/74
336	336						1981.00	2611.50	26.80	0.00	0.00		0.00	0.00		-23.20	7.0	06/21/74
337	337						1881.00	2611.50	26.60	4.60	-0.40		0.00	0.00		-23.40	6.5	06/20/74
338	338						1781.00	2611.50	27.00	4.00	0.50		0.00	0.00		-23.00	6.0	06/20/74
339	339						1681.00	2611.50	28.40	0.00	0.00		0.00	0.00		3.40	4.0	06/19/74
340	340						1381.00	2611.50	31.60	0.00	0.00		0.00	0.00		1.60	3.0	06/22/74
341	341						1081.00	2611.50	31.20	0.00	0.00		0.00	0.00		6.20	0.0	06/19/74
342	342						781.00	2611.50	32.60	16.00	2.60	T	0.00	0.00		2.60	5.0	06/20/74
343	343						481.00	2611.50	32.80	16.20	2.80	T	0.00	0.00		2.80	0.0	06/19/74

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI	STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
344	344				481.00	2896.00	32.40	16.40	-1.60		0.00	0.00		-9.60	3.0	06/19/74
345	345				481.00	3180.50	30.50	17.50	9.00		0.00	0.00		5.50	0.0	06/18/74
346	346				481.00	3460.00	31.10	21.40	8.40		0.00	0.00		-19.90	9.5	06/18/74
347	347				373.00	3460.00	32.20	0.00	0.00		0.00	0.00		-17.80	22.0	06/18/74
348	348			E	265.00	3410.00	0.00	0.00	0.00	N	0.00	0.00		0.00	0.0	/ /
349	349				157.00	3460.00	35.00	16.30	2.00		0.00	0.00		-25.00	13.0	06/13/74
350	350				49.00	3460.00	35.60	15.60	8.10		0.00	0.00		-4.40	9.0	06/12/74
351	351				50.90	4029.30	34.90	17.90	2.90		0.00	0.00		-0.10	3.0	06/05/74
352	352	Y	C4		57.60	4586.70	33.60	16.60	7.60		0.00	0.00		3.60	0.0	06/05/74
353	353		C4		43.10	5135.20	34.60	12.60	6.00		0.00	0.00		0.40	1.5	06/03/74
354	354	Y	C4		128.00	5347.70	34.80	0.00	0.00		0.00	0.00		4.80	2.5	06/05/74
355	355				2155.00	1173.00	33.60	0.00	0.00		0.00	0.00		-6.40	7.0	10/25/74
356	356				2153.00	1120.00	33.20	0.00	0.00		0.00	0.00		-6.80	8.0	10/25/74
357	357		2		2043.00	1201.00	33.20	0.00	0.00	S	0.00	0.00		8.20	2.5	08/06/74
358	358		2		2052.00	1082.00	33.30	9.30	8.30	T	0.00	0.00		8.30	2.0	08/01/74
359	359		2		1732.00	1044.00	32.90	-6.10	-10.10		0.00	0.00		-17.10	11.5	07/31/74
360	360		2		1729.00	1144.00	33.80	11.80	8.80		0.00	0.00		-16.20	7.0	07/31/74
361	361		2		1825.00	1182.00	34.00	11.00	8.50		0.00	0.00		-16.00	1.5	07/30/74
362	362		2		1970.00	1052.00	33.40	8.80	8.40		0.00	0.00		-16.60	8.5	07/30/74
363	363		2		1977.00	1169.00	33.40	12.00	9.40		0.00	0.00		-16.60	2.0	07/29/74
364	364		2		1879.00	1130.00	33.50	10.00	8.50		0.00	0.00		-16.50	6.0	07/29/74
365	365		2		1875.00	1062.00	33.20	0.00	0.00		0.00	0.00		-16.80	8.5	07/29/74
366	366				1921.00	1198.00	33.90	0.00	0.00		0.00	0.00		-16.10	3.0	07/23/74
367	367		2		1775.00	997.00	32.50	12.50	9.00		0.00	0.00		-17.50	10.5	07/23/74
368	368				1766.00	1193.00	34.10	12.50	9.10		0.00	0.00		-15.90	2.0	07/23/74
369	369		2		1773.00	1087.00	33.20	0.00	0.00		0.00	0.00		-16.80	11.5	07/22/74
370	370		2		1924.00	998.00	32.70	11.70	10.70		0.00	0.00		-17.30	8.5	07/22/74
371	371				1354.00	1209.00	33.90	12.90	7.90		0.00	0.00		-16.10	2.5	07/26/74
372	372	Y	2		1347.00	1089.00	31.80	14.30	1.80		0.00	0.00		-18.20	6.5	07/25/74
373	373		2		1256.00	1134.00	32.80	-1.20	-3.70		0.00	0.00		-17.20	2.0	07/25/74
374	374		2		1319.00	1162.00	33.00	11.00	7.00		0.00	0.00		-17.00	4.0	07/24/74
375	375		2		1249.00	1026.00	25.00	0.00	0.00		0.00	0.00		-15.00	0.0	07/24/74
376	376				1797.00	1314.00	33.20	0.00	0.00	S	0.00	0.00		8.20	3.5	08/13/74
377	377				1988.00	1317.00	33.10	0.00	0.00	S	0.00	0.00		8.10	6.5	08/14/74
378	378				1606.00	1318.00	34.00	15.50	13.00		0.00	0.00		9.00	4.5	08/13/74
379	379				1598.00	1251.00	33.80	0.00	0.00	S	0.00	0.00		8.80	2.0	08/13/74
380	380				1487.00	1219.00	35.00	0.00	0.00	S	0.00	0.00		10.00	2.0	07/26/74
381	381				1386.00	1242.00	33.60	0.00	0.00	S	0.00	0.00		8.60	3.0	08/01/74
382	382				1237.00	1240.00	33.20	14.20	11.90		0.00	0.00		8.20	1.0	07/26/74
383	383				3805.00	2300.00	15.00	0.00	0.00	S	0.00	0.00		10.00	1.5	08/07/74
384	384		C7		43.00	1343.00	34.50	12.50	5.50		0.00	0.00		-5.50	0.0	10/24/74
385	385		2		512.00	296.00	30.90	19.90	17.50		0.00	0.00		-9.10	3.0	10/23/75
386	386		2		560.00	121.00	31.30	-2.20	-3.70		0.00	0.00		-18.70	2.0	10/21/75

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
387	387						1880.00	2283.00	30.00	0.00	0.00		0.00	0.00		-5.00	0.0	06/25/75
388	388						1861.00	2522.00	28.40	0.00	0.00		0.00	0.00		-6.60	8.0	07/09/75
389	389						1872.00	2436.00	29.00	15.00	13.00		0.00	0.00		-6.00	0.0	06/23/75
390	390		C5				-229.00	5605.00	34.80	9.81	4.80	T	0.00	0.00		4.80	0.0	02/14/75
391	391		C5				-119.00	5603.00	34.80	9.80	4.80	T	0.00	0.00		4.80	0.0	02/14/75
392	392		2				856.00	104.00	31.00	0.00	0.00		0.00	0.00		1.00	0.0	02/15/75
393	393		2				834.00	270.00	30.80	0.00	0.00		0.00	0.00		-4.20	2.0	02/04/75
394	394						-77.00	6227.00	34.80	9.30	7.80		0.00	0.00		-15.20	1.0	12/10/74
395	395		3				-219.00	6295.00	34.70	9.30	6.70		0.00	0.00		-15.30	0.0	12/10/74
396	396						573.00	1828.00	34.50	17.50	4.50	T	0.00	0.00		4.50	6.5	01/22/75
397	397						600.00	1828.00	34.50	17.50	9.50	T	0.00	0.00		9.50	5.0	01/22/75
398	398						636.00	1827.00	34.60	0.00	0.00	F	0.00	0.00		30.00	4.5	01/22/75
399	399						677.00	1830.00	34.80	17.20	7.80		0.00	0.00		-0.20	4.0	01/23/75
400	400						671.00	1885.00	34.30	0.00	0.00	S	0.00	0.00		24.30	6.5	01/23/75
401	401						618.00	1882.00	34.50	0.00	0.00	S	0.00	0.00		24.50	10.0	01/24/75
402	402						680.00	1774.00	35.40	14.00	6.40		0.00	0.00		0.40	7.5	01/24/75
403	403						651.00	1796.00	34.30	17.34	6.30		0.00	0.00		-0.70	6.5	01/22/75
404	404						670.00	1857.00	34.50	17.50	7.50		0.00	0.00		-0.50	7.0	01/23/75
405	405						636.00	1867.00	34.40	18.40	5.40		0.00	0.00		-5.60	8.0	01/21/75
406	406						592.00	1853.00	34.50	19.50	5.00		0.00	0.00		-10.50	5.5	01/21/75
407	407						2235.00	1462.50	33.00	0.00	0.00		0.00	0.00		-7.00	9.5	01/27/75
408	408						2235.00	1182.50	33.70	13.70	9.70		0.00	0.00		3.70	10.0	01/24/75
409	409						2179.00	830.00	33.00	0.00	0.00	S	0.00	0.00		13.00	0.0	02/06/75
410	410						2138.00	871.00	33.00	0.00	0.00	S	0.00	0.00		13.00	2.0	02/06/75
411	411						2133.00	790.00	33.00	0.00	0.00	S	0.00	0.00		13.00	2.5	02/05/75
412	412		7				2305.00	3172.00	29.50	7.50	0.50		0.00	0.00		-10.50	12.0	05/13/75
413	413		7				2308.00	3214.00	29.00	6.00	1.00		0.00	0.00		-6.00	11.5	05/12/75
414	414	Y	7				2301.00	3240.00	28.50	-2.00	-6.50		0.00	0.00		-6.50	13.5	05/12/75
415	415		4	5	13		4637.00	1101.00	20.20	5.20	-2.80	T	0.00	0.00		-2.80	1.0	09/04/75
416	416	Y	4	5	13		4644.00	929.00	17.90	6.40	-2.10	T	0.00	0.00		-2.10	0.0	09/04/75
417	417		4	13		E	4740.00	1140.00	16.00	8.50	-4.00	T	0.00	0.00		-4.00	6.0	05/15/75
418	418	Y	4	13		E	4840.00	990.00	16.00	3.50	-4.00	T	0.00	0.00		-4.00	11.0	05/15/75
419	419	Y	4	13		E	4940.00	790.00	17.00	-10.50	-13.00	T	0.00	0.00		-13.00	10.0	05/13/75
420	420	Y	4			E	5005.00	610.00	18.00	1.00	-9.00		0.00	0.00		-12.00	10.0	05/14/75
421	421	Y	4			E	5070.00	400.00	19.00	8.00	2.00		0.00	0.00		-1.00	2.5	05/14/75
422	422		4			E	5125.00	215.00	23.00	6.50	3.00		0.00	0.00		-2.00	7.5	05/14/75
423	423		4	8		E	5005.00	160.00	24.00	0.00	-6.00	T	0.00	0.00		-6.00	8.0	05/13/75
424	424		9				2328.00	3832.00	38.00	11.00	9.00		0.00	0.00		3.00	18.0	09/24/75
425	425	Y	9				2275.00	3985.00	38.00	10.50	7.00		0.00	0.00		3.00	15.0	09/24/75
426	426	Y	7	9			2096.00	3507.00	25.00	10.00	-2.00		0.00	0.00		-5.00	7.0	07/08/75
427	427		7				1934.00	3311.00	24.00	12.00	9.00	T	0.00	0.00		9.00	5.0	07/07/75
428	428		7				1948.00	3106.00	23.00	9.00	8.00	T	0.00	0.00		8.00	4.5	07/07/75
429	429		7				1810.00	2992.00	24.90	0.00	0.00	S	0.00	0.00		9.90	3.0	07/08/75

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI		STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
430	430					1291.00	3360.00	23.90	0.00	0.00	S	0.00	0.00		8.90	3.0	07/08/75
431	431					3210.00	1086.00	31.30	0.00	0.00	S	0.00	0.00		11.30	1.5	08/15/75
432	432					3246.00	1056.00	31.10	13.50	11.10	T	0.00	0.00		11.10	0.0	02/15/75
433	433					3301.00	1029.00	31.00	14.00	11.00	T	0.00	0.00		11.00	0.0	02/15/75
434	434				N	0.00	0.00	36.00	0.00	0.00	S	0.00	0.00		16.00	9.5	12/05/75
435	435				N	0.00	0.00	35.00	0.00	0.00	S	0.00	0.00		20.00	9.0	12/05/75
436	436				N	0.00	0.00	35.00	0.00	0.00	S	0.00	0.00		20.00	9.5	12/05/75
437	437					1873.00	1479.00	35.00	0.00	0.00	S	0.00	0.00		15.00	9.0	12/05/75
438	438					1768.00	1495.00	35.00	0.00	0.00	S	0.00	0.00		15.00	8.5	12/04/75
439	439					1768.00	1561.00	35.00	0.00	0.00	S	0.00	0.00		20.00	14.0	12/04/75
440	440					2132.00	1632.00	35.00	0.00	0.00	S	0.00	0.00		20.00	9.0	11/07/75
441	441					2123.00	1626.00	35.00	0.00	0.00	S	0.00	0.00		20.00	9.0	11/07/75
442	442					2105.00	1659.00	34.50	0.00	0.00	S	0.00	0.00		19.50	9.5	11/07/75
443	443					2180.00	1659.00	34.50	0.00	0.00	S	0.00	0.00		19.50	9.5	11/07/75
444	444					2130.00	1659.00	34.50	0.00	0.00	S	0.00	0.00		19.50	8.5	11/07/75
445	445					2133.00	1659.00	34.50	0.00	0.00	S	0.00	0.00		19.50	9.0	11/06/75
446	446					1766.00	1492.00	35.50	0.00	0.00	S	0.00	0.00		15.50	9.5	10/27/75
447	447					1767.00	1571.00	35.00	0.00	0.00	S	0.00	0.00		15.00	15.0	10/27/75
448	448					2211.00	1575.00	0.00	0.00	0.00	N	0.00	0.00		14.50	9.5	10/27/75
449	449					2101.00	1664.00	35.00	0.00	0.00	S	0.00	0.00		20.00	9.0	10/23/75
450	450					2107.00	1664.00	35.00	0.00	0.00	S	0.00	0.00		20.00	8.0	10/23/75
451	451					2113.00	1664.00	0.00	0.00	0.00	N	0.00	0.00		20.00	9.0	10/23/75
452	452					2135.00	1664.00	0.00	0.00	0.00	N	0.00	0.00		19.00	7.0	10/22/75
453	453					2127.00	1664.00	0.00	0.00	0.00	N	0.00	0.00		19.00	9.5	10/22/75
454	454					2121.00	1664.00	0.00	0.00	0.00	N	0.00	0.00		19.00	8.0	10/22/75
455	455	Y	C6		E	-840.00	3010.00	36.90	15.40	9.90		0.00	0.00		-13.10	4.0	07/03/74
456	456		C4		L	300.00	4935.00	35.00	12.00	5.00	T	0.00	0.00		5.00	0.0	01/06/76
457	457	Y	3		L	-475.00	7400.00	35.50	0.00	0.00		0.00	0.00		-4.50	0.0	01/05/76
458	458	Y	C5		L	-775.00	4650.00	34.00	0.00	0.00		0.00	0.00		-6.00	0.0	01/06/76
459	459	Y	C7		L	-540.00	1560.00	33.00	5.50	3.00		0.00	0.00		-7.00	0.0	01/06/76
460	460	Y	C7		E	-470.00	850.00	32.00	0.00	0.00	S	0.00	0.00		7.00	1.0	12/09/70
461	461		1	C3	E	725.00	6500.00	28.00	4.00	3.00	T	0.00	0.00		3.00	1.0	12/08/70
462	462					195.00	4515.00	0.00	0.00	0.00	N	0.00	0.00		9.00	5.0	02/04/76
463	463					35.00	6325.00	0.00	0.00	0.00	N	0.00	0.00		0.00	6.0	/ /
464	464					35.00	5550.00	0.00	0.00	0.00	N	0.00	0.00		0.00	6.0	02/04/76
465	465		C4	C5		-215.00	5500.00	0.00	0.00	0.00	N	0.00	0.00		0.00	6.0	/ /
466	466		2			1971.00	738.00	33.60	9.60	3.60	T	0.00	0.00		3.60	4.0	09/16/76
467	467		2			1999.00	602.00	33.00	6.00	3.00	T	0.00	0.00		3.00	3.5	09/16/76
468	468		2			1965.00	486.00	39.60	0.00	0.00		0.00	0.00		4.60	6.0	09/16/76
469	469	Y	2			1967.00	282.00	33.60	11.00	4.60		0.00	0.00		3.60	0.0	09/15/76
470	470		2			1955.00	2.00	31.20	0.00	0.00		0.00	0.00		1.20	0.0	09/14/76
471	471	Y	2			1645.00	1.00	30.70	13.70	3.00		0.00	0.00		0.70	0.0	09/14/76
472	472		2			1370.00	5.00	33.00	0.00	0.00		0.00	0.00		3.00	0.0	09/14/76

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
473	473						314.00	3077.00	32.00	0.00	0.00		0.00	0.00		-13.00	4.5	05/24/77
474	474						316.00	3256.00	32.00	18.00	10.50		0.00	0.00		-13.00	6.0	05/24/77
475	475						656.00	3085.00	30.00	18.00	-5.50		0.00	0.00		-10.00	3.0	09/04/76
476	476						889.00	3206.00	30.00	18.00	2.00		0.00	0.00		-5.00	3.0	09/03/76
477	477						719.00	3326.00	30.00	18.00	3.00		0.00	0.00		-20.00	0.0	09/02/76
478	478						3265.00	2272.00	24.50	0.00	0.00		0.00	0.00		-15.50	6.5	10/08/76
479	479						3270.00	2382.00	32.70	10.70	9.70		0.00	0.00		-17.30	23.0	10/08/76
480	480						3362.00	2342.00	23.80	0.00	0.00		0.00	0.00		-11.20	6.5	10/08/76
481	481						3255.00	2230.00	25.00	0.00	0.00		0.00	0.00		-15.00	6.0	10/07/76
482	482						4560.00	1715.00	18.10	7.10	-23.90		-33.90	-37.90		-61.90	11.0	01/28/77
483	483						4705.00	1424.00	17.70	-4.00	-18.30		-34.30	-39.30		-42.30	21.5	01/25/77
484	484						4658.00	1529.00	17.70	8.70	-20.30		-34.30	-40.20		-42.30	11.0	01/26/77
485	485						4604.00	1633.00	17.20	7.20	-24.80		-34.20	-39.80		-62.80	10.0	01/27/77
486	486						1896.00	3155.00	30.00	8.00	3.50		0.00	0.00		0.00	11.5	01/28/77
487	487		2	C1	13		2111.00	895.00	32.50	0.00	0.00	S	0.00	0.00		7.50	1.0	05/20/77
488	488						2086.00	1404.00	34.60	0.00	0.00		0.00	0.00		4.60	8.5	05/23/77
489	489		2				506.00	485.00	31.40	5.40	4.60		0.00	0.00		-8.60	4.0	05/20/77
490	490	Y	2				530.00	632.00	31.50	4.50	-5.50		0.00	0.00		-8.50	0.0	05/19/77
491	491						2283.00	769.00	33.20	0.00	0.00		0.00	0.00		-6.80	0.0	10/04/77
492	492						2078.00	2708.00	28.00	16.50	4.00		0.00	0.00		-17.00	11.5	10/26/77
493	493						2177.00	2710.00	29.40	13.00	-0.60	T	0.00	0.00		-0.60	4.0	10/26/77
494	494						855.00	1655.00	34.70	13.70	6.70		0.00	0.00		-15.30	3.0	03/22/78
495	495						802.00	1385.00	34.70	15.20	-1.30		0.00	0.00		-15.30	3.5	03/21/77
496	496						724.00	1354.00	34.50	13.50	-1.50		0.00	0.00		-15.50	9.5	03/20/78
497	497		10				4253.00	691.00	21.50	0.00	0.00		0.00	0.00		-28.50	6.0	05/08/78
498	498	Y	10	14			3998.00	326.00	29.70	0.00	0.00		0.00	0.00		-20.30	3.0	05/08/78
499	499	Y	11	14			3812.00	723.00	28.30	0.00	0.00		0.00	0.00		-21.70	2.0	05/05/78
500	500						2112.00	2161.00	31.20	12.20	10.00		0.00	0.00		1.20	0.0	07/31/79
501	501						2167.00	2227.00	31.80	14.80	9.20		0.00	0.00		-3.20	2.0	07/31/79
502	502		C2				1083.80	5089.00	33.70	0.00	0.00	S	0.00	0.00		23.70	6.5	07/30/79
503	503		C2				1113.80	4836.20	33.20	0.00	0.00	F	0.00	0.00		23.20	9.0	07/30/79
504	504						482.00	947.00	34.50	0.00	0.00		0.00	0.00		-5.50	3.0	08/02/79
505	505						420.00	1080.00	34.50	0.00	0.00		0.00	0.00		-15.50	9.0	08/02/79
506	506					E	4155.00	2310.00	10.10	0.00	0.00		0.00	0.00		-24.90	9.0	03/27/81
507	507					E	4170.00	2290.00	9.50	0.00	0.00		0.00	0.00		-20.50	11.0	03/27/81
508	508						4110.00	2298.00	23.50	10.50	4.50		0.00	0.00	P	-66.50	13.0	06/17/80
509	509						4168.00	2224.00	23.50	0.00	0.00		0.00	0.00	P	-66.50	18.5	06/17/80
510	510						4230.00	2190.00	22.50	0.00	0.00	F	0.00	0.00		17.50	4.0	06/17/80
511	511						2714.00	902.00	33.60	0.00	0.00		0.00	0.00		3.60	2.0	07/23/80
512	512	Y	7				1909.00	3109.00	30.00	8.00	3.00		0.00	0.00		-25.00	12.0	03/25/81
513	513						1715.00	2904.00	28.40	0.00	0.00		0.00	0.00		-6.60	3.5	03/25/81
514	514	Y	7				1598.00	3017.00	27.40	10.40	3.40		0.00	0.00		-2.60	4.0	03/24/81
515	515						1418.00	3209.00	25.30	0.00	0.00	S	0.00	0.00		5.30	4.0	03/24/81

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
516	516						1236.00	3381.00	25.20	9.20	5.20	T	0.00	0.00		9.20	4.0	03/24/81
517	GMW-22					E	-1790.00	680.00	36.40	0.40	-4.00		0.00	0.00		-3.60	5.0	11/18/81
518	GMW-21					E	-1850.00	1715.00	36.80	16.80	7.80		0.00	0.00		6.80	11.0	10/27/81
519	GMW-20					E	-2020.00	3640.00	36.30	19.30	17.30		0.00	0.00		6.30	9.0	11/23/81
520	GMW-19		C5				-1110.31	4524.63	36.60	0.00	0.00	S	0.00	0.00		6.60	1.0	11/24/81
521	GMW-18	Y	3	C5			-1067.72	6244.07	36.10	14.10	6.10	T	0.00	0.00		6.10	1.5	11/19/81
522	GMW-17A		2				1344.60	-110.18	30.20	10.50	3.20		0.00	0.00		0.20	0.0	12/04/81
523	GMW-17	Y	2				1830.84	-373.11	27.90	0.00	0.00		0.00	0.00		-12.10	4.0	11/17/81
524	GMW-16		14				3665.07	97.62	33.40	9.00	3.40		0.00	0.00		-4.60	5.0	11/12/81
525	GMW-15	Y	10	12	13		4244.79	660.18	21.90	0.00	0.00		0.00	0.00		-8.10	6.0	11/10/81
526	GMW-14	Y	4				5170.56	229.33	19.20	1.20	-1.80		0.00	0.00		-20.80	5.0	10/30/81
527	GMW-13	Y	2				869.99	443.32	34.70	6.70	1.20		0.00	0.00		-5.30	3.5	12/08/81
528	GMW-12		2				2235.83	1019.00	33.90	12.90	10.90		0.00	0.00		3.90	2.0	12/14/81
529	GMW-11						4657.98	1523.70	17.70	7.70	-22.30	T	0.00	0.00		-22.30	10.0	12/01/81
530	GMW-10						1544.68	2029.37	33.30	0.00	0.00		0.00	0.00		-6.70	0.0	12/17/81
531	GMW-09						2064.47	2707.02	28.30	19.00	3.30		0.00	0.00		-1.70	9.5	12/10/81
532	GMW-08A	Y	C1				2837.06	2648.71	34.10	-2.90	-12.90		0.00	0.00		-15.90	14.0	11/30/81
533	GMW-08		C1				2825.97	2649.09	33.70	0.00	0.00	S	0.00	0.00		8.70	13.5	11/03/81
534	GMW-07						463.54	3487.72	31.20	17.20	7.50		0.00	0.00		6.20	11.0	12/14/81
535	GMW-06		9				1196.97	3346.18	26.50	0.00	0.00	S	0.00	0.00		1.50	3.0	12/11/81
536	GMW-05A		9				2454.07	3915.52	23.50	16.50	13.50		0.00	0.00		8.50	13.5	12/16/81
537	GMW-05	Y	9	7			2464.34	3922.03	24.40	17.40	-5.60	T	0.00	0.00		-5.60	7.0	12/16/81
538	GMW-04	Y	C2				1208.40	5154.48	33.20	15.50	10.20		0.00	0.00		3.20	9.0	11/02/81
539	GMW-03		C3				892.26	6047.74	36.90	18.90	6.90	T	0.00	0.00		6.90	4.0	11/09/81
540	GMW-02		3				-249.09	6720.57	35.50	16.50	5.50	T	0.00	0.00		5.50	0.0	11/10/81
541	GMW-01	Y	1				693.56	7487.79	30.10	20.10	2.50		0.00	0.00		0.10	7.0	10/29/81
542	542	Y	C7	C6			-591.00	2399.00	38.20	0.00	0.00	S	0.00	0.00		18.20	4.0	03/15/82
543	543		C7	C6			-597.00	2415.00	37.80	0.00	0.00	S	0.00	0.00		17.20	4.0	03/15/82
544	544	Y	4	8			4860.00	460.00	26.10	4.10	0.90		0.00	0.00		-3.90	7.0	02/03/84
545	545	Y	4	8			4900.00	350.00	26.20	0.00	0.00		0.00	0.00		-3.80	10.0	02/03/84
546	546		4	8			4950.90	227.40	26.70	0.00	0.00		0.00	0.00		-3.30	7.0	02/03/84
547	547		4				5150.00	50.00	19.50	11.50	-2.50		0.00	0.00		-9.50	22.0	02/03/84
548			4				5150.00	110.00	20.30	15.30	-4.70		0.00	0.00		-9.70	5.0	02/03/84
549	HRW-3P						2056.00	2723.00	27.90	17.90	12.90	T	0.00	0.00		12.90	8.0	12/09/83
550	HRW-02P						3437.00	2558.00	18.80	0.00	0.00		0.00	0.00		3.80	11.0	12/21/83
551	HRW-01P						4600.00	1600.00	17.50	-3.50	-7.50	T	0.00	0.00		-7.50	0.0	12/28/83
552	HRW-37						3135.09	2539.00	33.00	0.00	0.00		0.00	0.00		-2.00	12.0	02/06/84
553	HRW-36						3177.70	2377.70	33.30	0.00	0.00		0.00	0.00		-1.70	10.0	02/06/84
554	HRW-35		C1				2845.20	2441.10	34.70	11.70	7.70		0.00	0.00		4.70	11.0	01/10/84
555	HRW-34						2977.20	2552.80	34.40	0.00	0.00		0.00	0.00		-0.60	14.0	01/10/84
556	HRW-33A						3540.00	1450.00	32.50	0.00	0.00	S	0.00	0.00		26.50	6.0	12/28/83
557	HRW-33						3543.40	1549.60	32.90	0.00	0.00		0.00	0.00		-2.10	1.5	01/10/84
558	HRW-32						3735.00	1650.00	33.00	0.00	0.00		0.00	0.00		3.00	4.5	01/10/84

Datebase for Wells and Borings

Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
559	HRW-31						3434.40	1806.20	32.50	0.00	0.00		0.00	0.00		2.50	2.0	02/03/84
560	HRW-30		7				1845.90	2744.70	28.70	13.70	11.70	T	0.00	0.00		11.70	2.0	12/09/83
561	HRW-29		7				1970.40	2853.50	28.00	16.00	13.00	T	0.00	0.00		13.00	10.0	12/09/83
562	HRW-28						732.80	1260.70	32.50	7.50	5.00		0.00	0.00		2.50	5.0	12/21/83
563	HRW-27		2				1739.60	2608.10	28.60	14.60	11.60	T	0.00	0.00		11.60	5.0	12/12/83
564	HRW-26						1549.30	2337.60	31.00	18.00	14.00		0.00	0.00		8.00	0.0	12/15/83
565	HRW-25P		7				2141.50	3108.20	29.70	8.70	6.20		0.00	0.00		4.70	4.5	12/12/83
566	HRW-24		7				2116.30	2878.70	28.80	14.80	12.80		0.00	0.00		12.80	6.5	12/12/83
567	HRW-23		7				2249.10	2735.20	30.80	14.80	12.80		0.00	0.00		12.80	7.0	12/12/83
568	HRW-22						3397.50	1693.30	32.70	15.70	12.70		0.00	0.00		9.70	3.0	12/20/83
569	HRW-21						3430.00	2130.00	32.50	0.00	0.00		0.00	0.00		-2.50	1.0	12/21/83
570	HRW-20A	Y	C1				2548.00	2765.00	32.70	7.70	0.00		0.00	0.00		-2.30	5.5	02/06/84
571	HRW-20		C1	7			2550.00	2940.00	37.30	1.30	-0.70	T	0.00	0.00		-0.70	9.0	12/20/83
572	HRW-19						2128.40	2557.60	29.60	15.60	12.60	T	0.00	0.00		12.60	5.0	12/12/83
573	HRW-18		C1				2557.80	2536.20	30.20	13.70	10.20		0.00	0.00		8.20	8.0	12/19/83
574	HRW-17						2664.40	2222.20	32.00	0.00	0.00		0.00	0.00		2.00	12.5	12/19/83
575	HRW-16						3151.30	1645.70	32.90	4.90	2.90		0.00	0.00		2.90	5.0	12/20/83
576	HRW-15						2521.20	1953.20	30.90	10.90	7.90		0.00	0.00		6.90	4.5	12/20/83
577	HRW-14						2956.60	2115.50	34.90	0.00	0.00	S	0.00	0.00		8.90	23.0	12/27/83
578	HRW-13						3227.80	2240.00	22.40	9.40	7.40		0.00	0.00		2.40	5.0	12/21/83
579	HRW-12						3500.00	2540.00	20.00	5.00	3.00		0.00	0.00		0.00	15.0	12/21/83
580	HRW-11						3437.40	2558.40	18.90	0.00	0.00	F	0.00	0.00		0.90	6.0	12/21/83
581	HRW-10						4036.90	1651.60	27.30	11.30	9.30		0.00	0.00		7.30	6.0	12/27/83
582	HRW-09						3865.00	1863.20	32.60	0.00	0.00		0.00	0.00		7.60	1.0	12/28/83
583	HRW-08	Y	12	11	13		4113.30	1061.40	24.00	11.00	6.00		0.00	0.00		-1.00	6.5	12/27/83
584	HRW-07		12	13			4175.00	1080.00	23.70	0.00	0.00		0.00	0.00		-1.30	5.0	12/27/83
585	HRW-06						4508.90	1375.70	16.10	15.10	-3.90	T	0.00	0.00		-3.90	1.0	12/27/83
586	HRW-05						4301.10	1705.10	19.50	15.00	-0.50	T	0.00	0.00		-0.50	4.5	01/03/84
587	HRW-04		C1	5		M	4728.70	1236.60	17.00	8.00	-8.00	T	0.00	0.00		-8.00	4.0	01/03/84
588	HRW-03		4	13			4931.60	681.30	19.00	10.00	-1.00	T	0.00	0.00		-1.00	5.0	01/13/84
589	HRW-02	Y	4	13	5		4699.60	775.60	28.40	0.00	0.00		0.00	0.00		-1.60	17.0	01/11/84
590	HRW-01						4476.60	1834.00	19.50	16.50	1.50		0.00	0.00		-0.50	2.0	01/03/84
591	591						1668.75	2731.00	29.70	6.30	3.70		0.00	0.00		-0.30	0.0	01/03/84
592	592		7				1391.50	2285.00	34.80	15.80	10.80		0.00	0.00		1.80	10.0	02/22/84
593	593						1383.30	1755.00	35.00	9.00	7.00		0.00	0.00		5.00	8.0	02/17/84
594	594						21.00	3571.00	33.70	15.70	2.70		0.00	0.00		-16.30	5.0	04/10/84
595	595						2832.50	329.20	32.30	0.00	0.00	S	0.00	0.00		22.30	0.0	03/16/84
596	596						-86.30	3822.70	31.90	14.90	2.40		0.00	0.00		-18.10	2.0	03/15/84
597	597						2648.80	906.50	32.10	0.00	0.00		0.00	0.00		7.10	5.0	03/14/84
598	598						2647.40	808.90	31.90	0.00	0.00		0.00	0.00		6.90	0.0	03/13/84
599	599						2648.10	685.20	32.30	12.30	7.30	T	0.00	0.00		7.30	0.0	03/14/84
600	600						2675.80	618.50	32.70	11.70	7.70	T	0.00	0.00		7.70	0.0	03/14/84
601	601						2690.90	493.50	33.00	0.00	0.00	S	0.00	0.00		8.00	0.0	03/14/84

Datebase for Wells and Borings

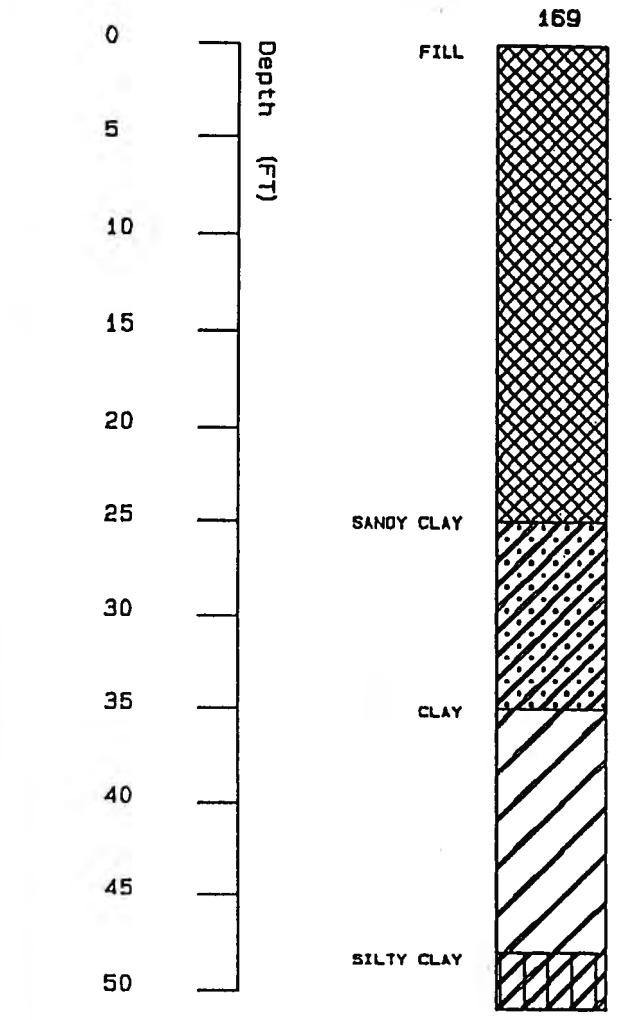
Boring No.	Well No.	Used in Xsec	UNI			STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL 1	DEPTH FILL FEET	DATE DRILLED
602	602						2736.20	393.70	32.80	0.00	0.00	S	0.00	0.00		7.80	7.0	03/13/84
603	603						2822.90	260.20	32.80	0.00	0.00		0.00	0.00		7.80	0.0	03/13/84
604	604						2831.50	95.50	33.40	13.00	10.90		0.00	0.00		8.40	2.0	03/13/84
605	605						2808.10	17.60	32.60	0.00	0.00	S	0.00	0.00		7.60	0.0	03/13/84
606	606						1374.30	1557.00	34.80	0.00	0.00		0.00	0.00		4.80	5.0	05/03/84
607	607						1358.70	1602.00	34.50	0.00	0.00		0.00	0.00		-10.50	8.0	05/03/84
608	608					E	3920.00	2435.00	16.50	0.00	0.00		-39.50	-42.00		-83.50	12.0	10/12/84
609	609					E	3970.00	2420.00	17.50	0.00	0.00		0.00	0.00	P	-82.50	11.0	10/11/84
610	610					E	4030.00	2405.00	10.50	-4.00	-6.00		0.00	0.00	P	-89.50	11.0	10/09/84
611	611		10	14			3937.40	464.20	32.50	0.00	0.00		0.00	0.00		-7.50	2.5	06/27/84
612	612		10	11			3939.80	650.60	26.30	0.00	0.00		0.00	0.00		-13.70	2.5	06/27/84
613	613	Y	10	11	14		3939.80	650.60	26.30	0.00	0.00		-40.00	-45.70		-78.70	2.5	07/12/84
614	614						3206.20	442.30	32.50	11.50	8.00		0.00	0.00		-0.50	0.0	06/26/84
615	615						3206.20	442.30	32.50	11.50	8.00		-44.00	-48.50		-67.50	0.0	07/13/84
616	GMW-33	Y	C3	1			413.30	6293.20	35.20	9.20	2.20		0.00	0.00		0.20	3.0	06/26/84
617	GMW-32	Y	1	C3			559.30	6574.30	33.30	17.30	5.30		0.00	0.00		3.30	0.0	06/25/84
618	GMW-31		1				87.20	6584.70	38.80	8.30	5.30		0.00	0.00		3.80	4.0	06/25/84
619	GMW-30		1				261.30	6989.70	35.10	20.60	11.10		0.00	0.00		0.10	0.0	06/25/84
620	GMW-29		3	C5			-228.70	6356.30	35.50	8.50	3.50		0.00	0.00		0.50	4.0	06/25/84
621	GMW-28		10	11	14		3939.84	650.59	26.30	11.30	9.00		0.00	0.00		1.30	3.5	10/19/84
622	GMW-27		10	11	14		3934.23	464.20	29.50	0.00	0.00		0.00	0.00		4.50	3.0	08/09/84
623	GMW-26		11	14			3707.60	661.10	31.40	0.00	0.00		0.00	0.00		-8.60	4.5	06/27/84
624	GMW-25	Y	14			M	3683.90	395.70	33.60	0.00	0.00		0.00	0.00		-6.40	7.0	06/26/84
625	GMW-24	Y	11	14			3514.30	565.30	30.30	0.00	0.00		0.00	0.00		-4.70	0.0	06/26/84
626	GMW-23						3206.20	428.30	32.50	13.00	8.50		3.50	2.50	T	2.50	1.0	08/08/84
627	627		4			E	5175.00	250.00	23.40	18.00	-6.60	T	0.00	0.00		-6.60	13.5	07/16/84
628	628		4			E	5180.00	250.00	23.10	19.50	13.50		0.00	0.00		-6.90	17.0	07/17/84
629	629		4			E	5185.00	250.00	19.20	17.20	7.20		0.00	0.00		-5.80	0.0	07/17/84
630	NELFP-1		4			E	5120.00	305.00	22.15	9.15	3.15		-22.00	-31.00		-32.85	10.0	/ /
631	NELFP-2		4				5090.61	411.13	20.58	10.58	2.58		0.00	0.00		-9.42	2.0	/ /
632	NELFP-3		4				5031.49	548.99	19.62	0.00	0.00	S	0.00	0.00		7.62	2.0	/ /
633	NELFP-4		4			E	5225.00	160.00	18.77	0.77	-8.23		0.00	0.00		-10.23	7.0	/ /
634	NELFP-5		4			E	5060.00	223.00	25.11	13.11	7.11		0.00	0.00		-8.89	2.0	/ /
635	GMW-34					E	-1745.00	550.00	0.00	0.00	0.00	N	0.00	0.00		0.00	0.0	/ /
636	GMW-35					E	-2050.00	3330.00	0.00	0.00	0.00	N	0.00	0.00		0.00	0.0	/ /
637	GMW-36					E	-1330.00	2530.00	0.00	0.00	0.00	N	0.00	0.00		0.00	0.0	/ /
638	GMW-37					E	-1180.00	1260.00	0.00	0.00	0.00	N	0.00	0.00		0.00	0.0	/ /
639	HRW-38					E	4950.00	200.00	0.00	0.00	0.00	N	0.00	0.00		0.00	0.0	/ /
640	WELL 38					N	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
641	WELL 39					N	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
642	WELL 40					N	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
643	WELL 41					N	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
644	WELL 42					N	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /

Datebase for Wells and Borings

Boring No.	Well No.	Used UNI in Xsec	STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL 1	DEPTH FILL FEET	DATE DRILLED
645	WELL 43		N	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
646	WELL 44			3341.00	381.37	24.90	0.00	0.00		0.00	0.00		-59.20	0.0	06/10/88
647	WELL 45			3419.30	672.96	24.90	0.00	0.00		0.00	0.00		-58.70	0.0	06/11/88
648	WELL 46			3536.24	606.75	26.70	0.00	0.00		0.00	0.00		-58.30	0.0	06/10/88
649	WELL 47			3850.32	728.53	19.70	0.00	0.00		0.00	0.00		-57.20	0.0	06/10/88
650	WELL 48			432.81	6092.53	30.80	0.00	0.00		0.00	0.00		-2.70	0.0	06/09/88
651	WELL 49			488.53	6678.53	22.50	0.00	0.00		0.00	0.00		-7.50	0.0	06/08/88
652	WELL 50			353.70	7182.19	27.30	0.00	0.00		0.00	0.00		-2.70	0.0	06/08/88
653	WELL 51			380.82	7493.65	26.60	0.00	0.00		0.00	0.00		-5.40	0.0	06/08/88
654	WELL 52			672.79	7408.35	25.00	0.00	0.00		0.00	0.00		-9.00	0.0	05/19/89
655	WELL 53			646.12	7277.20	22.80	0.00	0.00		0.00	0.00		-4.20	0.0	05/19/89
656	WELL 54			650.59	7173.45	17.10	0.00	0.00		0.00	0.00		-5.90	0.0	05/23/89
657	WELL 55			372.85	6901.08	23.80	0.00	0.00		0.00	0.00		0.80	0.0	05/19/89
658	WELL 56			4878.89	1058.62	7.80	0.00	0.00		0.00	0.00		-22.20	0.0	05/23/89
659	WELL 57			4998.97	771.31	8.80	0.00	0.00		0.00	0.00		-21.20	0.0	05/23/89
660	BORE 58			4821.26	530.60	18.60	0.00	0.00		0.00	0.00		4.60	0.0	05/19/89
661	BORE 58-A			4777.90	534.60	18.40	0.00	0.00		0.00	0.00		2.40	0.0	05/19/89
662	BORE 58-B			4548.07	444.70	16.20	0.00	0.00		0.00	0.00		-18.80	0.0	05/23/89
663	WELL 58-C			4236.42	666.12	13.90	0.00	0.00		0.00	0.00		-9.60	0.0	05/23/89
664	HRW-39			3706.35	2227.71	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
665	HRW-40			3578.17	2252.38	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
666	HRW-42			382.97	3321.82	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
667	HRW-43			-572.55	2112.65	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
668	HRW-54			1690.90	3017.28	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
669	HRW-56			566.79	3391.09	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
670	HRW-58			1932.38	344.84	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
671	HRW-64			4048.86	1411.88	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
672	HRW-69			3961.83	1294.83	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
673	HRW-80			352.49	2173.37	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
674	HRW-82			1225.54	3544.94	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
675	HRW-83			244.83	2614.60	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
676	HRW-85			3661.72	811.60	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
677	HRW-89			3727.71	804.93	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
678	HRW-92			3877.88	1442.24	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
679	HRW-93			3760.05	1432.46	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
680	HRW-94			1440.56	3249.41	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
682	HRW-100			762.99	2631.29	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
681	HRW-99		E	2820.00	1800.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
683	HRW-101		E	3400.00	1370.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
684	HRW-102		E	2400.00	1850.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
685	HRW-103		E	2355.00	2090.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
686	HWR-104		E	2440.00	2535.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
687	HRW-105		E	2430.00	2260.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /

Datebase for Wells and Borings

Boring No.	Well No.	Used UNI in Xsec	STATUS XY COORD	NORTHING	WESTING	SURFACE ELEVATION MSL	TOP WATER BEARING UNIT 1	BOTTOM WATER BEARING UNIT 1	WATER BEARING UNIT 1 PRESENT	TOP WATER BEARING UNIT 2	BOTTOM WATER BEARING UNIT 2	WATER BEARING UNIT 2 PRESENT	BOTTOM ELEVATION MSL	DEPTH FILL FEET	DATE DRILLED
688	HRW-106		E	2555.00	2345.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
689	HRW-107		E	2620.00	2040.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /
690	HRW-108		E	3140.00	1835.00	0.00	0.00	0.00		0.00	0.00		0.00	0.0	/ /



LEGEND

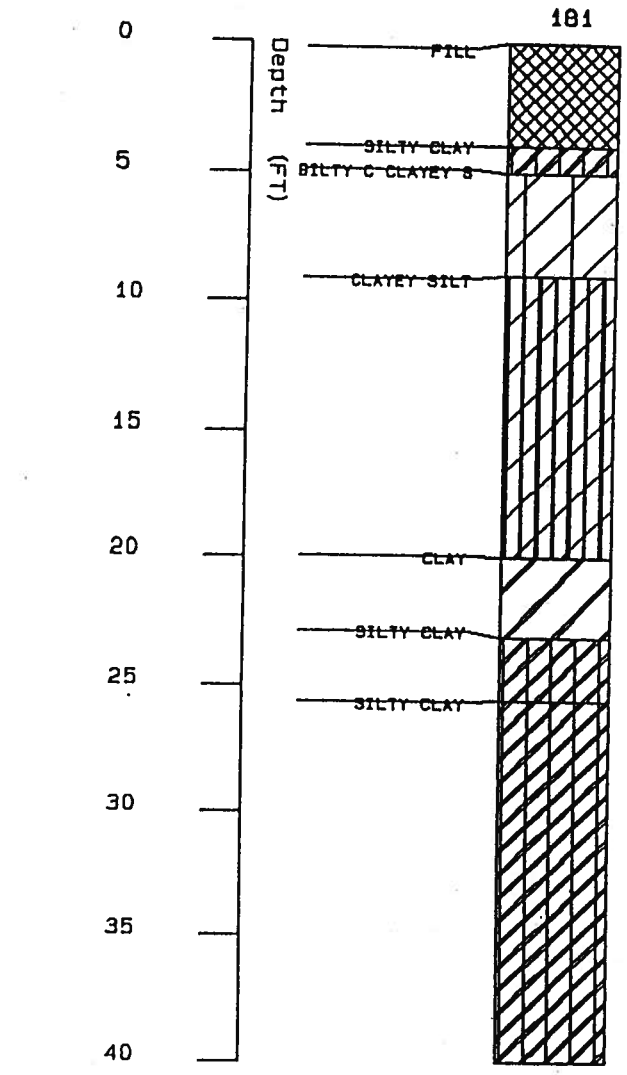
CLAY SANDY CLAY SILTY CLAY FILL

Lyondell Petrochemical Company
Boring Log #169

Westing , Northing
Elevation

BROWN AND CALDWELL

Figure : 169



LEGEND

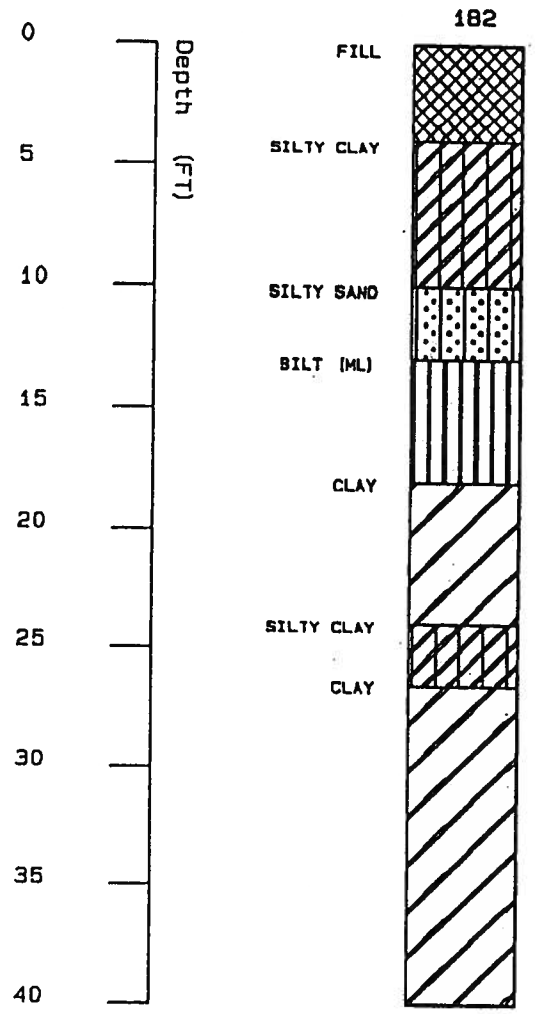
CLAY | SILTY CLAY | CLAYEY SILT | FILL | SILTY C CLAYEY S

WELL ID : Lyondell Petrochemical Company
Boring Log #181

Westing 776, Northing 4221
Elevation 21

BROWN AND CALDWELL

Figure : 181



LEGEND

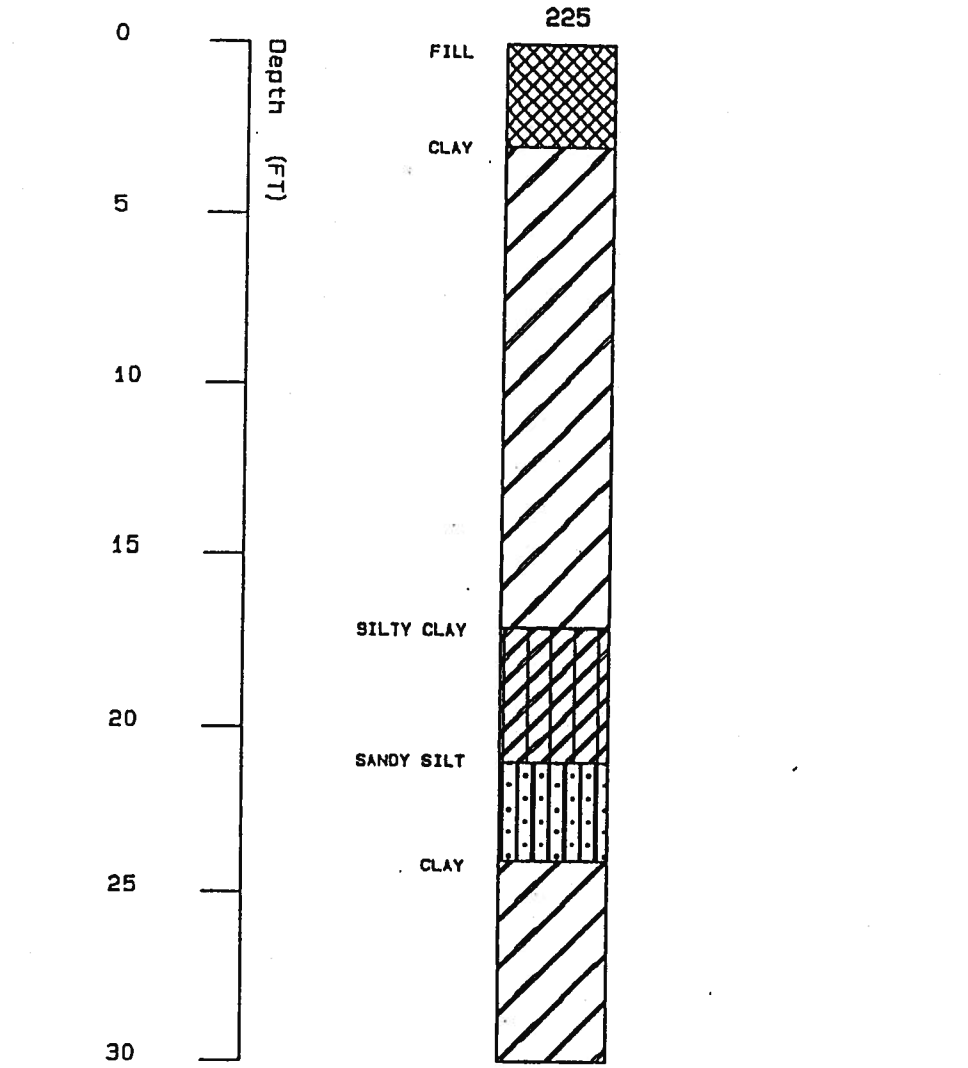
CLAY | SILTY CLAY | SILTY SAND | SILT (ML) | FILL

LYONDELL PETROCHEMICAL COMPANY
BORING LOG #182

WESTING 796.0, NORTHING 4255
ELEVATION 12.8

BROWN AND CALDWELL

Figure : 182



LEGEND

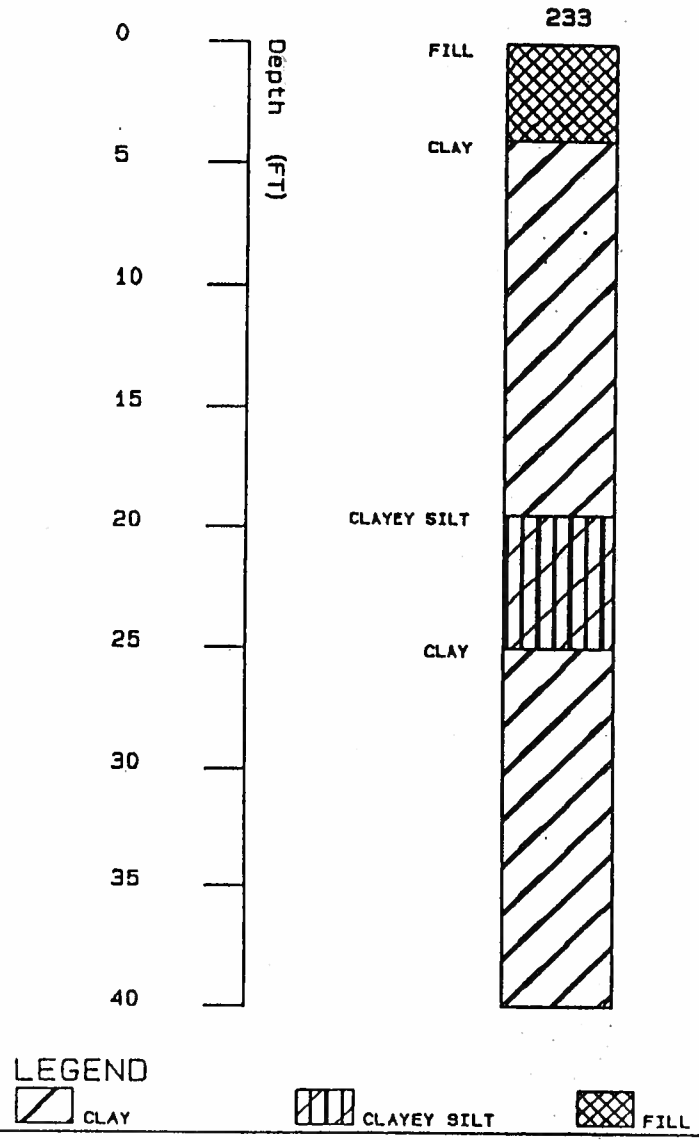
CLAY SILTY CLAY SANDY SILT FILL

WELL ID : Lyondell Petrochemical Company
Boring Log #225

Westing 1391, Northing 3001
Elevation 32.6

BROWN AND CALDWELL

Figure : 225

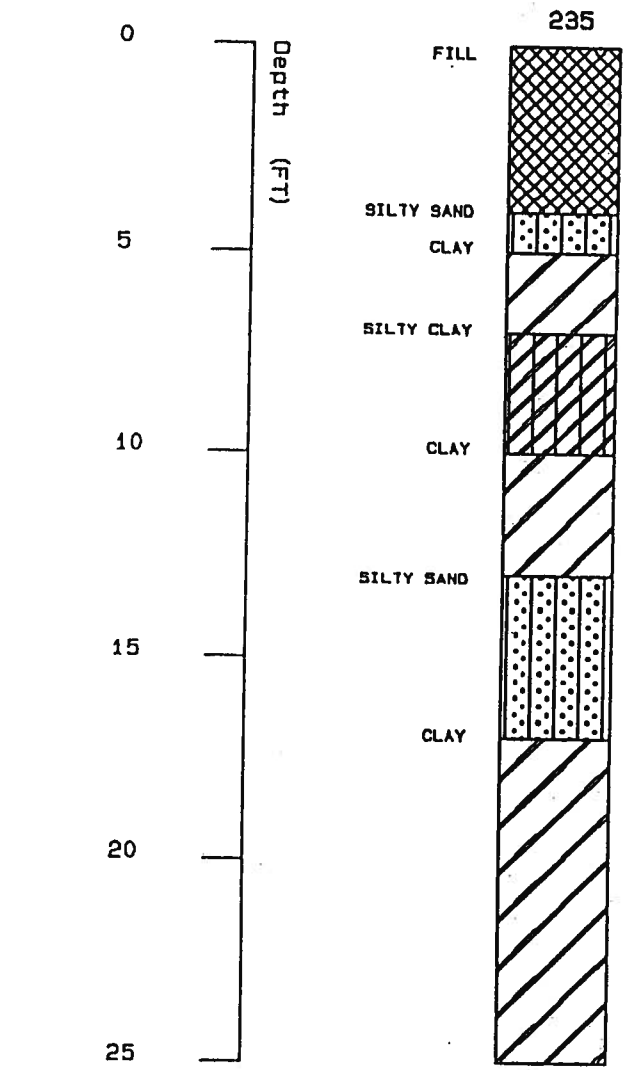


Lyondell Petrochemical Company
Boring Log #233

Westing 1178, Northing 3959
Elevation 15.80

BROWN AND CALDWELL

Figure : 233



LEGEND

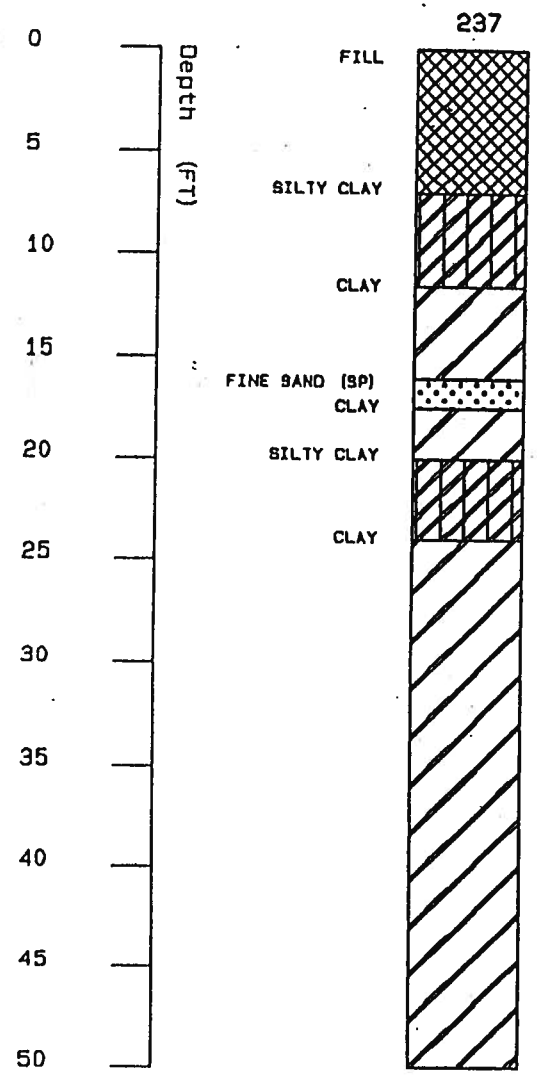
CLAY SILTY CLAY SILTY SAND FILL

WELL ID : Lyondell Petrochemical Company
Boring Log #235

Westing 1371, Northing 4030
Elevation 26.1

BROWN AND CALDWELL

Figure : 235



LEGEND

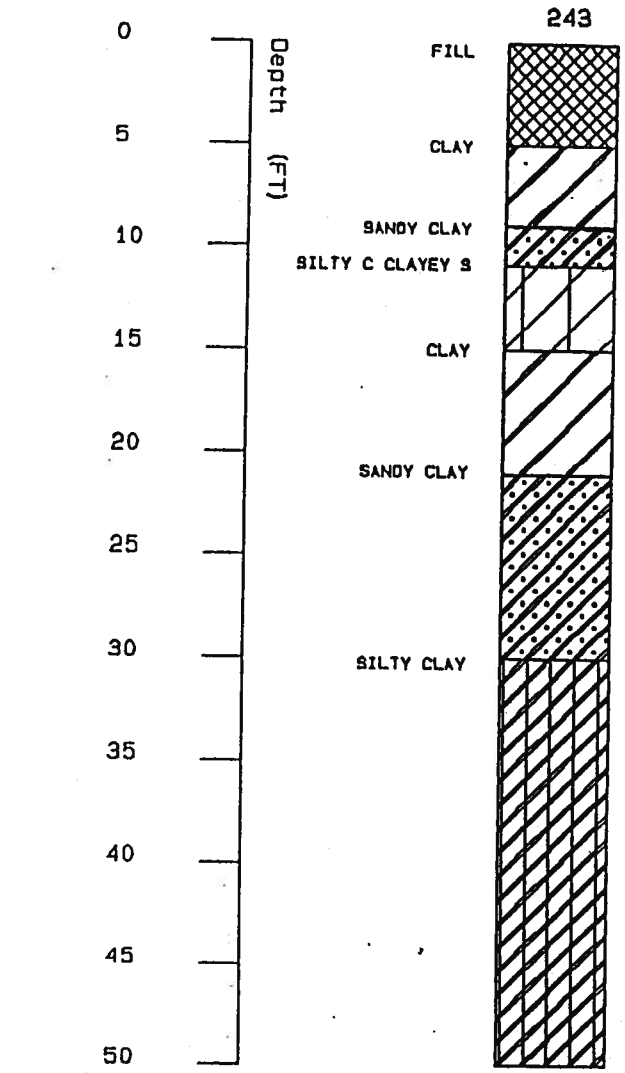
CLAY | SILTY CLAY | FINE SAND (SP) | FILL

WELL ID : Lyondell Petrochemical Company
Boring Log #237

Westing 1339, Northing 4353
Elevation 20.5

BROWN AND CALDWELL

Figure : 237



LEGEND

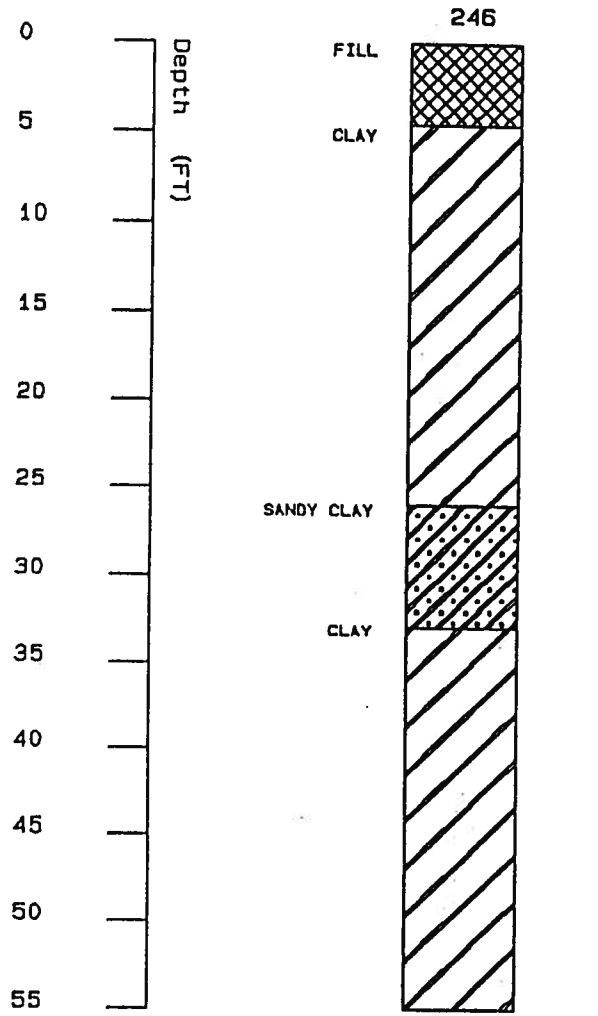
CLAY | SANDY CLAY | SILTY CLAY | FILL | SILTY C CLAYEY S

WELL ID : Lyondell Petrochemical Company
Boring Log #243

Westing 1279, Northing 4107
Elevation 24.3

BROWN AND CALDWELL

Figure : 243



LEGEND

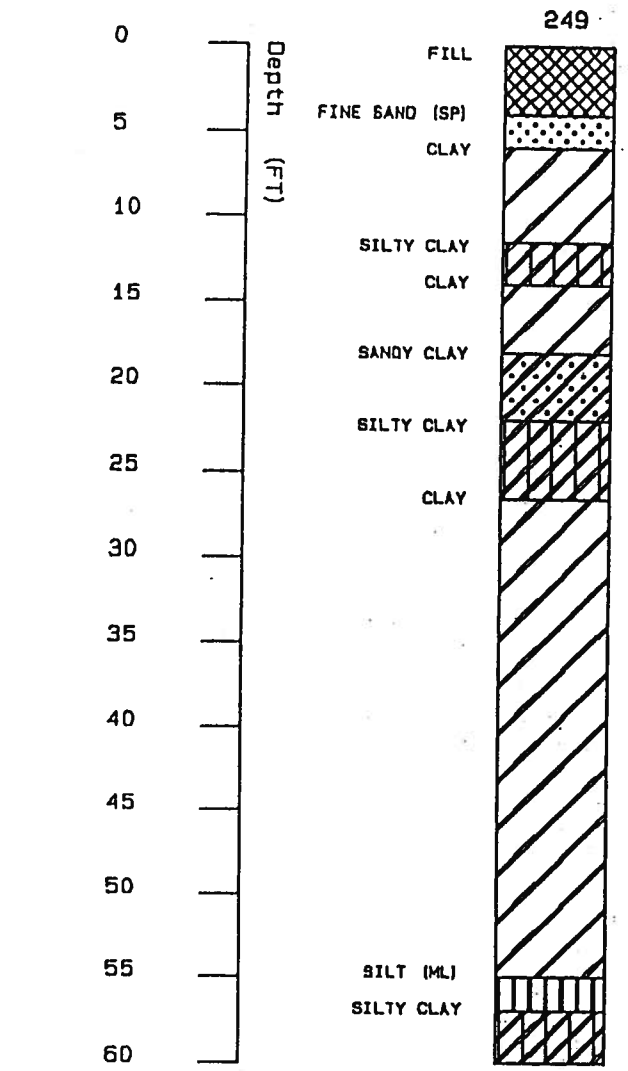
CLAY SANDY CLAY FILL

Lyondell Petrochemical Company
Boring Log #246

Westing -1277, Northing 4234
Elevation 15.50

BROWN AND CALDWELL

Figure : 246



LEGEND

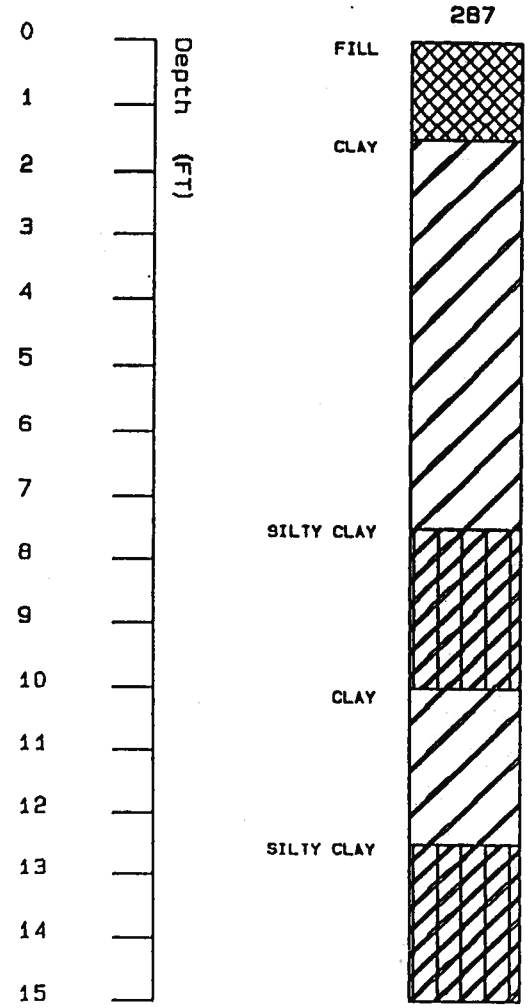
CLAY | SANDY CLAY | SILTY CLAY | FINE SAND (SP) | SILT (ML) | FILL

WELL ID : Lyondell Petrochemical Company
Boring Log #249

Westing 1277, Northing 4374
Elevation 21.4

BROWN AND CALDWELL

Figure : 249



LEGEND

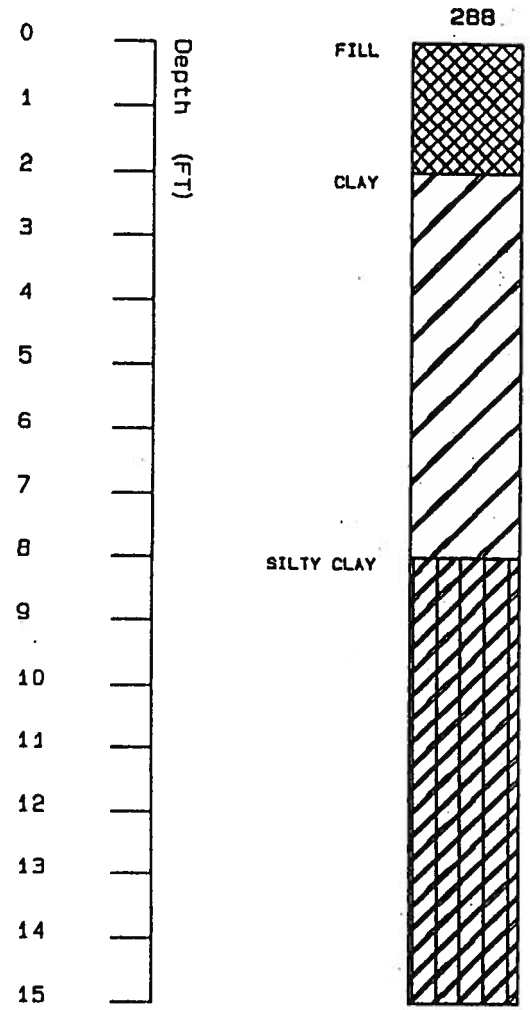
CLAY SILTY CLAY FILL

Lyondell Petrochemical Company
Boring Log #287

Westing 390, Northing 3693
Elevation 24.10

BROWN AND CALDWELL

Figure : 287



LEGEND

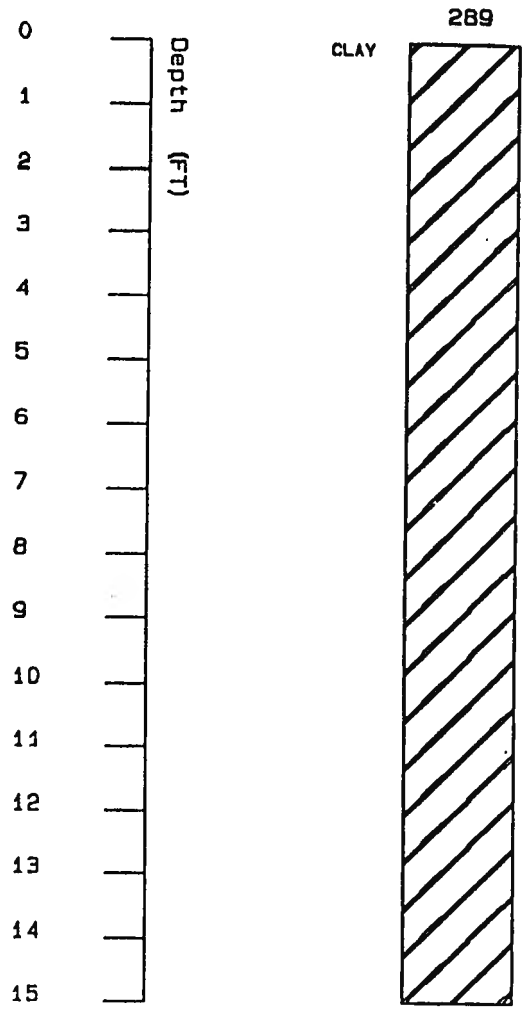
CLAY SILTY CLAY FILL

Lyondell Petrochemical Company
Boring Log #288

Westing 66, Northing 3625
Elevation 22.50

BROWN AND CALDWELL

Figure : 288



LEGEND

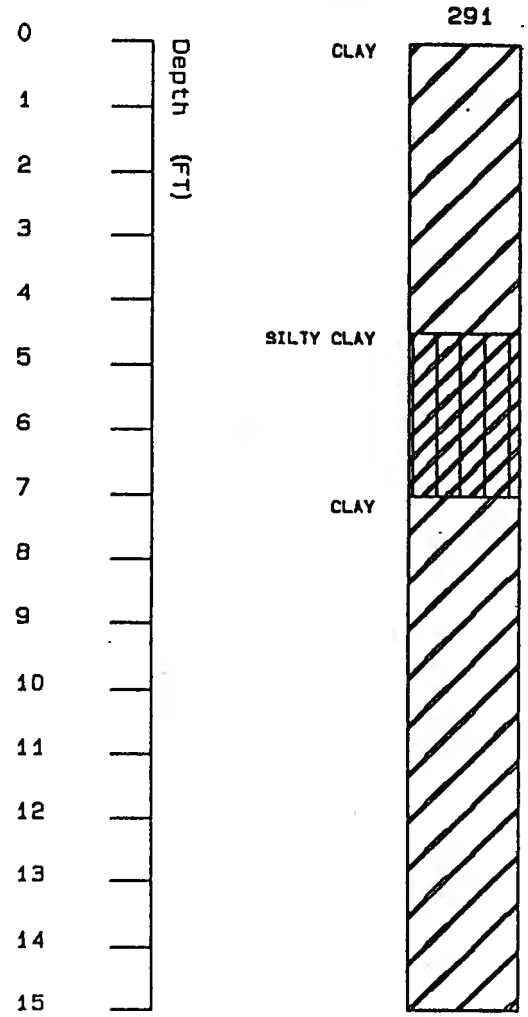
CLAY

Lyondell Petrochemical Company
Boring Log #289

Westing 333, Northing 3861
Elevation 21.80

BROWN AND CALDWELL

Figure : 289



LEGEND

CLAY

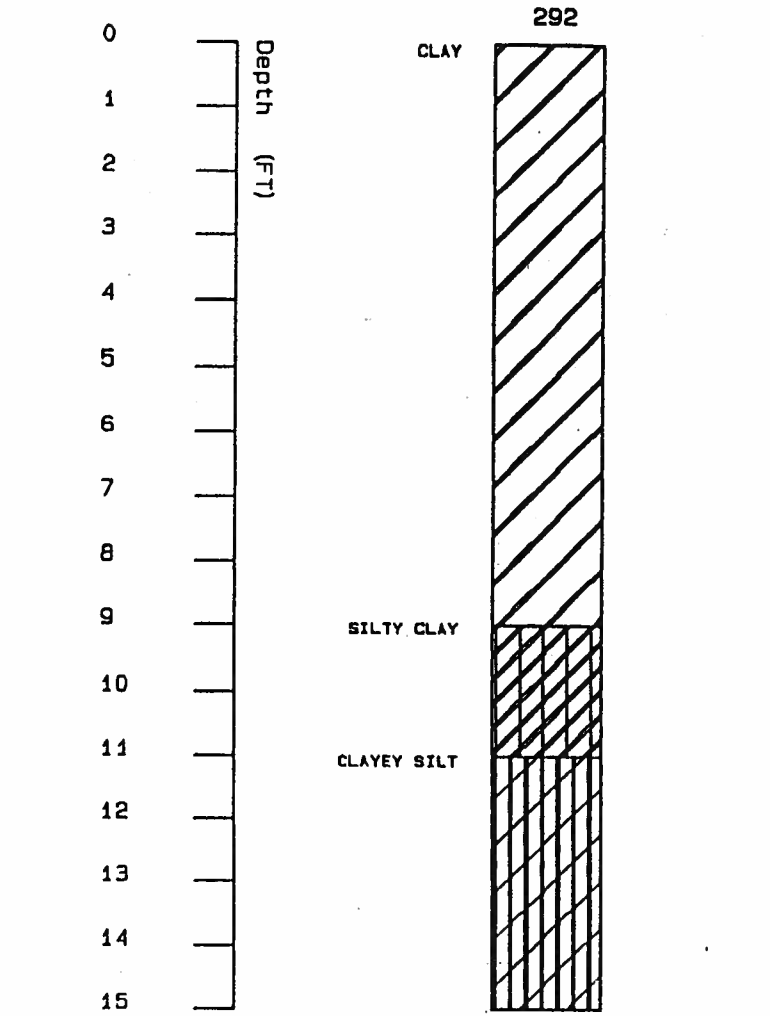
SILTY CLAY

Lyondell Petrochemical Company
Boring Log #291

Westing 399, Northing 3958
Elevation 21.30

BROWN AND CALDWELL

Figure : 291



LEGEND

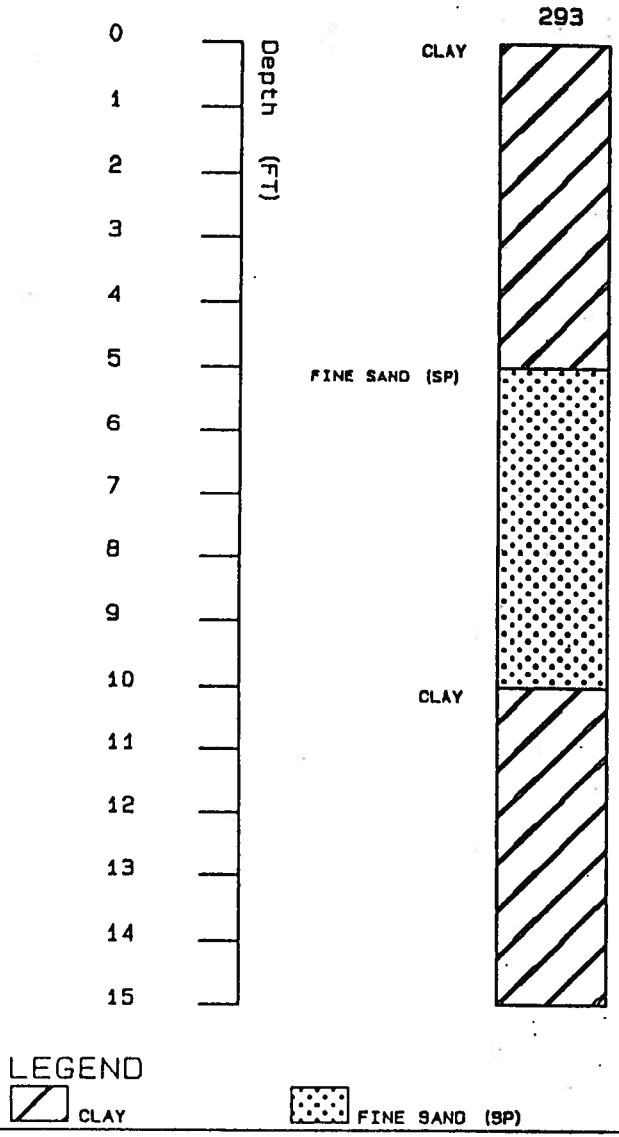
CLAY SILTY CLAY CLAYEY SILT

Lyondell Petrochemical Company
Boring Log #292

Westing 113, Northing 4077
Elevation 14.80

BROWN AND CALDWELL

Figure : 292

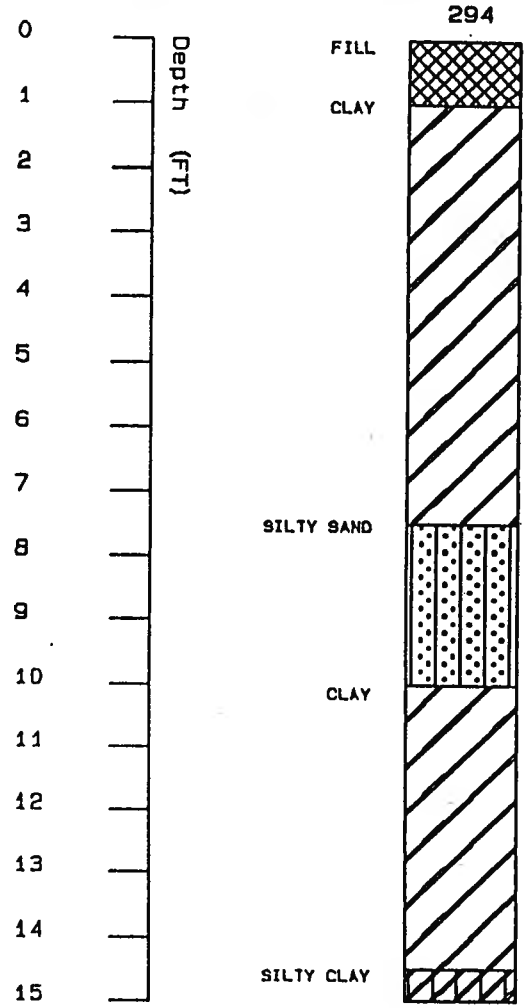


Lyondell Petrochemical Company
Boring Log #293

Westing 336, Northing 4073
Elevation 18.00

BROWN AND CALDWELL

Figure : 293



LEGEND

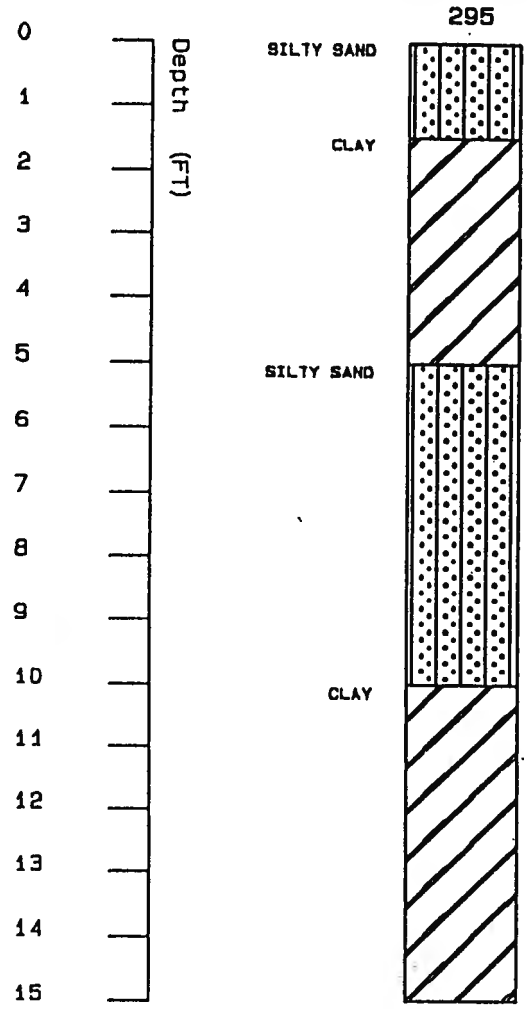
CLAY SILTY CLAY SILTY SAND FILL

Lyondell Petrochemical Company
Boring Log #294

Westing 552, Northing 4069
Elevation 16.50

BROWN AND CALDWELL

Figure : 294



LEGEND

CLAY

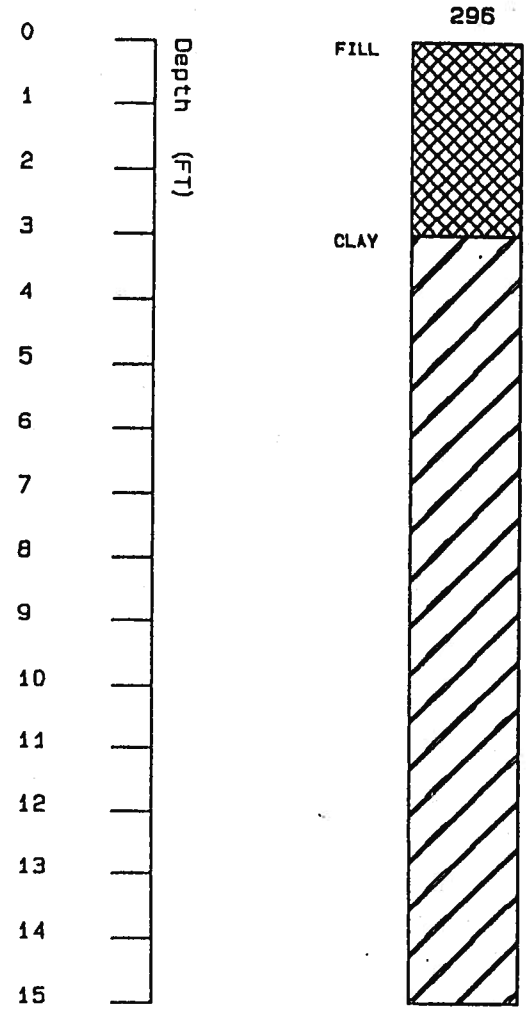
SILTY SAND

Lyondell Petrochemical Company
Boring Log #295

Westing 202, Northing 4151
Elevation 14.50

BROWN AND CALDWELL

Figure : 295



LEGEND

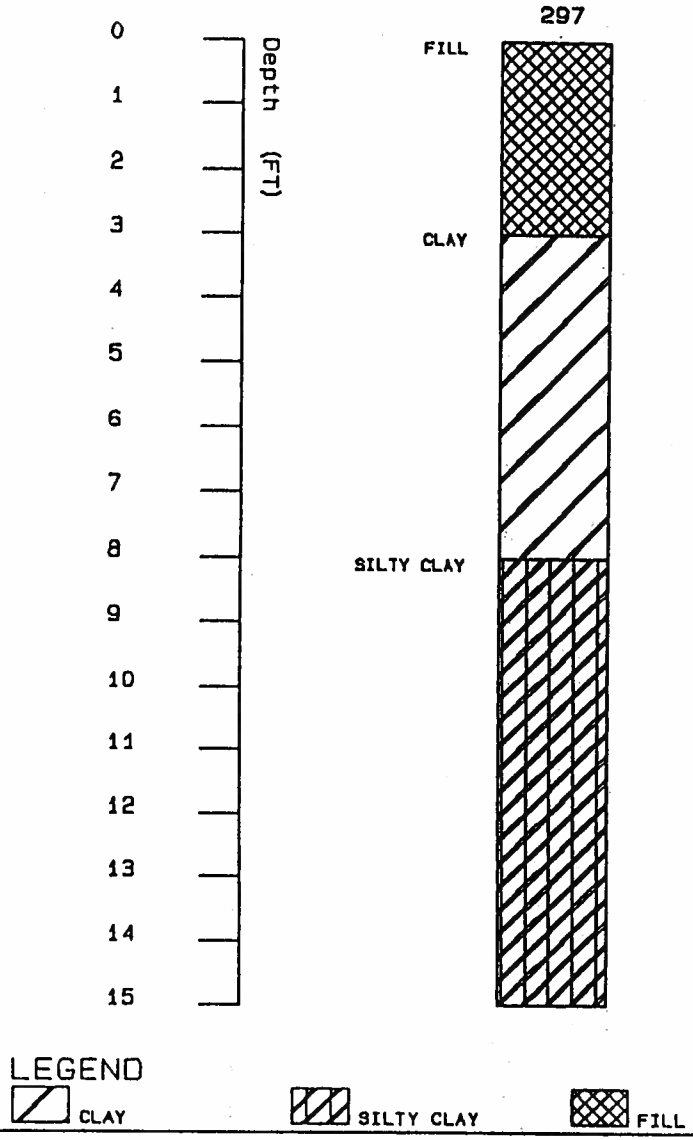
CLAY FILL

Lyondell Petrochemical Company
Boring Log #296

Westing 397, Northing 4198
Elevation 13.60

BROWN AND CALDWELL

Figure : 296

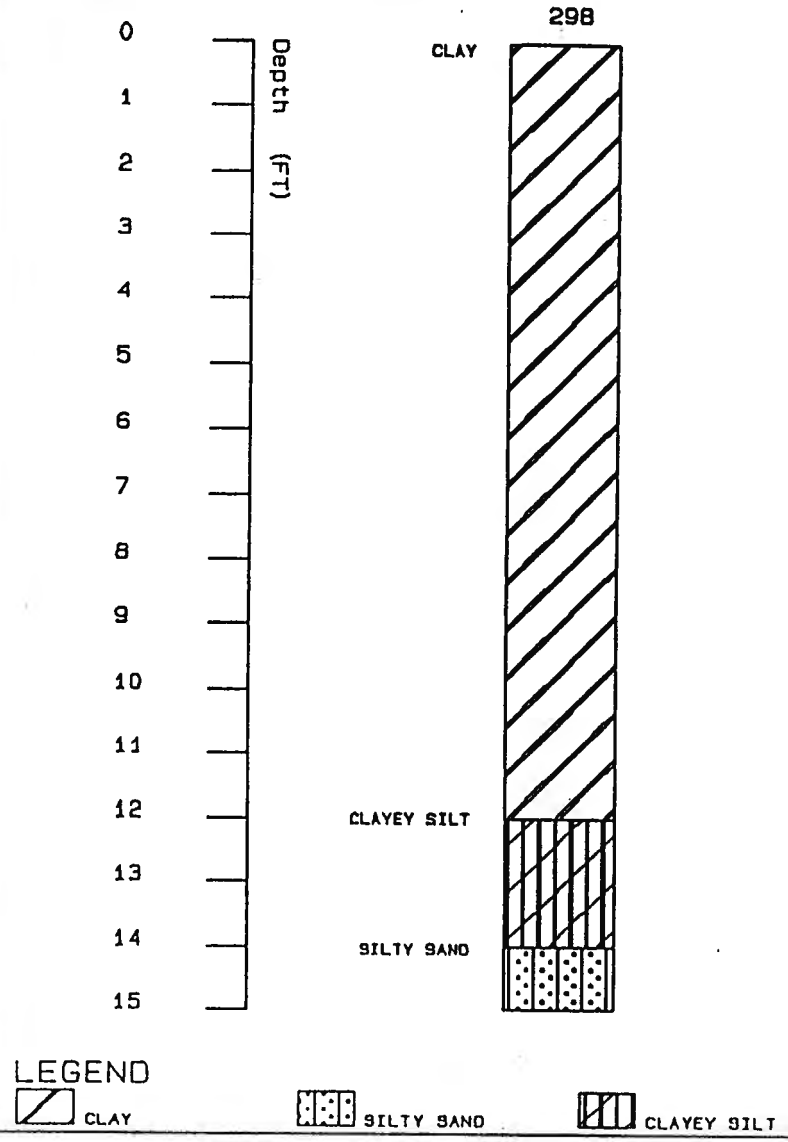


Lyondell Petrochemical Company
Boring Log #297

Westing 475, Northing 4319
Elevation 14.00

BROWN AND CALDWELL

Figure : 297

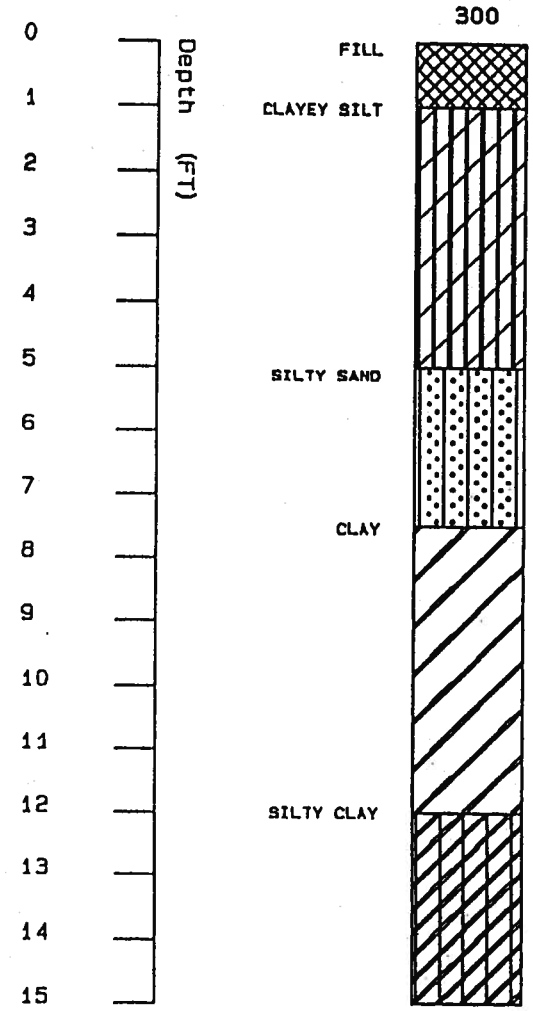


Lyondell Petrochemical Company
Boring Log #298

Westing 94, Northing 4302
Elevation 13.80

BROWN AND CALDWELL

Figure : 298



LEGEND

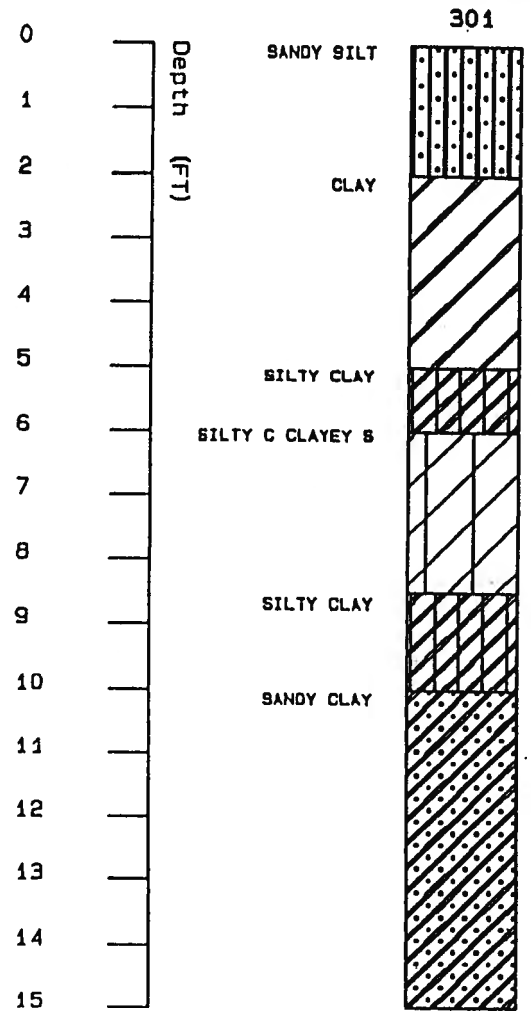
CLAY | SILTY CLAY | SILTY SAND | CLAYEY SILT | FILL

Lyondell Petrochemical Company
Boring Log #300

Westing 424, Northing 4426
Elevation 13.80

BROWN AND CALDWELL

Figure : 300



LEGEND

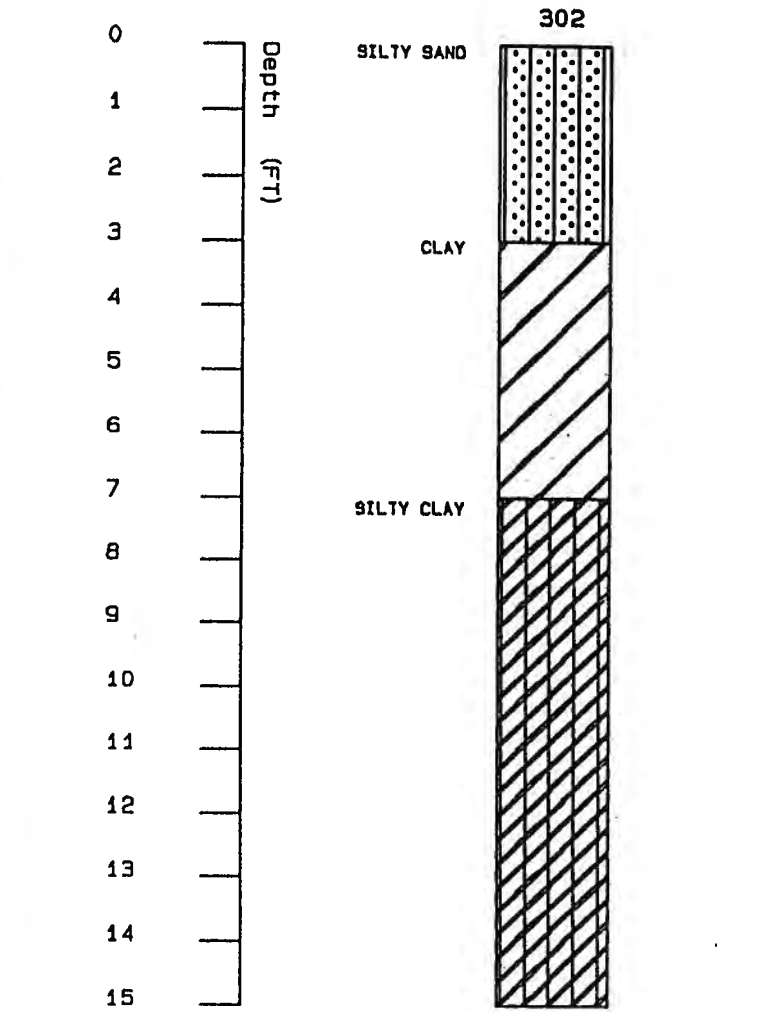
CLAY | SANDY CLAY | SILTY CLAY | SANDY SILT | SILTY C CLAYEY S

Lyondell Petrochemical Company
Boring Log #301

Westing 137, Northing 4504
Elevation 11.80

BROWN AND CALDWELL

Figure : 301



LEGEND

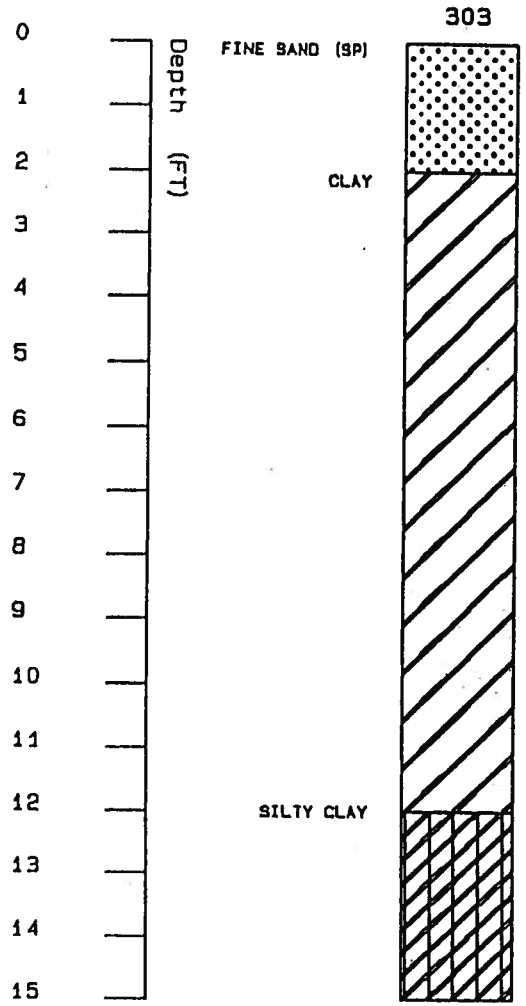
CLAY SILTY CLAY SILTY SAND

Lyondell Petrochemical Company
Boring Log #302

Westing 260, Northing 4570
Elevation 10.80

BROWN AND CALDWELL

Figure : 302



LEGEND

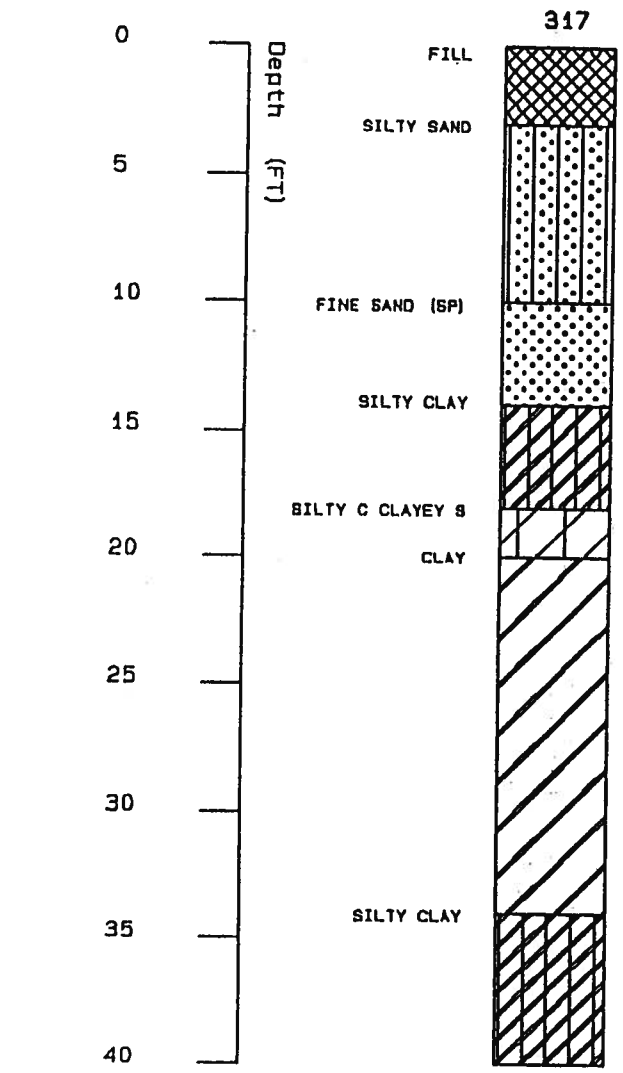
CLAY SILTY CLAY FINE SAND (SP)

Lyondell Petrochemical Company
Boring Log #303

Westing 288, Northing 4620
Elevation 10.90

BROWN AND CALDWELL

Figure : 303



LEGEND

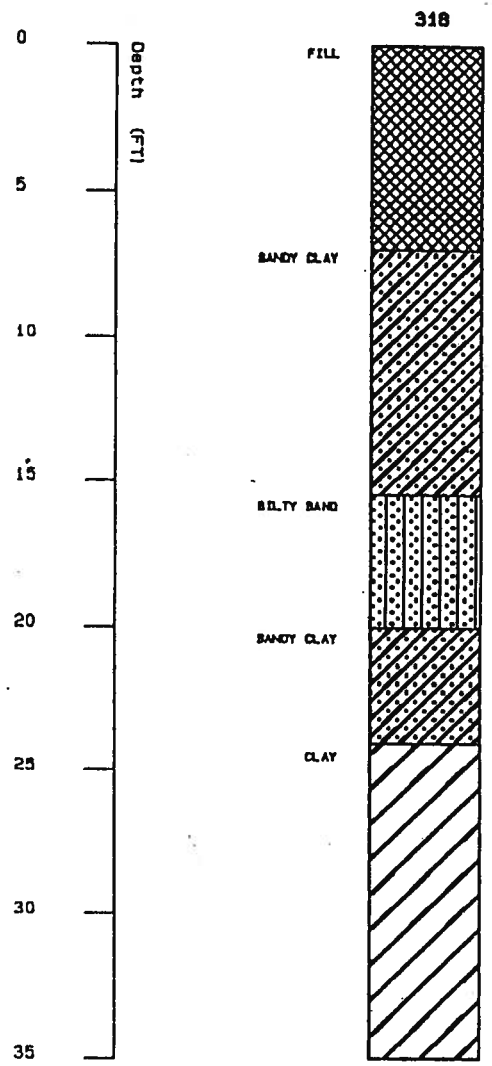
CLAY | SILTY CLAY | FINE SAND (SP) | SILTY SAND | FILL | SILTY C CLAYEY S

WELL ID : Lyondell Petrochemical Company
Boring Log #317

Westing 1367, Northing 4406
Elevation 21.6

BROWN AND CALDWELL

Figure : 317



LEGEND

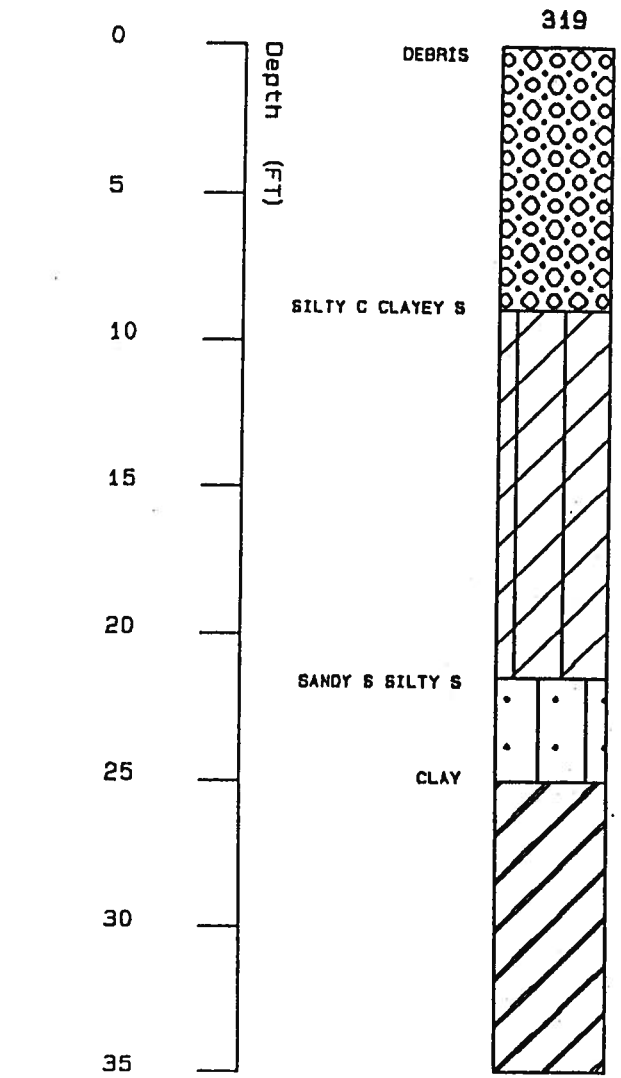
CLAY | SANDY CLAY | SILTY SAND | FILL

Lyondell Petrochemical Company
Boring Log #318

Westing 1205.0, Northing 4402.0
Elevation 22.60

BROWN AND CALDWELL

Figure : 318



LEGEND

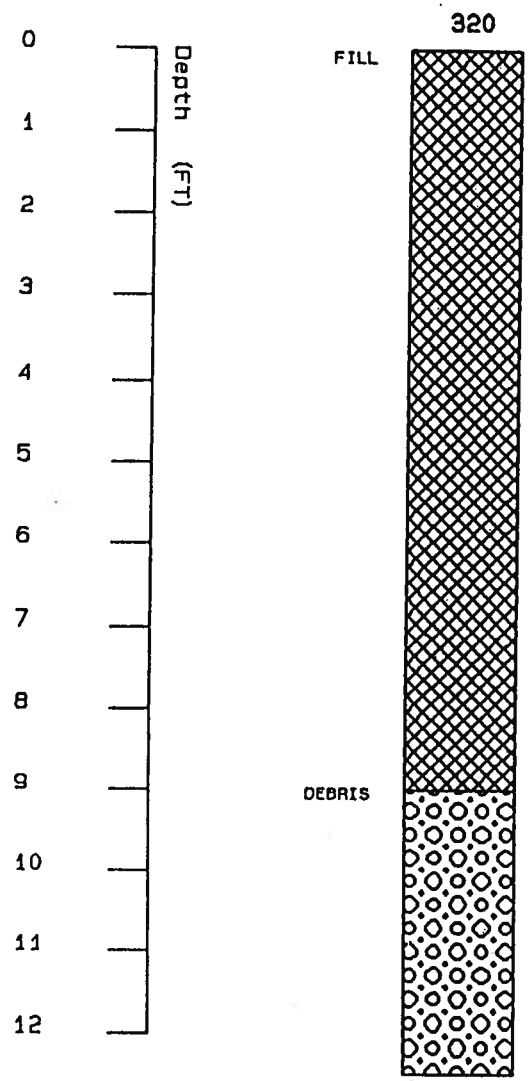
CLAY | SILTY C CLAYEY S | SANDY S SILTY S | DEBRIS

WELL ID : Lyondell Petrochemical Company
Boring Log #319

Westing 1222, Northing 4338
Elevation 23.6

BROWN AND CALDWELL

Figure : 319



LEGEND

FILL

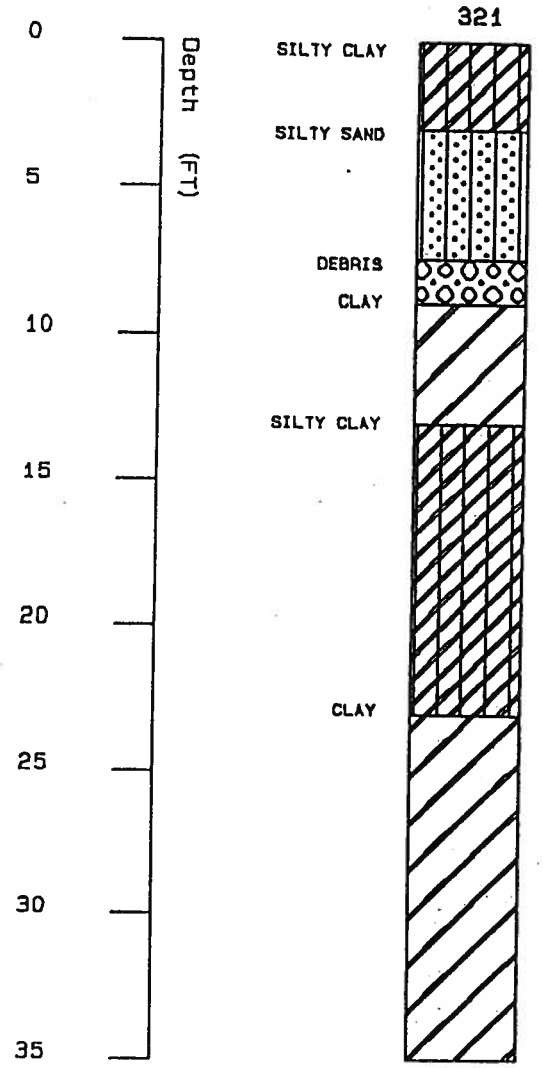
DEBRIS

WELL ID : Lyondell Petrochemical Company
Boring Log #320

Westing 1215, Northing 4337
Elevation 23.6

BROWN AND CALDWELL

Figure : 320



LEGEND

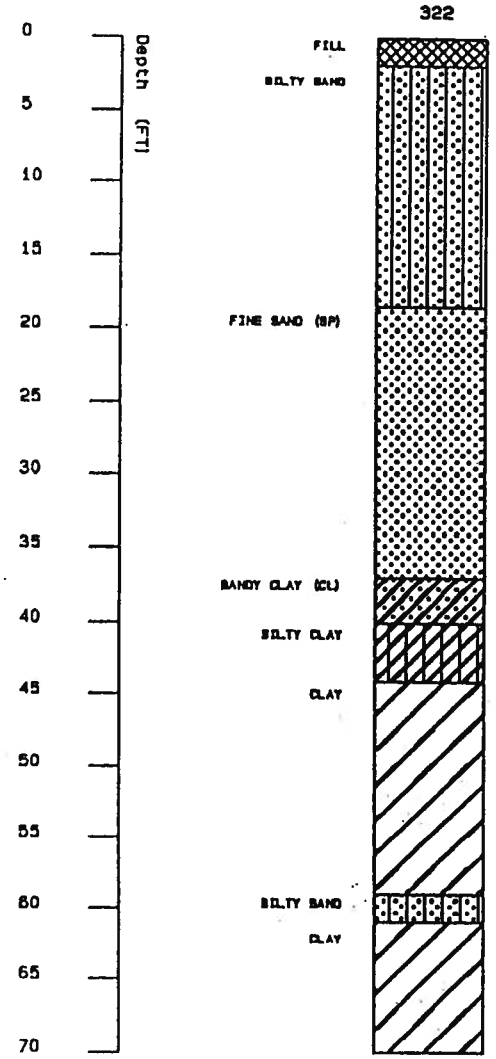
CLAY | SILTY CLAY | SILTY SAND | DEBRIS

WELL ID : Lyondell Petrochemical Company
Boring Log #321

Westing 1302, Northing 4405
Elevation 21.9

BROWN AND CALDWELL

Figure : 321



LEGEND

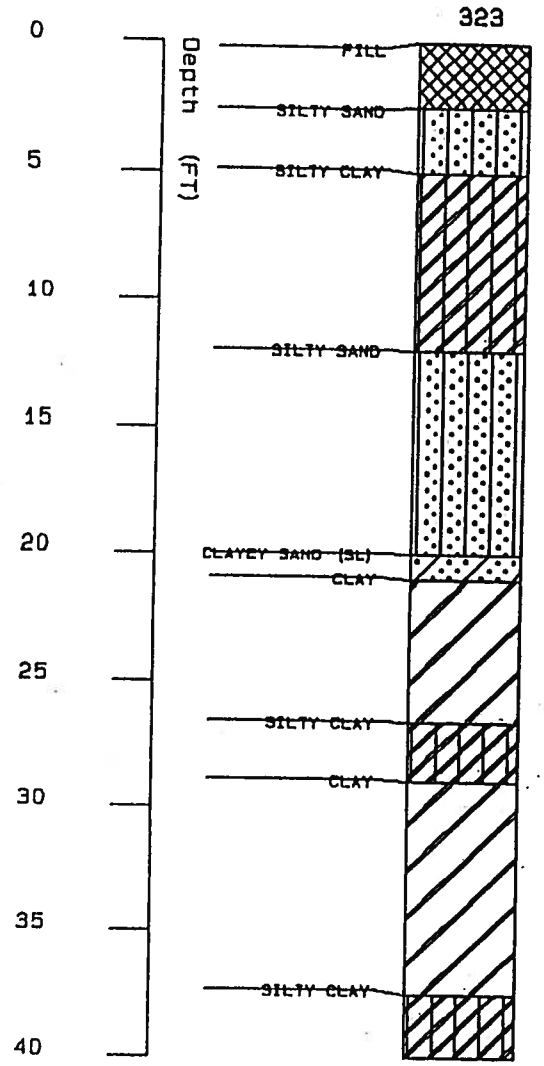
CLAY | SILTY CLAY | FINE SAND (SP) | SILTY SAND | FILL | SANDY CLAY (CL)

Lyondell Petrochemical Company
Boring Log #322

Westing 1488.0, Northing 4405.0
Elevation 20.60

BROWN AND CALDWELL

Figure : 322



LEGEND

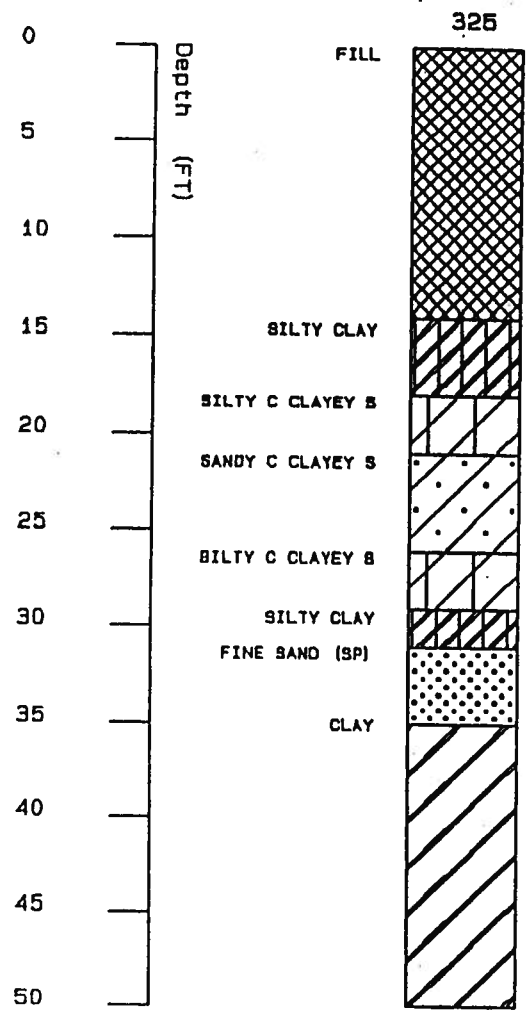
CLAY | SILTY CLAY | SILTY SAND | CLAYEY SAND (SL) | FILL

WELL ID : Lyondell Petrochemical Company
Boring Log #323

Westing 749, Northing 4195
Elevation 22

BROWN AND CALDWELL

Figure : 323



LEGEND

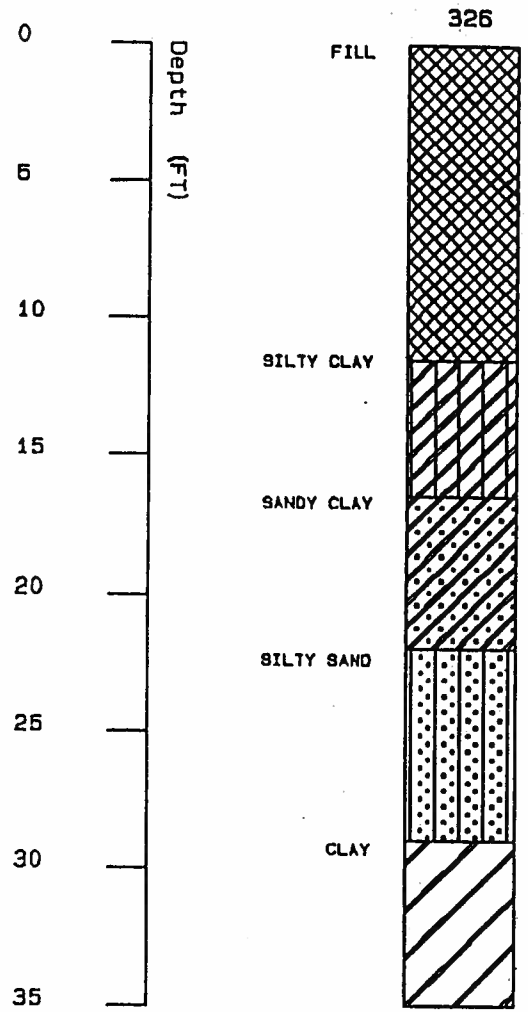
CLAY | SILTY CLAY | FINE SAND (SP) | FILL | SILTY C CLAYEY S | SANDY C CLAYEY S

Lyondell Petrochemical Company
Boring Log #325

Westing 225 Northing 4957
Elevation 18.40

BROWN AND CALDWELL

Figure : 325



LEGEND

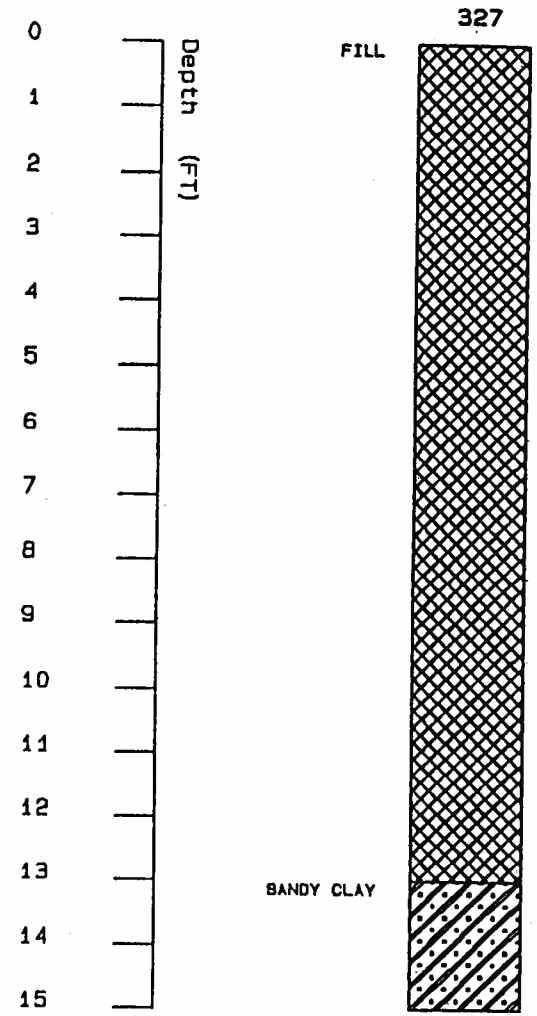
CLAY | SANDY CLAY | SILTY CLAY | SILTY SAND | FILL

Lyondell Petrochemical Company
Boring Log #326

Westing 517 Northing 4813
Elevation 17.30

BROWN AND CALDWELL

Figure : 326



LEGEND

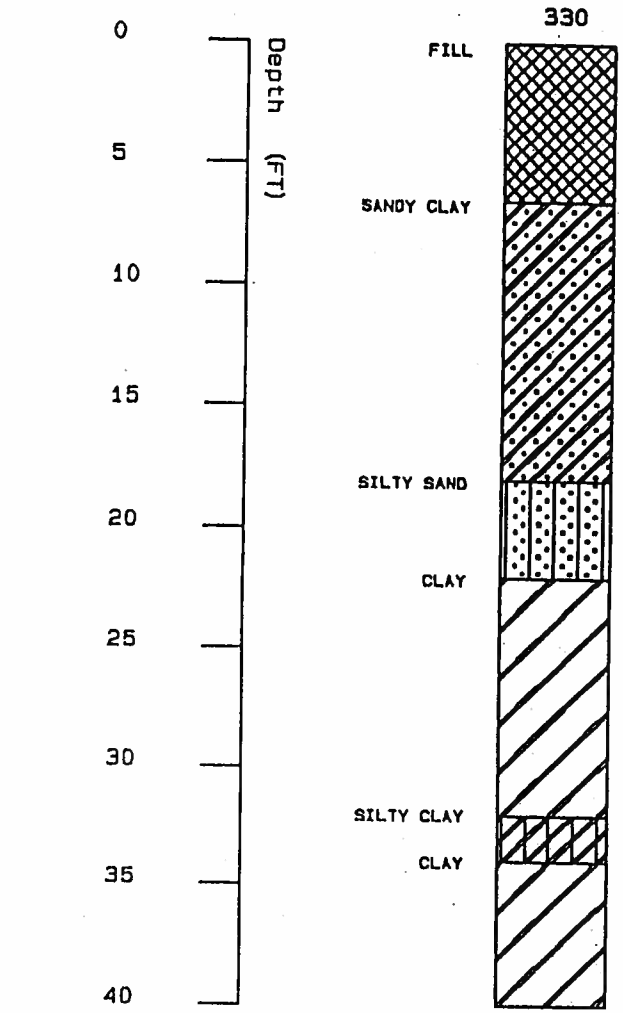
SANDY CLAY FILL

Lyondell Petrochemical Company
Boring Log #327

Westing 412 Northing 4601
Elevation 17.30

BROWN AND CALDWELL

Figure : 327



LEGEND

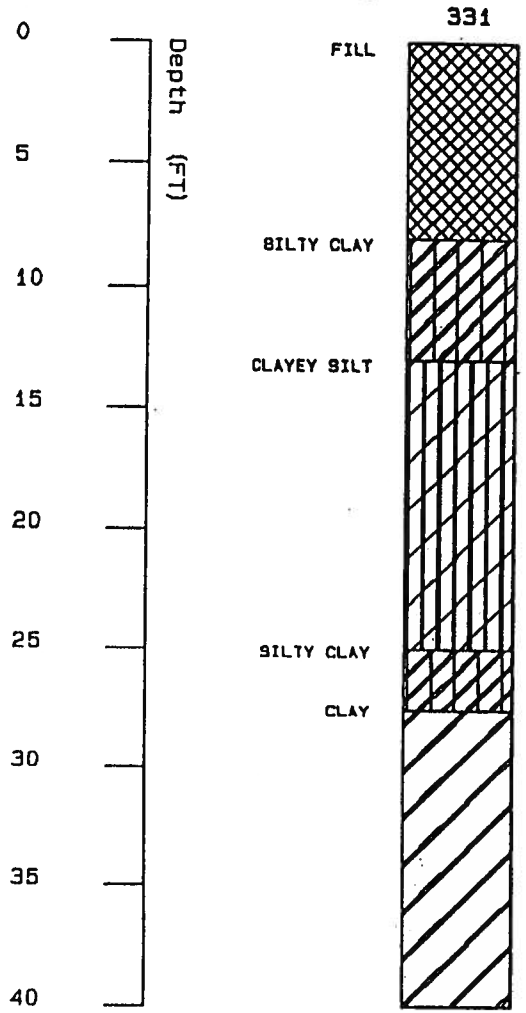
CLAY | SANDY CLAY | SILTY CLAY | SILTY SAND | FILL

Lyondell Petrochemical Company
Boring Log #330

Westing 1048 Northing 4187
Elevation 15.10

BROWN AND CALDWELL

Figure : 330



LEGEND

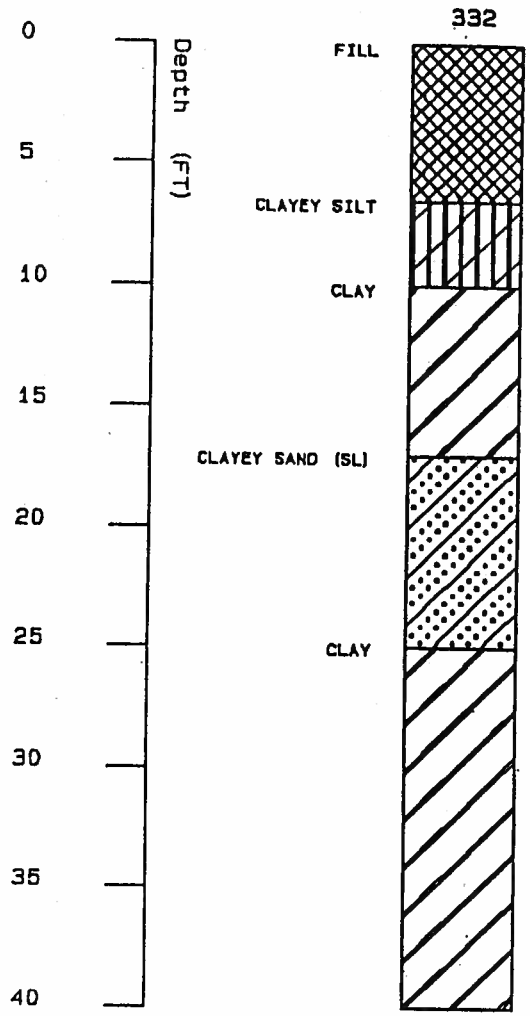
CLAY SILTY CLAY CLAYEY SILT FILL

Lyondell Petrochemical Company
Boring Log #331

Westing 1164 Northing 4384
Elevation 14.50

BROWN AND CALDWELL

Figure : 331



LEGEND

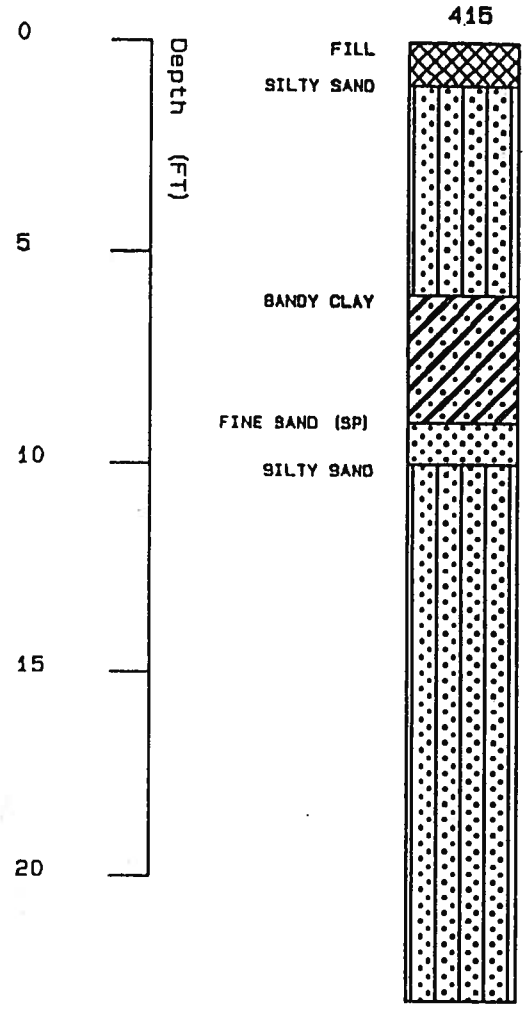
CLAY CLAYEY SAND (SL) CLAYEY SILT FILL

Lyondell Petrochemical Company
Boring Log #332

Westing_ 1208, Northing 4194
Elevation 16.40

BROWN AND CALDWELL

Figure : 332



LEGEND

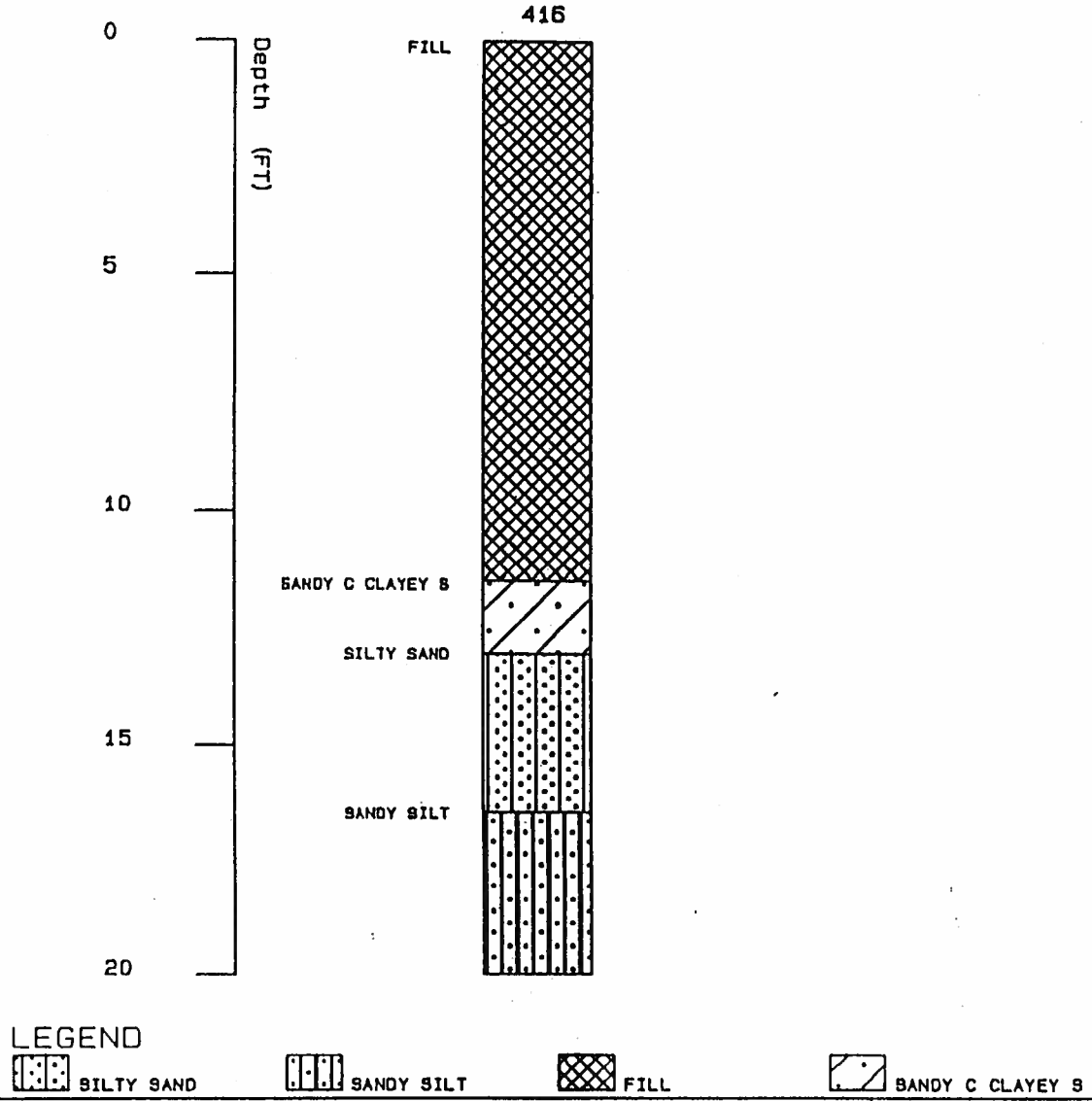
SANDY CLAY | FINE SAND (SP) | SILTY SAND | FILL

Lyondell Petrochemical Company
Boring Log #415

Westing 1101, Northing 4637
Elevation 12.00

BROWN AND CALDWELL

Figure : 415

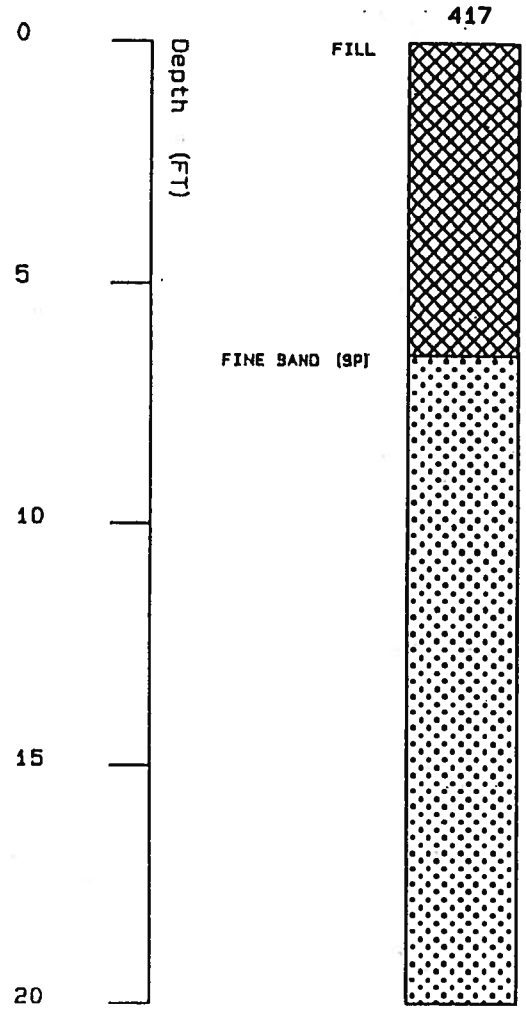


Lyondell Petrochemical Company
Boring Log #416

Westing 929, Northing 4644
Elevation 9.70

BROWN AND CALDWELL

Figure : 416



LEGEND

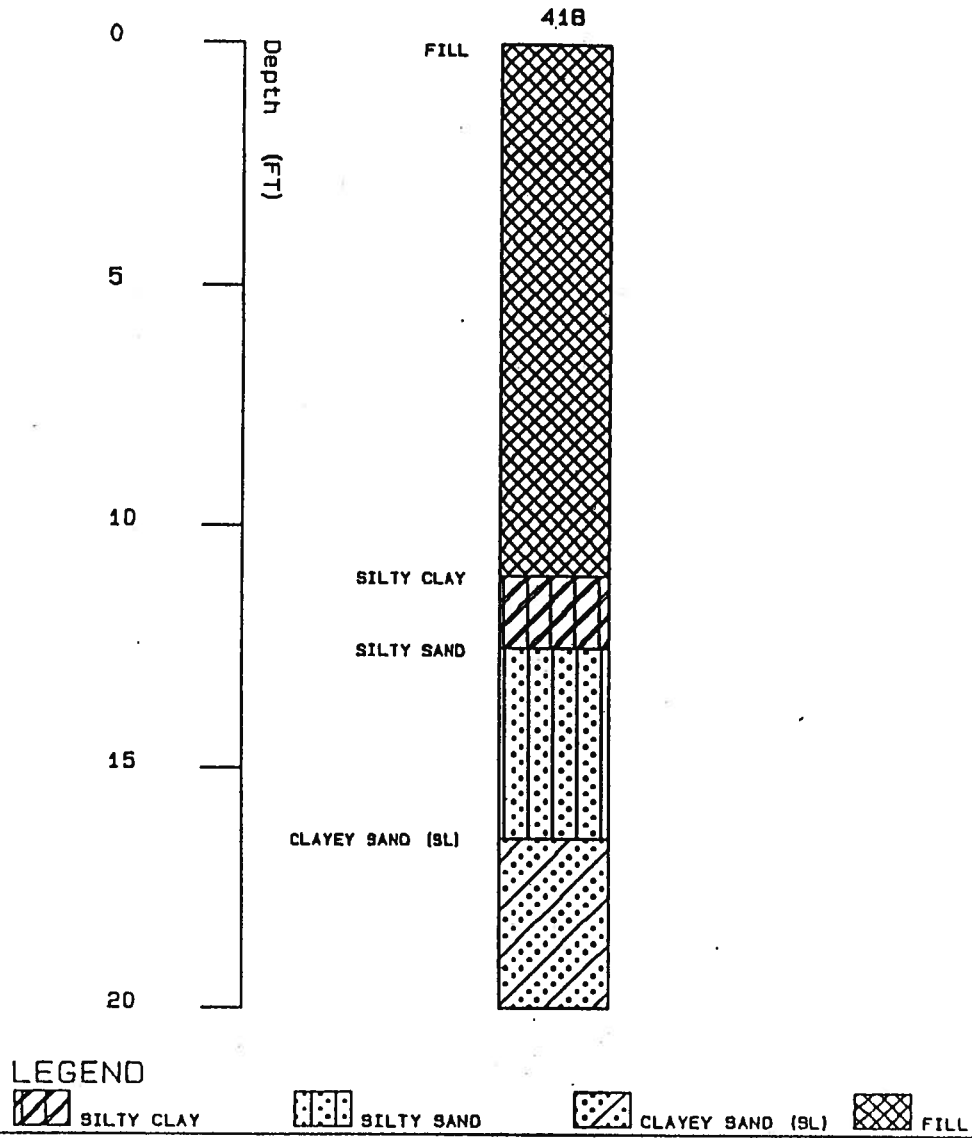
FINE SAND (SP) FILL

Lyondell Petrochemical Company
Boring Log #417

Westing 1149, Northing 4740
Elevation 7.80

BROWN AND CALDWELL

Figure : 417

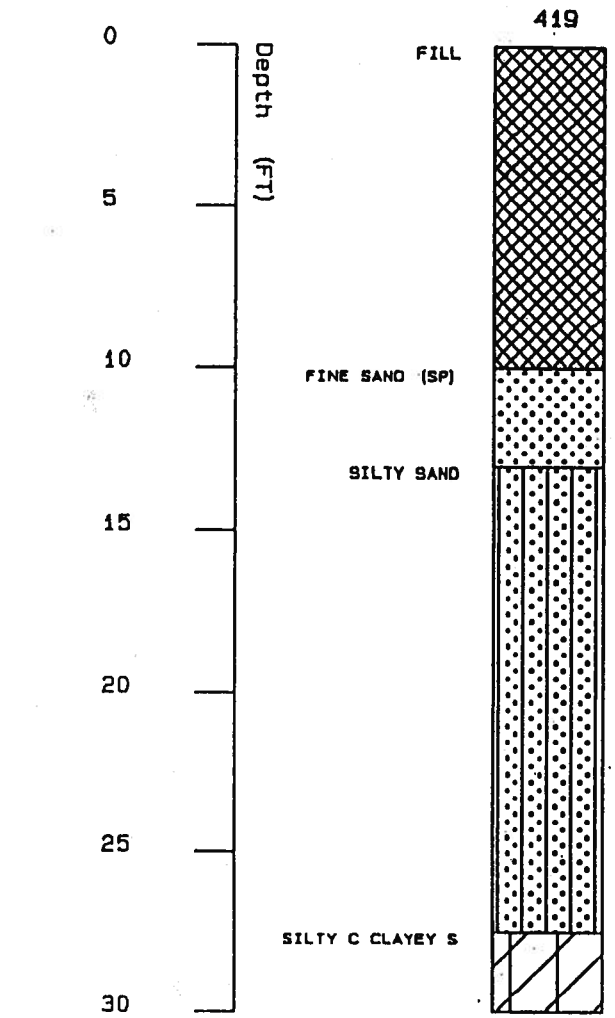


Lyondell Petrochemical Company
Boring Log #418

Westing 990, Northing 4840
Elevation 7.80

BROWN AND CALDWELL

Figure : 418



LEGEND

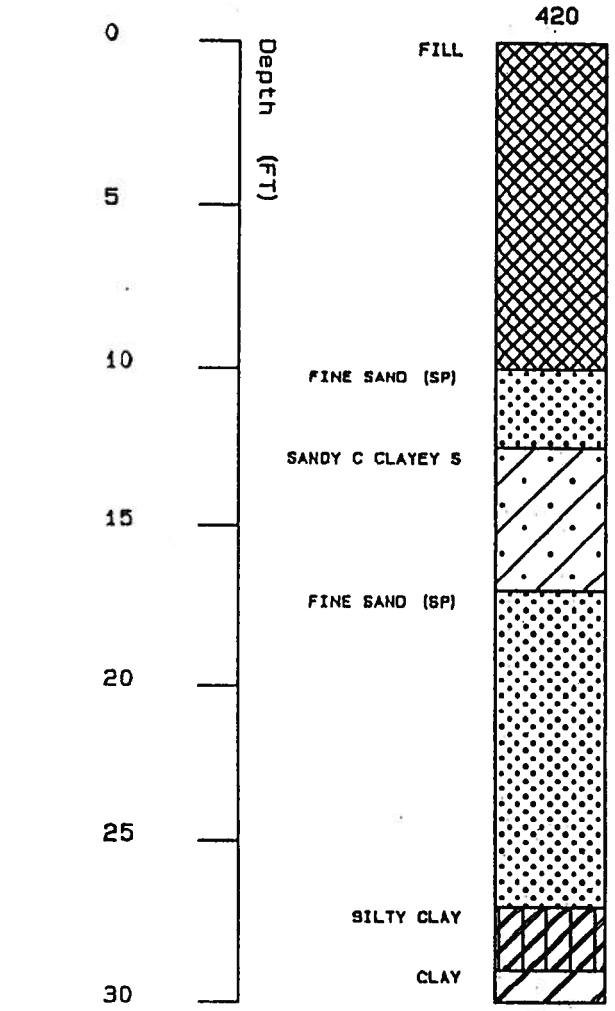
FINE SAND (SP) | SILTY SAND | FILL | SILTY C CLAYEY S

Lyondell Petrochemical Company
Boring Log #419

Westing 790, Northing 4940
Elevation 8.80

BROWN AND CALDWELL

Figure : 419



LEGEND

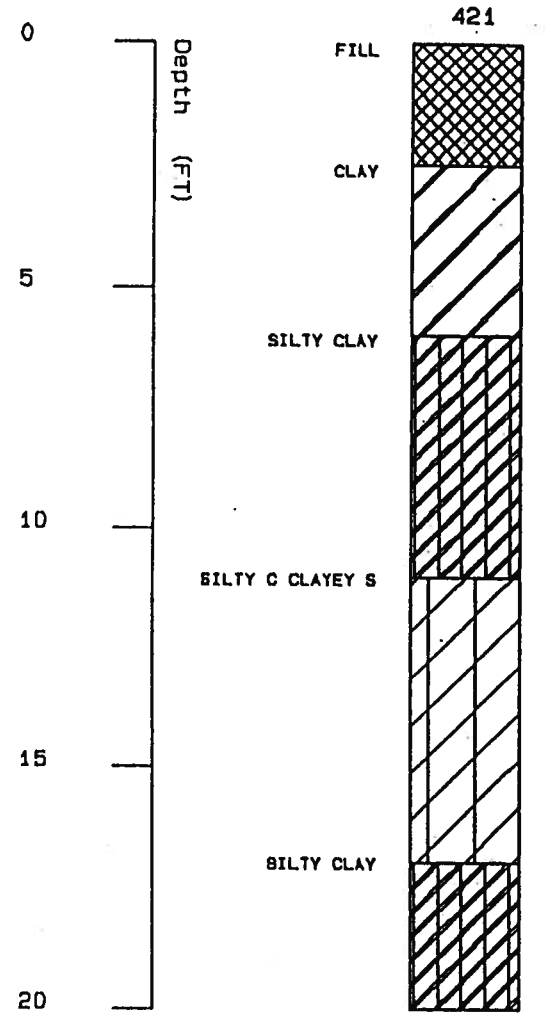
CLAY | SILTY CLAY | FINE SAND (SP) | FILL | SANDY C CLAYEY S

Lyondell Petrochemical Company
Boring Log #420

Westing 610, Northing 5005
Elevation 9.80

BROWN AND CALDWELL

Figure : 420



LEGEND

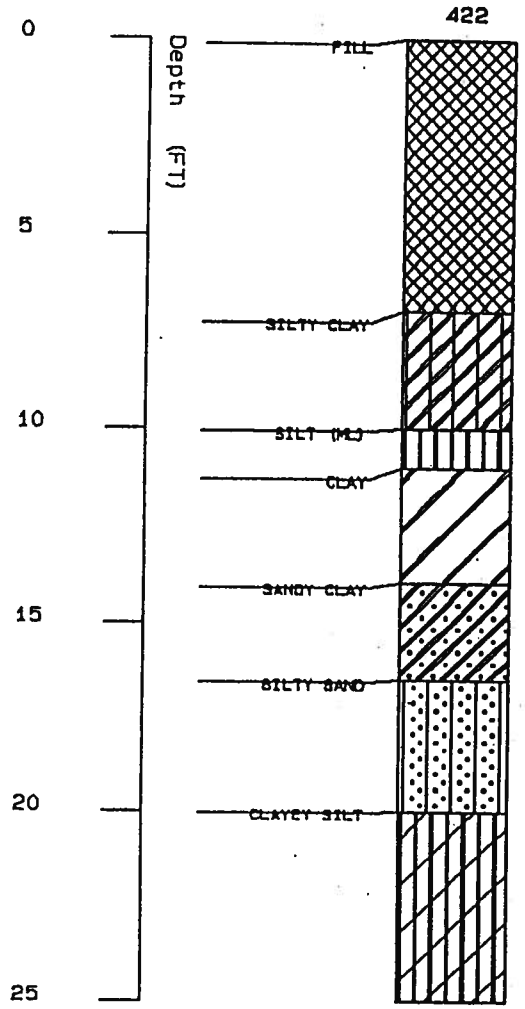
CLAY | SILTY CLAY | FILL | SILTY C CLAYEY S

Lyondell Petrochemical Company
Boring Log #421

Westing 400, Northing 5070
Elevation 10.80

BROWN AND CALDWELL

Figure : 421



LEGEND

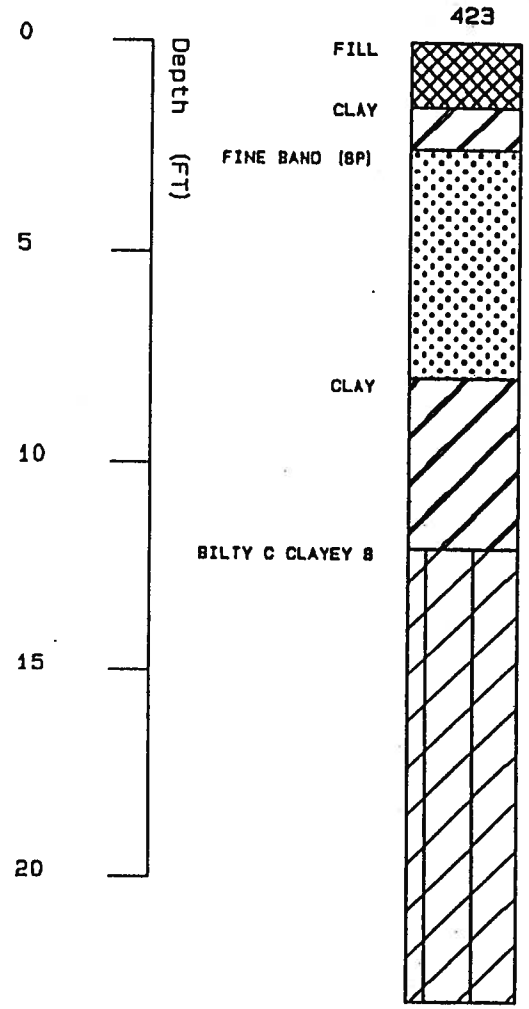
CLAY
SANDY CLAY
SILTY CLAY
SILTY SAND
SILT (ML)
CLAYEY SILT
FILL

WELL ID : Lyondell Petrochemical Company
Boring Log #422

Westing 215, Northing 5125
Elevation 23

BROWN AND CALDWELL

Figure : 422



LEGEND

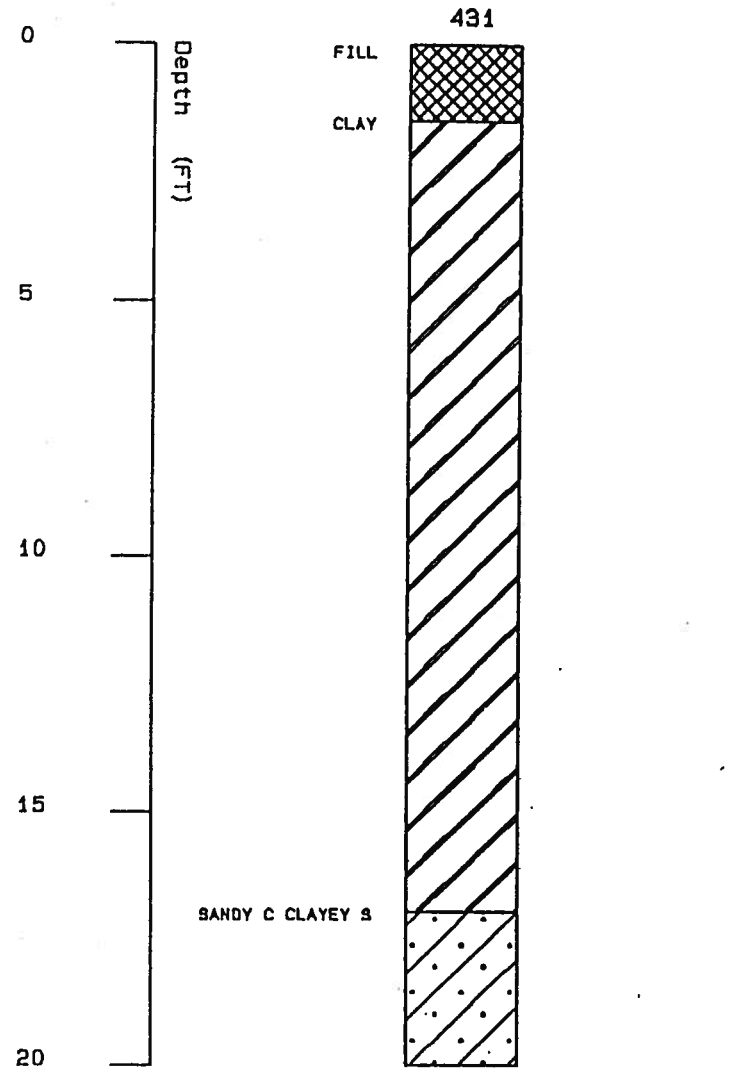
CLAY FINE SAND (SP) FILL SILTY C CLAYEY S

Lyondell Petrochemical Company
Boring Log #423

Westing 160, Northing 5005
Elevation 15.80

BROWN AND CALDWELL

Figure : 423



LEGEND

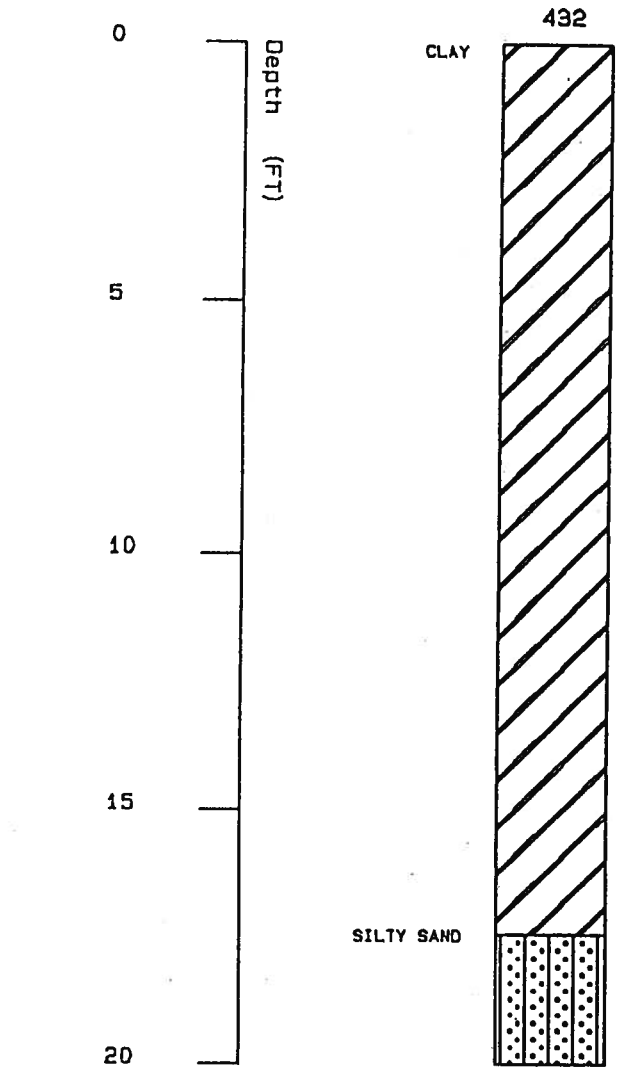
CLAY FILL SANDY C CLAYEY S

WELL ID : Lyondell Petrochemical Company
Boring Log #431

Westing 1086, Northing 3201
Elevation 31.3

BROWN AND CALDWELL

Figure : 431



LEGEND

CLAY

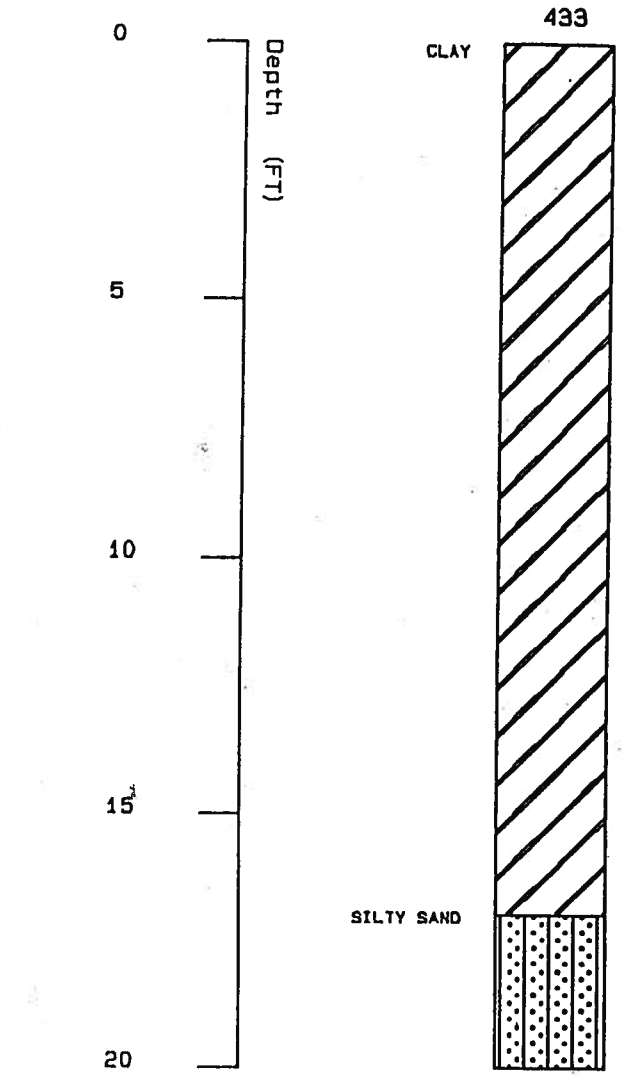
SILTY SAND

WELL ID : Lyondell Petrochemical Company
Boring Log #432

Westing 1056, Northing 3246
Elevation 31.1

BROWN AND CALDWELL

Figure : 432



LEGEND

CLAY

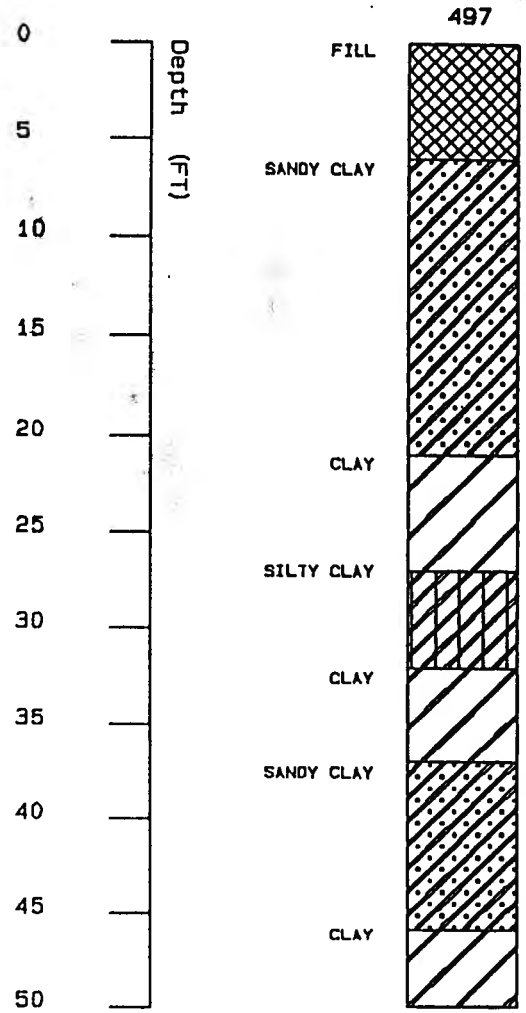
SILTY SAND

WELL ID : Lyondell Petrochemical Company
Boring Log #433

Westing 1029, Northing 3301
Elevation 31

BROWN AND CALDWELL

Figure : 433



LEGEND

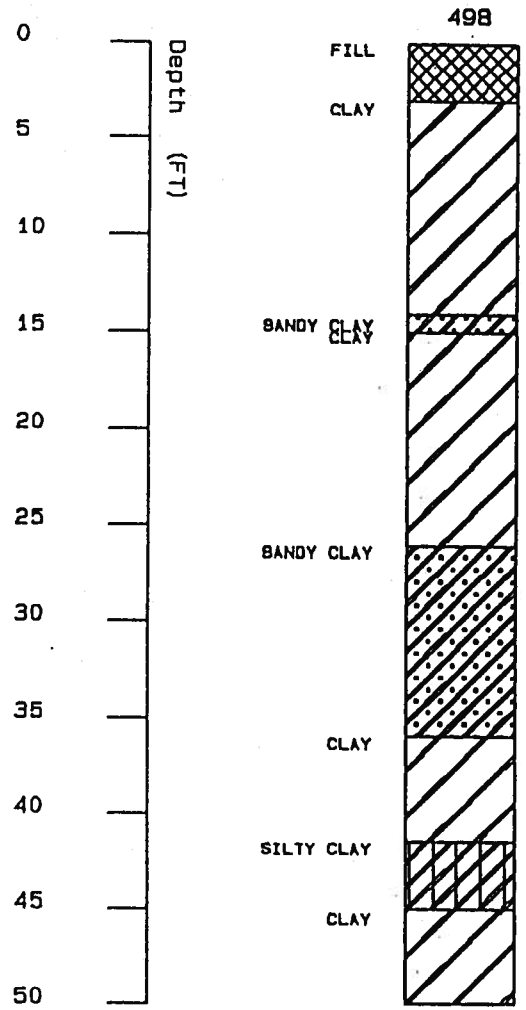
CLAY SANDY CLAY SILTY CLAY FILL

Lyondell Petrochemical Company
Boring Log #497

Westing 691, Northing 4253
Elevation 13.30

BROWN AND CALDWELL

Figure : 497



LEGEND

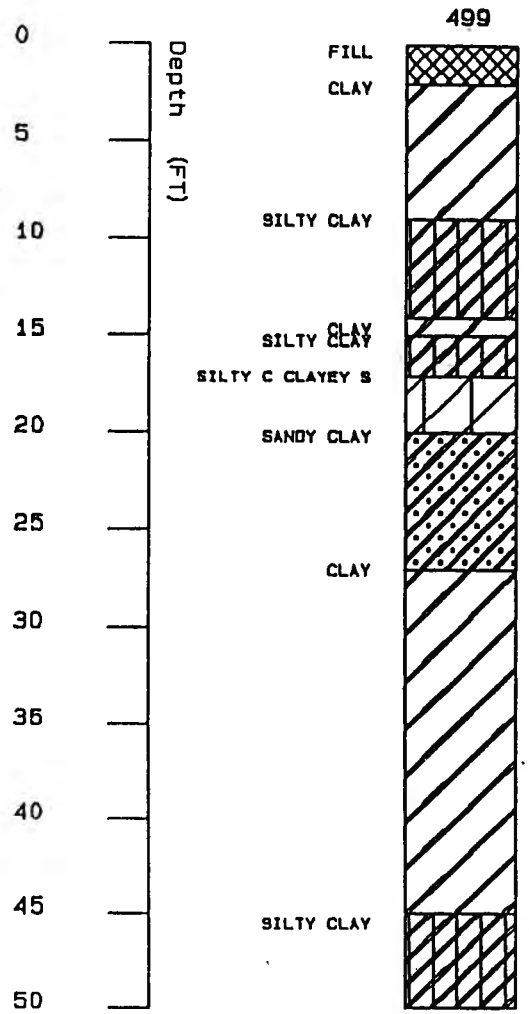
CLAY SANDY CLAY SILTY CLAY FILL

Lyondell Petrochemical Company
Boring Log #498

Westing 326, Northing 3998
Elevation 21.50

BROWN AND CALDWELL

Figure : 498



LEGEND

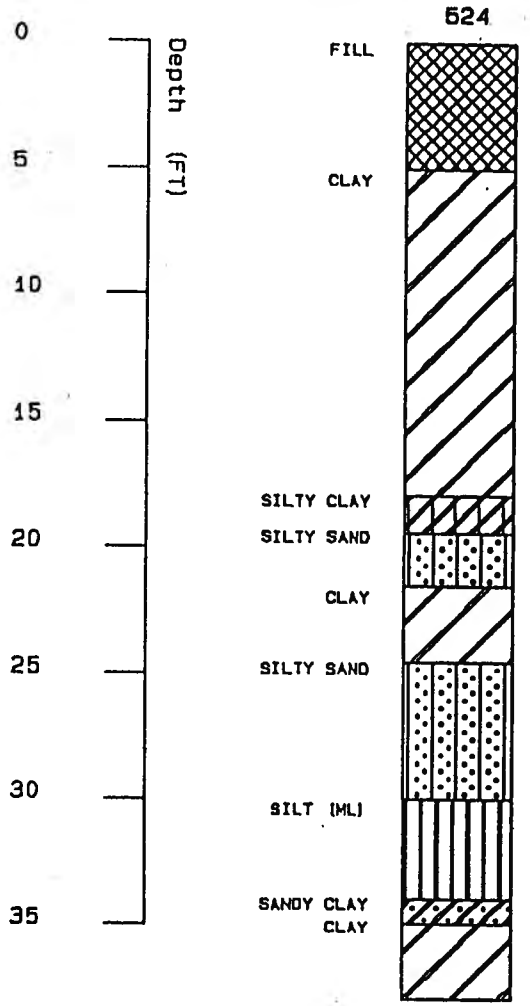
CLAY | SANDY CLAY | SILTY CLAY | FILL | SILTY C CLAYEY S

Lyondell Petrochemical Company
Boring Log #499

Westing 723, Northing 3812
Elevation 20.10

BROWN AND CALDWELL

Figure : 499



LEGEND

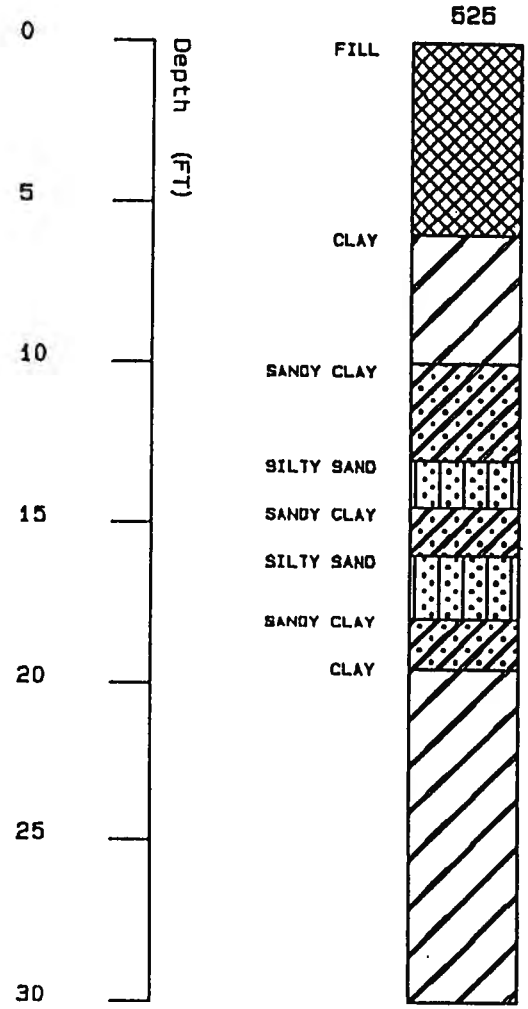
CLAY | SANDY CLAY | SILTY CLAY | SILTY SAND | SILT (ML) | FILL

Lyondell Petrochemical Company
Boring Log #524

Westing 97.62, Northing 1065.07
Elevation 25.20

BROWN AND CALDWELL

Figure : 524



LEGEND

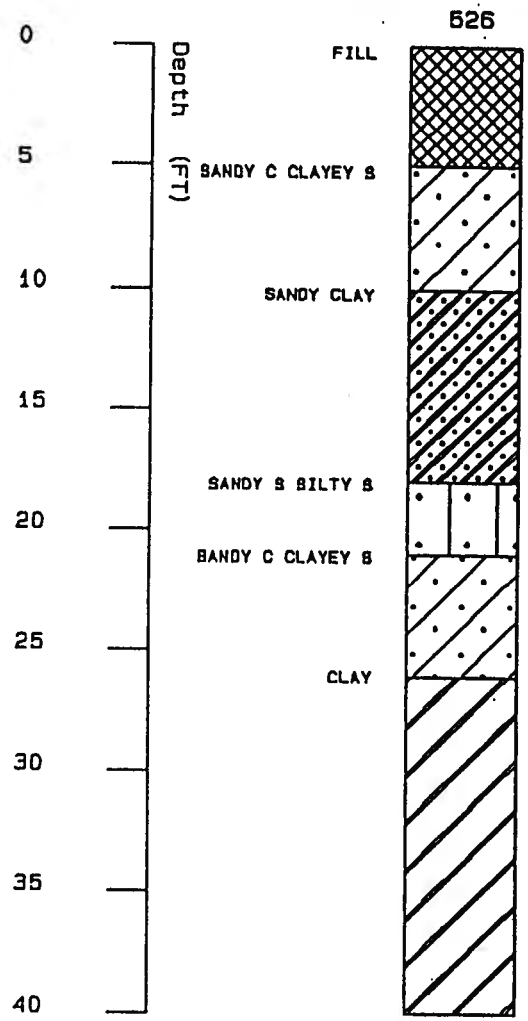
CLAY SANDY CLAY SILTY SAND FILL

Lyondell Petrochemical Company
Boring Log #525

Westing 660.18, Northing 4244.79
Elevation 13.70

BROWN AND CALDWELL

Figure : 525



LEGEND

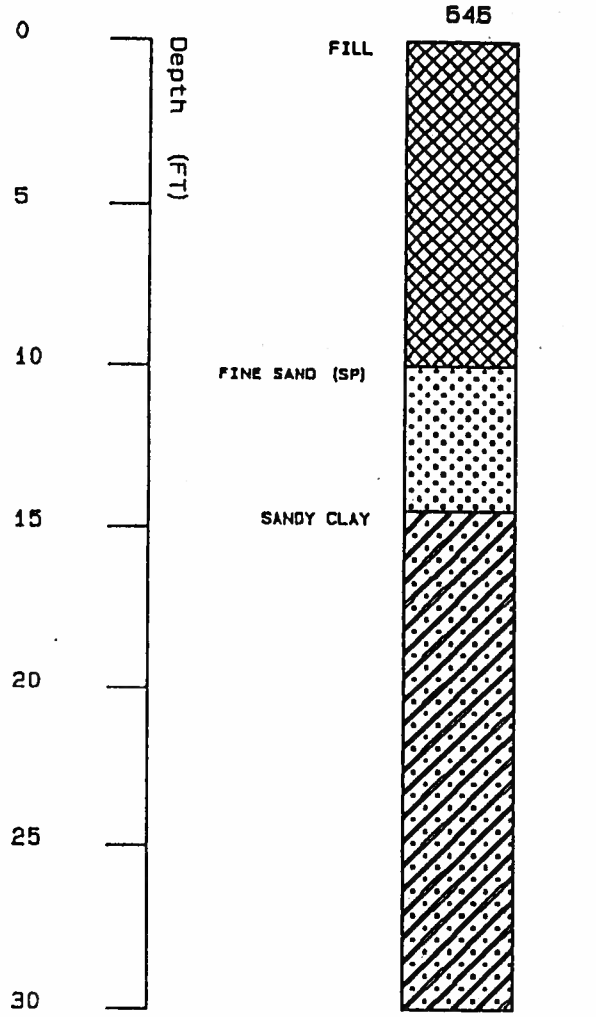
CLAY | SANDY CLAY | FILL | SANDY C CLAYEY S | SANDY S SILTY S

Lyondell Petrochemical Company
Boring Log #526

Westing 229.33, Northing 5170.56
Elevation 11.00

BROWN AND CALDWELL

Figure : 526



LEGEND

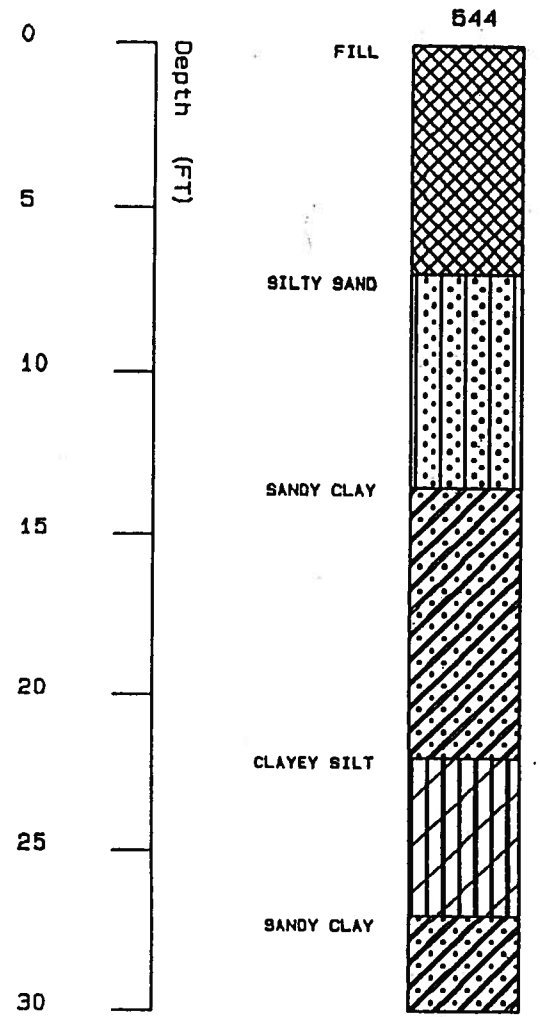
SANDY CLAY FINE SAND (SP) FILL

Lyondell Petrochemical Company
Boring Log #545

Westing 350, Northing 4900
Elevation 18.00

BROWN AND CALDWELL

Figure : 545



LEGEND

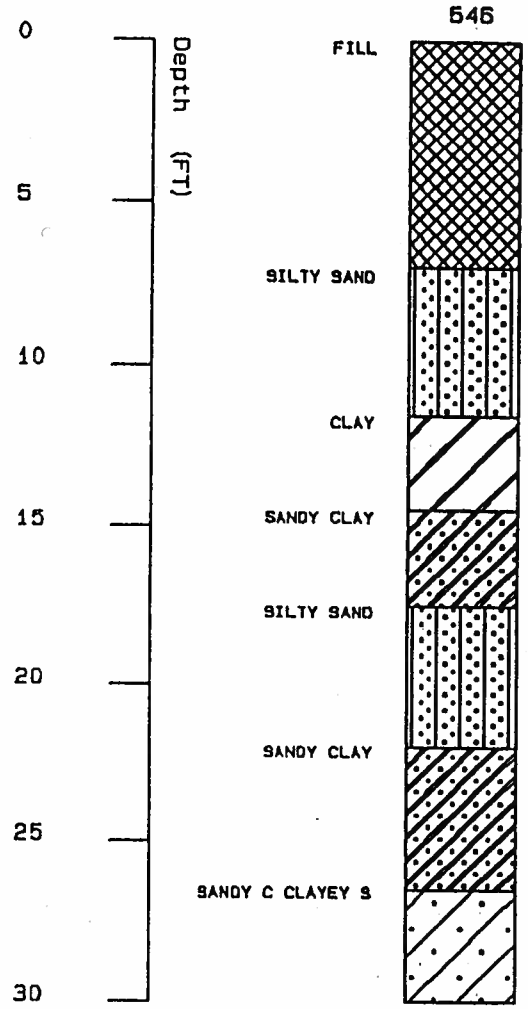
SANDY CLAY SILTY SAND CLAYEY SILT FILL

Lyondell Petrochemical Company
Boring Log #544

Westing 460, Northing 4860
Elevation 17.90

BROWN AND CALDWELL

Figure : 544



LEGEND

CLAY | SANDY CLAY | SILTY SAND | FILL | SANDY C CLAYEY S

Lyondell Petrochemical Company
Boring Log #546

Westing 227.40, Northing 4950.90
Elevation 18.50

BROWN AND CALDWELL

Figure : 546