Administratively Complete
RCRA Permit Application
Union Carbide Corporation
HW 50264
February 14, 2025

December 18, 2024 **FedEx # 7701 3506 5927**

Martin Torres, Manager
Industrial and Hazardous Waste Permits Division, MC-130
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Subject: RCRA Permit / Compliance Plan Renewal Application
Union Carbide Corporation – Texas City Operations
Off-Plant Disposal Area (OPDA) Facility.
Hazardous Waste Permit No. 50264
Industrial Solid Waste Registration No. 35921
EPA Identification No. TXD980626782
CN601688781 / RN105087829

Dear Mr. Torres:

Enclosed is an original Part A and Part B permit renewal application plus one copy for the above referenced Hazardous Waste Permit/Compliance Plan for the Union Carbide Corporation, Texas City Operations, Off-Plant Disposal Area (OPDA) Facility. Plain Language Summary Forms, Public Involvement Plan Form, Part B Administrative and Technical Evaluation Checklist, and Mailing Labels are also included. Application processing fees have been submitted under separate cover to the Financial Administration Division.

Should you have any questions or need further information for this submittal, please contact Michelle Vetterlein at 303-747-5308 or e-mail at [redacted].

Sincerely,

Casey Rhodes
Senior Responsible Care Director

Enclosures:
Plain Language Summary Form (English and Spanish)
Public Involvement Plan Form for Permit and Registration Applications
Part A Renewal Application (includes Part A Signature Page)
Part B Renewal Application (includes Part B Signature Page and Core Data Form)
Part B Administrative and Technical Evaluation Checklist (on CD)
Mailing Labels (on CD)

cc: Mike Duffin / TCEQ VCP-CA Section, FedEx # 7701 3516 0398
Karina Rocha / TCEQ Region 14 Waste Section Manager (Cover Letter Only), FedEx # 7701 3522 9751
Michelle Vetterlein / Dow (electronic)
Donnie Belote / Dow (electronic)
Richard Trevino / Arcadis (electronic)

Texas Commission on Environmental Quality

Waste Permits Division Correspondence Cover Sheet

Date: December 18, 2024
Facility Name: Union Carbide Corporation, Off-Plant Disposal Area
Permit or Registration No.: HW-50264

Nature of Correspondence:
☒ Initial/New
☐ Response/Revision to TCEQ Tracking No.: ______ (from subject line of TCEQ letter regarding initial submission)

Affix this cover sheet to the front of your submission to the Waste Permits Division. Check appropriate box for type of correspondence. Contact WPD at (512) 239-2335 if you have questions regarding this form.

Table 1 - Municipal Solid Waste Correspondence

Applications	Reports and Notifications
☐ New Notice of Intent	☐ Alternative Daily Cover Report
☐ Notice of Intent Revision	☐ Closure Report
☐ New Permit (including Subchapter T)	☐ Compost Report
☐ New Registration (including Subchapter T)	☐ Groundwater Alternate Source Demonstration
☐ Major Amendment	☐ Groundwater Corrective Action
☐ Minor Amendment	☐ Groundwater Monitoring Report
☐ Limited Scope Major Amendment	☐ Groundwater Background Evaluation
☐ Notice Modification	☐ Landfill Gas Corrective Action
☐ Non-Notice Modification	☐ Landfill Gas Monitoring
☐ Transfer/Name Change Modification	☐ Liner Evaluation Report
☐ Temporary Authorization	☐ Soil Boring Plan
☐ Voluntary Revocation	☐ Special Waste Request
☐ Subchapter T Disturbance Non-Enclosed Structure	☐ Other:
☐ Other:	

Table 2 - Industrial & Hazardous Waste Correspondence

Applications	Reports and Responses
☐ New	☐ Annual/Biennial Site Activity Report
☒ Renewal	☐ CPT Plan/Result
☐ Post-Closure Order	☐ Closure Certification/Report
☐ Major Amendment	☐ Construction Certification/Report
☐ Minor Amendment	☐ CPT Plan/Result
☐ CCR Registration	☐ Extension Request
☐ CCR Registration Major Amendment	☐ Groundwater Monitoring Report
☐ CCR Registration Minor Amendment	☐ Interim Status Change
☐ Class 3 Modification	☐ Interim Status Closure Plan
☐ Class 2 Modification	☐ Soil Core Monitoring Report
☐ Class 1 ED Modification	☐ Treatability Study
☐ Class 1 Modification	☐ Trial Burn Plan/Result
☐ Endorsement	☐ Unsaturated Zone Monitoring Report
☐ Temporary Authorization	☐ Waste Minimization Report
☐ Voluntary Revocation	☐ Other:
☐ 335.6 Notification	
☐ Other:	

Adjacent Landowners Mailing List

UNION CARBIDE CORP
DOW CHEMICAL COMPANY
TAX DEPT APB BLDG FLOOR 4-A
332 SH 332 E
LAKE JACKSON TX 77566

GULF COAST WSTE/DISP AUTH
BP PORPERTY TAX DEPT
PO BOX 3092
HOUSTON TX 77253-3092

OILTANKING TEXAS CITY LP
PROPERTY TAX DEPARTMENT
9805 KATY FRWY STE 400
HOUSTON TX 77024-1269

TEXAS CITY TERMINAL RAILWAY CO
2425 HIGHWAY 146 N
TEXAS CITY TEXAS 77590-8811

OIL TANKING TEXAS INDEPENDENT
DEEPWATER EXPANSION LLC
9805 KATY FRWY STE 400
HOUSTON TX 77024-1269

Plain Language Summary Form

Texas Commission on Environmental Quality

Plain Language Summary

Industrial and Hazardous Waste Permit Applications

Instructions: Complete this form and submit with any industrial hazardous waste, or industrial solid waste, permit application that is subject to 30 Texas Administrative Code §39.405(k) [applications for a Class 3 permit modification, permit amendment, permit renewals, and for a new permit]. Please be concise.

Application Information

Purpose of application: ☐New ☒Renewal ☐Modification/Amendment

Date Submitted to TCEQ: December 18, 2024

Customer Name: Union Carbide Corporation

Facility Name: Union Carbide Corporation, Off-Plant Disposal Area (OPDA) Facility

CN: 601688781	**RN:** 105087829
Permit Number: 50264	**Solid Waste Registration Number:** 35921

Facility Street Address: 2800 Loop 197 S, Texas City, TX 77592

Weblink to Street Address:

Facility Information *(check all that apply)*

What is the primary type of business?	☒Chemical manufacturing plant ☐ Oil refinery ☒ Treatment, storage or disposal facility ☐Other **If other, enter description:**
What does the facility produce?	☒Chemicals ☐Fuels / lubricants ☐No products ☐Other **If other, enter description:**

Waste Management Information *(check all that apply)*

What types of wastes are managed?	☒Nonhazardous industrial ☒Hazardous ☐Other **If other, enter description:**
Where does the waste come from?	☐Off-site source ☒On-site source
How is the waste managed?	☒Storage ☒Process / Treatment ☒Disposal ☐Other **If other, enter description:**
What type of units manage the waste?	☒Active ☒Post-Closure **Type and count:** Wastes managed in permit exempt container storage area or tank, 85 units are closed or post-closure care, 2 inactive units.
What happens to waste managed at the facility?	☒Transported off-site ☒Disposed on-site ☐Other **If other, enter description:**

Pollution Control Methods *(check all that apply)*

How will the facility prevent spills, leaks, and releases?	☐Routine inspections ☐Engineered liner systems ☒Spill containment ☐Proper waste handling ☐Operations in enclosed buildings ☐Groundwater monitoring ☐Other **If other, enter description:**
How will the facility clean up spills, leaks, and releases?	☒Spill clean-up supplies ☒Decontamination equipment ☐Other **If other, enter description:**
How will the facility prevent / minimize air emissions?	☐Air monitoring / control systems ☐Filters / scrubbers ☐Routine inspections ☐Proper waste handling ☐Operations in enclosed buildings ☐Other **If other, enter description:**

Description of Update *(for Class 3 Modifications and Amendments only)*

List and explain any changes this modification or amendment would make to the two sections above—**Waste Management Information** and **Pollution Control Methods**.

Clear Form

Comisión de Calidad Ambiental de Texas

Resumen en Lenguaje Sencillo

Solicitudes de Permisos de Desechos Industriales y Peligrosos

Instrucciones

Complete este formulario y envíe con cualquier solicitud de permiso de desechos industriales peligrosos, o desechos sólidos industriales, que esté sujeta al Código Administrativo de Texas 30 §39.405 (k) [es decir, solicitudes para una modificación de permiso de Clase 3, enmienda de permiso, renovaciones de permisos y para un nuevo permiso].

Sea conciso: toda la información debe caber en dos páginas.

Información de la Solicitud

Propósito de la solicitud: ☐Nuevo ☒Renovación ☐Modificación/Enmienda

Sometido a TCEQ: 18 de diciembre de 2024

Nombre del Cliente: Union Carbide Corporation

Nombre de la Instalación: Union Carbide Corporation, Off-Plant Disposal Area (OPDA) Facility

CN: 601688781	**RN:**105087829
Número de Permiso:50264	**Número de Registro de Desechos Sólidos:** 35921

Dirección de la Instalación: 2800 Loop 197 S, Texas City, TX 77592

Enlace Web a la Dirección Postal: Ingrese el enlace que permite al público ver la ubicación física de la instalación

Información de la Instalación *(marque todas lo que correspondan)*

¿Cuál es el tipo principal de negocio?	☒Planta de manufactura química ☐Refinería de aceite ☒ Instalación de tratamiento, almacenamiento o eliminación ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción
¿Qué produce la instalación?	☐Químicos ☐Combustibles / lubricantes ☐Sin productos ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción

Información sobre la Gestión de Desechos *(marque todas las que correspondan)*

¿Qué tipos de desechos se gestionan?	☒Industrial no peligroso ☒Peligroso ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción
¿De dónde provienen los desechos?	☐Fuente externa ☒Fuente interna
¿Cómo se gestionan los desechos?	☒Almacenar ☒Procesar / Tratar ☒Eliminación ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción

¿Qué tipo de unidades gestionan los desechos?	☒ Activo ☒ Postcierre **Teclee y cuente:** Residuos manejados en área de almacenamiento de contenedores o tanque exentos de permiso, 85 unidades están cerradas o en cuidado post-cierre, 2 unidades inactivas.
¿Qué sucede con los desechos gestionados en la instalación?	☒Transportados fuera del sitio ☐Eliminado en el sitio ☐Otro **Si es otro, introduzca la descripción:**Introduzca la descripción

Métodos de Control de la Contaminación *(marque todos los que correspondan)*

¿Cómo evitará la instalación derrames, fugas y liberaciones?	☐Inspecciones de Rutina ☐Sistemas de revestimiento de ingeniería ☒Contención de derrames ☐Manejo adecuado de desechos ☐Operaciones en edificios cerrados ☐Monitoreo de aguas subterráneas ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción
¿Cómo limpiará la instalación los derrames, fugas y liberaciones?	☒Suministros de limpieza de derrames ☒Equipos de descontaminación ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción
¿Cómo evitará / minimizará la instalación las emisiones atmosféricas?	☐Sistemas de monitoreo / control de aire ☐Filtros / depuradores ☐Inspecciones de rutina ☐Manejo adecuado de desechos ☐Operaciones en edificios cerrados ☐Otro **Si es otro, introduzca la descripción:** Introduzca la descripción

Descripción de la Actualización (*solo para Modificaciones y Enmiendas de Clase 3)*

Liste y explique cualquier cambio que esta modificación o enmienda haría a las dos secciones anteriores: **Información de Gestión de Desechos** y **Métodos de Control de la Contaminación**.

Introduzca una descripción concisa

Public Involvement Plan Form

Texas Commission on Environmental Quality

Public Involvement Plan Form
for Permit and Registration Applications

The Public Involvement Plan is intended to provide applicants and the agency with information about how public outreach will be accomplished for certain types of applications in certain geographical areas of the state. It is intended to apply to new activities; major changes at existing plants, facilities, and processes; and to activities which are likely to have significant interest from the public. This preliminary screening is designed to identify applications that will benefit from an initial assessment of the need for enhanced public outreach.

All applicable sections of this form should be completed and submitted with the permit or registration application. For instructions on how to complete this form, see TCEQ-20960-inst.

Section 1. Preliminary Screening

☐ New Permit or Registration Application
☒ New Activity – modification, registration, amendment, facility, etc. (see instructions)

If neither of the above boxes are checked, completion of the form is not required and does not need to be submitted.

Section 2. Secondary Screening

☒ Requires public notice,

☐ Considered to have significant public interest, **and**

☒ Located within any of the following geographical locations:

- Austin
- Dallas
- Fort Worth
- Houston
- San Antonio
- West Texas
- Texas Panhandle
- Along the Texas/Mexico Border
- Other geographical locations should be decided on a case-by-case basis

If all the above boxes are not checked, a Public Involvement Plan is not necessary.
Stop after Section 2 and submit the form.

☒ Public Involvement Plan not applicable to this application. Provide **brief** explanation.

The Dow Off-Plant Disposal Area Facility is not considered to have significant public interest.

Section 3. Application Information

Type of Application (check all that apply):

Air ☐ Initial ☐ Federal ☐ Amendment ☐ Standard Permit ☐ Title V

Waste ☐ Municipal Solid Waste ☒ Industrial and Hazardous Waste ☐ Scrap Tire
☐ Radioactive Material Licensing ☐ Underground Injection Control

Water Quality

☐ Texas Pollutant Discharge Elimination System (TPDES)

- ☐ Texas Land Application Permit (TLAP)
- ☐ State Only Concentrated Animal Feeding Operation (CAFO)
- ☐ Water Treatment Plant Residuals Disposal Permit

☐ Class B Biosolids Land Application Permit

☐ Domestic Septage Land Application Registration

Water Rights New Permit

☐ New Appropriation of Water

☐ New or existing reservoir

Amendment to an Existing Water Right

☐ Add a New Appropriation of Water

☐ Add a New or Existing Reservoir

☐ Major Amendment that could affect other water rights or the environment

Section 4. Plain Language Summary

Provide a brief description of planned activities.

Section 5. Community and Demographic Information

Community information can be found using EPA’s EJ Screen, U.S. Census Bureau information, or generally available demographic tools.

Information gathered in this section can assist with the determination of whether alternative language notice is necessary. Please provide the following information.

(City)

(County)

(Census Tract)

Please indicate which of these three is the level used for gathering the following information.

☐ City ☐ County ☐ Census Tract

(a) Percent of people over 25 years of age who at least graduated from high school

(b) Per capita income for population near the specified location

(c) Percent of minority population and percent of population by race within the specified location

(d) Percent of Linguistically Isolated Households by language within the specified location

(e) Languages commonly spoken in area by percentage

(f) Community and/or Stakeholder Groups

(g) Historic public interest or involvement

Section 6. Planned Public Outreach Activities

(a) Is this application subject to the public participation requirements of Title 30 Texas Administrative Code (30 TAC) Chapter 39?

☐ Yes ☐ No

(b) If yes, do you intend at this time to provide public outreach other than what is required by rule?

☐ Yes ☐ No

If Yes, please describe.

If you answered "yes" that this application is subject to 30 TAC Chapter 39, answering the remaining questions in Section 6 is not required.

(c) Will you provide notice of this application in alternative languages?

☐ Yes ☐ No

Please refer to Section 5. If more than 5% of the population potentially affected by your application is Limited English Proficient, then you are required to provide notice in the alternative language.

If yes, how will you provide notice in alternative languages?

☐ Publish in alternative language newspaper
☐ Posted on Commissioner's Integrated Database Website
☐ Mailed by TCEQ's Office of the Chief Clerk
☐ Other (specify)

(d) Is there an opportunity for some type of public meeting, including after notice?

☐ Yes ☐ No

(e) If a public meeting is held, will a translator be provided if requested?

☐ Yes ☐ No

(f) Hard copies of the application will be available at the following (check all that apply):

☐ TCEQ Regional Office ☐ TCEQ Central Office
☐ Public Place (specify)

Section 7. Voluntary Submittal

For applicants voluntarily providing this Public Involvement Plan, who are not subject to formal public participation requirements.

Will you provide notice of this application, including notice in alternative languages?

☐ Yes ☐ No

What types of notice will be provided?

☐ Publish in alternative language newspaper
☐ Posted on Commissioner's Integrated Database Website
☐ Mailed by TCEQ's Office of the Chief Clerk
☐ Other (specify)

Part A, Section 1

Application Text and Tables

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

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[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.

officer or ranking elected official.

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

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

5. Fees and Costs

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

   b. The applicant for a permit is required to bear the cost of publication of notice of the application in a newspaper as prescribed by 30 TAC Section 39.405(f).

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: __**Union Carbide Corporation, A Wholly Owned Subsidiary of The Dow Chemical Company** ________

(Individual, Corporation, or Other Legal Entity Name)

TCEQ Solid Waste Registration No: _**35921**_______ EPA I.D. No.: _**TXD 980626782**_

Street Address (If Available): _**2800 Loop 197 South**______________

City: _**Texas City**_____________, State: _**TX**_________ Zip Code: _**77590**______

County: _**Galveston**___________________

Telephone Number: __**409-945-7411**______ Charter Number: _**1335606**________

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.

Union Carbide Corporation
A Wholly Owned Subsidiary of The Dow Chemical Company
2800 Loop 197 South
Texas City, Texas 77592

Casey Rhodes
Senior Responsible Care Director
281-553-2030
[redacted]

Michelle Vetterlein
Texas Waste Compliance and Permit Manager
304-747-5308
[redacted]

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.

C.T. Corporation System
1999 Bryan St., Ste 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

   UCC owns the former off-plant disposal area (OPDA) facility. The former Marine Terminal (MT) property, located west of the OPDA facility, was part of the UCC property included in the OPDA/MT Permit and Compliance Plan issued on June 30, 2004. The former MT property was transferred to Oiltanking Texas City, L.P. on July 1, 2004, but UCC has retained financial responsibility for soil and/or groundwater impacts from Solid Waste Management Units (SWMUs) identified at the former MT property. The SWMUs at the former MT property are addressed in Section XI of Part B Permit Application.

   If you checked "no",

   a. Submit as "Attachment A" a copy of the lease for use of or the option

---

[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].

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: ________________________

Owner Name: _______________________________

Address: ___________________________________

City: ____________________, State: _____________ Zip Code: __________

Telephone Number: ___________________

E. Type of Application Submittal:

Initial ___X____ or Revision _ _______

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	**__35921__**	**__TCEQ___**
2. Wastewater disposal under the Texas Water Code	**None_**	_ __
3. Underground injection under the Texas Water Code	**__None____**	__________
4. Texas Clean Air Act	**__None____**	__ ___
5. Texas Uranium Surface Mining & Reclamation Act	**_None_____**	__________
6. Texas Surface Coal Mining & Reclamation Act	**_None_____**	__________
7. Hazardous Waste Management program under the Resource Conservation and Recovery Act	**__TXD980626782**	***_EPA***
	__HW-50264	***_TCEQ***

8. UIC program under the Safe Drinking Water Act	__**None**______	___________
9. TPDES program under the Clean Water Act	**TXRNET702**	***TCEQ (Stormwater)***
	TXRNEBI89	***TCEQ (Stormwater)***
10. PSD program under the Clean Air Act	_**None**_______	___________
11. Nonattainment program under the Clean Air Act	__**None**______	___________
12. National Emission Standards for Hazardous Pollutants (NESHAP) Pre-construction approval under the Clean Air Act	_**None**_______	___________
13. Ocean dumping permits under the Marine Protection Research and Sanctuaries Act	_**None**_______	___________
14. Dredge or fill permits under section 404 of the Clean Water Act	__**None**______	___________
15. Other relevant environmental permits	_**None**_______	___________

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

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

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

This inactive OPDA facility was historically used for treatment and disposal of the waste generated from the UCC Main Plant facility in Texas City, Texas. The OPDA facility is currently under the corrective action program of the Compliance Plan.

H. TCEQ Core Data Form

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

See Appendix I (General Information) of the Part B Permit Application for the Core Data Form..

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: 12/09/2024

Name and Official Title (type or print): Casey Rhodes Responsible Care Director

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, ________________ (operator) hereby designate ________________ (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 Casey Rhodes on this 9th day of December, 2024.

My commission expires of the 19th day of January, 2026

Kathryne Kurtz
Notary Public in and for Galveston County, Texas

KATHRYNE KURTZ
ID 129540656
EXP. 01-19-2026

II. Facility Background Information

A. Location of Facility for which the application is submitted

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

   The facility is located on the east side of Loop 197, to the south of the Texas City Industrial Ship Channel in Texas City, Galveston County, Texas.

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

   To access the facility, from the city of Texas City, head south on Loop 197 to the Dow OPDA entrance.

3. Enter the geographical coordinates of the facility:

   Latitude: __**29**_______ deg __**21**______ min __**27**______ sec

   Longitude: __**94**______ deg __**54**______ min __**20**______ 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.

Refer to Attachment B of the Part A Permit Application for the legal description of the OPDA facility.

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
2869	**Industrial Organic Chemicals**

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.

   Table III-1 has been completed and includes hazardous wastes which were and are presently handled at the UCC OPDA facility. Information in this table is based on the Notice of Registration (NOR) currently available at the TCEQ website.

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."

Table III-2 has been completed and includes all hazardous waste management units that have been closed, as there are no active or inactive hazardous waste management units at the UCC OPDA facility. Four regulated units, including Basins 3 and 5, North Phase Separation Organic Pit, and South Phase Separation Organic Pit (NOR No. 9, 5, 2, and 18, respectively), have been certified for closure and approved by the Texas Water Commission (TWC) on July 31, 1987. Information in this table is based on the Notice of Registration (NOR) currently available at the TCEQ website.

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 335.53)], processed, or disposed of at your facility, then you need not file this permit application. Otherwise proceed with the application form.

   The NOR for the UCC OPDA Facility (ISW Registration No. 35921) reflects the current status of inactive, closed, and permit exempt hazardous waste management units at the facility. Since there are no active or inactive hazardous waste management units at the facility, Table III-2 reflects only closed hazardous waste management units.

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.

   The estimated quantities of the hazardous waste material that has been disposed of and/or stored within the hazardous waste management units are provided in Table III-2.

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.

See Attachment C-1 for a topographic map extending one mile beyond the facility. See Attachment C-2 for an overall facility site map.

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

See Attachment C-2 for the overall facility and discharge structures.

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

Not applicable to this Part A Application.

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

See Attachment C-3 for all known monitor wells and boreholes within the property boundaries of the facility.

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

See Attachment C-4 for all other wells and surface water bodies extending within one mile beyond the facility boundaries.

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.

   Photographs of the permitted hazardous waste management units are not provided because all the hazardous waste management units at the UCC OPDA facility have been closed.

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.

   N/A - Not provided because there are no active hazardous waste management units at the OPDA facility.

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 Attachment C-1: OPDA Facility Map Attachment C-2: Overall Facility and Discharge Structures Attachment C-3: Monitoring Wells and Historical Soil Boring Location Map Attachment C-4: Water Well Location Map	C	**X**	
III.C.2	Photographs	D		**X**
III.D	Process flow diagram/description	E		**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	Processing2[2] of Wastes Generated On-Site	Disposal of Wastes Generated On-Site	Annual Quantity Generated and/or Received[3]
Soil contaminated with organics	200130H	D001, D002, D018, D025, D028, D043, U002, U031, U112, U113, U115, U140, U159, U161, U188, U240, U359				X			--[4]
Spent carbon from carbon bed	2004404H	D001, D028, D043, U113				X			--[4]
Aqueous waste with low toxic organics (recovered contaminated groundwater)	2036102H	D018, D028, D029, D040, D043				X (storage less than 90 days)			-[4]
Concentrated aqueous solution of organics (DNAPL mixture recovered)	2051207H	D001, D018, D028, D029				X (storage less than 90 days)			--[4]
Groundwater (remediation)	20581021	D018, D028, D029, D040, D043				X			5,412,000 lbs

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

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

[3] These quantities reported are from the 2023 Annual Waste Summary (in pounds). Quantities will vary over time and are included here for reference purposes only.

[4] Waste not generated in 2023.

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
North Phase Separation Organic Pit	002	Closed	85,000 gallons	8	1978
South Phase Separation Organic Pit	018	Closed	85,000 gallons	8	1978
OPDA Basin #3	009	Closed	59,900,000 gallons	38	1952
OPDA Basin #5	005	Closed	61,100,000 gallons	24	1966

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[1] Indicate only one of the following: Active, Inactive, Closed, or Proposed

[2] Cubic yards, gallons, pounds, gallons/minute, pounds/hour, BTUs/hour, etc.

Part A

Attachment B – Legal Description

NOTES:

1. THIS SURVEY RELIES ON THE TITLE COMMITMENT FROM FIRST AMERICAN TITLE INSURANCE COMPANY, G.F. No. NCS-67421-HOU1, EFFECTIVE DATE: JUNE 16, 2004 FOR ALL THINGS OF RECORD.
2. ALL COORDINATES ARE RELATIVE TO THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, (NAD 83), AND ARE BASED ON NATIONAL GEODETIC SURVEY MONUMENT "HGSCD 60" AT TEXAS STATE PLANE COORDINATES X = 3258210.576 AND Y = 13700349.930.
3. DISTANCES ARE HORIZONTAL SURFACE LEVEL LENGTHS, SCALE FACTOR = 0.999862341.
4. INFORMATION CONTAINED ON THIS SURVEY IS FROM THE GALVESTON COUNTY COURTHOUSE AND PRIVATE RECORDS, RESEARCHED BY AUTHOR AND PROVIDED BY CLIENT.
5. THIS PLAT IS ACCOMPANIED BY A METES AND BOUNDS DESCRIPTION ON FILE IN THE OFFICES OF DOYLE & WACHTSTETTER, INC. DATE: SEPTEMBER 23, 2012.

LINE TABLE

LINE #	DIRECTION	LENGTH
L1	S 88°01'09" W	91.88'
L2	N 85°15'47" W	14.92'
L3	N 64°32'39" W	10.65'
L4	S 84°14'19" W	11.41'
L5	N 85°43'13" W	32.96'
L6	S 24°34'41" W	10.23'
L7	S 47°01'05" W	11.40'
L8	S 87°01'23" W	233.92'
L9	S 88°51'38" W	99.30'
L10	S 86°33'40" W	100.60'

LINE TABLE

LINE #	DIRECTION	LENGTH
L11	S 89°46'11" W	47.45'
L12	S 86°16'36" W	51.99'
L13	S 89°51'58" W	49.65'
L14	N 88°43'09" W	50.53'
L15	S 80°29'24" W	43.67'
L16	N 77°22'38" W	13.62'
L17	N 55°48'17" W	14.01'
L18	S 88°25'41" W	152.28'
L19	S 86°47'51" W	152.88'
L20	S 87°47'59" W	248.59'

LINE TABLE

LINE #	DIRECTION	LENGTH
L21	N 81°32'09" W	43.72'
L22	S 85°19'35" W	65.54'
L23	S 74°50'05" W	69.95'
L24	S 86°55'50" W	200.36'
L25	S 88°56'33" W	200.83'
L26	S 86°47'54" W	49.99'
L27	S 88°30'15" W	50.32'
L28	N 89°30'48" W	37.01'
L29	S 88°01'09" W	134.20'

LEGEND

●	IRON PIPE/ROD
	TOP OF BANK
	EDGE OF WATER
—OH—	OVERHEAD WIRE
●	POWER POLE
•	MOORING
◩	MONITOR WELL
- - - -	₵ OF ESMT/R.O.W.
▬	TRACT LINE
G.C.D.R.	GALVESTON COUNTY DEED RECORDS
G.C.O.R.	GALVESTON COUNTY OFFICIAL RECORDS
G.C.P.R.	GALVESTON COUNTY PLAT RECORDS

I, Wm. PATRICK DOYLE, REGISTERED PROFESSIONAL LAND SURVEYOR, DO HEREBY CERTIFY THAT THE ABOVE AND FOREGOING PLAT IS A TRUE REPRESENTATION OF A SURVEY MADE UNDER MY SUPERVISION, ON THE GROUND, AND THAT THERE ARE NO EXCESSES NOR INTRUSIONS ON THIS PROPERTY, EXCEPT AS SHOWN HEREON.
DATE SURVEYED: JULY 25, 2012

WM. PATRICK DOYLE 4467

WM. PATRICK DOYLE
REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NUMBER 4467

Doyle & Wachtstetter, Inc.
Surveying and Mapping GPS/GIS
131 COMMERCE STREET, CLUTE, TEXAS 77531
OFFICE: 979.265.3622 FAX: 979.265.9940

REV. MARK	REVISION	BY	CHK	APP	DATE
A	DELETED INTERNAL TRAIL ROADS THROUGH BASIN #1 & BASIN #2	WPD	WPD		4/25/18
B	REMOVED PORTION OF OILTANKING TEXAS INDEPENDENT DEEPWATER EXPANSION, LLC CALLED 254.9549 ACRE TRACT	JAM	WPD		8/22/19

REV. MARK	REVISION	BY	CHK	APP	DATE

DRAWING ISSUE RECORD

ISSUE NO.	REV	MATERIAL OR JOB SPEC	BID	FAB	CONST	REF
			DATE ISSUED FOR			

DESIGNED		
DRAWN	JAM/HRG	8/22/19
CHECKED	WPD	8/22/19
APPROVED		
PROJ. SURV.	P.DOYLE	
MFG. REP.		

INDEXED
PLANT NO.
P.E. SEAL

THE DOW CHEMICAL COMPANY
TEXAS OPERATIONS TEXAS CITY, TEXAS

SURVEY PLAT OF DOW CHEMICAL COMPANY 90.173 ACRE INSTITUTIONAL CONTROL TRACT LITTLEFIELD SURVEY, A-143, GALVESTON COUNTY, TEXAS

CHARGE NO.	SCALE		REV.
425723	AS NOTED	B4-425723-TCO-OPDA-001	B

PRINTED

Doyle & Wachtstetter, Inc.
Surveying and Mapping • GPS/GIS • Pipeline Integrity
High Density 3D Laser Scanning • Robotic Imaging HD
Aerial Topographic Surveying • RTK/UAV Imagery

90.173 ACRE INSTITUTIONAL CONTROL BOUNDARY TRACT
THE DOW CHEMICAL COMPANY, TEXAS CITY, OPDA MARINE TERMINAL
H. B. LITTLEFIELD SURVEY, ABSTRACT 143
GALVESTON COUNTY, TEXAS
PAGE 1 OF 4

ALL THAT CERTAIN 90.173 ACRE tract of land lying and situated in the H. B. Littlefield Survey, Abstract 143, Galveston County, Texas, being portion of all that certain called 435.29 acre tract of land conveyed by deed on May 21, 1962 from the Board of Regents of the University of Texas to Union Carbide Corporation, as recorded in Volume 1495, Page 496 of the Galveston County Deed Records (G.C.D.R.), and a portion of all that certain called 104.840 acre tract conveyed by deed on November 12, 1963 from Texas City Terminal Rail Company to Union Carbide Corporation as recorded in Volume 159, Page 669 of the G.C.D.R., said 90.173 acre tract hereby conveyed being more particularly described by metes and bounds, using survey terminology which refers to the Texas State Plane Coordinate System, South Central Zone (NAD83), in which the directions are Lambert grid bearings and the distances are surface level horizontal lengths (S.F.= 0.999862341) as follows:

COMMENCING at a TxDOT concrete monument found marking an angle point of the eastern boundary line of the 160 foot wide Texas State Highway Loop 197 right-of-way same being the western boundary line the newly established Dow Chemical Marine Terminal property and being 15 feet easterly at right angles to the original eastern right-of-way of the former 130 foot wide Texas State Highway Loop 197 same being the western boundary line of the all that certain called 154.5039 acre tract of land conveyed by deed on July 27, 2004 from Union Carbide Corporation to Oiltanking Texas City, L.P., as recorded in Clerk’s File No. 2004049770 of the Galveston County Official Records (G.C.O.R.), same being the original western boundary line of the aforementioned called 435.29 acre tract of land conveyed by deed on May 21, 1962 from the Board of Regents of the University of Texas to Union Carbide Corporation, as recorded in Volume 1495, Page 496 of the G.C.D.R., from which the original Southwest corner of the said Union Carbide called 435.29 acre tract of land bears North 71°14’49” West, a distance of 15.00 feet and South 18°45’11” West, a distance of 254.79 feet, said TxDOT concrete monument at the Point of Commencement being located at position X=3267159.16 and Y=13699967.12;

THENCE South 18°45’11” West, coincident with the said eastern right-of-way boundary line of said 160 foot wide Loop 197, same being the present western boundary line of said Oiltanking Texas City, L.P. called 154.5039 acre tract and the western boundary line of said Dow Chemical Marine Terminal called 435.29 acre tract and being 15 feet easterly at right angles to the original eastern right-of-way of the former 130 foot wide Texas State Highway Loop 197 same being the western boundary line of the aforementioned called 435.29 acre tract, a distance of 249.11 feet to a point located in the southern boundary line of the said Dow Chemical Marine Terminal called 435.29 acre tract, same being the northern boundary of all that certain called 442.68 acre tract of land conveyed by deed on July 19, 1968 from the Board of Regents of the University of Texas to Union Carbide Corporation, as recorded in Volume 1963, Page 748 of the G.C.D.R., and the northern boundary line of a 150 foot wide Galveston County Drainage Easement, from which the original Southwest corner of the aforementioned called 435.29 acre tract of land bears South 88°01’09” West, a distance of 16.04 feet and said southwest corner being located at position X=3267063.05 and Y=13699730.71, for the southwest corner of said Oiltanking Texas City, L.P. called 154.5039 acre tract, at position X=3267079.08 and Y=13699731.27;

THENCE North 88°01’09” East, coincident with the northern boundary line of the aforementioned said Union Carbide called 442.68 acre tract and the 150 foot wide Galveston County Drainage Easement, same being the southern boundary line of said Oiltanking Texas City, L.P. called 154.5039 acre tract and the southern boundary line of said Union Carbide called 435.29 acre tract, a distance of 3321.58 feet to a 5/8” iron rod found marking the southeast corner of said Oiltanking Texas City, L.P. called 154.5039 acre tract, same being the southwest corner of all that certain called 254.9549 acre tract conveyed by deed on June 27, 2016 from Union Carbide Corporation to Oiltanking Texas Independent Deepwater Expansion, LLC as recorded in Clerk’s File No. 2016-038944 of the G.C.O.R., at position X=3270398.22 and Y=13699846.06;

THENCE North 1°58’51” East, coincident with the eastern boundary line of said Oiltanking Texas City, L.P. called 154.5039 acre tract, same being the western boundary line of said Oiltanking Texas Independent Deepwater Expansion, LLC called 254.9549 acre tract, a distance of 38.54 feet to the southwest corner and the **POINT OF BEGINNING** of the herein described 90.1726 acre institutional control boundary tract, at position X=3270396.89 and Y=13699844.58;

THENCE North 1°58’51” West, generally along and 1 foot east of a 8 foot tall chain link fence line and coincident with the eastern boundary line of said Oiltanking Texas City, L.P. called 154.5039 acre tract, at a distance of 18.46 feet pass a fence corner post, continuing for a total distance of 548.52 feet to a 5/8” iron rod with survey cap, for an interior corner of the herein described 90.173 acre institutional control boundary tract, at position X=3270377.93 and Y=13700432.70;

THENCE South 88°01’09” West, generally along and 1 foot north of an existing 8 foot tall chain link perimeter fence and coincident with a northern boundary line of said Oiltanking Texas City, L.P. called 154.5039 acre tract, a distance of 27.99 feet to a 5/8” iron rod with survey cap, for an exterior corner of the herein described 90.173 acre institutional control boundary tract, at position X=3270349.96 and Y=13700431.73;

THENCE North 1°58’51” West, generally along and 1 foot east of a 8 foot tall chain link fence line and coincident with the eastern boundary line of said Oiltanking Texas City, L.P. called 154.5039 acre tract, at a distance of 1368.54 feet pass a 5/8” iron rod with survey cap, continuing for a total distance of 1452.27 feet to the point of intersection with the southern water’s edge of the Texas City Industrial Ship Channel, for the northwest corner of the herein described 90.173 acre institutional control boundary tract, at position X=3270299.77 and Y=13701882.93;

THENCE along the southern water’s edge of Texas City Industrial Ship Channel and its meanders:
North 81°27’11” East, a distance of 235.14 feet;
South 88°04’56” East, a distance of 184.43 feet;
North 84°43’53” East, a distance of 201.64 feet;
South 86°48’33” East, a distance of 118.27 feet;
North 83°32’28” East, a distance of 131.68 feet;
North 87°33’01” East, a distance of 154.02 feet;
South 85°26’24” East, a distance of 67.28 feet;
North 87°34’07” East, a distance of 193.97 feet;

North 84°39’13” East, a distance of 154.55 feet;
North 72°02’31” East, a distance of 109.43 feet;
South 60°25’20” East, a distance of 52.51 feet;
South 82°23’01” East, a distance of 107.10 feet;
North 81°12’03” East, a distance of 84.73 feet to the intersection with the water’s edge of Basin 6 and barge staging area;

THENCE along the water’s edge of Basin 6 and barge staging area and its meanders:
South 37°06’15” East, a distance of 20.12 feet;
South 12°46’36” West, a distance of 56.74 feet;
South 82°57’43” West, a distance of 167.90 feet;
South 1°58’51” East, a distance of 945.94 feet;
North 88°01’09” East, a distance of 98.74 feet to a point located on the most northerly western boundary line of said Oiltanking Texas Independent Deepwater Expansion, LLC called 254.9549 acre tract, for the northeast corner of the herein described 90.173 acre institutional control boundary tract, at position X=3272638.26 and Y=13700955.85;

THENCE South 1°58’51” East, generally along the eastern side of a plant road along the eastern side of Basin 5 and Basin 6, a distance of 977.47 feet to a 5/8” iron rod found marking an angle corner of said Oiltanking Texas Independent Deepwater Expansion, LLC called 254.9549 acre tract, for the southeast corner of the herein described 90.173 acre institutional control boundary tract, at position X=3272672.04 and Y=13699979.10;

THENCE in a westerly direction, generally parallel with and 6 feet south the southern edge of Basin 5, Basin 1 and Basin 3, same being the northern boundary line of said Oiltanking Texas Independent Deepwater Expansion, LLC called 254.9549 acre tract, and it meanders:
South 88°01'09" West a distance of 91.88 feet;
North 85°15'47" West a distance of 14.92 feet;
North 64°32'39" West a distance of 10.65 feet;
South 84°14'19" West a distance of 11.41 feet;
North 85°43'13" West a distance of 32.96 feet;
South 24°34'41" West a distance of 10.23 feet;
South 47°01'05" West a distance of 11.40 feet;
South 87°01'23" West a distance of 233.92 feet;
South 88°51'38" West a distance of 99.30 feet;
South 86°33'40" West a distance of 100.60 feet;
South 89°46'11" West a distance of 47.45 feet;
South 86°16'36" West a distance of 51.99 feet;
South 89°51'58" West a distance of 49.65 feet;
North 88°43'09" West a distance of 50.53 feet;
South 80°29'24" West a distance of 43.67 feet;
North 77°22'38" West a distance of 13.62 feet;
North 55°48'17" West a distance of 14.01 feet;
South 88°25'41" West a distance of 152.28 feet;
South 86°47'51" West a distance of 152.88 feet;

90.173 ACRE INSTITUTIONAL CONTROL BOUNDARY TRACT
THE DOW CHEMICAL COMPANY, TEXAS CITY, OPDA MARINE TERMINAL
H. B. LITTLEFIELD SURVEY, ABSTRACT 143
GALVESTON COUNTY, TEXAS
PAGE 4 OF 4

South 87°47'59" West a distance of 248.59 feet;
North 81°32'09" West a distance of 43.72 feet;
South 85°19'35" West a distance of 65.54 feet;
South 74°50'05" West a distance of 69.95 feet;
South 86°55'50" West a distance of 200.36 feet;
South 88°56'33" West a distance of 200.83 feet;
South 86°47'54" West a distance of 49.99 feet;
South 88°30'15" West a distance of 50.32 feet;
North 89°30'48" West a distance of 37.01 feet;

THENCE South 88°01'09" West, a distance of 134.20 feet to the **POINT OF BEGINNING,** containing 90.173 acres of land, more or less.

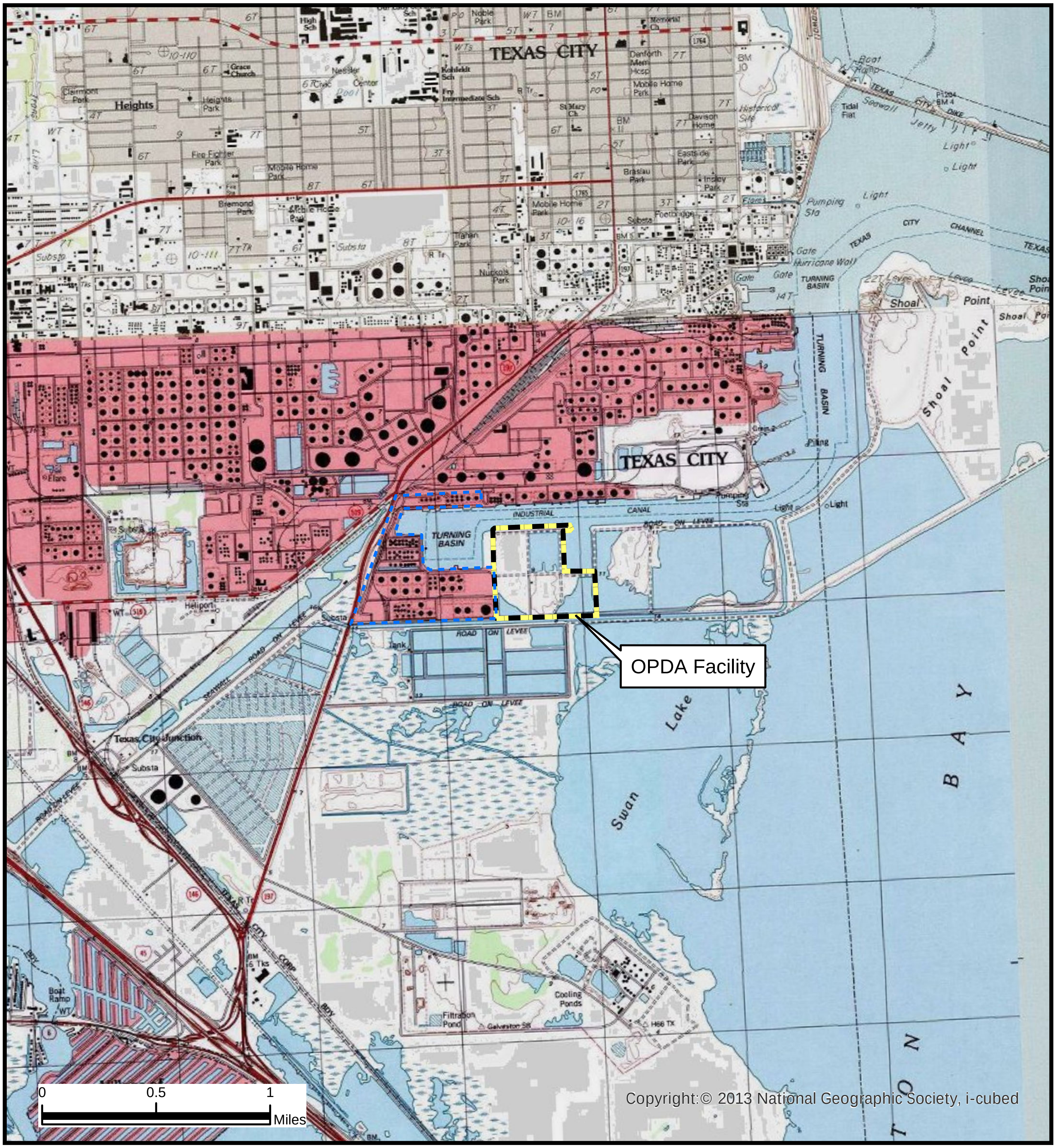
WM. PATRICK DOYLE
4467

Wm. Patrick Doyle
Registered Professional Land Surveyor
Texas Registration Number 4467
August 22, 2019

This description is based on a survey, a plat of which, dated July 25, 2012 is on file in the office of Doyle & Wachtstetter, Inc.
\\dwserv2\legals\pat\dow txcity\dow tco opda 90.1726 acre institutional control bndy tract.doc

Part A

Attachment C-1: OPDA Facility Map



LEGEND

▨ OPDA Facility Boundary

- - - Oiltanking Texas City, L.P. Facility Boundary

Reference: The displayed Digital Raster Graphic (DRG) includes portions of the United States Geological Survey 7.5 minute quadrangles of Virginia Point and Texas City (USGS, 1993).

Attachment C-1
OPDA Facility Map

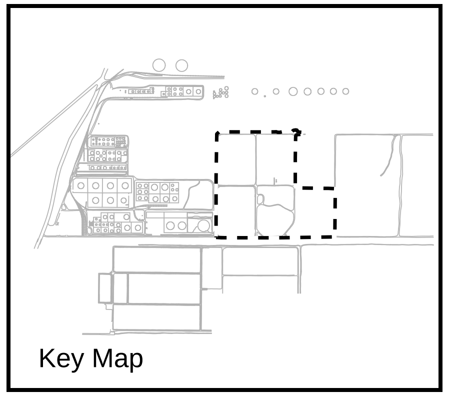
Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

T:_ENV\DOW\TEXAS_CITY\GIS\TCO_OPDA_APAR\TCO_OPDA_APAR\MAPFILES\GEC\TCO_OPDA_APAR\TCO_OPDA_APAR.APRX LS3621 10/22/2024 11:52 AM

Part A

Attachment C-2: Overall Facility and Off-Plant Disposal Area (OPDA)


Key Map

Legend

- -	OPDA Facility Boundary (Approximate)
🟥	SWMUs (Closed under TRRP; Soil Cover Installed)
🟦	RCRA-Regulated Units (Closed)
🟩	SWMUs (No Further Action)
⊕	Existing Stormwater Outfall

0 250 500 1,000
Feet

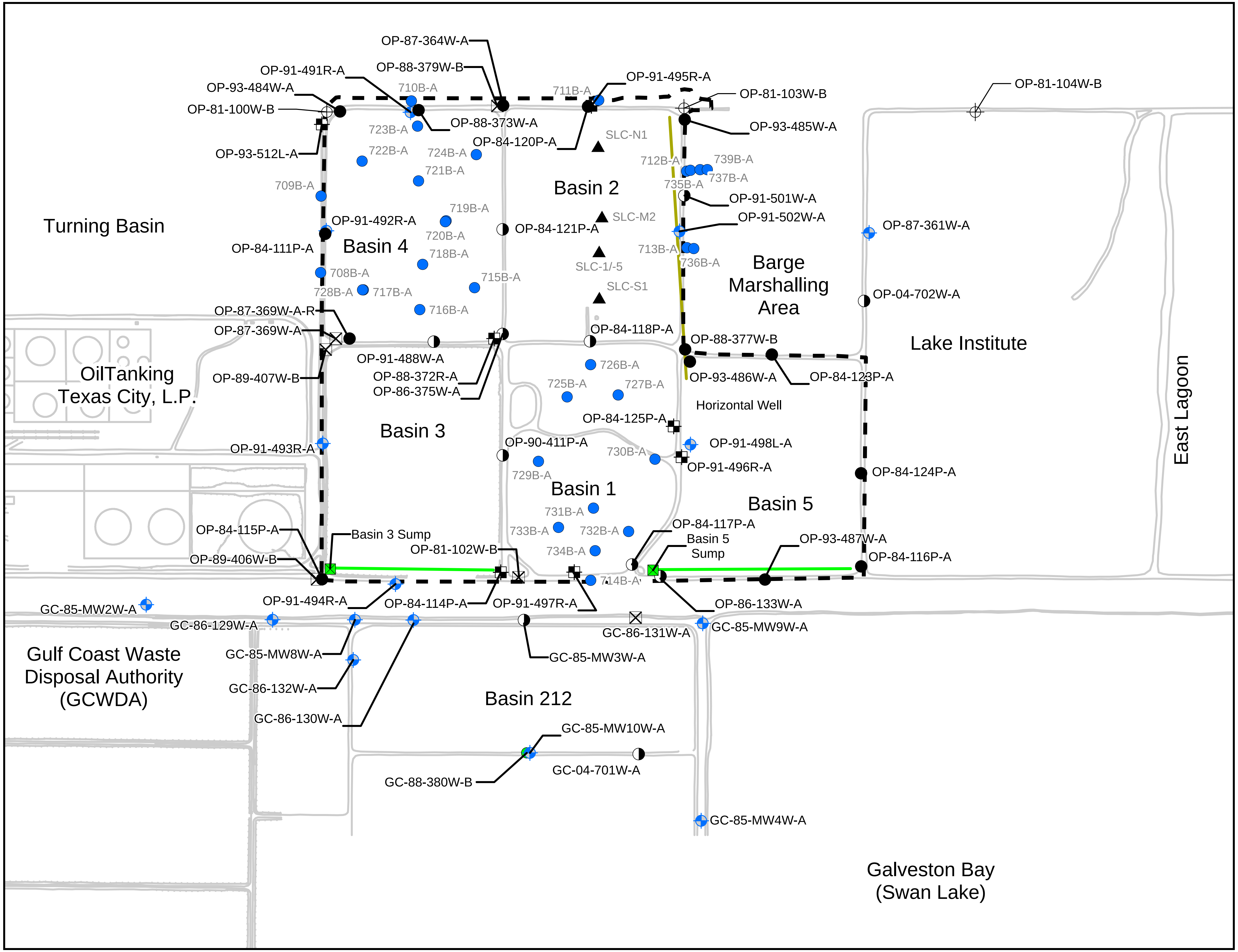
Attachment C-2
Overall Facility and Discharge Structures Off-Plant Disposal Area (OPDA)

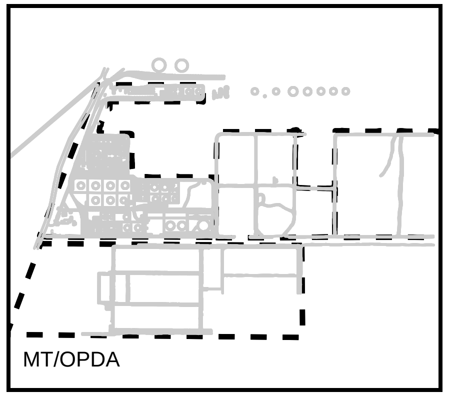
Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

Part A

Attachment C-3: Monitoring Wells and Historical Soil Boring Location Map





Legend

- ⊕ Well Completed in the "-30 Ft. MSL Aquifer"
- ◐ Well Completed in the "-100 Ft. MSL Aquifer"
- ● Soil Sample Location (2009 - 2010)
- ▲ Composite Sludge/Soil Sample Location (1987)
- ◑ Corrective Action Observation (CAO) Well
- ▣ Corrective Action System (CAS) Well
- ● Point of Compliance (POC) Well
- ⌖ Potentiometric Surface Observation (PSO) Well
- ☒ Plugged Well
- — Horizontal Well
- 🟩 Soil Cap Underdrain Line and Sump
- - - OPDA Facility Boundary

0 250 500
Feet

Attachment C-3
Monitoring Wells and Historical Soil Boring Location Map
Off -Plant Disposal Area

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

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Part A

Attachment C-4: Water Well Report

Prepared for:
ARCADIS U.S., Inc-Houston
2929 Briarpark Drive, Suite 215
Houston, TX 77077

BANKS
ENVIRONMENTAL DATA
A DIVISION OF THE BANKS GROUP

Water Well Report

Dow - OPDA
3301 5th Avenue South
Texas City, TX
Galveston County
ES-144522
Friday, September 06, 2024

Table of Contents

Geographic Summary

Location
Galveston County, TX
Subject property is 94.49 acres, 0.148 square miles, and has a 1.74 mile perimeter

Coordinates (centroid)	
Lat/Long in Degrees Minutes Seconds	29° 21' 32.93", -94° 54' 30.56"
Lat/Long in Decimal Degrees	29.35914621282375, -94.90848861277149
X/Y in NAD83 / UTM Zone 15N	314741.3192753965, 3249292.148776865

Elevation (centroid)
Subject Property lies 11.78 feet above sea level.

Zip Codes Searched

Search Distance	Zip Codes
Subject Property	77590
1.0 miles	77590

Topos Searched

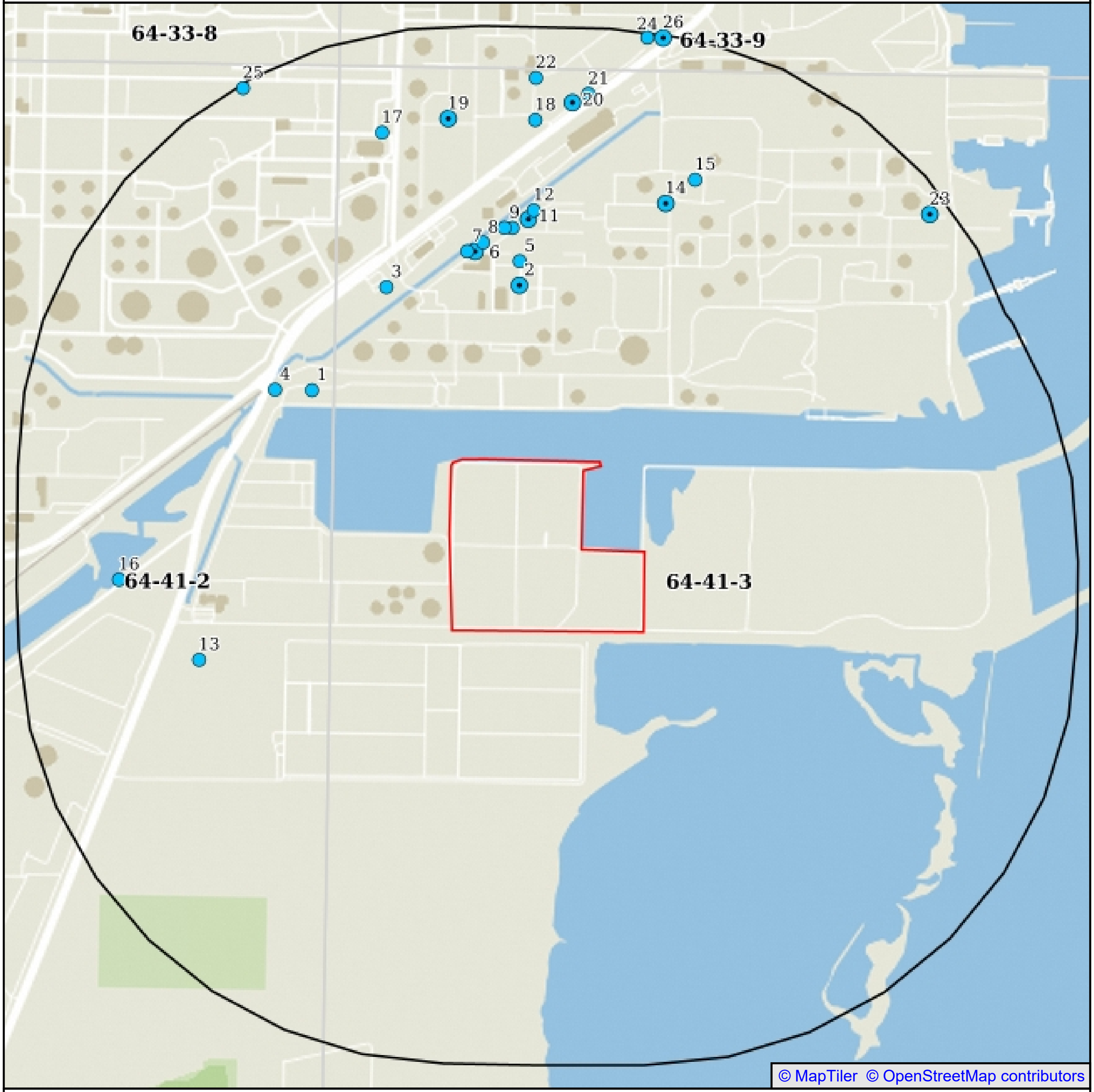
Search Distance	Topo Name
Subject Property	Virginia Point (1974)
1.0 miles	Virginia Point (1974), Texas City (1974)

Water Well Summary

Datasets Searched	Distance	Total
US Water Well (WW)	1.0	5
TX Groundwater Supply (GWS)	1.0	15
TX Harris/Galveston Subsidence District (HGSD)	1.0	10
TX Historical Water Well (HIST)	1.0	4
TX Public Water Supply (PWS)	1.0	0
TX Submitted Drillers Report (SDR)	1.0	0

Total Wells Found	**34**

Summary Map - 1.0 Mile Radius



Dow - OPDA

● Single Water Well ⊙ Water Well Cluster

US WW,TX GWS,TX HGSD,TX HIST
TX PWS,TX SDR

🟥 Subject Site
☐ Search Buffer
☐ Texas Quad Index

0' 1167' 2333'

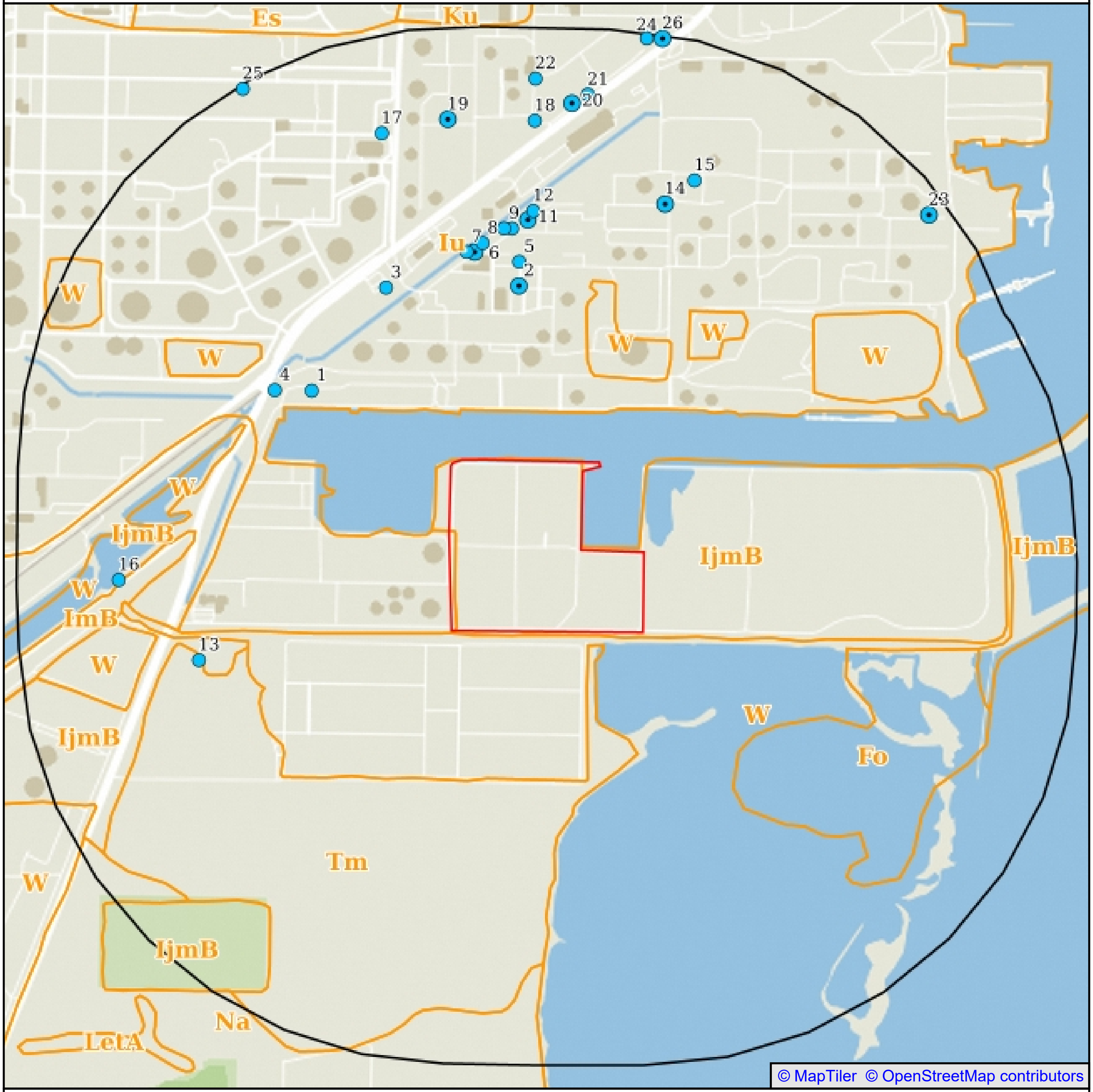
1:21000
1 in = 1750 ft
1 in = 0.331 mi
1 cm = 210 m
1 cm = 0.210 km

N

NAD83 / UTM Zone 15N
North American Datum 1983
Western Meridian: 96 0' 00" West
Eastern Meridian: 90 0' 00" West
Latitude of Origin: 0 0' 00" North

Soil Survey Map - 1.0 Mile Radius

BANKS
ENVIRONMENTAL DATA
A DIVISION OF THE BANKS GROUP



© MapTiler © OpenStreetMap contributors

Dow - OPDA

● Single Water Well ⊙ Water Well Cluster

US WW,TX GWS,TX HGSD,TX HIST
TX PWS,TX SDR

🟥 Subject Site
⬛ Search Buffer
🟧 Soils Boundary

0' 1167' 2333'

1:21000
1 in = 1750 ft
1 in = 0.331 mi
1 cm = 210 m
1 cm = 0.210 km

N

NAD83 / UTM Zone 15N
North American Datum 1983
Western Meridian: 96 0' 00" West
Eastern Meridian: 90 0' 00" West
Latitude of Origin: 0 0' 00" North

Soil Types Found	
Subject Property	IjmB, Iu, W
Within 1.0 miles of Subject Property	Fo, ImB, Na, Tm

Soil Type Descriptions

IjmB - Sievers-Ijam complex, 0 to 3 percent slopes, occasionally flooded, tidal	
Percent Hydric	45
Minimum Depth to Bedrock	

Sievers (55%)	
Hydrologic Group	Moderately high runoff potential when drained and high runoff potential undrained
Soil Drainage Class	Somewhat poorly drained
Corrosion Potential - Uncoated Steel	Moderate
Depth to Restrictive Feature	

Horizon	**Soil Texture**	**Upper Boundary**	**Lower Boundary**	**AASHTO**	**Unified**
A	Fine sandy loam	0 cm	15 cm	A-6, A-4	CL, SC-SM
C	Sandy clay loam	15 cm	74 cm	A-6, A-7-6	CL, SC
Cg	Fine sandy loam	74 cm	203 cm	A-6, A-2-4	SC, CL, SC-SM

Ijam (35%)	
Hydrologic Group	High runoff potential
Soil Drainage Class	Poorly drained
Corrosion Potential - Uncoated Steel	Moderate
Depth to Restrictive Feature	

Horizon	**Soil Texture**	**Upper Boundary**	**Lower Boundary**	**AASHTO**	**Unified**
A	Loam	0 cm	13 cm	A-6, A-7-6, A-4	CL, CH
C	Clay loam	13 cm	45 cm	A-7-6, A-6	CL, CH
Cg	Clay	45 cm	203 cm	A-7-6, A-6	CH, CL

Tracosa (10%)	
Hydrologic Group	
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Iu - Francitas-Urban land complex, 0 to 1 percent slopes, rarely flooded	
Percent Hydric	54
Minimum Depth to Bedrock	

Francitas (50%)	
Hydrologic Group	High runoff potential
Soil Drainage Class	Somewhat poorly drained
Corrosion Potential - Uncoated Steel	High
Depth to Restrictive Feature	

Horizon	Soil Texture	Upper Boundary	Lower Boundary	AASHTO	Unified
H1	Clay	0 cm	30 cm	A-7-6	CH, CL
H2	Clay	30 cm	152 cm	A-7-6	CH

Urban land (45%)	
Hydrologic Group	High runoff potential
Soil Drainage Class	
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Horizon	Soil Texture	Upper Boundary	Lower Boundary	AASHTO	Unified
H1	Variable	0 cm	102 cm		

Ijam (2%)	
Hydrologic Group	
Soil Drainage Class	Poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Sievers (2%)	
Hydrologic Group	
Soil Drainage Class	Somewhat poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Unnamed (1%)	
Hydrologic Group	
Soil Drainage Class	
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

W - Water	
Percent Hydric	0
Minimum Depth to Bedrock	

Water (100%)	
Hydrologic Group	High runoff potential
Soil Drainage Class	
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Fo - Follet clay loam, 0 to 1 percent slopes, frequently flooded	
Percent Hydric	100
Minimum Depth to Bedrock	

Follet (85%)	
Hydrologic Group	High runoff potential
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	Moderate
Depth to Restrictive Feature	

Horizon	Soil Texture	Upper Boundary	Lower Boundary	AASHTO	Unified
Ag	Clay loam	0 cm	10 cm	A-7-6, A-6	CL, CH
Cg1	Stratified loam	10 cm	122 cm	A-4, A-6	CL
Cg2	Stratified silty clay loam	122 cm	203 cm	A-7-6, A-6	CL

Karankawa (5%)	
Hydrologic Group	
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Tatlum (5%)	
Hydrologic Group	
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Tracosa (5%)	
Hydrologic Group	
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

ImB - Ijam clay, 2 to 8 percent slopes, rarely flooded	
Percent Hydric	85
Minimum Depth to Bedrock	

Ijam (75%)	
Hydrologic Group	High runoff potential
Soil Drainage Class	Poorly drained
Corrosion Potential - Uncoated Steel	High
Depth to Restrictive Feature	

Horizon	Soil Texture	Upper Boundary	Lower Boundary	AASHTO	Unified
H1	Clay	0 cm	30 cm	A-7-6	CL, CH
H2	Clay	30 cm	152 cm	A-7-6	CH

Unnamed (15%)	
Hydrologic Group	
Soil Drainage Class	
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Sievers (10%)	
Hydrologic Group	Moderately high runoff potential when drained and high runoff potential undrained
Soil Drainage Class	Somewhat poorly drained
Corrosion Potential - Uncoated Steel	High
Depth to Restrictive Feature	

Horizon	Soil Texture	Upper Boundary	Lower Boundary	AASHTO	Unified
H1	Loam	0 cm	30 cm	A-4, A-6	CL
H2	Clay loam	30 cm	76 cm	A-6, A-7	CL
H3	Fine sandy loam	76 cm	152 cm	A-7, A-4, A-6	CL, CL-ML, SC, SC-SM

Na - Narta fine sandy loam, 0 to 1 percent slopes, rarely flooded	
Percent Hydric	95
Minimum Depth to Bedrock	

Narta (90%)	
Hydrologic Group	High runoff potential
Soil Drainage Class	Poorly drained
Corrosion Potential - Uncoated Steel	High
Depth to Restrictive Feature	

Horizon	Soil Texture	Upper Boundary	Lower Boundary	AASHTO	Unified
A	Fine sandy loam	0 cm	23 cm	A-4, A-6	CL
Btkng	Clay loam	97 cm	203 cm	A-7-6, A-6	CL
Btn1	Clay	23 cm	36 cm	A-7-6	CH, CL
Btn2	Clay	36 cm	97 cm	A-7-6	CH

Francitas (5%)	
Hydrologic Group	
Soil Drainage Class	Somewhat poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Placedo (5%)	
Hydrologic Group	
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Tm - Tracosa mucky silty clay, 0 to 1 percent slopes, very frequently flooded	
Percent Hydric	100
Minimum Depth to Bedrock	

Tracosa (80%)	
Hydrologic Group	High runoff potential
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	High
Depth to Restrictive Feature	

Horizon	**Soil Texture**	**Upper Boundary**	**Lower Boundary**	**AASHTO**	**Unified**
Ag	Mucky silty clay	0 cm	20 cm	A-7-5, A-7-6	OH, MH, CH
Cg	Silty clay	20 cm	203 cm	A-7-6, A-7-5, A-6	CH, CL

Follet (7%)	
Hydrologic Group	
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Tatlum (7%)	
Hydrologic Group	
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Karankawa (6%)	
Hydrologic Group	
Soil Drainage Class	Very poorly drained
Corrosion Potential - Uncoated Steel	
Depth to Restrictive Feature	

Soils Descriptions

AASHTO Classification Definitions	
A-1, A-1-a, A-1-b	Granular materials (35% or less passing No. 200 sieve), sonte fragments, gravel and sand
A-2, A-2-4, A-2-5, A-2-6, A-2-7	Granular materials (35% or less passing No. 200 sieve), silty or clayey gravel and sand
A-3	Granular materials (35% or less passing No. 200 sieve), fine sand
A-4	Silt-Clay materials (more than 35% passing No. 200 sieve), silty soils
A-5	Silt-Clay materials (more than 35% passing No. 200 sieve), silty soils
A-6	Silt-Clay materials (more than 35% passing No. 200 sieve), clayey soils
A-7, A-7-5, A-7-6	Silt-Clay materials (more than 35% passing No. 200 sieve), clayey soils
A-8	Silt-Clay materials (more than 35% passing No. 200 sieve), clayey soils

Unified Classification Definitions	
CH	Fine-grained soils, silts and clays (liquid limit is 50% or more), Fat Clay
CL, CL-A (proposed), CL-K (proposed), CL-ML, CL-O (proposed), CL-T (proposed)	Fine-grained soils, silts and clays (liquid limit is less than 50%), Lean Clay
GC, GC-GM	Coarse-grained soils, Gravels, gravel with fines, Clayey Gravel
GM	Coarse-grained soils, Gravels, gravel with fines, Silty Gravel
GP, GP-GC, GP-GM	Coarse-grained soils, Gravels, clean gravels, Poorly Graded Gravel
GW, GW-GC, GW-GM	Coarse-grained soils, Gravels, clean gravels, Well-Graded Gravel
MH, MH-A, MH-K, MH-O, MH-T	Fine-grained soils, silts and clays (liquid limit is 50% or more), Elastic Silt
ML, ML-A (proposed), ML-K (proposed), ML-O (proposed), ML-T (proposed)	Fine-grained soils, silts and clays (liquid limit is less than 50%), Silt
OH, OH-T (proposed)	Fine-grained soils, silts and clays (liquid limit is 50% or more), Organic Clay or Organic Silt
OL	Fine-grained soils, silts and clays (liquid limit is less than 50%), Organic Clay or Organic Silt
PT	Highly organic soils, Peat
SC, SC-SM	Coarse-grained soils, Sands, sands with fines, Clayey Sand
SM	Coarse-grained soils, Sands, sands with fines, Silty Sand
SP, SP-SC, SP-SM	Coarse-grained soils, Sands, clean sands, Poorly Graded Sand
SW, SW-SC, SW-SM	Coarse-grained soils, Sands, clean sands, Well-Graded Sand

Source

Natural Resources Conservation Service, Soil Survey Geographic (SSURGO) Database.

Disclaimer

This Soils Survey from Banks Environmental Data, Inc. has searched Natural Resources Conservation Service (NRCS) and the Soil Survey Geographic Database (SSURGO). All soil data presented on the map and in the details section are based on information obtained from NRCS. Although Banks performs quality assurance and quality control on all data, inaccuracies of the data and mapped locations could possibly be traced to the source. Banks Environmental Data, Inc. cannot fully guarantee the accuracy of the SSURGO database maintained by NRCS.

Topographic Overlay Map - 1.0 Mile Radius

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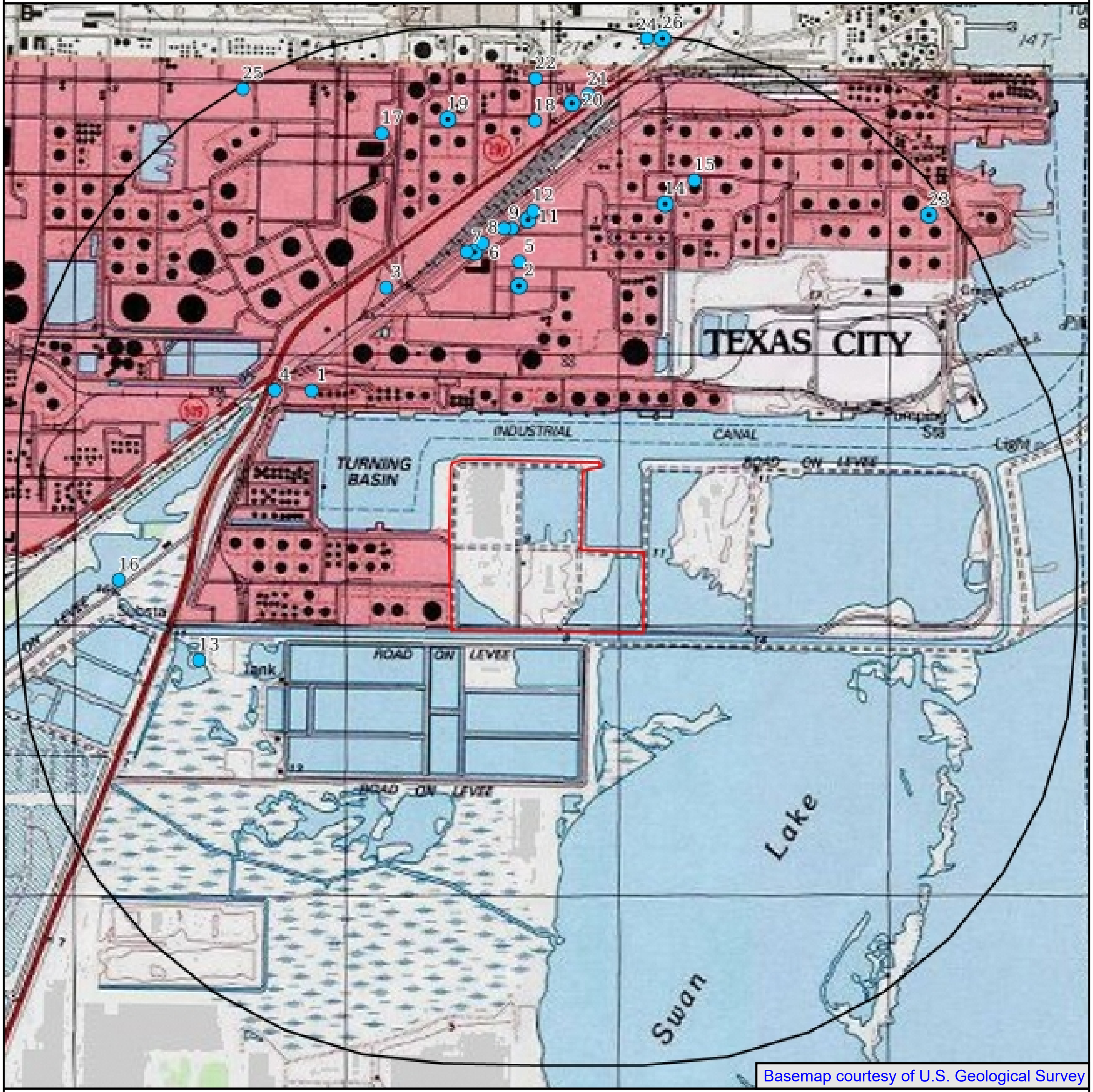


Basemap courtesy of U.S. Geological Survey

Dow - OPDA

Subject Property Quad Name(s)
See Geographic Summary

0' 1167' 2333'

1:21000
1 in = 1750 ft
1 in = 0.331 mi
1 cm = 210 m
1 cm = 0.210 km

N

🟥 Subject Site
☐ Search Buffer

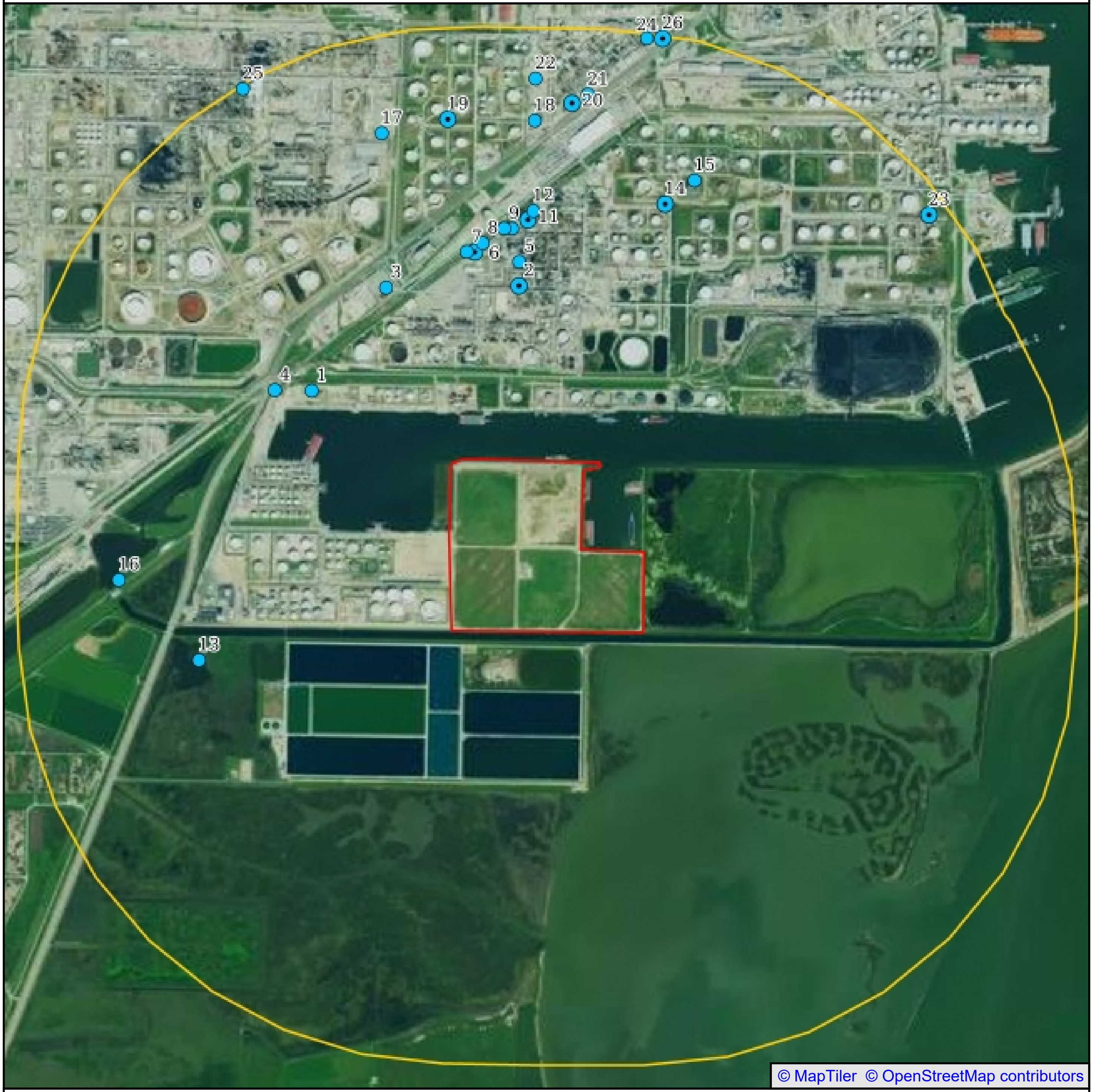
● Single Water Well ⊙ Water Well Cluster

US WW,TX GWS,TX HGSD,TX HIST
TX PWS,TX SDR

NAD83 / UTM Zone 15N
North American Datum 1983
Western Meridian: 96 0' 00" West
Eastern Meridian: 90 0' 00" West
Latitude of Origin: 0 0' 00" North

Current Imagery Overlay Map - 1.0 Mile Radius

BANKS
ENVIRONMENTAL DATA
A DIVISION OF THE BANKS GROUP



Dow - OPDA

● Single Water Well ⦿ Water Well Cluster

US WW,TX GWS,TX HGSD,TX HIST
TX PWS,TX SDR

🟥 Subject Site
🟨 Search Buffer

0' 1167' 2333'

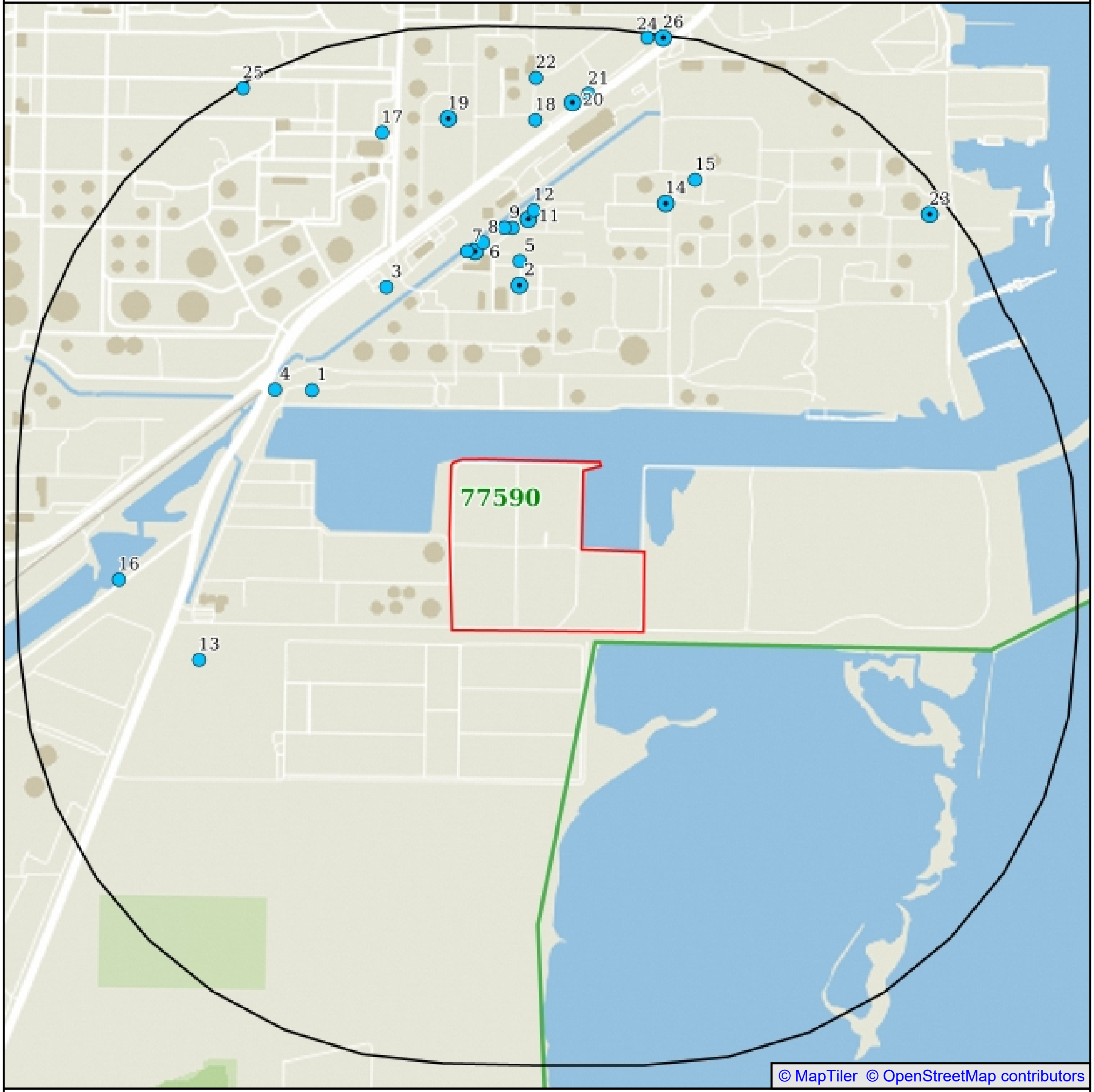
1:21000
1 in = 1750 ft
1 in = 0.331 mi
1 cm = 210 m
1 cm = 0.210 km

N

NAD83 / UTM Zone 15N
North American Datum 1983
Western Meridian: 96 0' 00" West
Eastern Meridian: 90 0' 00" West
Latitude of Origin: 0 0' 00" North

Zip Code Map - 1.0 Mile Radius

BANKS ENVIRONMENTAL DATA
A DIVISION OF THE BANKS GROUP



Dow - OPDA

● Single Water Well ⦿ Water Well Cluster

US WW,TX GWS,TX HGSD,TX HIST
TX PWS,TX SDR

🟥 Subject Site
☐ Search Buffer
🟩 Zip Code Boundary

0' 1167' 2333'

1:21000
1 in = 1750 ft
1 in = 0.331 mi
1 cm = 210 m
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N

NAD83 / UTM Zone 15N
North American Datum 1983
Western Meridian: 96 0' 00" West
Eastern Meridian: 90 0' 00" West
Latitude of Origin: 0 0' 00" North

Water Well Summary

Map ID	Source ID	Dataset	Owner	Well Type	Drill Depth	Static Level	Completion Date	Distance	Elevation	Details Page #
11	6441305	GWS	Texas City Refining Corp.	Industrial	1042		1943-01-01	0.56mi N	-8.50 ft	18
14	6441303	GWS	Texas City Refining Corp.	Unused	1015		1943-01-01	0.62mi N	-8.50 ft	30
17	6441313	GWS	Pan-American Refining	Industrial	993		1920-01-01	0.78mi N	-1.94 ft	47
18	6441308	GWS	Marathon Oil Co.	Industrial	738		1942-01-01	0.79mi N	-5.22 ft	50
19	6441310	GWS	Marathon Oil Co.	Industrial	1017		1942-01-01	0.79mi N	-5.22 ft	63
2	6441304	GWS	Texas City Refining Corp.	Unused	974		1947-11-01	0.40mi N	-5.22 ft	69
2	6441302	GWS	Texas City Refining Corp.	Unused	1030		1919-01-01	0.40mi N	-5.22 ft	72
21	6441309	GWS	Republic Refining Oil Co.	Industrial	1009		1939-01-01	0.85mi N	-5.22 ft	75
25	6441217	GWS	Pan American Refining Corp.	Unused	974		1933-01-01	0.99mi NW	-1.94 ft	77
26	6433912	GWS	Marathon Oil Co	Industrial	771		1967-08-01	0.99mi N	-8.50 ft	80
4	6441223	GWS	Union Carbide Co.	Industrial	513		1948-01-01	0.44mi W	-8.50 ft	87
5	6441311	GWS	Texas City Refining	Unused	970		1908-01-01	0.46mi N	-8.50 ft	90
6	6441312	GWS	Texas City Refining Co	Industrial	645		1969-12-01	0.48mi N	-8.50 ft	93
8	6441306	GWS	Texas City Refining Corp.	Industrial	655		1948-01-01	0.50mi N	-5.22 ft	111
9	6441307	GWS	Texas City Refinery	Industrial	645		1965-06-23	0.53mi N	-8.50 ft	127
1	HGSD1586	HGSD	UNION CARBIDE CO RPORATION	Irrigation	691		1942-01-01	0.37mi NW	-5.22 ft	142
10	HGSD1423	HGSD	Valero Refining - Texas LP	Irrigation	1050		1943-01-01	0.53mi N	-8.50 ft	143
12	HGSD1426	HGSD	Valero Refining - Texas LP	Irrigation	650		1970-01-01	0.58mi N	-8.50 ft	144
15	HGSD1425	HGSD	TEXAS CITY REFINING, INC.	Irrigation	1015		1943-01-01	0.69mi N	-11.78 ft	145
16	HGSD3128	HGSD	Galveston County	Public Supply	595		1973-01-01	0.76mi W	-5.22 ft	146

20	HGSD1322	HGSD	Blanchard Refining Company, LLC	Irrigation	1016		1942-01-01	0.83mi N	-8.50 ft	147
20	HGSD1324	HGSD	Blanchard Refining Company, LLC	Irrigation	1013		1950-01-01	0.83mi N	-8.50 ft	148
22	HGSD1323	HGSD	Blanchard Refining Company, LLC	Irrigation	749		1950-01-01	0.88mi N	-5.22 ft	149
24	HGSD1321	HGSD	Blanchard Refining Company, LLC	Irrigation	771		1967-01-01	0.99mi N	-5.22 ft	150
7	HGSD1424	HGSD	Valero Refining - Texas LP	Irrigation	644		1965-01-01	0.48mi N	-5.22 ft	151
13	64-41-2G	HIST	Florida Gas & Exploration	Industrial	598		1977-11-02	0.59mi W	-8.50 ft	152
23	64-41-3E	HIST	Cockrell Oil	Domestic	545		1981-02-06	0.95mi NE	-8.50 ft	154
23	64-41-3E	HIST	Amoco	Industrial	776		1980-10-17	0.95mi NE	-8.50 ft	156
3	64-41-3B	HIST	Amoco c/o Don Love, Inc.	Industrial	582		1978-09-26	0.43mi NW	-8.50 ft	158
11	USGS292211094543301	WW	USGS	Not Reported	1042			0.56mi N	-8.50 ft	160
14	USGS292213094541401	WW	USGS	Not Reported	1015			0.62mi N	-8.50 ft	161
19	USGS292223094544401	WW	USGS	Not Reported	1017			0.79mi N	-5.22 ft	162
26	USGS292233094541501	WW	USGS	Not Reported	771		1967-08-01	0.99mi N	-8.50 ft	163
6	USGS292207094544001	WW	USGS	Not Reported	645		1969-12-23	0.48mi N	-8.50 ft	164

End of Water Well Summary

GWS - Groundwater Supply

Map ID: 11		**Source: Texas Water Development Board**
Well Number: 6441305	**GWS - Groundwater Supply**	**Banks ID: 6441305**
Well Address: TX		**Rel. Loc.: 0.56mi N**
Completion Date: 1943-01-01		**Drill Depth: 1042.0**
Owner: Texas City Refining Corp.		**Elevation: 3.28 ft (-8.50 ft)**

County:	Galveston
Aquifer Code:	112ALLM
Driller:	Texas Water Wells
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

Sites in Map ID 11 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Texas City Refining Corp.	TX	18
WW	USGS	US	160

WRD Exp. (GW)
April 1966

Well No. KH-64-41-305

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by G. McAdoo / Don Petitt 1952 / G.H. Cromack 1943 — Source of data File — Date 3-12-68 — Map Virginia Point 1954 1:24,000

State Texas [4|8] — County (or town) Galveston [K|H]

Latitude: [2|9|2|2|1|1|N] N S (deg, min, sec) — Longitude: [0|9|4|5|4|3|3] (degrees, min, sec) — Sequential number: [1]

Lat-long accuracy: [1] T.____ N S, R____ E W, Sec____, ____¼, ____¼, ____¼

Local well number: [K|H|6|4|4|1|3|0|5] — Other number: (M-39) B & M # 1, 1956

Local use: [ ] — Owner or name: Texas City Ref. Corp

Owner or name: [T|E|X|A|S| |C|I|T|Y| |R|E|F|.] — Address: Texas City, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist ____ [N]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other ____ [N]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed [W]

DATA AVAILABLE: Well data [1] Freq. W/L meas.: Annual [A] Field aquifer char. [ ]

Hyd. lab. data: ____ [ ]

Qual. water data; type: ____ [ ]

Freq. sampling: 8-12-43 [A] Pumpage inventory: yes no, period: ____ [ ]

Aperture cards: ____ yes [ ]

Log data: D-Log 0 - 1050 [D|]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD — Depth well: 1042 ft [1|0|4|2] Meas. [✓ rept] accuracy Driller [3]

Depth cased: (first perf.) 900 ft [|9|0|0] Casing type: WI ; Diam. 16 - 10¾ in [1|6]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., [✓ (S) screen], (T) sd. pt., (W) shored, (X) open hole, (Z) ____ other [S]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ____ other [H]

Date Drilled: Jan 1943 [9|4|3] Pump intake setting: ____ ft [| |]

Driller: Texas Water Wells (name), Houston, Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other [T] [✓ Deep] Shallow [D]

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. 75 [V] Trans. or meter no. ____

Descrip. MP ____ ft above below LSD . Alt. MP ____

Alt. LSD: 8 [| | | |8] Accuracy: (source) Topo 5' [3]

Water Level 90 ft above below MP; Ft above below LSD [| |9|0] Accuracy: rept. [D]

Date meas: Jan. 1943 [1|4|3] Yield: 800 gpm [| |8|0|0] Method determined [ ]

Drawdown: 27 ft [|2|7] Accuracy: rept. WD [ ] Pumping period 8 hrs [| |8]

QUALITY OF WATER DATA: Iron ____ ppm [ ] Sulfate ____ ppm [ ] Chloride ____ ppm [ ] Hard. ____ ppm [ ]

Sp. Conduct ____ K x 10^6 [ ] Temp. ____ °F [| |] Date sampled [| — |]

Taste, color, etc. ____

Well No. KH-64-41-305

Well No. KH-64-41-305

Latitude-longitude 29 22 11 Ⓝ S 094 54 33
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19

Physiographic Province: Coastal Plain 0 3 20 21 Section:

F 22 Drainage Basin: 5 1 T 23 25 Subbasin: 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat 27

MAJOR AQUIFER: system, series 28 29 aquifer, formation, group 30 31

Lithology: 32 33 Origin: 34 Aquifer Thickness: ft

35 37 Length of well open to: 106 ft 1 0 6 38 40 Depth to top of: ft 41 43

MINOR AQUIFER: system, series 44 45 aquifer, formation, group 46 47

Lithology: 48 49 Origin: 50 Aquifer Thickness: ft

51 53 Length of well open to: ft 54 56 Depth to top of: ft 57 59

Intervals Screened: 900 - 1006

Depth to consolidated rock: ft 60 63 Source of data: 64

Depth to basement: ft 65 68 Source of data: 69

Surficial material: 70 71 Infiltration characteristics: 72

Coefficient Trans: gpd/ft 73 75 Coefficient Storage: 76 78

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards: 79

800' of 16" csg

206' of 10 3/4" csg.

Well No. KH-64-41-305

GPO 857-700

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY
Organization No. ________ Lab No. 02
Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston
State Well No. 64-41-305
________ Well No. ________
Date Collected 05-10-76

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________
Source (type of well) ________ Owner ________
Date Drilled ________ Depth ________ ft. WBF ________
Producing intervals ________ Water level ________ ft. Sample depth ☐☐☐☐ ft.
Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ☐☐☐ °F 30 °C
Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		%Na ________
☐ Boron	01022		SAR ________
[3] ☐ Total Iron	01045		RSC ________

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm^3) 00095 3840

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	349	
Sulfate	00945	0	
Chloride	00940	110	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.6	Total
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as CaCO$_3$	00415		
Total Alkalinity as CaCO$_3$	00410		
Total Hardness as CaCO$_3$	00900		
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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CR/TDWR

Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] *Total Iron and Manganese require separate sample.*

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-305

Well No. ________

Date Collected 05-20-74

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth ________ ft. WBF ________

Producing intervals ________ Water level ________ ft. Sample depth ________ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ________ °F 29 °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		
☐ (other) ________			

%Na ________

SAR ________

RSC 3.1

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	348	
Sulfate	00945		
Chloride	00940	1100	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.8	
Total			

[1] Dissolved Solids (residue at 180°C)	70300	
Phenolphthalein Alkalinity as CaCO3	00415	
Total Alkalinity as CaCO3	00410	
Total Hardness as CaCO3	00900	130
[2] Nitrogen Cycle		
Ammonia - N	00610	
Nitrite - N	00615	
Nitrate - N	00620	
Organic Nitrogen	00605	

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GW/TDWR

Specific Conductance (micromhos/cm3) 00095 3650

Diluted Conductance (micromhos/cm3) X

"☐" items will be analyzed if checked.

Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-305

________ Well No. ________

Date Collected 04-23-73

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth ________ ft. WBF ________

Producing intervals ________ Water level ________ ft. Sample depth ________ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ________ °F 30 °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ________

SAR ________

RSC 3.2

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm^3) 00095 3630

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	350	
Sulfate	00945		
Chloride	00940	1000	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.7	
Total			

[1] Dissolved Solids (residue at 180°C)	70300	
Phenolphthalein Alkalinity as $CaCO_3$	00415	
Total Alkalinity as $CaCO_3$	00410	
Total Hardness as $CaCO_3$	00900	130
[2] Nitrogen Cycle		
Ammonia - N	00610	
Nitrite - N	00615	
Nitrate - N	00620	
Organic Nitrogen	00605	

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CR/TDWR

Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

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Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-305

________ Well No. ________

Date Collected 04-08-70

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth 1006 ft. WBF ~~378~~ 379

Producing intervals ________ Water level ________ ft. Sample depth ☐ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ☐ °F ☐ °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ________

SAR ________

RSC 3.4

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm^3) 00095 3540

Diluted Conductance (micromhos/cm^3) x

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	356	
Sulfate	00945		
Chloride	00940	1000	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.7	
Total			

[1] Dissolved Solids (residue at 180°C)	70300	
Phenolphthalein Alkalinity as $CaCO_3$	00415	
Total Alkalinity as $CaCO_3$	00410	
Total Hardness as $CaCO_3$	00900	120
[2] Nitrogen Cycle		
Ammonia - N	00610	
Nitrite - N	00615	
Nitrate - N	00620	
Organic Nitrogen	00605	

RECEIVED
JUL 27 1982
CR/TDWR

Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ________

Proj. No. ________

CHEMICAL WATER ANALYSIS REPORT

0 8 4 KH Galveston
County

State Well No. 64-41-305

Well No. ________

Date Collected 05-07-69

By ________

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth 1006 ft. WBF Gulf Coast

Producing intervals ________ Water level ________ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ___ °F 30 °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/ ☐ Total Iron		

%Na ________

SAR ________

RSC 3.3

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm³) 3370

Diluted Conductance (micromhos/cm³) ____ X ____

	MG/L	ME/L
Carbonate		
Bicarbonate	352	
Sulfate		
Chloride	940	
Fluoride		
Nitrate		
pH	7.8	
Total		
1/ Dissolved Solids (sum in MG/L)		
Phenolphthalein Alkalinity as CaCO3		
Total Alkalinity as CaCO3		
Total Hardness as CaCO3		126

2/ Nitrogen Cycle

Ammonia - N	
Nitrite - N	
Nitrate - N	
Organic Nitrogen	

RECEIVED
JUL 27 1982
CR/TDWR

"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ________ Checked By ________

Austin, Texas

64-41-305

Latitude ° ' "	Longitude ° ' "	Seq. No.
29 22 11	094 54 33	01

County code 167 County Galveston

Well # KH-64-41-305

Project number 4648-01200

Date 5-10-76 Time — Temp°C 29.5

Owner Texas City Refining Corp.

Address well 1

Date drld — WBF code 112 CHCTL

Sample interval: (top) 900 (bottom) 1006

Water level — Appr clear Use Ind.

Collector Naftel Yield — GPM

Smpld aftr pmpg on arrival Depth 1042

Pt of coll tap on discharge pipe

Field: Cond ___ pH ___ HCO_3 ___ DO ___

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule I

Other

Herbicide ___ Insecticide ___

Remarks: re-sampled

KEY PUNCHED

Type	Station identification number
2	292211094543301
1	2 9 16

Y M D	Time of measurement
760510	
17 Begin 22	29 32

	Parameter code	Value	Exp.	Rmk
Depth	72008	1042	04	
Yield (GPM)	00059			
Sample interval TOP	72015	9000	03	
Sample interval BOTTOM	72016	1006	04	
Water level	72019			

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004				
DO (mg/1)	00300				
DO % Sat.	00301				
Temp °C	00010	2950	02		29.
pH	00400	7600	01		7.
Specific conductance	00095	3840	04		38
HCO_3	00440	3490	03		34
CO_3	00445	0000	01		0
Chloride (Cl)	00940	1100	04		110
Sulfate (SO_4)	00945	0000	00		0.
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31616				
Streptococci	31679				
BOD	00310				

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ____

Proj. No. ____

CHEMICAL WATER ANALYSIS REPORT

County 084 KH Galveston

State Well No. 64-41-305

____ Well No. ____

Date Collected 05-12-66

By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____

Source (type of well) ____ Owner ____

Date Drilled ____ Depth 1006 ft. WBF Gulf Coast

Producing intervals ____ Water level ____ ft.

Sampled after pumping ____ hrs. Yield ____ GPM meas. est. Temperature ____ °F 29 °C

Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ____ Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

	MG/L	ME/L
Carbonate		
Bicarbonate	368	
Sulfate		
Chloride	900	
Fluoride		
Nitrate		
pH	7.4	
Total		

%Na ____

SAR ____

RSC 3.9

☐ (other) ____ MG/L

Specific Conductance (micromhos/cm³) 3330

Diluted Conductance (micromhos/cm³) X

"☐" items will be analyzed if checked.

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as CaCO$_3$	
Total Alkalinity as CaCO$_3$	
Total Hardness as CaCO$_3$	106

2/ Nitrogen Cycle

Ammonia - N	
Nitrite - N	
Nitrate - N	
Organic Nitrogen	

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JUL 27 1982
CR/TDWR

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ____ Checked By ____

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

0 8 4 KH Galveston
County

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

State Well No. 64-41-305

______ Well No. ______

Date Collected 05-09-63

By ______

Location ______

Source (type of well) ______ *Owner* ______

Date Drilled ______ Depth 1006 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/ ☐ Total Iron		

%Na ______

SAR ______

RSC 3.7

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm3) 3090

Diluted Conductance (micromhos/cm3) ______ X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		
Bicarbonate	354	
Sulfate		
Chloride	880	
Fluoride		
Nitrate		
pH	7.8	
Total		

1/ Dissolved Solids (sum in MG/L) ______

Phenolphthalein Alkalinity as C aCO3 ______

Total Alkalinity as C aCO3 ______

Total Hardness as C aCO3 103

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

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JUL 27 1982
CR/TDWR

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ______ Checked By ______

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

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1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

084 KH Galveston
County

State Well No. 64-41-305

______ Well No. ______

Date Collected 05-04-61

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 1006 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 3310

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		
Bicarbonate	358	
Sulfate		
Chloride	900	
Fluoride		
Nitrate		
pH	7.8	
Total		

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as C aCO$_3$	
Total Alkalinity as C aCO$_3$	
Total Hardness as C aCO$_3$	103

2/ Nitrogen Cycle

Ammonia - N	
Nitrite - N	
Nitrate - N	
Organic Nitrogen	

RECEIVED
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1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ______ Checked By ______

Map ID: 14		**Source: Texas Water Development Board**
Well Number: 6441303	**GWS - Groundwater Supply**	**Banks ID: 6441303**
Well Address: TX		**Rel. Loc.: 0.62mi N**
Completion Date: 1943-01-01		**Drill Depth: 1015.0**
Owner: Texas City Refining Corp.		**Elevation: 3.28 ft (-8.50 ft)**

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Texas Water Wells
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

Sites in Map ID 14 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Texas City Refining Corp.	TX	30
WW	USGS	US	161

WRD Exp. (GW)
April 1966

Well No. H-64-41-303

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by Ben Petitt 1952 G. McAdoo   Source of data File   Date 3-12-68   Map Virginia Point 1954 1:24000

State Texas [4 8]   County (or town) Galveston [K H]

Latitude: ✓ [2 9 2 2 1 3 N] N/S (deg, min, sec)   Longitude: [0 9 4 5 4 1 4] (degrees, min, sec)   Sequential number: [1]

Lat-long accuracy: [1]   T. ____ N/S, R. ____ E/W, Sec ____, ____ ¼, ____ ¼, ____ ¼

Local well number: [K H 6 4 4 1 3 0 3]   Other number: (M-38) B & M No. 2

Local use: [ ]   Owner or name: Texas City Refining corp.

Owner or name: [T E X A S C I T Y R E F]   Address: Texas City, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist [N]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other [N]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed [W]

DATA AVAILABLE: Well data [1]   Freq. W/L meas.: Annual [A]   Field aquifer char. [ ]

Hyd. lab. data: [ ]

Qual. water data; type: [ ]

Freq. sampling: 4-12-44 [I]   Pumpage inventory: yes no; period: [ ]

Aperture cards: yes [ ]

Log data: D-Log [D]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD   Depth well: 1015 ft [1 0 1 5]   Meas. [✓ rept] owner accuracy [6]

Depth cased; (first perf.) 897 ft [8 9 7]   Casing type: S ; Diam. 16-10 3/4 in [1 6]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., [✓ (S) screen], (T) sd. pt., (W) shored, (X) open hole, (Z) other [S]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other [H]

Date Drilled: 1943 [9 4 3]   Pump intake setting: ____ ft [ ]

Driller: Texas Water Wells (name), Houston, Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other [T]   [✓ Deep] Shallow [D]

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. ____ [5]   Trans. or meter no. ____

Descrip. MP ____ ft above/below LSD. Alt. MP ____

Alt. LSD: ~~8.4~~ [~~T.4~~]   Accuracy: (source) Topo 5' [3]

Water Level 75 ft above/below MP; Ft above/[✓ below LSD] [7 5]   Accuracy: rept. [ ]

Date meas: Nov. 43 [N 4 3]   Yield: 800 gpm [8 0 0]   Method determined [ ]

Drawdown: 34 ft [3 4]   Accuracy: rept. W.D. [ ]   Pumping period ____ hrs [ ]

QUALITY OF WATER DATA: Iron ____ ppm [ ]   Sulfate ____ ppm [ ]   Chloride ____ ppm [ ]   Hard. ____ ppm [ ]

Sp. Conduct ____ K x 10⁶ [ ]   Temp. ____ °F [ ]   Date sampled [ ]

Taste, color, etc. ____

Well No. KH-64-41-303

Well No. KH-64 1-303

Latitude-longitude 29 , 22 , 13 [✓ N] S 094 , 54 , 14
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD

Physiographic Province: Coastal Plain 0 3 Section:

F Drainage Basin: 51 T Subbasin:

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (0) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat

MAJOR AQUIFER: system, series; Lower Chicot aquifer, formation, group C L

Lithology: Origin: Aquifer Thickness: ft

Length of well open to: 107 ft 1 0 7 Depth to top of: ft

MINOR AQUIFER: system, series; aquifer, formation, group

Lithology: Origin: Aquifer Thickness: ft

Length of well open to: ft Depth to top of: ft

Intervals Screened: 897-1004

Depth to consolidated rock: ft Source of data:

Depth to basement: ft Source of data:

Surficial material: Infiltration characteristics:

Coefficient Trans: gpd/ft Coefficient Storage:

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards:

Well No. KH-64-41-303

GPO 857-700

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(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ______ Lab No. 02

Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-303

______ Well No. ______

Date Collected 05-14-75

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By Naftel- USGS

Source (type of well) ______ Owner Texas City Refining Corp. No. 2

Date Drilled 1943 Depth 1015 ft. WBF Chicot Sample depth ______ ft.

Producing intervals 897 - 1004 Water level ______ ft.

Sampled after pumping on arrival hrs. Yield — GPM meas. est. Temperature ______ °F 29 °C

Point of collection blow off pipe Appearance ☒ clear ☐ turbid ☐ colored ☐ other

Use Ind Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
		Total	
☐ Potassium	00937		
[3] ☐ Manganese	01055		%Na ______
☐ Boron	01022		SAR ______
[3] ☐ Total Iron	01045		RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) · 00095 · 3690

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	352	
Sulfate	00945	4	
Chloride	00940	1000	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.7	Total
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as CaCO$_3$	00415		
Total Alkalinity as CaCO$_3$	00410		
Total Hardness as CaCO$_3$	00900		
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

015747

64-41-303

Latitude ° ' "	Longitude ° ' "	Seq. No.
2 9 2 2 1 3	0 9 4 5 4 1 4	0 1

County code 167 County Galveston

Well # BH-64-41-303

Project number 5-4648-01200

Date 5-14-75 Time — Temp°C 29.0

Owner Texas City Refining Corp. No. 2

Address Texas City Tex.

Date drld 1943 WBF code 112 CHCTL

Sample interval: (top) 897 (bottom) 1004

Water level — Appr clear Use Ind

Collector Naftel Yield — GPM

Smpld aftr pmpg on arrival Depth 1015

Pt of coll blow off pipe

Field: Cond ____ pH ____ HCO$_3$ ____ DO ____

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule I + SO$_4$

Other

Herbicide Insecticide

Remarks: Re-sample

KEY PUNCHED

Type	Station identification number
2	2 9 2 2 1 3 0 9 4 5 4 1 4 0 1
1	2 9 16

Y M D (Begin)	Time of measurement
7 5 0 5 1 4	
17 22	29 32

	Parameter code	Value	Exp.	Rmk
Depth	72008	1015	04	☐
Yield (GPM)	00059			☐
Sample interval TOP	72015	8970	03	☐
Sample interval BOTTOM	72016	1004	04	☐
Water level	72019			☐

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004			☐	
DO (mg/1)	00300			☐	
DO % Sat.	00301			☐	
Temp °C	00010	2900	02	☐	29.
pH	00400	7700	01	☐	7.7
Specific conductance	00095	3690	04	☐	369
HCO$_3$	00440	3520	03	☐	35
CO$_3$	00445	0000	01	☐	0
Chloride (Cl)	00940	Same 1000	04	☐	100
Sulfate (SO$_4$)	00945	3600	01	☐	3.
Color	00080			☐	
Coliform, membrane filter	31501			☐	
Coliform, fecal	31616			☐	
Strep-tococci	31679			☐	
BOD	00310			☐	
				☐	
				☐	
				☐	
				☐	

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(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ______ Lab No. 02

Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-303

______ Well No. ______

Date Collected 05-20-74

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 1004 ft. WBF ~~378~~ 379

Producing intervals ______ Water level ______ ft. Sample depth ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F 29 °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ______

SAR ______

RSC 3.2

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm³) · 00095 · 3650

Diluted Conductance (micromhos/cm³) x

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	348	
Sulfate	00945		
Chloride	00940	1000	
Fluoride	00951		
Nitrate	71850		
pH	00403	8.0	
Total			

[1] Dissolved Solids (residue at 180°C)	70300	
Phenolphthalein Alkalinity as $CaCO_3$	00415	
Total Alkalinity as $CaCO_3$	00410	
Total Hardness as $CaCO_3$	00900	120
[2] Nitrogen Cycle		
Ammonia - N	00610	
Nitrite - N	00615	
Nitrate - N	00620	
Organic Nitrogen	00605	

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CR/TDWR

Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County 0|8|4 KH Galveston

State Well No. 64-41-303

______ Well No. ______

Date Collected 05-14-68

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 1004 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas./est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

	MG/L	ME/L
Carbonate		
Bicarbonate	348	
Sulfate		
Chloride	1090	
Fluoride		
Nitrate		
pH	8.1	
Total		

%Na ______

SAR ______

RSC 3.1

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 3750

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

1/ Dissolved Solids (sum in MG/L) ______

Phenolphthalein Alkalinity as CaCO$_3$ ______

Total Alkalinity as CaCO$_3$ ______

Total Hardness as CaCO$_3$ 129

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

RECEIVED
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CR/TDWR

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ______ Checked By ______

Typewrite (Black ribbon) or Print Plainly
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Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston

State Well No. 64-41-303

______ Well No. ______

Date Collected 05-11-64

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 1004 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas./est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica	27	
Calcium	27	
Magnesium	11	
Sodium +K	758	
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na 94

SAR 31

RSC 3.6

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm3) 3700

Diluted Conductance (micromhos/cm3) X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		
Bicarbonate	356	
Sulfate	0	
Chloride	1040	
Fluoride	0.8	
Nitrate	0.2	
pH	8.0	
Total		

1/ Dissolved Solids (sum in MG/L) 2040

Phenolphthalein Alkalinity as C aCO3 ______

Total Alkalinity as C aCO3 ______

Total Hardness as C aCO3 112

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ______ Checked By ______

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ____

Proj. No. ____

64-41-303

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston

State Well No. ~~66-44~~

____ Well No. ____

Date Collected 05-14-59

By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____

Source (type of well) ____ Owner ____

Date Drilled ____ Depth 1004 ft. WBF Gulf Coast

Producing intervals ____ Water level ____ ft.

Sampled after pumping ____ hrs. Yield ____ GPM meas. est. Temperature ____ °F ____ °C

Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ____ Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ____

SAR ____

RSC ____

☐ (other) ____ MG/L

Specific Conductance (micromhos/cm³) 3750

Diluted Conductance (micromhos/cm³) ____ X ____

☐ " items will be analyzed if checked.

	MG/L	ME/L
Carbonate	)	
Bicarbonate	328	
Sulfate		
Chloride	1040	
Fluoride		
Nitrate		
pH	8.4	
Total		

1/ Dissolved Solids (sum in MG/L)

Phenolphthalein Alkalinity as C aCO3

Total Alkalinity as C aCO3

Total Hardness as C aCO3 82

2/ Nitrogen Cycle

Ammonia - N

Nitrite - N

Nitrate - N

Organic Nitrogen

1/ The bicarbonate reported in this analysis is converted by computation multiplying by 0.4917) to an equivalent amount of carbonate, and the arbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

WDBE-GW-50 (Rev. 7-1-71)

Analyst ____ Checked By ____

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

0 8 4 KH Galveston
County

State Well No. 64-41-303

______ Well No. ______

Date Collected 05-09-62

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 1004 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 3510

Diluted Conductance (micromhos/cm^3) ______ X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		
Bicarbonate	370	
Sulfate		
Chloride	990	
Fluoride		
Nitrate		
pH	8.0	
Total		

1/ Dissolved Solids (sum in MG/L) ______

Phenolphthalein Alkalinity as C aCO$_3$ ______

Total Alkalinity as C aCO$_3$ ______

Total Hardness as C aCO$_3$ 106

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

RECEIVED
JUL 27 1982
TDWR

Analyst ______ Checked By ______

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 KH Galveston

State Well No. 64-41-303

Well No. ______

Date Collected 05-04-60

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 1004 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		.
Magnesium		.
Sodium		.
Total		.
☐ Potassium	.	
☐ Manganese	.	
☐ Boron	.	
3/☐ Total Iron	.	
☐ (other) ______ MG/L		

%Na ______

SAR ______

RSC ______

Specific Conductance (micromhos/cm3) 3750

Diluted Conductance (micromhos/cm3) ______ X

	MG/L	ME/L
Carbonate	3	.
Bicarbonate	328	.
Sulfate		.
Chloride	1040	.
Fluoride	.	.
Nitrate	.	.
pH	8.4	
Total		.

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as CaCO3	
Total Alkalinity as CaCO3	
Total Hardness as CaCO3	82

2/ Nitrogen Cycle

RECEIVED
JUL 27 1982
TDWR

Ammonia - N	.
Nitrite - N	.
Nitrate - N	.
Organic Nitrogen	.

"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

Analyst ______ Checked By ______

TWDBE-GW-50 (Rev. 7-1-71)

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ____

Proj. No. ____

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston

State Well No. 64-41-303

____ Well No. ____

Date Collected 05-13-58

By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____

Source (type of well) ____ Owner ____

Date Drilled ____ Depth 1004 ft. WBF Gulf Coast

Producing intervals ____ Water level ____ ft.

Sampled after pumping ____ hrs. Yield ____ GPM meas. est. Temperature ____ °F ____ °C

Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ____ Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/ ☐ Total Iron		

☐ (other) ____ MG/L

%Na ____

SAR ____

RSC ____

	MG/L	ME/L
Carbonate		
Bicarbonate	363	
Sulfate		
Chloride	1080	
Fluoride		
Nitrate		
pH	8.0	
Total		

1/ Dissolved Solids (sum in MG/L) ____

Phenolphthalein Alkalinity as C aCO3 ____

Total Alkalinity as C aCO3 ____

Total Hardness as C aCO3 112

Specific Conductance (micromhos/cm3) 3790

Diluted Conductance (micromhos/cm3) X

2/ Nitrogen Cycle

Ammonia - N ____

Nitrite - N ____

Nitrate - N ____

Organic Nitrogen ____

" ☐ " items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

Analyst ____ Checked By ____

TWDBE-GW-50 (Rev. 7-1-71)

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ____

Proj. No. ____

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston

State Well No. 64-41-303

____ Well No. ____

Date Collected 05-07-56

By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____

Source (type of well) ____ Owner ____

Date Drilled ____ Depth 1004 ft. WBF Gulf Coast

Producing intervals ____ Water level ____ ft.

Sampled after pumping ____ hrs. Yield ____ GPM meas./est. Temperature ____ °F ____ °C

Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ____ Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ____

SAR ____

RSC ____

☐ (other) ____ MG/L

Specific Conductance (micromhos/cm3) 3820

Diluted Conductance (micromhos/cm3) X

	MG/L	ME/L
Carbonate	3	
Bicarbonate	368	
Sulfate		
Chloride	1100	
Fluoride		
Nitrate		
pH	8.5	
Total		

1/ Dissolved Solids (sum in MG/L) ____

Phenolphthalein Alkalinity as C aCO3 ____

Total Alkalinity as C aCO3 ____

Total Hardness as C aCO3 118

2/ Nitrogen Cycle

Ammonia - N ____

Nitrite - N ____

Nitrate - N ____

Organic Nitrogen ____

"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

Analyst ____ Checked By ____

TWDBE-GW-50 (Rev. 7-1-71)

DUP

File original with Texas Water Development Board P. O. Box 13087 Austin, Texas 78711	State of Texas WATER WELL ~~COMPLETION AND~~ PLUGGING REPORT	For TWDB use only Well No. 64-41-3B ✓ Form GW 53 received YES Form GW 54 received TM

1) Well Owner: [illegible] P. O. Box 1271 Texas City Texas 7759[illegible]
Name Street or RFD City State

2) Landowner: Same
Name Street or RFD City State

3) Intended Use: Industrial ☒; Municipal ☐; Irrigation ☐; Domestic ☐; Stock ☐; Other

4) Location Of Well: Count[redacted] League Abstract No.

NW¼ NE¼ SW¼ SE¼ of Section Block No. Survey
(Circle as many as known)
See attached map well No. M-3[illegible] ([illegible])

miles in (NE, SW, etc.) direction from Town. Use reverse side to sketch map of well location showing distances from adjacent section or survey lines, or to landmarks, roads, and creeks.

~~COMPLETION AND~~ PLUGGING DATA

5) Driller Texas Water Well Registration Number — Address —

6) Party ~~Completing Or~~ Plugging Well Layne Texas Co Registration Number 24 Address P.O. Box 9465 Hou 77[illegible]

Plugged Feb. 1974

7) Drilled — 1972; Dug ☐; Cable Tool ☐; Rotary ☒; Other Owners Well Number 2

8) Diameter Of Hole 26 inches, from 0 to [illegible] feet, and 36 inches, from [illegible] to 1010 feet; Total depth [illegible] feet.

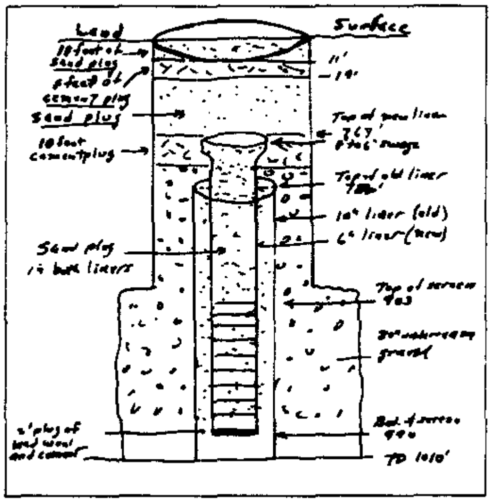
9) Casing and Cement:

Diameter (inches)	Set in Well		Left in Well		Cement Baskets or Packers, Depth (feet)	Cement	
	From (feet)	To (feet)	From (feet)	To (feet)		From (feet)	To (feet)
16	0	76[illegible]	-	[illegible]	-		
10	772	1010	772	1010			
6	767	772	767	772			

10) Well Log: All measurements made from feet above ground level.

From (ft.)	To (ft.)	Description and color of formation material
		See attached
		Original Log [illegible]
		and Completion
		Schedule
		All [illegible] Workover

11) Sketch Of Well: Show method of ~~completion and/or~~ plugging including all casing and cemented intervals.



12) Fresh Water-Bearing Zone(s): Depth in feet to top of 903, Thickness 87 feet.

13) Undesirable Water-Bearing Zone(s): Depth in feet to top of None, Thickness feet.

14) Static Water Level(s) feet below land surface. Was the water level measured after penetrating the first water-bearing zone ☐, or after drilling to total depth ☐? Check applicable box(s).

15) Describe in detail the type, volume and manner of placement of all cement. Indicate depth to top of cement behind each casing string. Describe and give percent of all cement additives: Well plugged with [illegible] of [illegible] and 12 sks of cement

990 - 777 Sand
777 - 767 Cement
767 - 14 Sand
14 - 11 Cement
11 - 0 Sand

16) Was undesirable water exclusion or retention or plugging program checked for adequacy? No
If so describe method(s) used.

17) Attach electrical, gamma ray or other mechanical log(s), water analyses, and other pertinent data if available.

VALIDATION

18) We, the party performing the undesirable water exclusion ☐ retention ☐ plugging ☒ (Check applicable box) operations, ________, and the landowner or party having well drilled, deepened or otherwise altered, ________, certify that the undesirable water exclusion or retention or plugging operations were performed in the manner described above.

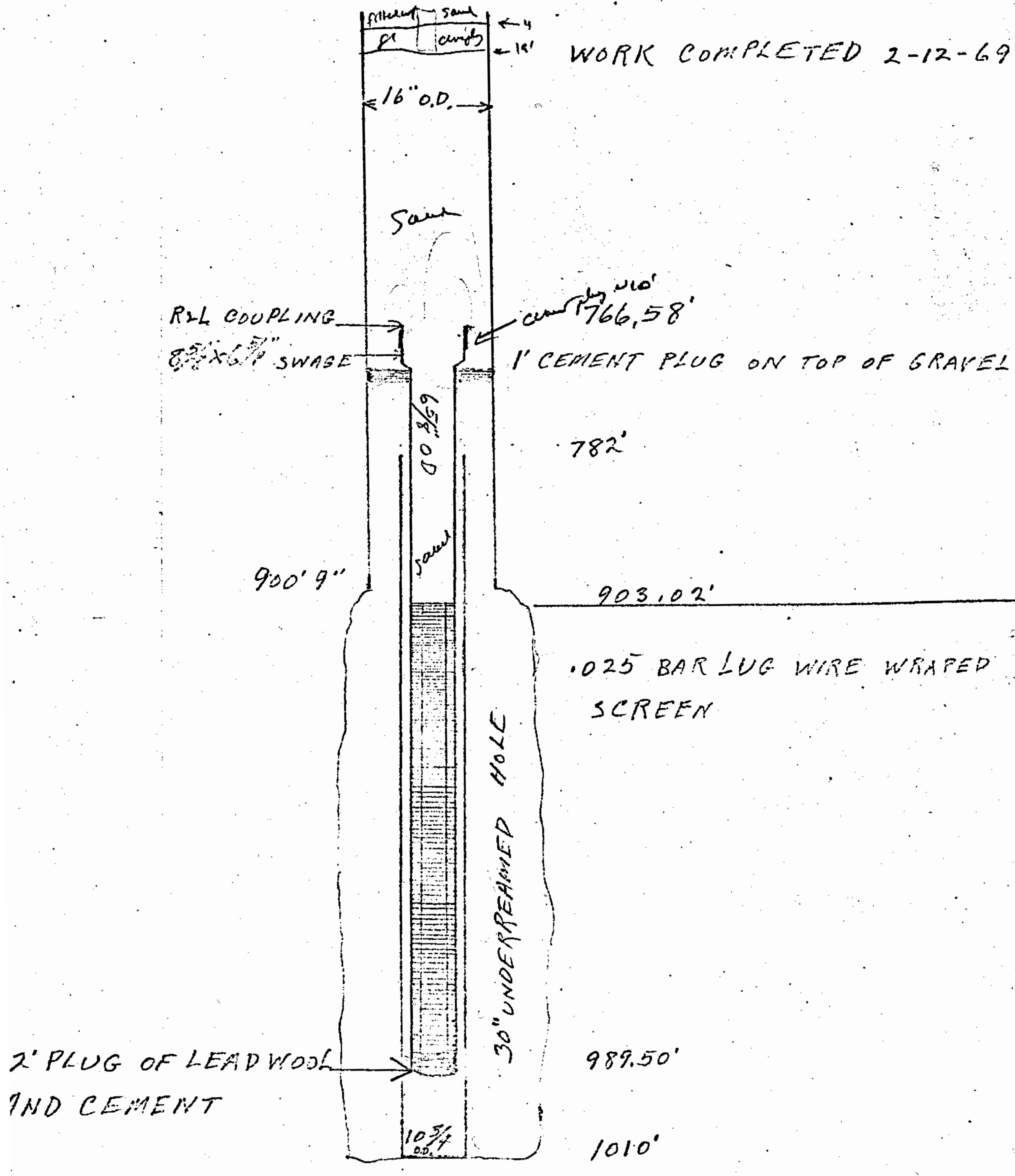
Leland Lawson
Leland Lawson Reg. No. 24
Layne Texas Co

KH64-41-303

TWDBE-GW-55

'WELL NO. 2 TEXAS CITY REFINING CO.

WORK COMPLETED 2-12-69



KH64-41-303

WATER WELL #2

Well Log

0	to	30	Surface Dlay
30	"	60	Sandy Shale
60	"	90	Hard Blue Shale
90	"	110	Sandy Shale
110	"	135	Shale
135	"	160	Sticky Shale
160	"	180	Fine Sand & Shale
180	"	202	Sticky Shale
202	"	245	Sticky Shale
245	"	270	Hard Shale
270	"	280	Sandy Shale
280	"	300	Hard Fine Sand
300	"	325	Sandy Shale
325	"	340	Course Sand
340	"	380	Sandy Shale
380	"	402	Sticky Shale
402	"	424	Shale & Sand Streaks
424	"	447	Sticky Shale
447	"	475	Hard Shale
475	"	518	Hard Shale
518	"	575	Stick Shale
575	"	590	Hard Sand590
590	"	650	Shale & Shell
650	"	670	Hard Shale
670	"	715	Sandy Shale
715	"	745	Sand
745	"	770	Sticky Shale
770	"	790	Hard Sandy Shale
790	"	830	Hard Sandy Lime
830	"	875	Sandy Shale
875	"	896	Water Sand Medium
986	"	912	Water Sand Course
912	"	935	Water Sand Course
935	"	1015	Water Sand Course

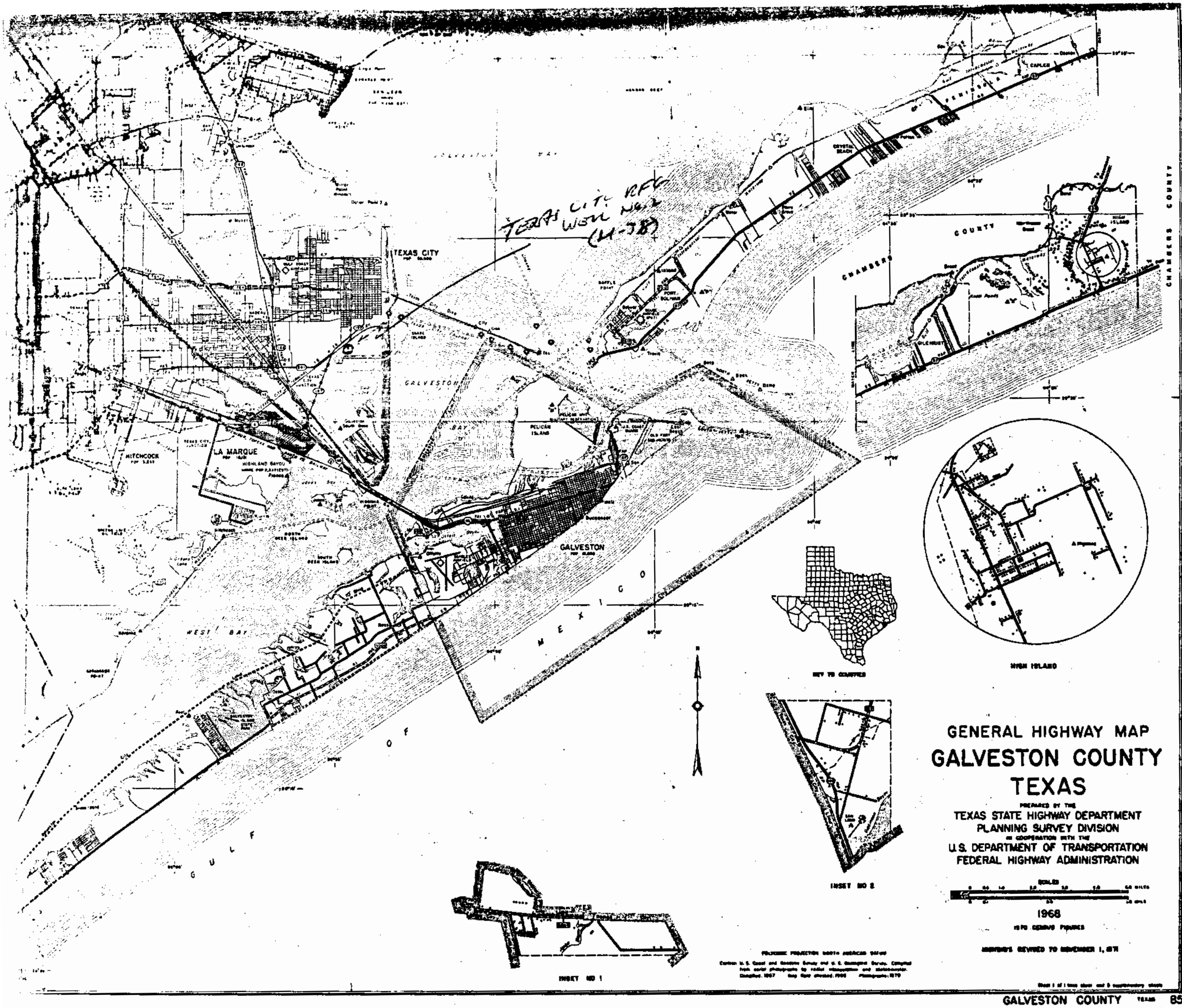
Pump
Ass. #145

Hole bottomed at 1,015'
Set 900' 9" 16" O.D. Cell & spigot welded casing
Cement - 500 sacks Hi-Early strength cemented top to bottom
underream -30" dia. 901' to 1010'
Screen - 1017' 10 3/4" O.D. - Admirality bronze wire wrapped
Liner - 121' - 10 3/4" O.D.
Top of liner 782' - 0"
Gravel - gravel packed from bottom to 782' - 0"
pump setting 170' - 0"
Water level 75'
Water pull down 34'

766
16

DRILLED BY TEXAS WATER WELLS, 1943 WELL NO. H-38 (Bull 5502, TBWE, 1955)

KH 64-41-303



Texas City Ref Well No. 2 (M-38)

GENERAL HIGHWAY MAP
GALVESTON COUNTY
TEXAS

PREPARED BY THE
TEXAS STATE HIGHWAY DEPARTMENT
PLANNING SURVEY DIVISION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

1968

1970 CENSUS FIGURES

HIGHWAYS REVISED TO NOVEMBER 1, 1971

KH 64-41-303

Map ID: 17		**Source: Texas Water Development Board**
Well Number: 6441313	**GWS - Groundwater Supply**	**Banks ID: 6441313**
Well Address: TX		**Rel. Loc.: 0.78mi N**
Completion Date: 1920-01-01		**Drill Depth: 993.0**
Owner: Pan-American Refining		**Elevation: 9.84 ft (-1.94 ft)**

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	J.A. Walling
Drilling Start Date:	
Drilling Method:	
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

9-50 Exp. (GW)
April 1966

WELL SCHEDULE

64-41-313

U. S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

1:24000

MASTER CARD

Record by W. L. NAFTEL Source of data Bul. 5502 Date 11-19-75 Map Virginia Point

State Texas 4 8 County (or town) Galveston K H

Latitude: ✓ 2 9 2 2 2 2 N (deg, min, sec) Longitude: ✓ 0 9 4 5 4 5 4 (degrees, min, sec) Sequential number: 1

Lat-long accuracy: 2 T ___ N/S, R ___ E/W, Sec ___, ___ ¼, ___ ¼, ___ ¼ ___ B & M

Local well number: K H - 6 4 - 4 1 - 3 1 3 Other number: M-34

Local use: ☐ Owner or name: Pan-American Refining

Owner or name: ☐ Address: Corp. Well?

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other Called Tank Farm well N

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (B) Destroyed. ☐ ?

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: none N Field aquifer char. ☐

Hyd. lab. data: ☐

Qual. water data; type: ☐

Freq. sampling: 3-11-43 O Pumpage inventory: yes no, period: ☐

Aperture cards: yes ☐

Log data: D-log D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD

Depth well: 993 ft 9 9 3 Meas. [✓ rept] accuracy 6

Depth cased: (first perf.) — ft ☐ Casing type: S ; Diam. 10x6x4 in 1 0

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) ___ other ☐

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ___ other ☐

Date Drilled: 1920 9 2 0 Pump intake setting: ___ ft ☐

Driller: J. A. Walling (name), ___ (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other T [✓ Deep] Shallow D

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. 25 ☐ Trans. or meter no. ___

Descrip. MP ___ ft above/below LSD, Alt. MP ___

Alt. LSD: ✓11 1 1 Accuracy: (source) 5' topo 3

Water Level Flowing ft above/below MP; Ft above/below LSD ☐ Accuracy: rept. D

Date meas: 1920 2 0 Yield: Flowed 30 gpm 3 0 Method determined ☐

Drawdown: ___ ft ☐ Accuracy: ☐ Pumping period ___ hrs ☐

QUALITY OF WATER DATA: Iron ___ ppm ☐ Sulfate ___ ppm ☐ Chloride ___ ppm ☐ Hard. ___ ppm ☐

Sp. Conduct ___ K x 10⁶ ☐ Temp. ___ °F ☐ Date sampled ___ ☐

Taste, color, etc. ___

Well No.

Well no. [illegible]

64-41-313

Latitude-longitude ___ d ___ m ___ s N S ___ d ___ m ___ s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19

Physiographic Province: Coastal Plain [0 3] 20 21 Section: W.G.C.P

[F] 22 Drainage Basin: [5 1 T] 23 25 Subbasin: [ ] 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, [✓ (F) flat], (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat 27 [F]

MAJOR AQUIFER: ___ system, ___ series [Q G] 28 29 Lower Chicot aquifer, formation, group [C L] 30 31

Lithology: sand [S] 32 33 Origin: deltaic [3] 34 Aquifer Thickness: ___ ft

[ ] 35 37 Length of well open to: ___ ft [ ] 38 40 Depth to top of: ___ ft [ ] 41 43

MINOR AQUIFER: ___ system, ___ series [ ] 44 45 ___ aquifer, formation, group [ ] 46 47

Lithology: ___ [ ] 48 49 Origin: ___ [ ] 50 Aquifer Thickness: ___ ft

[ ] 51 53 Length of well open to: ___ ft [ ] 54 56 Depth to top of: ___ ft [ ] 57 59

Intervals Screened: set opposite sand at bottom of well

Depth to consolidated rock: ___ ft [ ] 60 63 Source of data: ___ 64 [ ]

Depth to basement: ___ ft [ ] 65 68 Source of data: ___ 69 [ ]

Surficial material: ___ [ ] 70 71 Infiltration characteristics: ___ 72 [ ]

Coefficient Trans: ___ gpd/ft [ ] 73 75 Coefficient Storage: ___ [ ] 76 78

Coefficient Perm: ___ gpd/ft^2; Spec cap: ___ gpm/ft; Number of geologic cards: ___ [ ] 79

Flowed about 30 gpm in 1920

Well No.

GPO 857-700

Map ID: 18

Source: Texas Water Development Board

Well Number: 6441308

GWS - Groundwater Supply

Banks ID: 6441308

Well Address: TX

Rel. Loc.: 0.79mi N

Completion Date: 1942-01-01

Drill Depth: 738.0

Owner: Marathon Oil Co.

Elevation: 6.56 ft (-5.22 ft)

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas Co.
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

WRD Exp. (GW)
April 1966

Well No KH-64-41-308

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

1:24,000

Record by McAdoo Source of data Bul 5502 Date 10-29-69 Map Virginia Point 1954

State Texas 48 County (or town) Galveston KH

Latitude: 29 22 23 N (deg min sec N S) Longitude: 094 54 32 (degrees min sec) Sequential number: 1

Lat-long accuracy: 1 T____ N S, R____ E W, Sec____, ____¼, ____¼, ____¼ ____ B & M

Local well number: KH-64-41-308 Other number: M-36 (No-3) ✓

Local use: ☐ Owner or name: Marathon Oil Co.

Owner or name: MARATHON OIL CO Address: Texas City, Tex.

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist ____ N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other ____ N

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed. W

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: ____ O Field aquifer char. ☐

Hyd. lab. data: ____ ☐

Qual. water data; type: ____ ☐

Freq. sampling: Yes 4-13-44 A Pumpage inventory: yes no, period: ____ ☐

Aperture cards: ____ yes ☐

Log data: D-Log D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 759 ft 759 Meas. [✓ Rept] D-Log accuracy 3

Depth cased: (first perf.) 450 ft 450 Casing type: ST. ; Diam. 16-8⅝ in 16

Finish: (C) porous concrete, (F) gravel w. (perf.), [✓ (G) gravel w. (screen)], (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) ____ other G ✓

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ____ other H

Date Drilled: 1942 942 Pump intake setting: ____ ft ☐

Driller: Layne Texas Co. (name), Houston, Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other T [✓ Deep] Shallow D

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. 50 ☐ Trans. or meter no. ____

Descrip. MP ____ ft above below LSD, Alt. MP ____

Alt. LSD: 7 7 Accuracy: (source) Topo 5' 3

Water Level 100 ft above below MP; Ft above [✓ below] LSD 100 Accuracy: rept D

Date meas: Dec 1942 D42 Yield: 600 gpm 600 Method determined ☐

Drawdown: 46 ft 46 Accuracy: rept 3 Pumping period ____ hrs ☐

QUALITY OF WATER DATA: Iron ____ ppm ☐ Sulfate ____ ppm ☐ Chloride ____ ppm ☐ Hard. ____ ppm ☐

Sp. Conduct ____ K x 10^6 ☐ Temp. ____ °F ☐ Date sampled ____ ☐

Taste, color, etc. ____

Well No. KH-64-41-308

Well No. KH-64-41-308

Latitude-longitude 29, 22, 23 (N) S 094, 54, 32, 1
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19

Physiographic Province: Coastal Plain 0 3 (20 21) Section:

F (22) Drainage Basin: (23 25) Subbasin: (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (ϕ) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat (27)

MAJOR AQUIFER: system, series (28 29) aquifer, formation, group C V (30 31)

Lithology: (32 33) Origin: (34) Aquifer Thickness: ft

(35 37) Length of well open to: 127 ft 1 2 7 (38 40) Depth to top of: ft (41 43)

MINOR AQUIFER: system, series (44 45) aquifer, formation, group (46 47)

Lithology: (48 49) Origin: (50) Aquifer Thickness: ft

(51 53) Length of well open to: ft (54 56) Depth to top of: ft (57 59)

Intervals Screened: 40 450-490; 14 548-562; 7 570-577; 11 587-598; 5 672-677; 50 688-738.

Depth to consolidated rock: ft (60 63) Source of data: (64)

Depth to basement: ft (65 68) Source of data: (69)

Surficial material: (70 71) Infiltration characteristics: (72)

Coefficient Trans: gpd/ft (73 75) Coefficient Storage: (76 78)

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards: (79)

343' of 16" csg
406' of 8⅝ csg.

Well No. KH-64-41-308

GPO 857-700

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1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ________ Lab No. 0 2

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 0 8 4 Galveston

State Well No. 6 4 - 4 1 - 3 0 8

Well No. ________

Date Collected 0 5 - 1 4 - 7 5

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By Naftel - USGS

Source (type of well) ________ Owner Marathon Oil Co. No. 3

Date Drilled 1942 Depth 759 ft. WBF Chicot

Producing intervals 450 - 738 Water level ________ ft. Sample depth ☐☐☐☐ ft.

Sampled after pumping on arrival hrs. Yield ________ GPM meas. est. Temperature ________ °F 27 °C

Point of collection tap on discharge pipe Appearance ☑ clear ☐ turbid ☐ colored ☐ other

Use Ind. Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
³☐ Manganese	01055		
☐ Boron	01022		
³☐ Total Iron	01045		

%Na ________

SAR ________

RSC ________

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm³) 00095 1490

Diluted Conductance (micromhos/cm³) X

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	518	
Sulfate	00945	0	
Chloride	00940	220	
Fluoride	00951		
Nitrate	71850		
pH	00403	8.0	
Total			
¹ Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as CaCO₃	00415		
Total Alkalinity as CaCO₃	00410		
Total Hardness as CaCO₃	00900		
² Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

Latitude ° ' " Longitude ° ' " Seq. No.

2 9 2 2 2 3	0 9 4 5 4 3 2	0 1

County code 167 County Galveston

Well # KH-64-41-308

Project number 5-4648-01200

Date 5-14-75 Time — Temp°C 27.0

Owner Marathon Oil Co. No. 3

Address Texas City

Date drld 1942 WBF code 112ZHCTL

Sample interval: (top) 450 (bottom) 738

Water level — Appr Clear Use Ind

Collector Naftel Yield — GPM

Smpld aftr pmpg on arrival Depth 759

Pt of coll tap on discharge pipe

Field: Cond ___ pH ___ HCO3 ___ DO ___

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule I + SO4

Other

Herbicide ___ Insecticide ___

Remarks: Re Sample

KEY PUNCHED

Type 2

Station identification number 292223094543201

Y M D 750514 Begin

Time of measurement

	Parameter code	Value	Exp.	Rmk
Depth	72008	7590	03	
Yield (GPM)	00059			
Sample interval TOP	72015	4500	03	
Sample interval BOTTOM	72016	7380	03	
Water level	72019			

015720

64-41-308

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004				
DO (mg/l)	00300				
DO % Sat.	00301				
Temp °C	00010	2700	02		27.
pH	00400	8000	01		8.0
Specific conductance	00095	1490	04		149
HCO3	00440	5180	03		51
CO3	00445	0000	01		0
Chloride (Cl)	00940	Same 2200	03		22
Sulfate (SO4)	00945	0000	00		0.0
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31616				
Strep-tococci	31679				
BOD	00310				

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Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ______ Lab No. 02

Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-308

______ Well No. ______

Date Collected 05-20-74

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth ______ ft. WBF ______

Producing intervals ______ Water level ______ ft. Sample depth ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F 27 °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3]☐ Manganese	01055		
☐ Boron	01022		
[3]☐ Total Iron	01045		
☐ (other) ______			

%Na ______

SAR ______

RSC 8.1

Specific Conductance (micromhos/cm^3) · 00095 · 1500

Diluted Conductance (micromhos/cm^3) X

" ☐ " items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	520	
Sulfate	00945		
Chloride	00940	220	
Fluoride	00951		
Nitrate	71850		
pH	00403	8.2	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as $CaCO_3$	00415		
Total Alkalinity as $CaCO_3$	00410		
Total Hardness as $CaCO_3$	00900		23
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-308

________ Well No. ________

Date Collected 05-15-72

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth ________ ft. WBF ________

Producing intervals ________ Water level ________ ft. Sample depth ________ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ____ °F 27 °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		
☐ (other) ________		MG/L	

%Na ________

SAR ________

RSC 8.2

Specific Conductance (micromhos/cm^3) 00095 1490

Diluted Conductance (micromhos/cm^3) ____X____

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	528	
Sulfate	00945		
Chloride	00940	230	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.7	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as $CaCO_3$	00415		
Total Alkalinity as $CaCO_3$	00410		
Total Hardness as $CaCO_3$	00900		23
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

[2] Nitrogen Cycle

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Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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Organization No. ______ Lab No. 02
Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston
State Well No. 64-41-308
______ Well No. ______
Date Collected 11-08-71

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By ______
Source (type of well) ______ Owner ______
Date Drilled ______ Depth ______ ft. WBF ______
Producing intervals ______ Water level ______ ft. Sample depth ______ ft.
Sampled after pumping ______ hrs. Yield ______ GPM meas./est. Temperature ______ °F 27 °C
Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3]☐ Manganese	01055		
☐ Boron	01022		
[3]☐ Total Iron	01045		

%Na ______
SAR ______
RSC 7.4

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm³) 00095 1440

Diluted Conductance (micromhos/cm³) ______ X ______

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	476	
Sulfate	00945		
Chloride	00940	210	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.7	
Total			

[1] Dissolved Solids (residue at 180°C)	70300	
Phenolphthalein Alkalinity as CaCO3	00415	
Total Alkalinity as CaCO3	00410	
Total Hardness as CaCO3	00900	20

[2] Nitrogen Cycle

Ammonia - N	00610	
Nitrite - N	00615	
Nitrate - N	00620	
Organic Nitrogen	00605	

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Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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Organization No. ______ Lab No. 02

Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-308

______ Well No. ______

Date Collected 05-14-69

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. 2 By ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth ______ ft. WBF ______

Producing intervals ______ Water level ______ ft. Sample depth ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F 27 °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		
☐ (other) ______			

%Na ______

SAR ______

RSC 8.1

Specific Conductance (micromhos/cm3) 00095 1480

Diluted Conductance (micromhos/cm3) x

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	526	
Sulfate	00945		
Chloride	00940	220	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.9	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as CaCO3	00415		
Total Alkalinity as CaCO3	00410		
Total Hardness as CaCO3	00900	24	
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

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Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-308

________ Well No. ________

Date Collected 05-14-68

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. 1 By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth ________ ft. WBF ________

Producing intervals ________ Water level ________ ft. Sample depth ________ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ________ °F 27 °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		
☐ (other) ________			

%Na ________

SAR ________

RSC 8.2

Specific Conductance (micromhos/cm^3) 00095 1460

Diluted Conductance (micromhos/cm^3) ____x____

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445		
Bicarbonate	00440	520	
Sulfate	00945		
Chloride	00940	210	
Fluoride	00951		
Nitrate	71850		
pH	00403	8.3	
Total			
[1] Dissolved Solids (residue at 180° C)	70300		
Phenolphthalein Alkalinity as C aCO$_3$	00415		
Total Alkalinity as C aCO$_3$	00410		
Total Hardness as C aCO$_3$	00900	25	
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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TDWR ONLY

Organization No. ______ Lab No. 02

Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-308

______ Well No. ______

Date Collected 05-12-66

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 738 ft. WBF ~~378~~ 379 ☐☐☐☐

Producing intervals ______ Water level ______ ft. Sample depth ☐☐☐☐ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ☐☐☐ °F ☐☐☐ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
	Total		
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ______

SAR ______

RSC 8.0

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm3) 00095 1410

Diluted Conductance (micromhos/cm3) x

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	510	
Sulfate	00945		
Chloride	00940	220	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.5	Total
[1] Dissolved Solids (residue at 180° C)	70300		
Phenolphthalein Alkalinity as $CaCO_3$	00415		
Total Alkalinity as $CaCO_3$	00410		
Total Hardness as $CaCO_3$	00900		19
Ammonia - N ([2] Nitrogen Cycle)	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

RECEIVED
JUL 27 1982
CR/TDWR

"☐" items will be analyzed if checked.

Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

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Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY
Program No.
Proj. No.

CHEMICAL WATER ANALYSIS REPORT

County KN Galveston
State Well No. 64-41-308
Well No.
Date Collected 05-13-54
By

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location
Source (type of well)
Owner Gulf Coast
Date Drilled
Depth 738 ft.
WBF
Producing intervals
Water level ft.
Sampled after pumping hrs.
Yield GPM meas. est.
Temperature °F °C
Point of collection
Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use
Remarks

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No.
Date Received
Date Reported

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

☐ (other) MG/L
%Na
SAR
RSC

Specific Conductance (micromhos/cm³) 1460
Diluted Conductance (micromhos/cm³) X

	MG/L	ME/L
Carbonate		
Bicarbonate	553	
Sulfate		
Chloride	212	
Fluoride		
Nitrate		
pH	8.8	
Total		

1/ Dissolved Solids (sum in MG/L)
Phenolphthalein Alkalinity as C aCO₃
Total Alkalinity as C aCO₃
Total Hardness as C aCO₃ 27

2/ Nitrogen Cycle
Ammonia - N
Nitrite - N
Nitrate - N
Organic Nitrogen

"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

Analyst
Checked By

TWDBE-GW-50 (Rev. 7-1-71)

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston

State Well No. 64-41-308

______ Well No. ______

Date Collected 05-08-53

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 238 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas./est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

	MG/L	ME/L
Carbonate		
Bicarbonate	567	
Sulfate		
Chloride	208	
Fluoride		
Nitrate		
pH	8.8	
Total		

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 1530

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as C aCO$_3$	
Total Alkalinity as C aCO$_3$	
Total Hardness as C aCO$_3$	26

2/ Nitrogen Cycle

Ammonia - N	
Nitrite - N	
Nitrate - N	
Organic Nitrogen	

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

Analyst ______ Checked By ______

TWDBE-GW-50 (Rev. 7-1-71)

Map ID: 19		**Source: Texas Water Development Board**
Well Number: 6441310	**GWS - Groundwater Supply**	**Banks ID: 6441310**
Well Address: TX		**Rel. Loc.: 0.79mi N**
Completion Date: 1942-01-01		**Drill Depth: 1017.0**
Owner: Marathon Oil Co.		**Elevation: 6.56 ft (-5.22 ft)**

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas Co.
Drilling Start Date:	
Drilling Method:	
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

Sites in Map ID 19 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Marathon Oil Co.	TX	63
WW	USGS	US	162

WRD Exp. (GW)
April 1966

Well No. H-64-41-310

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR GEOLOGICAL SURVEY WATER RESOURCES DIVISION

1:24000

MASTER CARD

Record by W. L. Naftel Source of data Bul. 5502 Date 11-26-75 Map Virginia Point, Tex. 1969

State Texas 4 8 County (or town) Galveston K H

Latitude: 2 9 2 2 2 3 N deg min sec Longitude: 0 9 5 5 4 4 4 degrees min sec Sequential number: ☐

Lat-long accuracy: ☐ T ___ N S, R ___ E W, Sec ___, ¼, ¼, ¼

Local well number: K H - 6 4 - 4 1 - 3 1 0 Other number: B & M M-35 in 5502

Local use: ☐ Owner or name: Marathon Oil Co #4

Owner or name: ☐ Address: ___

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist ___ N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other ___ N

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed. ☐ ?

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: ___ 0 Field aquifer char. ☐

Hyd. lab. data: ___ ☐

Qual. water data; type: ___ ☐

Freq. sampling: 4-13-44 I Pumpage inventory: yes no, period: ___ ☐

Aperture cards: ___ yes ☐

Log data: D-log ☐

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 1017 ft 1 0 1 7 Meas. [✓ rep] ___ accuracy 6

Depth cased: (first perf.) 852 ft 8 5 2 Casing type: 5 ; Diam. 20x12 in 2 0

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) ___ other ☐

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ___ other ☐

Date Drilled: 1942 9 4 2 Pump intake setting: ___ ft ☐

Driller: Layne-Texas name, ___ address

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other 7 [✓ Deep] Shallow D

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. 250 ☐ Trans. or meter no. ___

Descrip. MP ___ ft above below LSD, Alt. MP ___

Alt. LSD: 8 8 Accuracy: (source) 5' topo 3

Water Level 56 ft above below MP; Ft above [✓ below LSD] 5 6 Accuracy: rept. D

Date meas: Nov. 4-1942 N 4 2 Yield: 1225 gpm 1 2 2 5 Method determined ☐

Drawdown: 40 ft 4 0 Accuracy: rept. ☐ Pumping period ___ hrs ☐

QUALITY OF WATER DATA: Iron ___ ppm ☐ Sulfate ___ ppm ☐ Chloride ___ ppm ☐ Hard. ___ ppm ☐

Sp. Conduct ___ K x 10⁶ ☐ Temp. ___ °F ☐ Date sampled ___ ☐

Taste, color, etc. ___

✓Kuuk

Well No.

31

Well No. KH-64 41-311

Latitude-longitude ___ d ___ m ___ s N S ___ d ___ m ___ s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19)

Physiographic Province: Coastal Plain [0|3] (20–21) Section: W.G.C.P

[F] (22) Drainage Basin: ___ [5|1|T] (23–25) Subbasin: ___ [ ] (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, [✓ (F) flat], (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ___ (27) [F]

MAJOR AQUIFER: ___ system, ___ series [Q|G] (28–29) Lower Chicot aquifer, formation, group [C|L] (30–31)

Lithology: Sand [S|] (32–33) Origin: deltaic [3] (34) Aquifer Thickness: ___ ft

[| |] (35–37) Length of well open to: 155 ft [1|5|5] (38–40) Depth to top of: ___ ft [| |] (41–43)

MINOR AQUIFER: ___ system, ___ series [|] (44–45) ___ aquifer, formation, group [|] (46–47)

Lithology: ___ [|] (48–49) Origin: ___ [ ] (50) Aquifer Thickness: ___ ft

[| |] (51–53) Length of well open to: ___ ft [| |] (54–56) Depth to top of: ___ ft [| |] (57–59)

Intervals Screened: 852-1007

Depth to consolidated rock: 852 155 ft [| | |] (60–63) Source of data: ___ (64) [ ]

Depth to basement: ___ ft [| | |] (65–68) Source of data: ___ (69) [ ]

Surficial material: ___ [|] (70–71) Infiltration characteristics: ___ (72) [ ]

Coefficient Trans: ___ gpd/ft [| |] (73–75) Coefficient Storage: ___ [| |] (76–78)

Coefficient Perm: ___ gpd/ft^2; Spec cap: ___ gpm/ft; Number of geologic cards: ___ [ ] (79)

741' of 20" csg.

276' of 12¾" "

Well No.

GPO 857-700

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ~~TWDBE-GW ONLY~~

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County 84 Galveston

State Well No. 64-11-310

Date Collected 05-16-64

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner Gulf Coast

Date Drilled ______ Depth 1002 ft. WBF ______

Producing intervals ______ Water level ______ ft. WBF

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ☐☐☐ °F 29 °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L		MG/L	ME/L
Silica	29		Carbonate		
Calcium	28		Bicarbonate	350	
Magnesium	20		Sulfate	352	
Sodium 4K	666		Chloride	900	
	665 Total		Fluoride	882	
☐ Potassium			Nitrate	0.2	
☐ Manganese			pH	7.72	Total
☐ Boron			1/ Dissolved Solids (sum in MG/L)	7.6	1910
3/ ☐ Total Iron			Phenolphthalein Alkalinity as CaCO3		1810
3/ ☐ (other)	MG/L . /		Total Alkalinity as CaCO3		
			Total Hardness as CaCO3		111
			2/ Nitrogen Cycle		
			Ammonia - N		112
			Nitrite - N		
			Nitrate - N		
			Organic Nitrogen		

%Na 93

SAR 29

RSC 3.7

Specific Conductance (micromhos/cm3) 3290

Diluted Conductance (micromhos/cm3) ______ X 3230

"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample

3/ Total Iron requires separate sample

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ______ Checked By ______

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen
Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

CHEMICAL WATER ANALYSIS REPORT

6/8/7

County 84 Galveston

State Well No. 64-11-310

Date Collected 07-18-63

By ______

Send report to:
Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______
Source (type of well) ______ Owner Gulf Coast
Date Drilled ______ Depth 1002 ft. WBF
Producing intervals ______ Water level ______ ft.
Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ☐☐☐ °F ☐☐ °C
Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use ______ Remarks ______
(FOR LABORATORY USE ONLY)
CHEMICAL ANALYSIS KEY PUNCHED
Laboratory No. ______ Date Received ______ Date Reported ______
Silica 28
Calcium 20
Magnesium 666
Sodium 4K 665
Potassium
Manganese
Boron
Total Iron
(other) MG/L
%Na 93
SAR 29
RSC 3.5
Carbonate
Bicarbonate 352
Sulfate 900
Chloride 882
Fluoride 0.2
Nitrate 7.72
pH 7.6
1/ Dissolved Solids (sum in MG/L) 1810
Phenolphthalein Alkalinity as CaCO3
Total Alkalinity as CaCO3 111
Total Hardness as CaCO3 112
2/ Nitrogen Cycle
Ammonia - N
Nitrite - N
Nitrate - N
Organic Nitrogen
Specific Conductance (micromhos/cm3) 3230
Diluted Conductance (micromhos/cm3) ______ X
"☐" items will be analyzed if checked.
1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample
3/ Total Iron requires separate sample
TWDBE-GW-50 (Rev. 7-1-71)
Analyst ______ Checked By ______

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ____

Proj. No. ____

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston

State Well No. 64-41-310

____ Well No. ____

Date Collected 05-13-54

By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____

Source (type of well) ____ Owner ____

Date Drilled ____ Depth 1007 ft. WBF Gulf Coast

Producing intervals ____ Water level ____ ft.

Sampled after pumping ____ hrs. Yield ____ GPM meas. est. Temperature ____ °F ____ °C

Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ____ Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/ ☐ Total Iron		

%Na ____

SAR ____

RSC ____

☐ (other) ____ MG/L

Specific Conductance (micromhos/cm^3) 3420

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate	7	
Bicarbonate	347	
Sulfate		
Chloride	970	
Fluoride		
Nitrate		
pH	8.8	
Total		

1/ Dissolved Solids (sum in MG/L) ____

Phenolphthalein Alkalinity as C aCO$_3$ ____

Total Alkalinity as C aCO$_3$ ____

Total Hardness as C aCO$_3$ 130

2/ Nitrogen Cycle

Ammonia - N ____

Nitrite - N ____

Nitrate - N ____

Organic Nitrogen ____

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ____ Checked By ____

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston

State Well No. 64-41-310

Well No. ______

Date Collected 05-08-56

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 1007 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		.
Magnesium		.
Sodium		.
Total		.
☐ Potassium	.	
☐ Manganese	.	
☐ Boron	.	
3/☐ Total Iron	.	

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm³) 3730

Diluted Conductance (micromhos/cm³) ______ X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		.
Bicarbonate	351	.
Sulfate		.
Chloride	910	.
Fluoride	.	.
Nitrate	.	.
pH	8.5	
Total		.

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as C aCO3	
Total Alkalinity as C aCO3	
Total Hardness as C aCO3	121

2/ Nitrogen Cycle

Ammonia - N	.
Nitrite - N	.
Nitrate - N	.
Organic Nitrogen	.

1/ The bicarbonate reported in this analysis is converted by computation *(multiplying by 0.4917) to an equivalent amount of carbonate, and the* carbonate figure is used in the computation of this sum.

2/ *Nitrogen cycle requires separate sample.*

3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ______ Checked By ______

Map ID: 2		**Source: Texas Water Development Board**
Well Number: 6441304	**GWS - Groundwater Supply**	**Banks ID: 6441304**
Well Address: TX		**Rel. Loc.: 0.40mi N**
Completion Date: 1947-11-01		**Drill Depth: 974.0**
Owner: Texas City Refining Corp.		**Elevation: 6.56 ft (-5.22 ft)**

County:	Galveston
Aquifer Code:	112GLFC
Driller:	Henry Lane
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

Sites in Map ID 2 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Texas City Refining Corp.	TX	69
GWS	Texas City Refining Corp.	TX	72

WRD Exp. (GW)
April 1966

Well No. H-64-41-304

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR　GEOLOGICAL SURVEY　WATER RESOURCES DIVISION

MASTER CARD

Record by A.G. Winslow 1950 G. McAdoo　Source of data File　Date 3-12-68　Map Virginia Point 1954 1:24,000

State Texas [4 8]　County (or town) Galveston [K H]

Latitude: [2 9 2 2 0 3 N] N/S　Longitude: [0 9 4 5 4 3 4]　Sequential number: [1]

Lat-long accuracy: [1]　T. ____ N/S, R ____ E/W, Sec ____, ____ ¼, ____ ¼, ____ ¼

Local well number: [K H 6 4 4 1 3 0 4]　Other number: M-42 (361) B & M

Local use: [ ]　Owner or name: Texas City Refining Corp.

Owner or name: [T E X A S C I T Y R E F.]　Address: Texas City, Tex.

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist　[N]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, [✓ (U) Unused], (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other plugged w/cmt 1970　[U]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, [✓ (U) Unused], (W) Withdraw, (X) Waste, [✓ (Z) Destroyed]　[~~U~~] Z 1971

DATA AVAILABLE: Well data [8]　Freq. W/L meas.: Annual 1947 [A]　Field aquifer char. [ ]

Hyd. lab. data: ____ [ ]

Qual. water data; type: ____ [ ]

Freq. sampling: 5-19-48 [0]　Pumpage inventory: yes, no, period: ____ [ ]

Aperture cards: ____ yes [ ]

Log data: — [ ]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD　Depth well: 974 ft [9 7 4]　Meas. [✓ rept]　Rept. accuracy [6]

Depth cased: (first perf.) 484 ft [4 8 4]　Casing type: S ; Diam. 10 3/4- in [1 0]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., [✓ (S) screen], (T) sd. pt., (W) shored, (X) open hole, (Z) other　[S]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other　[H]

Date Drilled: Nov. 1947 [9 4 7]　Pump intake setting: ____ ft [ ]

Driller: Henry Lane (name), Bay City, Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), [✓ (N) none], (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other　[N]　Deep Shallow [ ]

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. ____ [ ]　Trans. or meter no.

Descrip. MP ____ ft above below LSD . Alt. MP ____

Alt. LSD: 6 [6]　Accuracy: (source) Topo 5'　[3]

Water Level 94 ft above below MP; Ft above [✓ below] LSD [9 4]　Accuracy: rept.　[ ]

Date meas: Nov. 1943 [N 4 3]　Yield: ____ gpm [ ]　Method determined [ ]

Drawdown: ____ ft [ ]　Accuracy: ____ [ ]　Pumping period ____ hrs [ ]

QUALITY OF WATER DATA: Iron ____ ppm [ ]　Sulfate ____ ppm [ ]　Chloride ____ ppm [ ]　Hard. ____ ppm [ ]

Sp. Conduct ____ K x 10⁶ [ ]　Temp. ____ °F [ ]　Date sampled [ ]

Taste, color, etc. ____

Well No. KH-64-41-304

Well No. KH-64-41-304

Latitude-longitude 29, 22, 03 [✓ N] S 094, 59 34
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19 Physiographic Province: Coastal Plain 0 3 (20 21) Section:

F (22) Drainage Basin: 5 1 T (23 25) Subbasin: (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat (27)

MAJOR AQUIFER: system, series (28 29) Chicot aquifer, formation, group (30 31)

Lithology: (32 33) Origin: (34) Aquifer Thickness: ft

(35 37) Length of well open to: 84 ft 8 4 (38 40) Depth to top of: ft (41 43)

MINOR AQUIFER: system, series (44 45) aquifer, formation, group (46 47)

Lithology: (48 49) Origin: (50) Aquifer Thickness: ft

(51 53) Length of well open to: ft (54 56) Depth to top of: ft (57 59)

Intervals Screened: 484-508; 851-911.
24 60

Depth to consolidated rock: ft (60 63) Source of data: (64)

Depth to basement: ft (65 68) Source of data: (69)

Surficial material: (70 71) Infiltration characteristics: (72)

Coefficient Trans: gpd/ft (73 75) Coefficient Storage: (76 78)

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards: (79)

Well No. KH-64-41-304

Map ID: 2		**Source: Texas Water Development Board**
Well Number: 6441302	**GWS - Groundwater Supply**	**Banks ID: 6441302**
Well Address: TX		**Rel. Loc.: 0.40mi N**
Completion Date: 1919-01-01		**Drill Depth: 1030.0**
Owner: Texas City Refining Corp.		**Elevation: 6.56 ft (-5.22 ft)**

County:	Galveston
Aquifer Code:	112GLFC
Driller:	
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

Sites in Map ID 2 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Texas City Refining Corp.	TX	69
GWS	Texas City Refining Corp.	TX	72

WRD Exp. (GW)
April 1966

Well No. V-64-41-302

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR   GEOLOGICAL SURVEY   WATER RESOURCES DIVISION

MASTER CARD

Record by McAdoo B. Petitt (1952) Source of data File Date 10-29-69 Map 1:24,000 Virginia Point, 1954

State Texas 48 County (or town) Galveston KH

Latitude: 29 22 03 N (deg, min, sec) Longitude: 094 54 34 (degrees, min, sec) Sequential number: 2 ✓

Lat-long accuracy: L T. ____ N/S, R ____ E/W, Sec ____, ____¼, ____¼, ____¼ ____ B & M

Local well number: KH-64-41-302 Other number: M-41

Local use: ☐ Owner or name: Sid Richardson ~~Refining~~ Co.

Owner or name: TEXAS CITY REF. Address: Texas City Refining Corp. Ft. Worth, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, (N) Ind, (P) P S, (R) Rec, (S) Stock, (T) Instit, [✓ (U) Unused], (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other U

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, [✓ (U) Unused], (W) Withdraw, (X) Waste, [✓ (Z) Destroyed]. U destroyed 1966?

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: 1947 A Field aquifer char. ☐

Hyd. lab. data: ☐

Qual. water data; type: ☐

Freq. sampling: 7-19-33; 48 I Pumpage inventory: yes no, period: ☐

Aperture cards: yes ☐

Log data: ☐

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 1030 ft 1030 Meas. [✓ rept] Rept. accuracy 6

Depth cased: (first perf.) — ft ☐ Casing type: S ; Diam. 10 in 10

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., [✓ (S) screen], (T) sd. pt., (W) shored, (X) open hole, (Z) other S

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other H

Date Drilled: 1919 919 Pump intake setting: ____ ft ☐

Driller: unknown (name), — (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), [✓ (N) none], (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other N Deep Shallow ☐

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. None ☐ Trans. or meter no.

Descrip. MP ____ ft above below LSD, Alt. MP

Alt. LSD: 6 6 Accuracy: (source) Topo 5' 3

Water Level 86.5 ft above below MP; Ft above [✓ below LSD] 86 Accuracy: meas. A

Date meas. 7-10-47 747 Yield: ____ gpm ☐ Method determined ☐

Drawdown: ____ ft ☐ Accuracy: ☐ Pumping period ____ hrs ☐

QUALITY OF WATER DATA: Iron ____ ppm ☐ Sulfate ____ ppm ☐ Chloride ____ ppm ☐ Hard. ____ ppm ☐

Sp. Conduct ____ K x 10⁶ ☐ Temp. ____ °F ☐ Date sampled ☐

Taste, color, etc.

Well No. KH-64-41-302

Well No. KH-64-[illegible]1-302

Latitude-longitude 29 , 22 , 03 [✓ N] S 094 , 54 , 34 . 2
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19

Physiographic Province: Coastal Plain [0 3] 20 21 Section: ______

[F] 22 Drainage Basin: ______ [| |] 23 25 Subbasin: ______ [ ] 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ______ 27 [ ]

MAJOR AQUIFER: ______ system , ______ series [|] 28 29 ______ aquifer, formation, group [|] 30 31

Lithology: ______ [|] 32 33 Origin: ______ [ ] 34 Aquifer Thickness: ______ ft

[| |] 35 37 Length of well open to: ______ ft [| |] 38 40 Depth to top of: ______ ft [| |] 41 43

MINOR AQUIFER: ______ system , ______ series [|] 44 45 ______ aquifer, formation, group [|] 46 47

Lithology: ______ [|] 48 49 Origin: ______ [ ] 50 Aquifer Thickness: ______ ft

[| |] 51 53 Length of well open to: ______ ft [| |] 54 56 Depth to top of: ______ ft [| |] 57 59

Intervals Screened: ______

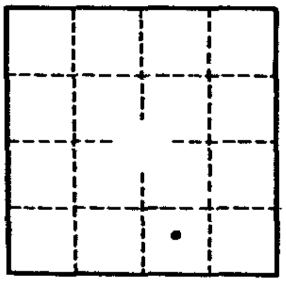
Depth to consolidated rock: ______ ft [| | |] 60 63 Source of data: ______ 64 [ ]

Depth to basement: ______ ft [| | |] 65 68 Source of data: ______ 69 [ ]

Surficial material: ______ [|] 70 71 Infiltration characteristics: ______ 72 [ ]

Coefficient Trans: ______ gpd/ft [| |] 73 75 Coefficient Storage: ______ [| |] 76 78

Coefficient Perm: ______ gpd/ft^2 ; Spec cap: ______ gpm/ft; Number of geologic cards: ______ [ ] 79



Well No. KH-64-41-302

GPO 857-700

Map ID: 21		**Source: Texas Water Development Board**
Well Number: 6441309	**GWS - Groundwater Supply**	**Banks ID: 6441309**
Well Address: TX		**Rel. Loc.: 0.85mi N**
Completion Date: 1939-01-01		**Drill Depth: 1009.0**
Owner: Republic Refining Oil Co.		**Elevation: 6.56 ft (-5.22 ft)**

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas Co.
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

TEXAS WATER DEVELOPMENT BOARD
WELL SCHEDULE

State Well Number - 64 41 309 Previous Well Number - M-37 County - Galveston 167
River Basin - San Jacinto-Brazos Rivers - 11 Zone - 1Latitude - 29 22 26 Longitude - 94 54 25 Source of

Owners Well No. ______________ Location _______ 1/4, _______ 1/4, Section _______, Block _________, Survey _

Owner - Republic Refining Oil
Co.
Driller - Layne Texas Co.

Address ____ Tenant/Oper. ________
Date Drilled - / /1939 Depth - 1,009 ft. Source of Depth - D Altitude - 7 ft. Source of Alt.
Aquifer - 112CHCTL CHICOT AQUIFER,LOWER Well Type - W User -
WELL CONSTRUCTION Const. Method - HYDRAULIC ROTARY Casing Material - STEEL
Completion - ______________________ Screen Material - __________________________

LIFT DATA - Pump Mfr. __________________ Type - TURBINE PUMP No. Stages ____

Bowls Diam. - _____________ in. Setting - _________ ft. Column Diam. - _____________ in.

Motor Mfr. - ___________________ Fuel or Power - ELECTRIC MOTOR Horsepower - 125

YIELD Flow- _________ GPM Pump- ________ GPM Meas.,Rept.,Est- __________ Date- _________

PERFORMANCE TEST Date- ___________ Length of Test- __________ Production- _________GPM

Static Level- _____ft. Pumping Level- _____ft. Drawdown- _____ft. Sp.Cap.- _____GPM/ft

QUALITY (Remarks- ____

WATER USE Primary- INDUSTRIAL Secondary- ______________ Tertiary- ______________

OTHER DATA AVAILAIBLE Water Levels- N Quality- Y Logs- D Other Data-

WATER LEVELS Date- / / Measurement-
Date- / / Measurement-

Recorded By ___________________________ Date Record Collected or Updated- / /

Reporting Agency - UNITED STATES GEOLOGICAL SURVEY
REMARKS -

| Casing or Blan
| Well Screen or
| Open Hole (O)
| Cemented from_
| Diam.
| (in.)
|________
1|
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19|
|-----------

Aqu
Well

Map ID 25: GWS

Map ID: 25

Source: Texas Water Development Board

Well Number: 6441217

GWS - Groundwater Supply

Banks ID: 6441217

Well Address: TX

Rel. Loc.: 0.99mi NW

Completion Date: 1933-01-01

Drill Depth: 974.0

Owner: Pan American Refining Corp.

Elevation: 9.84 ft (-1.94 ft)

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas Co.
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

Exp. (GW)
April 1966

217

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR GEOLOGICAL SURVEY WATER RESOURCES DIVISION

1:24000

MASTER CARD

Record by W. L. NAFTEL Source of data Bul. 5502 Date 11-19-75 Map Virginia Point 1969

State Texas 4 8 County (or town) Galveston K H

Latitude: 2 9 2 2 2 6 N (deg, min, sec; N/S) Longitude 0 9 4 5 5 1 2 (degrees, min, sec) Sequential number: 1

Lat-long accuracy: 2 T___ N/S, R___ E/W, Sec___, ___¼, ___¼, ___¼ ___ B & M

Local well number: K H - 6 4 - 4 1 - 2 1 7 Other number: M-30

Local use: ☐ Owner or name: Pan-American Refining

Owner or name: ☐ Address: Corp. well 4

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist ___ N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, [✓ (U) Unused], (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other ___ U

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, [✓ (U) Unused], (W) Withdraw, (X) Waste, (Z) Destroyed U

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: ___ I Field aquifer char. ☐

Hyd. lab. data: ___ ☐

Qual. water data; type: ___ ☐

Freq. sampling: 7-14-39; 48 I Pumpage inventory: yes no, period: ___ ☐

Aperture cards: ___ yes ☐

Log data: D-log D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 974 ft 9 7 4 Meas. [✓ rep] accuracy 6

Depth cased; (first perf.) 665 ft 6 6 5 Casing type: S ; Diam. 16 x 8 in 1 6

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., [✓ (S) screen], (T) sd. pt., (W) shored, (X) open hole, (Z) ___ other S

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ___ other H

Date Drilled: 1933 9 3 3 Pump intake setting: ___ ft ☐

Driller: Layne-Texas Co., (name) ___ (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), [✓ (N) none], (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other N Deep Shallow ☐

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. none ☐ Trans. or meter no. ___

Descrip. MP ___ ft above below LSD, Alt. MP ___

Alt. LSD: ~15 1 5 Accuracy: (source) 5' topo 3

* Water Level 7.0 ft above below MP; Ft above [✓ below] LSD 7 Accuracy: rept. D

Date meas: Dec. 1933 D 3 3 Yield: 900 gpm 9 0 0 Method determined ☐

Drawdown: ___ ft ☐ Accuracy: (1933) rept. ☐ Pumping period ___ hrs ☐

QUALITY OF WATER DATA: Iron ___ ppm ☐ Sulfate ___ ppm ☐ Chloride ___ ppm ☐ Hard. ___ ppm ☐

Sp. Conduct ___ K x 10^6 ☐ Temp. ___ °F ☐ Date sampled ___ ☐

Taste, color, etc. ___

* 95.2' 5-9-52

Well No.

Well no.

64-41-217

Latitude-longitude ____ N S ____
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19

Physiographic Province: Coastal Plain [0 3] 20 21 Section: W.G.C.P

[F] 22 Drainage Basin: [5 1 T] 23 25 Subbasin: [ ] 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, [✓ (F)] flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ____ 27 [F]

MAJOR AQUIFER: ____ system, ____ series [Q G] 28 29 Lower Chicot aquifer, formation, group [C L] 30 31

Lithology: Sand [S] 32 33 Origin: deltaic [3] 34 Aquifer Thickness: ____ ft

[ ] 35 37 Length of well open to: ✓111 ft [1 1 1] 38 40 Depth to top of: ____ ft [ ] 41 43

MINOR AQUIFER: ____ system, ____ series [ ] 44 45 ____ aquifer, formation, group [ ] 46 47

Lithology: ____ [ ] 48 49 Origin: ____ [ ] 50 Aquifer Thickness: ____ ft

[ ] 51 53 Length of well open to: ____ ft [ ] 54 56 Depth to top of: ____ ft [ ] 57 59

Intervals Screened: * below

Depth to consolidated rock: ____ ft [ ] 60 63 Source of data: ____ 64 [ ]

Depth to basement: ____ ft [ ] 65 68 Source of data: ____ 69 [ ]

Surficial material: ____ [ ] 70 71 Infiltration characteristics: ____ 72 [ ]

Coefficient Trans: ____ gpd/ft [ ] 73 75 Coefficient Storage: ____ [ ] 76 78

Coefficient Perm: ____ gpd/ft^2; Spec cap: ____ gpm/ft; Number of geologic cards: ____ [ ] 79

603' of 16" csg.
351' of 8" csg.

Screen:
665 - 706' - 41'
800 - 824' - 24'
888 - 934' - 46'
111

Well No.

GPO 857-700

Map ID: 26		**Source: Texas Water Development Board**
Well Number: 6433912	**GWS - Groundwater Supply**	**Banks ID: 6433912**
Well Address: TX		**Rel. Loc.: 0.99mi N**
Completion Date: 1967-08-01		**Drill Depth: 771.0**
Owner: Marathon Oil Co		**Elevation: 3.28 ft (-8.50 ft)**

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

Sites in Map ID 26 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Marathon Oil Co	TX	80
WW	USGS	US	163

WRD Exp. (GW)
April 1966

Well No. KH-64-33-912

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

1:24,000

Record by G. McAdoo   Source of data T.M. Johnson D-records   Date 11-24-67   Map Texas City 1954

State Texas [4 8]   County (or town) Galveston [K H]

Latitude: [2 9 2 2 3 3 N] N/S (deg, min, sec)   Longitude: [0 9 4 5 4 1 5] (degrees, min, sec)   Sequential number: [1]

Lat-long accuracy: [1]   T ______ N/S, R ______ E/W, Sec ______, ______ ¼, ______ ¼, ______ ¼

Local well number: [K H - 6 4 - 3 3 - 9 1 2]   Other number: B & M NO-10

Local use: [ ]   Owner or name: Marathon Oil Co.

Owner or name: [M A R A T H O N O I L C O]   Address: Texas City, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist ______ [N]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other ______ [N]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed. [W]

DATA AVAILABLE: Well data [ ]   Freq. W/L meas.: ______ [O]   Field aquifer char. [ ]

Hyd. lab. data: ______ [ ]

Qual. water data; type: ______ [ ]

Freq. sampling: ______ [ ]   Pumpage inventory: yes no, period: ______ [ ]

Aperture cards: ______ yes [ ]

Log data: D-Log 0-771   E-Log (E-17) [D E]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD   Depth well: 771 ft [7 7 1]   Meas. [✓ rept] D-Log accuracy [3]

Depth cased: (first perf.) 470 ft [4 7 0]   Casing type: S ; Diam. 16-10¾ in [1 6]

Finish: (C) porous concrete, (F) gravel w. (perf.), [✓ (G) gravel w. (screen)], (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) ______ other [G]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ______ other [H]

Date Drilled: 8-1-67 [9 6 7]   Pump intake setting: ______ ft [ ]

Driller: Layne Texas Co. (name), Houston, Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other [T]   [✓ Deep] Shallow [D]

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. ______ [5]   Trans. or meter no. ______

Descrip. MP ______ ft above/below LSD, Alt. MP ______

Alt. LSD: 8 [8]   Accuracy: (source) Topo 5' [3]

Water Level 176 ft above/below MP; Ft above/[✓ below] LSD [1 7 6]   Accuracy: rept [D]

Date meas: 8-1-67 [8 6 7]   Yield: 650 gpm [6 5 0]   Method determined [ ]

Drawdown: 75 ft [7 5]   Accuracy: rept [3]   Pumping period 7 hrs [ ]

QUALITY OF WATER DATA: Iron ______ ppm [ ]   Sulfate ______ ppm [ ]   Chloride ______ ppm [ ]   Hard. ______ ppm [ ]

Sp. Conduct ______ K x 10⁶ [ ]   Temp. ______ °F [ ]   Date sampled ______ [ ]

Taste, color, etc. ______

Well No. KH-64-33-912

Well No. *KH-64-33-912*

Latitude-longitude *29 , 22 , 33* ⓦ *094 , 54 , 15*
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19 **Physiographic Province:** *Coastal Plain* *0 3* 20 21 **Section:**

F 22 **Drainage Basin:** 23 25 **Subbasin:** 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat 27

MAJOR AQUIFER: system, series 28 29 aquifer, formation, group 30 31

Lithology: 32 33 **Origin:** 34 **Aquifer Thickness:** ft

35 37 **Length of well open to:** *130* ft *1 3 0* 38 40 **Depth to top of:** ft 41 43

MINOR AQUIFER: system, series 44 45 aquifer, formation, group 46 47

Lithology: 48 49 **Origin:** 50 **Aquifer Thickness:** ft

51 53 **Length of well open to:** ft 54 56 **Depth to top of:** ft 57 59

30 15 20 35 30

Intervals Screened: *470-500; 565-580; 600-620; 665-700; 731-761.*

Depth to consolidated rock: ft 60 63 **Source of data:** 64

Depth to basement: ft 65 68 **Source of data:** 69

Surficial material: 70 71 **Infiltration characteristics:** 72

Coefficient Trans: gpd/ft 73 75 **Coefficient Storage:** 76 78

Coefficient Perm: gpd/ft^2; **Spec cap:** gpm/ft; **Number of geologic cards:** 79

csg

16" - 0 - 460

10 3/4 - 360 - 771

Well No. *KH-64-33-912*

GPO 857-700

FORM NO. 28

State

AYNE TEXAS COMPA

HOUSTON · DALLAS

WELL LOG

LOCATION NO

REPORT NO B[illegible] - 67

S. O. 2150-67

PAGE

FILE NO 3192

DATE

CUSTOMER LOCATION

FOR Marathon Oil Company

LOCATION WELL Texas City

SURVEY FIELD

COUNTY Galveston STATE Texas

OTHER LAND MARKS Plant site

WELL DATA

NAME WELL WELL NO. 2

ELEVATION DATUM

RT C GR

TEST HOLE SIZE 9-7/8 TD 771 Reg 25

DATE STARTED DRILLING 7-31-67

DATE FINISHED DRILLING 8-1-67

DRILLER W.Patton RIG NO. 3

TYPE MUD Gel NO. SACKS 40

ELECTRIC LOG yes TYPE Widco

SURVEY Eastman TYPE Widco

OTHER

DEPTH STRATA	EACH STRATUM	DESCRIPTION FORMATION	SAMPLES DEPTH	SAMPLES TYPE	NUMBER
0		Surface			
10	10	Soil			
31	21	Sand and Clay			
94	63	Clay			
120	26	Sandy clay			
255	135	Shale and sandy shale			
270	15	sand			
331	61	Sandy shale			
361	30	Sand and shale streaks			
458	97	Shale			
480	22	Fine sand and streaks shale			
566	86	Shale and sandy shale			
594	28	Fine gray sand			
601	7	Shale			
623	22	Fine gray sand			
667	44	Shale and streaks of sand			
684	17	Streaks of sand and shale			
695	11	Shale			
724	29	Streaks of sand and shale			
761	37	Sand and streaks of shale			
771	10	Shale			
T.D. 771'					

64-33-912

SM

FORM NO. 1202

AYNE TEXAS COMPA

HOUSTON -:- DALLAS

MATERIAL SETTING

REPORT NO.
S. O. 2150-67
PAGE OF
FILE NO. 3192
DATE

CUSTOMER LOCATION

FOR Marathon Oil Company
LOCATION WELL Texas City
SURVEY FIELD
COUNTY Galveston STATE Te as
OTHER LAND MARKS Plant site

WELL DATA

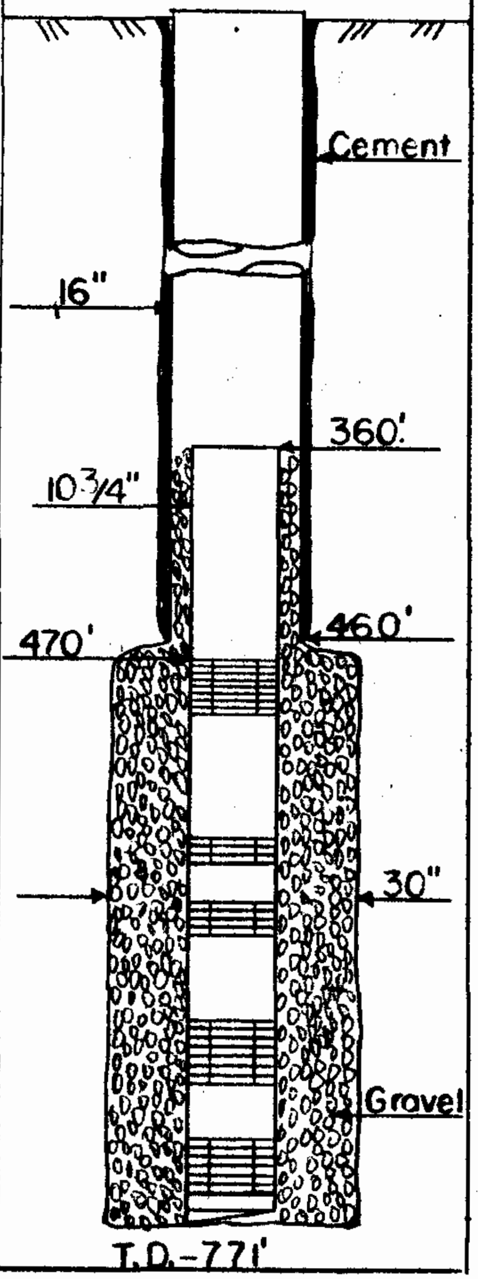
NAME WELL WELL NO. 2
ELEVATION DATUM
TYPE WELL gravel wall
SURFACE CASING CEMENTED 460' NO. SACKS 450
SIZE HOLE UNDERREAMED 30 DEPTH 460-771'
GRAVEL TYPE 112,113 & 162 NO. CU. YDS. 110
TYPE SCREEN S.S.W.W. GAGE .045
DRILLER W.Patton RIG NO. 3
OTHER P.B. Hefferman

DEPTH	LENGTH	SIZE, KIND, WEIGHT MATERIAL
+ 6'		16" O.D. surface casing 6' above ground
0		surface
360'		top of 10-3/4" O.D. liner
460'	466'	16" O.D. surface casing
470'	110'	10-3/4"O.D. blank liner 31.20#
500'	30'	10-3/4"O.D.S.S.W.W. screen .045 ga.
565'	65'	10-3/4"O.D. blank pipe
580'	15'	10-3/4" O.D.S.S.W.W. screen .045 ga.
600'	20'	10-3/4" O.D. blank pipe
620'	20'	10-3/4" O.D. S.S.W.W. screen, .045 ga.
665'	45'	10-3/4"O.D. blank pipe
700	35	10-3/4" O.D. S.S.W.W. .045 ga.
731	31	10-3/4" O.D. blank pipe
761	30	10-3/4" O.D. S.S.W.W. screen, .045 ga.
769	8	10-3/4" O.D. blank pipe
771	2	10-3/4" O.D. set nipple and back pressure valve
T.D. 771'		

64-33-912

attach to
8-1-67

SKETCH



LAYNE TEXAS COMPANY,

HOUSTON -:- DALLAS

WATER WELL TEST

REPORT NO.
S. O. 2150-67
PAGE
FILE NO. 3192
DATE

CUSTOMER LOCATION

TEST FOR Marathon Oil Company
LOCATION OF WELL Texas City
SURVEY
FIELD
COUNTY Galveston
STATE Texas
DESCRIPTION OF LAND MARKS

WELL DATA

NAME WELL
WELL NO. 2
ELEVATION
DATUM
WELL SIZE 16" x 10-3/4 x 30 U.R.
TOTAL DEPTH 771'
TOP SCREEN 470'
GRAVEL WELL yes
STRAIGHT WELL
TYPE SCREEN S.S.W.W.
GAGE .045
TEMPERATURE OF WATER
WATER CONDITION slight brown cast

WATER MEASURING DEVICE

ORIFICE SIZE 6" 5"
LENGTH 5
OTHER

TEST PUMP DATA

DEPTH SETTING TOP OF BOWL 330
LENGTH AIR LINE 330
SIZE 1/4
TYPE BOWL RKHC
NO. STAGES 12
LENGTH BOWL
SUCTION LT.

SAND CONTENT
OZ. PER 100 GAL.

ACTIVE STATIC HEAD AFTER PUMP STOPPED

5 MIN.	197 FT.	20 MIN.	191 FT.
10 MIN.	193 FT.	25 MIN.	191 FT.
15 MIN.	192 FT.	30 MIN.	190 FT.

WATER SAMPLE TAKEN
NO. SAMPLES
BACTERIOLOGICAL SAMPLE TAKEN
DRAWDOWN
SPECIFIC CAPACITY

DATE HOUR	AIR LINE GAGE	PUMPING LEVEL	DISCH. PRESS.	HEAD ON ORIFICE INCHES	GPM	RPM	OPERATOR	REMARKS
8-15-67								182'
8:00 A.M.	80	250		29	656			All measurements 6' above ground level
9:00 "	76	254		29	656			
10:00 "	73	257		29	656			
11:00 "	73	257		29	656			
12:00 "	73	257		29	656			
1:00 P.M.	72	258		29	656			
2:00 "	72	258		29	656			
2:15 "	105	225		7	328			
2:30	98	232		11¼	416			
2:45	88	242		17	510			
3:00	78	252		24½	602			
3:30	73	257		28½	650			

attach to
8-1-67

OBSERVERS

T. M. Johnson
FOR OWNER

Warren Patton
FOR LAYNE TEXAS CO.

FORM NO. 25 -

MICROBIOLOGY SERV ABORATORIES

water technologists . . chemi . . . microbiologists

22 August 1967

To: Layne Texas Company
Houston, Texas

SO 2150-67

Sample marked: Well No. 2, Marathon Oil Co., Texas City, Galveston Cty, Texas. Taken: 8-16-67 after 24 hrs. pumping at 656 gpm with Layne Texas Pump. Static Head: 182'. Pumping Level: 258'. Screened: 470-761'. Slight brown cast. No odor. Warren Patton.

Rec'd: 8-18-67. Turbid sample, filtered for analysis.

WATER ANALYSIS

results in parts per million (mg/1) except as noted

Dissolved Residue at 105°C		1007	Conductance, micromhos/cm, 25°C	1770
Total Dissolved Solids, actual†		1321	Color, units	40
Total Dissolved Solids, calc.		1325	Turbidity, units	4
Silica	SiO_2	14	As Calcium Carbonate, $CaCO_3$:	
Iron and Aluminum Oxides	R_2O_3	0	Phenolphthalein Alkalinity	0
Calcium	Ca	8	Total Alkalinity	507
Magnesium	Mg	3	Total Hardness	33
Sodium (diff.) Na + K as	Na	400	Free Carbon Dioxide CO_2	9
Carbonate	CO_3	0	pH . . . 8.00	
Bicarbonate	HCO_3	619	HYPOTHETICAL COMBINATIONS	
Sulfate	SO_4	0	Calcium Bicarbonate	32
Chloride	Cl	281	Magnesium Bicarbonate	19
			Sodium Bicarbonate	797
Total Iron	Fe	0.26	Sodium Chloride	463
			SiO_2 + R_2O_3	14
Iron, filtered sample	Fe	0.14	Total Dissolved Solids, calc.	1325

attached 8-1-67

†Total Dissolved Solids, actual = Dissolved Residue + 50.8% of bicarbonate (HCO_3) ion

Microbiology Service Laboratories

64-33-912

By: Muriel Sadlier
Muriel Sadlier

8067
lb

6433912

Map ID: 4

Source: Texas Water Development Board

Well Number: 6441223

GWS - Groundwater Supply

Banks ID: 6441223

Well Address: TX

Rel. Loc.: 0.44mi W

Completion Date: 1948-01-01

Drill Depth: 513.0

Owner: Union Carbide Co.

Elevation: 3.28 ft (-8.50 ft)

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas Co.
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

...D Exp. (GW)
April 1966

Well No. 64-41-223

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

1:24000

MASTER CARD

Record by W. L. NAFTEL Source of data Bul. 5502 Date 11-19-75 Map Virginia Point 1969

State Texas 48 County (or town) Galveston KH

Latitude: 29 56 50 N (deg, min, sec; N/S) Longitude: 094 55 07 (degrees, min, sec) Sequential number: 1

Lat-long accuracy: 2 T____ N/S, R____ E/W, Sec____, ____¼, ____¼, ____¼ ____ B & M

Local well number: KH-64-41-223 Other number: M-43

Local use: ☐ Owner or name: Union Carbide Co.

Owner or name: ☐ Address: Well ?

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist ____ N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other Dock well N

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed ☐ ?

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: ____ O Field aquifer char. ☐

Hyd. lab. data: ____ ☐

Qual. water data; type: ____ ☐

Freq. sampling: none ☐ Pumpage inventory: yes no, period: ____ ☐

Aperture cards: ____ yes ☐

Log data: D-log D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 513 ft 513 Meas. [✓ rept] accuracy 6

Depth cased (first perf.) 480 ft 480 Casing type: S ; Diam. 6 x 4 in 6

Finish: (C) porous concrete, (F) gravel w. (perf.), [✓ (G) gravel w. (screen)], (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) ____ other G

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ____ other H

Date Drilled: 1948 948 Pump intake setting: ____ ft ☐

Driller: Layne Texas Co. (name), ____ (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other T [✓ Deep] Shallow ☐

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. 10 ☐ Trans. or meter no. ____

Descrip. MP ____ ft above/below LSD, Alt. MP ____

Alt. LSD: 4 4 Accuracy: (source) 5' topo 3

Water Level 156 ft above/below MP; Ft above [✓ below LSD] 156 Accuracy: rept. D

Date meas: July 1948 748 Yield: — gpm ☐ Method determined ☐

Drawdown: ____ ft ☐ Accuracy: ☐ Pumping period ____ hrs ☐

QUALITY OF WATER DATA: Iron ____ ppm ☐ Sulfate ____ ppm ☐ Chloride ____ ppm ☐ Hard. ____ ppm ☐

Sp. Conduct ____ K x 10^6 ☐ Temp. ____ °F ☐ Date sampled ____ ☐

Taste, color, etc. ____

Well No.

Well No. __________

64-41-223

Latitude-longitude ____ d ____ m ____ s N S ____ d ____ m ____ s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19

Physiographic Province: Coastal Plain [0 3] 20 21 Section: W.G.C.P

__________ [F] 22 Drainage Basin: __________ [5 1 T] 23 25 Subbasin: __________ [ ] 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, [✓ (F) flat], (H) hilltop, (K) sink, (L) swamp, (∅) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat __________ 27 [F]

MAJOR AQUIFER: __________ system, __________ series [Q G] 28 29 Lower Chicot aquifer, formation, group [C L] 30 31

Lithology: Sand [S] 32 33 Origin: deltaic [3] 34 Aquifer Thickness: __________ ft

[ ] 35 37 Length of well open to: ✓ 30 ft [3 0] 38 40 Depth to top of: __________ ft [ ] 41 43

MINOR AQUIFER: __________ system, __________ series [ ] 44 45 __________ aquifer, formation, group [ ] 46 47

Lithology: __________ [ ] 48 49 Origin: __________ [ ] 50 Aquifer Thickness: __________ ft

[ ] 51 53 Length of well open to: __________ ft [ ] 54 56 Depth to top of: __________ ft [ ] 57 59

Intervals Screened: 480-510

Depth to consolidated rock: __________ ft [ ] 60 63 Source of data: __________ 64 [ ]

Depth to basement: __________ ft [ ] 65 68 Source of data: __________ 69 [ ]

Surficial material: __________ [ ] 70 71 Infiltration characteristics: __________ 72 [ ]

Coefficient Trans: __________ gpd/ft [ ] 73 75 Coefficient Storage: __________ [ ] 76 78

Coefficient Perm: __________ gpd/ft^2; Spec cap: __________ gpm/ft; Number of geologic cards: __________ [ ] 79

Well No.

GPO 857-700

Source: Texas Water Development Board

Map ID: 5

Well Number: 6441311 **GWS - Groundwater Supply** **Banks ID: 6441311**

Well Address: TX **Rel. Loc.: 0.46mi N**

Completion Date: 1908-01-01 **Drill Depth: 970.0**

Owner: Texas City Refining **Elevation: 3.28 ft (-8.50 ft)**

County:	Galveston
Aquifer Code:	112GLFC
Driller:	
Drilling Start Date:	
Drilling Method:	
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

WRD Exp. (GW)
April 1966

Well No. JH-64-41-311

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR　GEOLOGICAL SURVEY　WATER RESOURCES DIVISION

1:24000

MASTER CARD

Record by W. L. Naftel　Source of data Rept. 123　Date 11-26-75　Map Virginia Point, Tex. 1969

State Texas　48　County (or town) Galveston　KH

Latitude: 29 22 06 N (deg, min, sec)　Longitude: 094 54 34 (degrees, min, sec)　Sequential number: 1

Lat-long accuracy: ☐　T ____ N S, R ____ E W, Sec ____, ____ ¼, ____ ¼, ____ ¼　B & M

Local well number: KH-64-41-311　Other number: 359 (1939 rept?)

Local use: ☐　Owner or name: New Texas City Refinery

Owner or name: SID RICHARDSON　Address: ____

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist ____ 67 N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other ____ 68 N

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, (W) Withdraw, (X) Waste, [✓ (Z) Destroyed]. 69 Z

DATA AVAILABLE: Well data ☐ 70　Freq. W/L meas.: 1941-46　A 71　Field aquifer char. ☐ 72

Hyd. lab. data: ____ ☐ 73

Qual. water data; type: ____ ☐ 74

Freq. sampling: ? ☐ 75　Pumpage inventory: yes no, period: ____ ☐ 76

Aperture cards: ____ yes ☐ 77

Log data: ____ ☐☐ 78 79

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD　Depth well: 970 ft　970　Meas. [✓ rep] ____ accuracy 24 6

Depth cased: (first perf.) — ft ☐　Casing type: — ; Diam. — in ☐

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) ____ other ☐ 31

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, (H) hyd rot., (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ____ other ☐ 32

Date Drilled: 1908　908　Pump intake setting: ____ ft ☐

Driller: — name, ____ address

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), [✓ (N) none], (P) piston, (R) rot, (S) submerg, (T) turb, (Z) other　N 39　Deep Shallow ☐ 40

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. ____ ☐ 41　Trans. or meter no. ____

Descrip. MP ____ ft above below LSD, Alt. MP ____

Alt. LSD: 6　6　Accuracy: (source) 5' topo　47 3

Water Level 24.44 ft above below MP; Ft above [✓ below LSD]　24　Accuracy: meas.　52 A

Date meas: 8-6-41　841　Yield: ____ gpm ☐　Method determined ☐

Drawdown: ____ ft ☐　Accuracy: ____ ☐ 65　Pumping period ____ hrs ☐

QUALITY OF WATER DATA: Iron ____ ppm ☐ 69　Sulfate ____ ppm ☐ 70　Chloride ____ ppm ☐ 71　Hard. ____ ppm ☐ 72

Sp. Conduct ____ K x 10⁶ ☐ 73　Temp. ____ °F ☐　Date sampled ____ ☐

Taste, color, etc. ____

Well No.

vKMR

Well No. KH 6[illegible]-41-311

Latitude-longitude 29 , 22 , 06 9 s 094 , 54 , 34
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19 | Physiographic Province: ______ 0 3 20 21 | Section: ______

______ F 22 | Drainage Basin: ______ 23 25 | Subbasin: ______ 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ______ 27

MAJOR AQUIFER: ______ system, ______ series 28 29 Chicot aquifer, formation, group C 30 31

Lithology: ______ 32 33 Origin: ______ 34 Aquifer Thickness: ______ ft

35 37 Length of well open to: ______ ft 38 40 Depth to top of: ______ ft 41 43

MINOR AQUIFER: ______ system, ______ series 44 45 ______ aquifer, formation, group 46 47

Lithology: ______ 48 49 Origin: ______ 50 Aquifer Thickness: ______ ft

51 53 Length of well open to: ______ ft 54 56 Depth to top of: ______ ft 57 59

Intervals Screened: ______

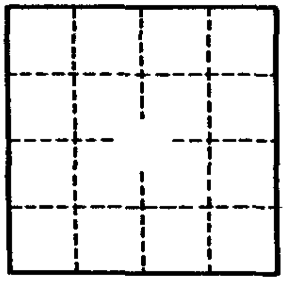
Depth to consolidated rock: ______ ft 60 63 Source of data: ______ 64

Depth to basement: ______ ft 65 68 Source of data: ______ 69

Surficial material: ______ 70 71 Infiltration characteristics: ______ 72

Coefficient Trans: ______ gpd/ft 73 75 Coefficient Storage: ______ 76 78

Coefficient Perm: ______ gpd/ft^2; Spec cap: ______ gpm/ft; Number of geologic cards: ______ 79



Well No.

GPO 857-700

Map ID: 6		**Source: Texas Water Development Board**
Well Number: 6441312	**GWS - Groundwater Supply**	**Banks ID: 6441312**
Well Address: TX		**Rel. Loc.: 0.48mi N**
Completion Date: 1969-12-01		**Drill Depth: 645.0**
Owner: Texas City Refining Co		**Elevation: 3.28 ft (-8.50 ft)**

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas Co.
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

Sites in Map ID 6 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Texas City Refining Co	TX	93
WW	USGS	US	164

WRD Exp. (GW)
April 1966

Well No. KH-64-41-312

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR GEOLOGICAL SURVEY WATER RESOURCES DIVISION

MASTER CARD

1:24 000

Record by W. L. Naftel Source of data driller log Date 2-8-71 Map Virginia Point 1969

State Texas 4 8 County (or town) Galveston K H

ck Latitude: 2 9 2 2 0 7 N N/S deg min sec Longitude: 0 9 4 5 4 4 0 degrees min sec Sequential number: 1

Lat-long accuracy: 1 T___ N/S, R___ E/W, Sec___, ___¼, ___¼, ___¼ ___ B & M

Local well number: K H - 6 4 - 4 1 - 3 1 2 Other number:

Local use: Owner or name: Texas City Refining Co. Well #5

Owner or name: T E X A S C I T Y R E F. Address:

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other N

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed. W

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: I Field aquifer char. ☐

Hyd. lab. data: ☐

Qual. water data; type: ☐

Freq. sampling: 12-29-69 E. Wood Lab. 5-19-71 A Pumpage inventory: yes no, period: ☐

Aperture cards: yes ☐

Log data: D log 0-650 Material setting in File D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 645 ft 6 4 5 Meas. [✓ rept] driller accuracy 3

Depth cased: (first perf.) 478.55 ft 4 7 8 Casing type: S ; Diam. 16 x 10¾ in 1 6

Finish: (C) porous concrete, (F) gravel w. (perf.), [✓ (G) gravel w. screen], (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) ___ other G

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) ___ other H

Date Drilled: Dec. 1969 9 6 9 Pump intake setting: ___ ft

Driller: Layne-Texas name, Houston address

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other T Deep Shallow D

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. steam ☐ Trans. or meter no.

Descrip. MP Measuring pipe +0.50 ft above/below LSD, Alt. MP

Alt. LSD: 8 8 Accuracy: (source) 5' Topo sheet 3

* Water Level 211 ft above/below MP; Ft above/below LSD 2 1 1 Accuracy: rept. D

Date meas: 12-23-69 D 6 9 Yield: 457 gpm 4 5 7 Method determined ☐

Drawdown: 47 ft 4 7 Accuracy: driller ☐ Pumping period 8 hrs 8

QUALITY OF WATER DATA: Iron ppm ☐ Sulfate ppm ☐ Chloride ppm ☐ Hard. ppm ☐

Sp. Conduct K x 10⁶ ☐ Temp. °F Date sampled

Taste, color, etc.

* 30 min static PL 258 @ 457 GPM
WL 202' before test

Well No.

Well No. KH-64-41-312

Latitude-longitude 29 22 07 [✓ N] S 094 54 40
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD

Physiographic Province: Coastal Plain 0 3 Section: W.G.C.P

F Drainage Basin: 5 1 7 Subbasin: ☐

Topo of well site: (D) depression, (C) stream channel, (E) dunes, [✓ (F) flat], (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat F

MAJOR AQUIFER: system, series Q G lower Chicot aquifer, formation, group C L

Lithology: Sand S Origin: deltaic 3 Aquifer Thickness: ft

Length of well open to: 85 ft 85 Depth to top of: ft

MINOR AQUIFER: system, series aquifer, formation, group

Lithology: Origin: Aquifer Thickness: ft

Length of well open to: ft Depth to top of: ft

30 25 30

Intervals Screened: 478.55-508.55; 548.60-573.60; 598.70-628.70 SS Borlug 0.045

Depth to consolidated rock: ft Source of data:

Depth to basement: ft Source of data:

Surficial material: Infiltration characteristics:

Coefficient Trans: gpd/ft Coefficient Storage:

Coefficient Perm: gpd/ft^2; Spec cap: gpm/ft; Number of geologic cards:

Gravel wall cemented 30" UR

470' of 16" csg.

10¾" from 368 to 645'

Well No.

64-41-3A

Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 12386
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 64-41-3A
Located on map yes
Received: 70
25

1) OWNER:
Person having well drilled Texas City Refining Co. (Name) Address P.O. Box 1271 (Street or RFD) Texas City (City) 77590 (State)

Landowner ______ (Name) Address ______ (Street or RFD) ______ (City) ______ (State)

2) LOCATION OF WELL:
County Galveston, ______ miles in ______ (N.E., S.W., etc.) direction from ______ (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

See attached map

North

(Use reverse side if necessary)

or Give legal location with distances and directions from adjacent sections or survey lines.

Labor ______ League ______
Block ______ Survey ______
Abstract No. ______
(NW¼ NE¼ SW¼ SE¼) of Section ______

3) TYPE OF WORK (Check):
New Well *Deepening*
Reconditioning Plugging

4) PROPOSED USE (Check):
Domestic *Industrial* *Municipal*
Irrigation Test Well Other

5) TYPE OF WELL (Check):
Rotary Driven Dug
Cable Jetted Bored

6) WELL LOG:
Diameter of hole ______ in. Depth drilled ______ ft. Depth of completed well ______ ft. Date drilled ______

All measurements made from ______ ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
		See attached completion report

(Use reverse side if necessary)

9) Casing:
Type: Old New Steel Plastic Other
Cemented from ______ ft. to ______ ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage

10) SCREEN:
Type ______
Perforated Slotted

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size

7) COMPLETION (Check):
Straight wall Gravel packed Other
Under reamed *Open Hole*

8) WATER LEVEL:
Static level ______ ft. below land surface Date ______
Artesian pressure ______ lbs. per square inch Date ______
Depth to pump bowls, cylinder, jet, etc., ______ ft. below land surface.

11) WELL TESTS:
Was a pump test made? Yes No If yes, by whom? ______
Yield: ______ gpm with ______ ft. drawdown after ______ hrs.
Bailer test ______ gpm with ______ ft. drawdown after ______ hrs.
Artesian flow ______ gpm
Temperature of water ______

12) WATER QUALITY:
Was a chemical analysis made? Yes No
Did any strata contain undesirable water? Yes No
Type of water? ______ depth of strata ______

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Wally Clayton (Type or Print) Water Well Drillers Registration No. 227

ADDRESS P.O. Box 9469 (Street or RFD) Houston (City) 77011 (State)

(Signed) Wally Clayton (Water Well Driller) Layne Texas Co (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TWDB-GW-53

Q-506

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ______ Lab No. 02

Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-312

Well No. ______

Date Collected 05-20-74

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth ______ ft. WBF ______

Producing intervals ______ Water level ______ ft. Sample depth ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F 26 °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		
☐ (other) ______			

%Na ______

SAR ______

RSC 9.03

Specific Conductance (micromhos/cm^3) 00095 1500

Diluted Conductance (micromhos/cm^3) x

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	584	
Sulfate	00945		
Chloride	00940	200	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.9	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as C aCO$_3$	00415		
Total Alkalinity as C aCO$_3$	00410		
Total Hardness as C aCO$_3$	00900		27
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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CR/TDWR

Analyst ______ Checked By ______

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

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Texas Department of Health Laboratories
1100 West 49th Street
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TDWR ONLY
Organization No. ________ Lab No. 02
Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston
State Well No. 64-41-312
________ Well No. ________
Date Collected 04-23-73

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth ________ ft. WBF ________

Producing intervals ________ Water level ________ ft. Sample depth ________ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas./est. Temperature ________ °F 27 °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			

		MG/L
☐ Potassium	00937	
[3]☐ Manganese	01055	
☐ Boron	01022	
[3]☐ Total Iron	01045	
☐ (other) ________		

%Na ________

SAR ________

RSC 9.22

Specific Conductance (micromhos/cm^3) 00095 1500

Diluted Conductance (micromhos/cm^3) x

" ☐ " items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	594	
Sulfate	00945		
Chloride	00940	190	
Fluoride	00951		
Nitrate	71850		
pH	00403	8.1	
Total			

[1] Dissolved Solids (residue at 180°C)	70300	
Phenolphthalein Alkalinity as CaCO$_3$	00415	
Total Alkalinity as CaCO$_3$	00410	
Total Hardness as CaCO$_3$	00900	26
[2] Nitrogen Cycle		
Ammonia - N	00610	
Nitrite - N	00615	
Nitrate - N	00620	
Organic Nitrogen	00605	

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Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] *Total Iron and Manganese require separate sample.*

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(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. _______ Lab No. 02 _______

Work No. _______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-312

_______ Well No. _______

Date Collected 05-15-72

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location _______ Sample No. ☐ By _______

Source (type of well) _______ Owner _______

Date Drilled _______ Depth _______ ft. WBF _______

Producing intervals _______ Water level _______ ft. Sample depth _______ ft.

Sampled after pumping _______ hrs. Yield _______ GPM meas. est. Temperature ____ °F 27 °C

Point of collection _______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use _______ Remarks _______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. _______ Date Received _______ Date Reported _______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na _______

SAR _______

RSC 9.1

☐ (other) _______ MG/L

Specific Conductance (micromhos/cm³) 00095 1480

Diluted Conductance (micromhos/cm³) x

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	584	
Sulfate	00945		
Chloride	00940	190	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.6	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as C aCO3	00415		
Total Alkalinity as C aCO3	00410		
Total Hardness as C aCO3	00900		25
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst _______ Checked By _______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

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1100 West 49th Street
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TDWR ONLY
Organization No. ______ Lab No. 02
Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston
State Well No. 64-41-312
______ Well No. ______
Date Collected 05-19-71

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By ______
Source (type of well) ______ Owner ______
Date Drilled ______ Depth ______ ft. WBF ______
Producing intervals ______ Water level ______ ft. Sample depth ______ ft.
Sampled after pumping ______ hrs. Yield ______ GPM meas./est. Temperature ______ °F 27 °C
Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ______
SAR ______
RSC 8.6

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 00095 1460

Diluted Conductance (micromhos/cm^3) ____X____

" ☐ " items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	576	
Sulfate	00945		
Chloride	00940	190	
Fluoride	00951		
Nitrate	71850		
pH	00403	8.2	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as CaCO$_3$	00415		
Total Alkalinity as CaCO$_3$	00410		
Total Hardness as CaCO$_3$	00900		41
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-312

Well No. ________

Date Collected 12-23-69

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth 629 ft. WBF ~~378~~ 379

Producing intervals ________ Water level ________ ft. Sample depth ☐☐☐☐ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ☐☐☐ °F ☐☐☐ °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955	13	
Calcium	00915	6	
Magnesium	00925	2	
Sodium	00929	326	
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045	.1	

%Na 97

SAR 29

RSC 9.1

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm^3) 00095 1400

Diluted Conductance (micromhos/cm^3) x

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	581	
Sulfate	00945		
Chloride	00940	180	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.9	
Total			
[1] Dissolved Solids (residue at 180° C)	70300	806	
Phenolphthalein Alkalinity as C aCO$_3$	00415		
Total Alkalinity as C aCO$_3$	00410		
Total Hardness as C aCO$_3$	00900	23	
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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1100 West 49th Street
Austin, Texas 78756

TDWR ONLY

Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-312

________ Well No. ________

Date Collected 05-10-76

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By Naftel - USGS

Source (type of well) ________ Owner Texas City Refining Corp.

Date Drilled — Depth 645 ft. WBF chicot

Producing intervals 478 - 628 Water level ________ ft. Sample depth ☐☐☐☐ ft.

Sampled after pumping on arrival hrs. Yield ________ GPM meas. est. Temperature ________ °F 26 °C

Point of collection tap on discharge pipe Appearance ☒ clear ☐ turbid ☐ colored ☐ other

Use Ind. Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ________

SAR ________

RSC ________

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm^3) 00095 1500

Diluted Conductance (micromhos/cm^3) x

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	588	
Sulfate	00945	0	
Chloride	00940	200	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.8	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as C aCO$_3$	00415		
Total Alkalinity as C aCO$_3$	00410		
Total Hardness as C aCO$_3$	00900		
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

Analyst ________ Checked By ________

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

64-41-312

Latitude ° ' "	Longitude ° ' "	Seq. No.
29 22 07	094 54 40	01

(aty code 167 County Galveston

Well # BH-64-41-312

Project number 4648-01200

Date 5-10-76 Time — Temp°C 26.0

Owner Texas City Refining Corp.

Address Well 5

Date drld — WBF code 112CHCIL

Sample interval:(top) 478 (bottom) 625

Water level — Appr clear Use Ind

Collector Wattel Yield — GPM

Smpld aftr pmpg on arrival Depth 645

Pt of coll tap on discharge pipe

Field: Cond ___ pH ___ HCO3 ___ DO ___

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

chem schedule I

Other ___

Herbicide ___ Insecticide ___

Remarks: resampled

KEY PUNCHED

Type	Station identification number
2	292207094544001

Y M D Begin	Time of measurement
760510	

	Parameter code	Value	Exp.	Rmk
Depth	72008	6450	03	
Yield (GPM)	00059			
Sample interval TOP	72015	4780	03	
iple interval BOTTOM	72016	6280	03	
Water level	72019			

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004				
DO (mg/1)	00300				
DO % Sat.	00301				
Temp °C	00010	2600	02		26.0
pH	00400	7800	01		7.8
Specific conductance	00095	1500	04		1500
HCO_3	00440	5880	03		588
CO_3	00445	0000	01		0
Chloride (Cl)	00940	2000	03		200
Sulfate (SO_4)	00945	0000	00		0.0
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31616				
Strep-tococci	31679				
BOD	00310				

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TDWR ONLY

Organization No. ______ Lab No. 02

Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-312

______ Well No. ______

Date Collected 05-14-75

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By Naftel - USGS

Source (type of well) ______ Owner Texas City Refining Co. No. 5

Date Drilled 12-69 Depth 645 ft. WBF Chicot

Producing intervals 479 - 629 Water level ______ ft. Sample depth ______ ft.

Sampled after pumping on arrival hrs. Yield ______ GPM meas. est. Temperature ______ °F 26 °C

Point of collection tap on discharge pipe Appearance ☒ clear ☐ turbid ☐ colored ☐ other

Use Ind Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 00095 1500

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	584	
Sulfate	00945	0	
Chloride	00940	200	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.6	
Total			

[1] Dissolved Solids (residue at 180° C)	70300	
Phenolphthalein Alkalinity as C aCO$_3$	00415	
Total Alkalinity as C aCO$_3$	00410	
Total Hardness as C aCO$_3$	00900	
[2] Nitrogen Cycle		
Ammonia - N	00610	
Nitrite - N	00615	
Nitrate - N	00620	
Organic Nitrogen	00605	

Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

TDWR-0148 (Rev. 1-8-80)

015756
64-41-312

Latitude ° ' "	Longitude ° ' "	Seq. No.
29 22 07	094 54 40	01

County code 167 County Galveston

Well # KH-64-41-312

Project number 5-4648-01200

Date 5-14-75 Time — Temp°C 26.0

Owner Texas City Refining Co. No. 5

Address Texas City

Date drld 12-69 WBF code 121CHCTL

Sample interval:(top) 479 (bottom) 629

Water level — Appr clear Use Ind

Collector Vattel Yield — GPM

Smpld aftr pmpg on arrival Depth 645

Pt of coll tap on discharge pipe

Field: Cond ___ pH ___ HCO_3 ___ DO ___

Indicate types of analyses

Coliform Phenols Minors

Nutrients MBAS BOD TOC DOC

Std chem schedule I + SO_4

Other

Herbicide Insecticide

Remarks: Re Sample

KEY PUNCHED

Type	Station identification number
2	292207094544001

1 2 9 16

Y M D	Time of measurement
750514	

17 Begin 22 · 28 32

	Parameter code	Value	Exp.	Rmk
Depth	72008	6450	03	
Yield (GPM)	00059			
Sample interval TOP	72015	4790	03	
Sample interval BOTTOM	72016	6290	03	
Water level	72019			

	Parameter code	Value	Exp.	Rmk	
Sampled after pumping	72004				
DO (mg/l)	00300				
DO % Sat.	00301				
Temp °C	00010	26.00	02		26
pH	00400	7600	01		7.
Specific conductance	00095	1500	04		15
HCO_3	00440	5840	03		58
CO_3	00445	0000	01		0
Chloride (Cl)	00940	same 2000	03		2
Sulfate (SO_4)	00945	0000	00		0.
Color	00080				
Coliform, membrane filter	31501				
Coliform, fecal	31616				
Strep-tococci	31679				
BOD	00310				

FORM NO. 28

State

LAYNE TEXAS COMPANY
HOUSTON -:- DALLAS

WELL LOG

REPORT NO 8271
S. O. 2180-69
PAGE 1 of 1
FILE NO. 3405
DATE 12/3/69

CUSTOMER LOCATION

FOR Texas City Refining Company

LOCATION WELL Texas City

SURVEY FIELD

COUNTY Galveston STATE Texas

OTHER LAND MARKS
150' West of Well #3 - Parking lot area

WELL DATA

NAME WELL WELL NO. 3-A
ELEVATION DATUM
RT C GR
TEST HOLE SIZE 7-7/8" TD 650'
DATE STARTED DRILLING 12-1-69
DATE FINISHED DRILLING 12-2-69
DRILLER Ferguson RIG NO. 10
TYPE MUD Gel NO SACKS 15
ELECTRIC LOG Yes TYPE Widco
SURVEY Eastman TYPE Single-shot
OTHER

DEPTH STRATA	EACH STRATUM	DESCRIPTION FORMATION	SAMPLES		
			DEPTH	TYPE	NUMBER
0		Surface			
38	38	Clay			
98	60	Sandy clay			
115	17	Sand			
231	116	Sandy clay			
263	32	Shale			
279	16	Sandy clay			
312	33	Sand (broken)			
428	116	Sandy clay w/streaks of sand			
479	51	Shale			
511	32	Sand (hard)			
547	36	Shale			
591	44	Sand w/streaks of shale			
599	8	Shale			
631	32	Sand w/streaks of lime			
650	19	Shale			

Total depth 650 ft.

65-41-312

GM

FORM NO. 1202 · 1M · 8-51 · B&L

THE LAYNE TEXAS COMPANY, LTD.

HOUSTON -:- DALLAS

MATERIAL SETTING

REPORT NO. 8272
S. O. 2180-69
PAGE 1 OF 1
FILE NO 3405
DATE 1/6/70

CUSTOMER LOCATION

FOR Texas City Refinery

LOCATION WELL 150' W. of Well #3

SURVEY FIELD

COUNTY Galveston STATE Texas

OTHER LAND MARKS

WELL DATA

NAME WELL WELL NO. 3-A

ELEVATION DATUM

TYPE WELL Gravel-wall

SURFACE CASING CEMENTED Yes NO. SACKS 320'

SIZE HOLE UNDERREAMED 30" DEPTH 470-645'

GRAVEL TYPE 112-165-131 NO CU YDS 70

TYPE SCREEN S.S. W.W. Barlug GAGE .045"

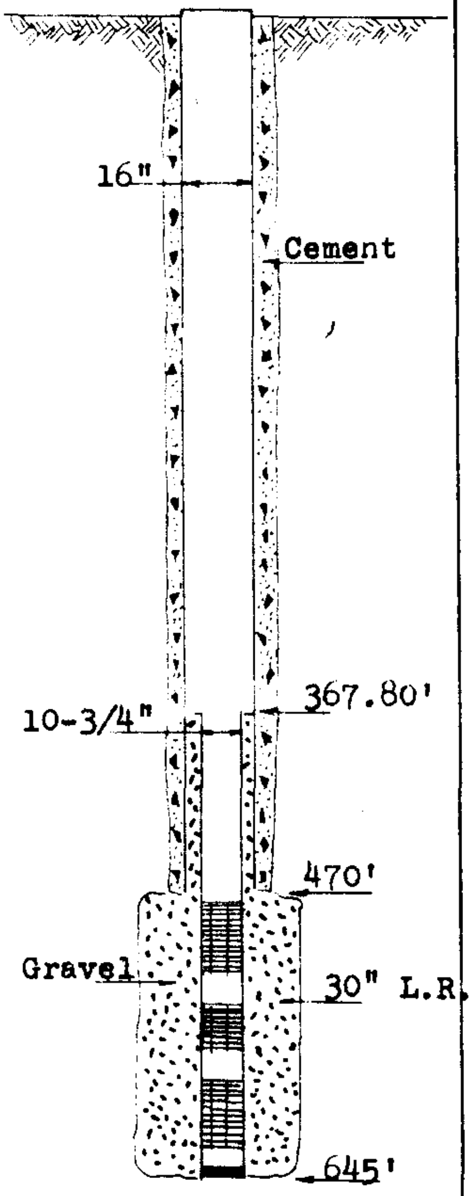
DRILLER G. Ferguson RIG NO 10

OTHER

DEPTH	LENGTH	SIZE, KIND, WEIGHT MATERIAL
+3'		16" O.D. surface casing
0		Surface
368.30'		Top of 10-3/4" liner with L&R coupling
470.00'	473.00'	16" O.D. surface casing
478.55'	110.25'	10-3/4" O.D. blank liner
508.55'	30.00'	10-3/4" O.D. S.S. W.W. Barlug screen .045" ga.
548.60'	40.05'	10-3/4" O.D. blank liner
573.60'	25.00'	10-3/4" O.D. S.S. W.W. Barlug screen .045" ga.
598.70'	25.10'	10-3/4" O.D. blank liner
628.70'	30.00'	10-3/4" O.D. S.S. W.W. Barlug screen .045" ga.
641.80'	13.10'	10-3/4" O.D. blank liner
645.00'	3.20'	10-3/4" O.D. set nipple & back pressure valve

Total depth 645 ft.

SKETCH



65-41-312

LAYNE TEXAS COMPANY

HOUSTON -:- DALLAS

WATER WELL TEST

REPORT NO 8273
S. O. 2180-69
PAGE 1 of 1
FILE NO. 3405
DATE 1/8/70

CUSTOMER LOCATION

TEST FOR Texas City Refining Company
LOCATION OF WELL 150' W. of Well #3
SURVEY FIELD
COUNTY Galveston STATE Texas
DESCRIPTION OF LAND MARKS

WELL DATA

NAME WELL WELL NO. 3A
ELEVATION DATUM
WELL SIZE 16" x 10-3/4" x 30" UR
TOTAL DEPTH 645' TOP SCREEN 478'-508'
GRAVEL WELL Yes STRAIGHT WELL
TYPE SCREEN S.S. W.W. GAGE .045"
TEMPERATURE OF WATER Barlug
WATER CONDITION

WATER MEASURING DEVICE

ORIFICE SIZE 6"x5" LENGTH 45'
OTHER

TEST PUMP DATA

DEPTH SETTING TOP OF BOWL 300'
LENGTH AIR LINE 300' SIZE 1/4"
TYPE BOWL 10" NO. STAGES 8
LENGTH BOWL SUCTION LT. 7'

SAND CONTENT Trace OZ. PER 100 GAL.

ACTIVE STATIC HEAD AFTER PUMP STOPPED

5 MIN. 217 FT. 20 MIN. 212 FT.
10 MIN. 214 FT. 25 MIN. 211 FT.
15 MIN. 213 FT. 30 MIN. 211 FT.

S.L. before start 202 ft.

WATER SAMPLE TAKEN Yes NO. SAMPLES 2
BACTERIOLOGICAL SAMPLE TAKEN
DRAWDOWN SPECIFIC CAPACITY

DATE HOUR	AIR LINE GAGE	PUMPING LEVEL	DISCH. PRESS.	HEAD ON ORIFICE INCHES	GPM	RPM	OPERATOR	REMARKS Sand content
12/23/69 - Started 8 hr. test at 8:00 A.M.								
8:30AM	48	252		14	465	G.E.F.		1/4 oz.
9:00	48	252		14	465			1/4 oz.
10:00	46	254		13.5	457			1/8 oz.
11:00	45	255		13.5	457			Trace
12:00 N	44	256		13.5	457			"
1:00PM	44	256		13.5	457			"
2:00	43	257		13.5	457			"
3:00	42	258		13.5	457			"
4:00	42	258		13.5	457			"

65-41-312

OBSERVERS

D. E. Edwards
FOR OWNER

G. E. Ferguson
FOR LAYNE TEXAS CO.

FORM NO. 85-

EDNA WOOD LABORATORIES

WATER TECHNOLOGISTS . . . CHEMISTS . . . MICROBIOLOGISTS

31 December 1969

To: Layne Texas Company
Houston, Texas

SO 2180-69

Sample marked: Well No. 3A, Texas City Refinery, Galveston Cty., Texas.
Taken: 12-23-69 after 8 hrs. test pumping at 457 gpm.
Static Head: 10 minutes recovery 214'. Pumping Level: 258'.
Screened: 480'- 630'. G. E. Ferguson.

Received: 12-29-69. Turbid sample, filtered for analysis.

WATER ANALYSIS

results in parts per million (mg/1) except as noted

Dissolved Residue at 350°C	818*	**Conductance, micromhos/cm, 25°C**	1400
Total Dissolved Solids, actual†	1113*	**Color, units**	55
Total Dissolved Solids, calc.	1101	**Turbidity, units**	8
Silica SiO_2	13	**As Calcium Carbonate, $CaCO_3$:**	
Calcium Ca	6	**Phenolphthalein Alkalinity**	0
Magnesium Mg	2	**Total Alkalinity**	476
Sodium (diff.) Na + K as Na	322	**Total Hardness**	25
Carbonate CO_3	0	**Free Carbon Dioxide** CO_2	9
Bicarbonate HCO_3	581	pH . . . 7.88	
Sulfate SO_4	0	**HYPOTHETICAL COMBINATIONS**	
Chloride Cl	177	Calcium Bicarbonate	24
Total Iron Fe	0.12	Magnesium Bicarbonate	15
Iron, filtered sample Fe	0.07	Sodium Bicarbonate	758
		Sodium Chloride	291
		Silica	13
		Total Dissolved Solids, calc.	1101
* Includes organic matter.		65-41-312	

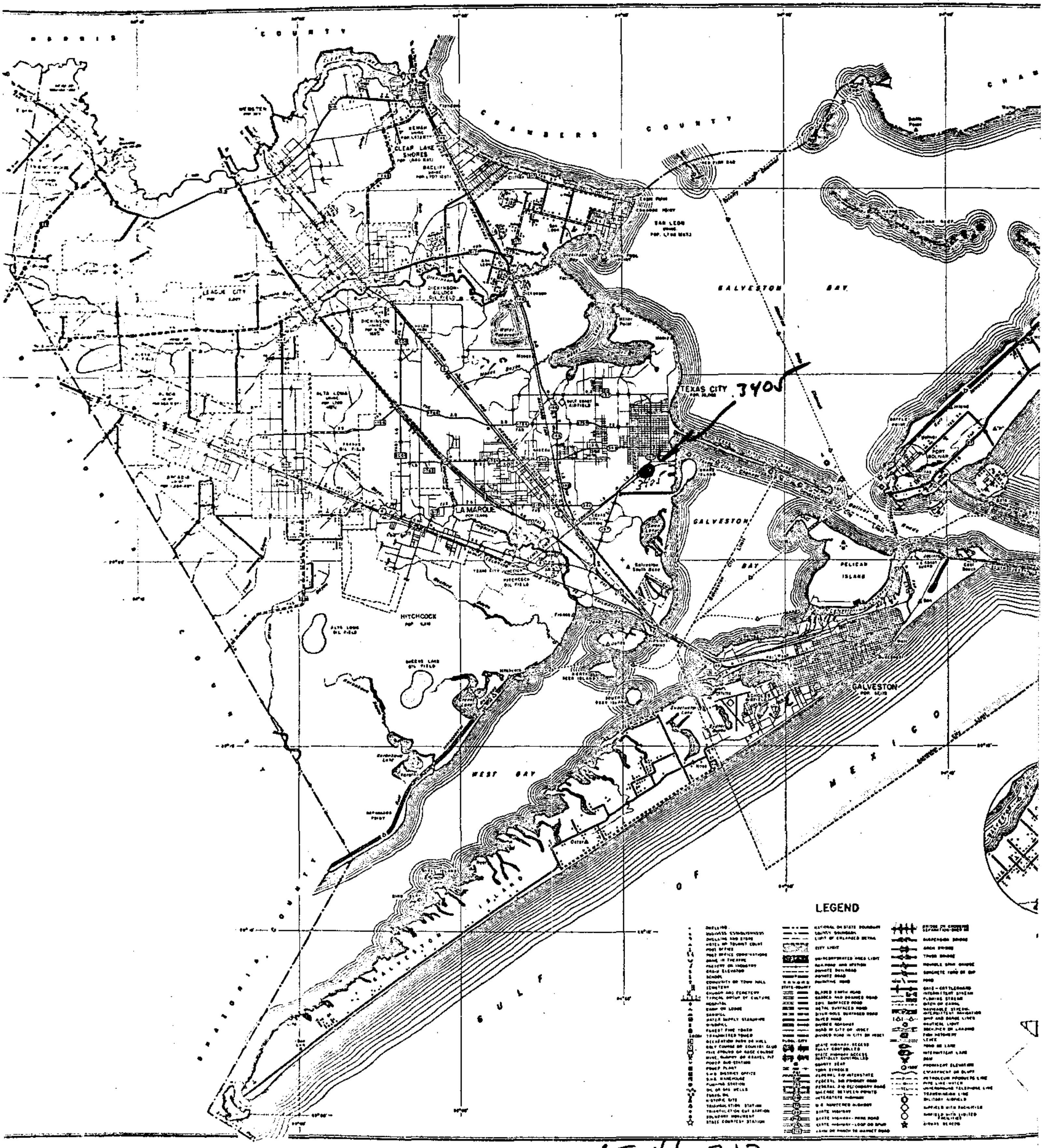
†Total Dissolved Solids, actual = Dissolved Residue + 50.8% of bicarbonate (HCO_3) ion

2578
1b

EDNA WOOD LABORATORIES

By: Edna Wood
Edna Wood

Tel: (713) 747-7271 • P. O. BOX 14171 • 4820 OLD SPANISH TRAIL • HOUSTON, TEXAS 77021

HARRIS COUNTY
CHAMBERS COUNTY
CLEAR LAKE SHORES
KEMAH
BACLIFF
SAN LEON
LEAGUE CITY
DICKINSON
ALTA LOMA
ARCADIA
TEXAS CITY
LA MARQUE
HITCHCOCK
GALVESTON BAY
GALVESTON
PELICAN ISLAND
PORT BOLIVAR
WEST BAY
GALVESTON ISLAND
GULF OF MEXICO
BRAZORIA COUNTY
3405
LEGEND
NATIONAL OR STATE BOUNDARY
COUNTY BOUNDARY
CITY LIMIT
SCHOOL
CEMETERY
HOSPITAL
STATE HIGHWAY
INTERSTATE HIGHWAY
U.S. NUMBERED HIGHWAY
FARM OR RANCH TO MARKET ROAD
SUSPENSION BRIDGE
ARCH BRIDGE
TRUSS BRIDGE
MOVABLE SPAN BRIDGE
FORD
LEVEE
DAM
MILITARY AIRFIELD
AIRWAY BEACON

65-41-312

Map ID: 8		**Source: Texas Water Development Board**
Well Number: 6441306	**GWS - Groundwater Supply**	**Banks ID: 6441306**
Well Address: TX		**Rel. Loc.: 0.50mi N**
Completion Date: 1948-01-01		**Drill Depth: 655.0**
Owner: Texas City Refining Corp.		**Elevation: 6.56 ft (-5.22 ft)**

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas Co.
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

WRD Exp. (GW)
April 1966

Well No. KH-64-41-306

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by A.G. Winslow 1950 C. McAdoo — Source of data File — Date 3-12-68 — Map Virginia Point 1954 1:24,000

State Texas [4 8] — County (or town) Galveston [K H]

Latitude: [2 9 2 2 0 8 N] deg min sec N/S — Longitude: [0 9 4 5 4 3 9] degrees min sec — Sequential number: [1]

Lat-long accuracy: [1] T.____ N/S, R____ E/W, Sec____, ____¼, ____¼, ____¼

Local well number: [K H 6 4 4 1 3 0 6] — Other number: B & M (M-40) #3

Local use: [ ] — Owner or name: Texas City Ref. Corp.

Owner or name: [T E X A S C I T Y R E F.] — Address: Texas City, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist [N]

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, [✓ (U) Unused], (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other [U]

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (F) Oil-gas, (R) Recharge, (T) Test, ~~(U) Unused~~, (W) Withdraw, (X) Waste, [✓ (Z) Destroyed] [E] destroyed ?1969

DATA AVAILABLE: Well data [1] Freq. W/L meas.: ~~Annual~~ [I] Field aquifer char. [ ]

Hyd. lab. data: ________ [ ]

Qual. water data; type: ________ [ ]

Freq. sampling: 5-19-48 [A] Pumpage inventory: yes no; period: ________ [ ]

Aperture cards: ________ yes [ ]

Log data: D-Log 0-655 [D]

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD — Depth well: 655 ft [6 5 5] Meas. [✓ Rept.] Rept. accuracy [6]

Depth cased: (first perf.) 475 ft [4 7 5] — Casing type: ST. ; Diam. 16-8⅝ in [1 6]

Finish: (C) porous concrete, (F) gravel w. (perf.), (G) gravel w. (screen), (H) horiz. gallery, (O) open end, (P) perf., [✓ (S) screen], (T) sd. pt., (W) shored, (X) open hole, (Z) other [S]

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other [H]

Date Drilled: 1948 [9 4 8] — Pump intake setting: ________ ft [ ]

Driller: Layne Texas Co. (name), Houston, Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other [T] [✓ Deep] Shallow [D]

Power (type): diesel, [✓ elec], nat gas, gasoline, hand, LP gas, wind; H.P. ________ [ ] Trans. or meter no. ________

Descrip. MP ________ ft above/below LSD . Alt. MP ________

Alt. LSD: 8 [8] Accuracy: (source) Topo. 5' [3]

Water Level 146.48 ft above/below MP; Ft above [✓ below LSD] [1 4 6] Accuracy: meas. [A]

Date meas: 5-4-50 [5 5 0] Yield: 325 gpm [3 2 5] Method determined [ ]

Drawdown: 28 ft [2 8] Accuracy: rept. W.D. [ ] Pumping period ________ hrs [ ]

QUALITY OF WATER DATA: Iron ____ ppm [ ] Sulfate ____ ppm [ ] Chloride ____ ppm [ ] Hard. ____ ppm [ ]

Sp. Conduct ____ K x 10⁶ [ ] Temp. ____ °F [ ] Date sampled ____ [ ]

Taste, color, etc. ________

Well No. KH-64-41-306

Well No. KH-64-41-306

Latitude-longitude 29 , 22 , 08 Ⓢ 094 , 54 , 39
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD 1 19 Physiographic Province: Coastal Plain 0 3 (20 21) Section: ______

F (22) Drainage Basin: ______ 5 1 T (23 25) Subbasin: ______ ☐ 26

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ______ 27 ☐

MAJOR AQUIFER: ______ system, ______ series ☐ 28 29 ______ aquifer, formation, group ☐ 30 31

Lithology: ______ ☐ 32 33 Origin: ______ ☐ 34 Aquifer Thickness: ______ ft

☐ 35 37 Length of well open to: 80 ft 8 0 (38 40) Depth to top of: ______ ft ☐ 41 43

MINOR AQUIFER: ______ system, ______ series ☐ 44 45 ______ aquifer, formation, group ☐ 46 47

Lithology: ______ ☐ 48 49 Origin: ______ ☐ 50 Aquifer Thickness: ______ ft

☐ 51 53 Length of well open to: ______ ft ☐ 54 56 Depth to top of: ______ ft ☐ 57 59

Intervals Screened: 475-505; (30) 550-580; (30) ~~610-630;~~ (20) * 630-650 (7)

Depth to consolidated rock: ______ ft ☐ 60 63 Source of data: ______ 64 ☐

Depth to basement: ______ ft ☐ 65 68 Source of data: ______ 69 ☐

Surficial material: ______ ☐ 70 71 Infiltration characteristics: ______ 72 ☐

Coefficient Trans: ______ gpd/ft ☐ 73 75 Coefficient Storage: ______ ☐ 76 78

Coefficient Perm: ______ gpd/ft^2; Spec cap: ______ gpm/ft; Number of geologic cards: ______ ☐ 79

* Published in 5502
Screen 630-650 ?

Well No. KH-64-41-306

GPO 857-700

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ____

Proj. No. ____

CHEMICAL WATER ANALYSIS REPORT

084 KH Galveston
County

State Well No. 64-41-306

____ Well No. ____

Date Collected 05-07-69

By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____

Source (type of well) ____ Owner ____

Date Drilled ____ Depth 650 ft. WBF Gulf Coast

Producing intervals ____ Water level ____ ft.

Sampled after pumping ____ hrs. Yield ____ GPM meas./est. Temperature ____ °F 27 °C

Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ____ Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		
☐ (other) ____		

%Na ____

SAR ____

RSC 9.3

Specific Conductance (micromhos/cm³) 1480

Diluted Conductance (micromhos/cm³) ____ X ____

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		
Bicarbonate	600	
Sulfate		
Chloride	205	
Fluoride		
Nitrate		
pH	8.0	
Total		
1/ Dissolved Solids (sum in MG/L)		
Phenolphthalein Alkalinity as C aCO3		
Total Alkalinity as C aCO3		
Total Hardness as C aCO3		28

2/ Nitrogen Cycle

Ammonia - N	
Nitrite - N	
Nitrate - N	
Organic Nitrogen	

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GW/TDWR

Analyst ____ Checked By ____

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston

State Well No. 64-41-305

______ Well No. ______

Date Collected 11-13-56

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 1006 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm3) 3640

Diluted Conductance (micromhos/cm3) X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		
Bicarbonate	361	
Sulfate		
Chloride	1030	
Fluoride		
Nitrate		
pH	8.5	
Total		

1/ Dissolved Solids (sum in MG/L) ______

Phenolphthalein Alkalinity as C aCO3 ______

Total Alkalinity as C aCO3 ______

Total Hardness as C aCO3 125

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

Analyst ______ Checked By ______

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

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Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY
Program No. ____
Proj. No. ____

CHEMICAL WATER ANALYSIS REPORT

084 KH Galveston
County

State Well No. 64-41-306
____ Well No. ____
Date Collected 05-17-67
By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____
Source (type of well) ____ Owner ____
Date Drilled ____ Depth 650 ft. WBF Gulf Coast
Producing intervals ____ Water level ____ ft.
Sampled after pumping ____ hrs. Yield ____ GPM meas. est. Temperature ____ °F 26 °C
Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use ____ Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ____
SAR ____
RSC 9.1

☐ (other) ____ MG/L

Specific Conductance (micromhos/cm³) 1460
Diluted Conductance (micromhos/cm³) X

	MG/L	ME/L
Carbonate		
Bicarbonate	590	
Sulfate		
Chloride	194	
Fluoride		
Nitrate		
pH	7.8	
Total		

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as C aCO3	
Total Alkalinity as C aCO3	
Total Hardness as C aCO3	27

2/ Nitrogen Cycle

Ammonia - N	
Nitrite - N	
Nitrate - N	
Organic Nitrogen	

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"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ____ Checked By ____

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Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ____

Proj. No. ____

CHEMICAL WATER ANALYSIS REPORT

084 Galveston
County

State Well No. 64-41-306

____ Well No. ____

Date Collected 05-12-66

By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____

Source (type of well) ____ Owner ____

Date Drilled ____ Depth 650 ft. WBF Gulf Coast

Producing intervals ____ Water level ____ ft.

Sampled after pumping ____ hrs. Yield ____ GPM meas. est. Temperature ____ °F ____ °C

Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ____ Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		

	MG/L
☐ Potassium	
☐ Manganese	
☐ Boron	
3/ ☐ Total Iron	
☐ (other) ____	

%Na ____

SAR ____

RSC 9.5

Specific Conductance (micromhos/cm^3) 1520

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		
Bicarbonate	614	
Sulfate		
Chloride	200	
Fluoride		
Nitrate		
pH	8.0	
Total		

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as C aCO$_3$	
Total Alkalinity as C aCO$_3$	
Total Hardness as C aCO$_3$	26

2/ Nitrogen Cycle

Ammonia - N	
Nitrite - N	
Nitrate - N	
Organic Nitrogen	

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Analyst ____ Checked By ____

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

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1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

084 KH Galveston
County

State Well No. 64-41-306

Well No. ______

Date Collected 05-27-65

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 650 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/ ☐ Total Iron		

%Na ______

SAR ______

RSC 9.5

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm³) 1500

Diluted Conductance (micromhos/cm³) ______ X

	MG/L	ME/L
Carbonate		
Bicarbonate	612	
Sulfate		
Chloride	202	
Fluoride		
Nitrate		
pH	8.2	
Total		

1/ Dissolved Solids (sum in MG/L) ______

Phenolphthalein Alkalinity as CaCO₃ ______

Total Alkalinity as CaCO₃ ______

Total Hardness as CaCO₃ 28

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

RECEIVED
JUL 27 1982
CR/TDWR

"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ______ Checked By ______

Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

0 8 4 KH Galveston
County

State Well No. 64-41-306

______ Well No. ______

Date Collected 05-11-64

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 650 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/ ☐ Total Iron		

%Na ______

SAR ______

RSC 8.3

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm3) 1510

Diluted Conductance (micromhos/cm3) ______ X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate	3	
Bicarbonate	610	
Sulfate		
Chloride	205	
Fluoride		
Nitrate		
pH	8.6	
Total		

1/ Dissolved Solids (sum in MG/L) ______

Phenolphthalein Alkalinity as C aCO3 ______

Total Alkalinity as C aCO3 ______

Total Hardness as C aCO3 26

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

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1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total iron requires separate sample.

Analyst ______ Checked By ______

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Typewrite (Black ribbon) or Print Plainly
(soft pencil or black ink)
Do not use ball point pen

Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY
Organization No. ______ Lab No. 02
Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston
State Well No. 64-41-306
Well No. ______
Date Collected 11-15-62

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth ______ ft. WBF ______ ☐☐☐☐

Producing intervals ______ Water level ______ ft. Sample depth ☐☐☐☐ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ☐☐☐ °F ☐☐☐ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		
☐ (other) ______		MG/L	

%Na ______

SAR ______

RSC ______

Specific Conductance (micromhos/cm^3) · 00095 · 1500

Diluted Conductance (micromhos/cm^3) X

" ☐ " items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445		
Bicarbonate	00440	598	
Sulfate	00945		
Chloride	00940	205	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.7	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as $CaCO_3$	00415		
Total Alkalinity as $CaCO_3$	00410		
Total Hardness as $CaCO_3$	00900		26
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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TWDBE-GW ONLY

Program No.

Proj. No.

CHEMICAL WATER ANALYSIS REPORT

0 B 4 KA ~~WH~~ Galveston
County

State Well No. 64-41-306

Well No.

Date Collected 05-09-62

By

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location

Source (type of well) Owner

Date Drilled Depth 650 ft. WBF Gulf Coast

Producing intervals Water level ft.

Sampled after pumping hrs. Yield GPM meas. est. Temperature °F °C

Point of collection Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use Remarks

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. Date Received Date Reported

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		
☐ (other)		

%Na

SAR

RSC

Specific Conductance (micromhos/cm^3) 1480

Diluted Conductance (micromhos/cm^3) X

	MG/L	ME/L
Carbonate		
Bicarbonate	604	
Sulfate		
Chloride	202	
Fluoride		
Nitrate		
pH	8.0	
Total		

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as C aCO$_3$	
Total Alkalinity as C aCO$_3$	
Total Hardness as C aCO$_3$	26

2/ Nitrogen Cycle

Ammonia - N	
Nitrite - N	
Nitrate - N	
Organic Nitrogen	

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"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

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Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County 0 8 4 KW Galveston

State Well No. 64-41-306

Well No. ______

Date Collected 05-04-61

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 650 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 1490

Diluted Conductance (micromhos/cm^3) ______ X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		
Bicarbonate	598	
Sulfate	4	
Chloride	196	
Fluoride		
Nitrate		
pH	8.4	
Total		

1/ Dissolved Solids (sum in MG/L) ______

Phenolphthalein Alkalinity as C aCO$_3$ ______

Total Alkalinity as C aCO$_3$ ______

Total Hardness as C aCO$_3$ 25

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

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1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

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Analyst ______ Checked By ______

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Program No. ______
Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

0 8 4 County KH Galveston

State Well No. 64-41-306

______ Well No. ______

Date Collected 05-04-60

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 650 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ______

SAR ______

RSC ______

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm³) 1480

Diluted Conductance (micromhos/cm³) X

	MG/L	ME/L
Carbonate		
Bicarbonate	592	
Sulfate		
Chloride	195	
Fluoride		
Nitrate		
pH	7.2	
Total		

1/ Dissolved Solids (sum in MG/L) ______

Phenolphthalein Alkalinity as $CaCO_3$ ______

Total Alkalinity as $CaCO_3$ ______

Total Hardness as $CaCO_3$ 26

2/ Nitrogen Cycle

Ammonia - N ______

Nitrite - N ______

Nitrate - N ______

Organic Nitrogen ______

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CR/TDWR

"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total iron requires separate sample.

Analyst ______ Checked By ______

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Program No. ______
Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

084 [illegible] Galveston
County

State Well No. 64-41-306

______ Well No. ______

Date Collected 05-14-59

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner ______

Date Drilled ______ Depth 650 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F ______ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		.
Magnesium		.
Sodium		.
Total		.
☐ Potassium	.	
☐ Manganese	.	%Na ______
☐ Boron	.	SAR ______
3/ ☐ Total Iron	.	RSC ______
☐ (other) ______	MG/L	

Specific Conductance (micromhos/cm³) 1500

Diluted Conductance (micromhos/cm³) ______ X ______

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate	)	.
Bicarbonate	598	.
Sulfate		.
Chloride	192	.
Fluoride	.	.
Nitrate	.	.
pH	8.7	
Total		.

1/ Dissolved Solids (sum in MG/L)	
Phenolphthalein Alkalinity as C aCO3	
Total Alkalinity as C aCO3	
Total Hardness as C aCO3	26

2/ Nitrogen Cycle

Ammonia - N	.
Nitrite - N	.
Nitrate - N	.
Organic Nitrogen	.

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1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total iron requires separate sample.

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Analyst ______ Checked By ______

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Program No.
Proj. No.

64-41-306

CHEMICAL WATER ANALYSIS REPORT

KH-GALVESTON-084

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

County KH Galveston
State Well No. 64-41-306
Well No.
Date Collected 05-13-58
By

Location
Source (type of well) Owner
Date Drilled Depth 650 ft. WBF Gulf Coast
Producing intervals Water level ft.
Sampled after pumping hrs. Yield GPM meas. est. Temperature °F °C
Point of collection Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use Remarks

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. Date Received Date Reported

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na
SAR
RSC
☐ (other) MG/L
Specific Conductance (micromhos/cm3) 1470
Diluted Conductance (micromhos/cm3) X

	MG/L	ME/L
Carbonate		
Bicarbonate	637	
Sulfate		
Chloride	202	
Fluoride		
Nitrate		
pH	8.3	
Total		

1/ Dissolved Solids (sum in MG/L)
Phenolphthalein Alkalinity as CaCO3
Total Alkalinity as CaCO3
Total Hardness as CaCO3 26

2/ Nitrogen Cycle
Ammonia - N
Nitrite - N
Nitrate - N
Organic Nitrogen

"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst Checked By

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Do not use ball point pen

Texas State Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY
Program No. ______
Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

County KH Galveston
State Well No. 64-41-306
______ Well No. ______
Date Collected 05-07-56
By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______
Source (type of well) ______ Owner ______
Date Drilled ______ Depth 650 ft. WBF Gulf Coast
Producing intervals ______ Water level ______ ft.
Sampled after pumping ______ hrs. Yield ______ GPM meas./est. Temperature ______ °F ______ °C
Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/ ☐ Total Iron		

☐ (other) ______ MG/L

%Na ______
SAR ______
RSC ______

Specific Conductance (micromhos/cm³) 1990
Diluted Conductance (micromhos/cm³) X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate	7	
Bicarbonate	594	
Sulfate		
Chloride	199	
Fluoride		
Nitrate		
pH	8.7	
Total		

1/ Dissolved Solids (sum in MG/L) ______
Phenolphthalein Alkalinity as $CaCO_3$ ______
Total Alkalinity as $CaCO_3$ ______
Total Hardness as $CaCO_3$ 25

2/ Nitrogen Cycle
Ammonia - N ______
Nitrite - N ______
Nitrate - N ______
Organic Nitrogen ______

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst ______ Checked By ______

Map ID: 9		**Source: Texas Water Development Board**
Well Number: 6441307	**GWS - Groundwater Supply**	**Banks ID: 6441307**
Well Address: TX		**Rel. Loc.: 0.53mi N**
Completion Date: 1965-06-23		**Drill Depth: 645.0**
Owner: Texas City Refinery		**Elevation: 3.28 ft (-8.50 ft)**

County:	Galveston
Aquifer Code:	112CHCTL
Driller:	Layne Texas
Drilling Start Date:	
Drilling Method:	Mud (Hydraulic) Rotary
Well Type:	Withdrawal of Water
Digital Log:	Go to webpage

End of GWS Section

WRD Exp. (GW)
April 1966

Well No. KH-64-41-307

WELL SCHEDULE

U. S. DEPT. OF THE INTERIOR — GEOLOGICAL SURVEY — WATER RESOURCES DIVISION

MASTER CARD

Record by McAdoo Naftel (1966) Source of data File Date 10-24-69 Map Virginia Point 1954 1:24,000

State Texas 4 8 County (or town) Galveston K H

Latitude: 2 9 2 2 1 0 N (deg, min, sec; N S) Longitude: 0 9 4 5 4 3 6 (degrees, min, sec) Sequential number: 1

Lat-long accuracy: 1 T____ N S, R ____ E W, Sec ____, ____¼, ____¼, ____¼

Local well number: K H - 6 4 - 4 1 - 3 0 7 Other number: B & M NO. 4 7

Local use: Owner or name: Texas City Refinery

Owner or name: T E X C I T Y R E F Address: Texas City, Texas

Ownership: (C) County, (F) Fed Gov't, (M) City, [✓ (N) Corp or Co], (P) Private, (S) State Agency, (W) Water Dist N

Use of water: (A) Air cond, (B) Bottling, (C) Comm, (D) Dewater, (E) Power, (F) Fire, (H) Dom, (I) Irr, (M) Med, [✓ (N) Ind], (P) P S, (R) Rec, (S) Stock, (T) Instit, (U) Unused, (V) Repressure, (W) Recharge, (X) Desal-P S, (Y) Desal-other, (Z) Other N

Use of well: (A) Anode, (D) Drain, (G) Seismic, (H) Heat Res, (O) Obs, (P) Oil-gas, (R) Recharge, (T) Test, (U) Unused, [✓ (W) Withdraw], (X) Waste, (Z) Destroyed. W

DATA AVAILABLE: Well data ☐ Freq. W/L meas.: I Field aquifer char. ☐

Hyd. lab. data: ☐

Qual. water data; type: ☐

Freq. sampling: 5-12-66 I Pumpage inventory: yes no, period: ☐

Aperture cards: yes ☐

Log data: E-Log M-19 D-Log E D

WELL-DESCRIPTION CARD

SAME AS ON MASTER CARD Depth well: 645 ft 6 4 5 Meas. [✓ rept] Driller accuracy 3

Depth cased: (first perf.) 484 ft 4 8 4 Casing type: S ; Diam. 10-8⅝ in 1 4

Finish: (C) porous concrete, (F) gravel w. (perf.), [✓ (G) gravel w. (screen)], (H) horiz. gallery, (O) open end, (P) perf., (S) screen, (T) sd. pt., (W) shored, (X) open hole, (Z) other G

Method Drilled: (A) air rot, (B) bored, (C) cable, (D) dug, [✓ (H) hyd rot.], (J) jetted, (P) air percussion, (R) reverse rotary, (T) trenching, (V) driven, (W) drive wash, (Z) other H

Date Drilled: 6-23-65 9 6 5 Pump intake setting: ft

Driller: Layne Texas Co. (name), Houston Texas (address)

Lift (type): (A) air, (B) bucket, (C) cent, (J) jet, (L) multiple (cent.), (M) multiple (turb.), (N) none, (P) piston, (R) rot, (S) submerg, [✓ (T) turb], (Z) other T [✓ Deep] Shallow D

Power (type): diesel, elec, nat gas, gasoline, hand, LP gas, wind; H.P. Steam ☐ Trans. or meter no.

Descrip. MP Hole in pump base +2.5 ft [✓ above] below LSD Alt. MP

Alt. LSD: 8 8 Accuracy: (source) Topo 5' 3

* Water Level 90 min static 185 ft above below MP; Ft above [✓ below] LSD 1 8 5 Accuracy: rept D

Date meas: June 23 1965 6 6 5 Yield: 448 gpm 4 4 8 Method determined ☐

Drawdown: 42 ft 4 2 Accuracy: rept 3 Pumping period 8 hrs 8

QUALITY OF WATER DATA: Iron ppm ☐ Sulfate ppm ☐ Chloride ppm ☐ Hard. ppm ☐

Sp. Conduct K x 10^6 ☐ Temp. °F ☐ Date sampled ☐

Taste, color, etc.

* PL 182.94 below MP 5-12-66

Well No. KH-64-41-307

Well No. KH-64-41-307

Latitude-longitude 29 , 22 , 10 Ⓝ S 094 , 54 , 36
d m s d m s

HYDROGEOLOGIC CARD

SAME AS ON MASTER CARD (1–19) **Physiographic Province:** Coastal Plain [0 3] (20–21) **Section:** ______

[F] (22) **Drainage Basin:** ______ [ ] (23–25) **Subbasin:** ______ [ ] (26)

Topo of well site: (D) depression, (C) stream channel, (E) dunes, (F) flat, (H) hilltop, (K) sink, (L) swamp, (O) offshore, (P) pediment, (S) hillside, (T) terrace, (U) undulating, (V) valley flat ______ [ ] (27)

MAJOR AQUIFER: ______ system, ______ series [ ] (28–29) ______ aquifer, formation, group [L k] (30–31)

Lithology: ______ [ ] (32–33) **Origin:** ______ [ ] (34) **Aquifer Thickness:** ______ ft

[ ] (35–37) **Length of well open to:** 100 ft [1 0 0] (38–40) **Depth to top of:** ______ ft [ ] (41–43)

MINOR AQUIFER: ______ system, ______ series [ ] (44–45) ______ aquifer, formation, group [ ] (46–47)

Lithology: ______ [ ] (48–49) **Origin:** ______ [ ] (50) **Aquifer Thickness:** ______ ft

[ ] (51–53) **Length of well open to:** ______ ft [ ] (54–56) **Depth to top of:** ______ ft [ ] (57–59)

Intervals Screened: 484-529 (45); 544-579 (35); 604-624 (20), 8 5/8" screen.

Depth to consolidated rock: ______ ft [ ] (60–63) **Source of data:** ______ [ ] (64)

Depth to basement: ______ ft [ ] (65–68) **Source of data:** ______ [ ] (69)

Surficial material: ______ [ ] (70–71) **Infiltration characteristics:** ______ [ ] (72)

Coefficient Trans: ______ gpd/ft [ ] (73–75) **Coefficient Storage:** ______ [ ] (76–78)

Coefficient Perm: ______ gpd/ft^2; **Spec cap:** ______ gpm/ft; **Number of geologic cards:** ______ [ ] (79)

0-475 = 14" csg.
374-645 = 8 5/8" csg.

8 hr. Pump Test.
P/L : 227' @ 448 gpm
recovery

5 min - 189
10 " - 188
15 " - 187
20 " - 186
25 " - 185.5
30 " - 185.

Well No. KH-64-41-307

STATE

64-33 9A

FORM NO. 28

LAYNE TEXAS COMPANY,
HOUSTON -:- DALLAS

WELL LOG

REPORT NO 7096
S 2069-65
PAGE 1 of 1
FILE NO 3026
DATE 7/8/65

CUSTOMER LOCATION

FOR Texas City Refining Company
LOCATION WELL Texas City
SURVEY
FIELD
COUNTY Galveston
STATE Texas
OTHER LAND MARKS

WELL DATA

NAME WELL
WELL NO 3
ELEVATION
DATUM
RT C GR
TEST HOLE SIZE 12¼"& 6-3/4" TO 360 & 655'
DATE STARTED DRILLING 6-22-65
DATE FINISHED DRILLING 6-23-65
DRILLER O.Gutzmann
RIG NO 17
TYPE MUD Gel
NO SACKS 25
ELECTRIC LOG Yes
TYPE Widco
SURVEY
TYPE
OTHER Jake Hodges

DEPTH STRATA	EACH STRATUM	DESCRIPTION FORMATION	SAMPLES		
			DEPTH	TYPE	NUMBER
0		Surface			
15	15	Fill clay & shale			
52	37	Clay			
70	18	Sandy shale			
90	20	Shale & sandy shale			
119	29	Sand			
139	20	Shale & sandy shale			
163	24	Sandy shale & shell			
174	11	Shale			
187	13	Sand			
197	10	Clay			
230	33	Sandy shale, sand & shell			
273	43	Shale			
316	43	Shale & shell			
391	75	Shale & sandy shale			
456	65	Sandy shale with sand breaks			
477	21	Sand (broken)			
500	23	Hard sandy shale & sand			
520	20	Sand			
525	5	Shale			
545	20	Sandy shale, sand & shale			
584	39	Sand (broken)			
597	13	Sandy shale & shell			
607	10	Shale & shell			
621	14	Sand			
635	14	Sand (broken)			
655	20	Hard shale & sandy shale			
Total depth 655 ft.					

64-33-9a

GM 6441307

REPORT NO 7098
S. O. 2069-65
PAGE 1 of 1
FILE NO 3026
DATE 7/8/65

LAYNE TEXAS COMPANY

HOUSTON -:- DALLAS

WATER WELL TEST

CUSTOMER LOCATION

TEST FOR Texas City Refining Company
LOCATION OF WELL Texas City
SURVEY
FIELD
COUNTY Galveston
STATE Texas
DESCRIPTION OF LAND MARKS

WELL DATA

NAME WELL
WELL NO 3
ELEVATION
DATUM
WELL SIZE 14" x 8-5/8" x 30" UR
TOTAL DEPTH 645'
TOP SCREEN 484.22'
GRAVEL WELL Yes
STRAIGHT WELL
TYPE SCREEN S.S. W.W.
GAGE .045"
TEMPERATURE OF WATER 78° F
WATER CONDITION

WATER MEASURING DEVICE

ORIFICE SIZE 6"x5"
LENGTH 4'
OTHER

TEST PUMP DATA

DEPTH SETTING TOP OF BOWL 300'
LENGTH AIR LINE
SIZE
TYPE BOWL 10" RKHC
NO. STAGES 7
LENGTH BOWL
SUCTION LT

SAND CONTENT OZ. PER 100 GAL

ACTIVE STATIC HEAD AFTER PUMP STOPPED

5 MIN 189 FT
10 MIN 188 FT
15 MIN 187 FT
20 MIN 186 FT
25 MIN 185.5 FT
30 MIN 185 FT

Float

WATER SAMPLE TAKEN
NO. SAMPLES
BACTERIOLOGICAL SAMPLE TAKEN
DRAWDOWN
SPECIFIC CAPACITY

DATE HOUR	GAGE	PUMPING LEVEL	DISCH PRESS	HEAD ON ORIFICE INCHES	GPM	RPM	OPERATOR	REMARKS
7/6/65 Started 8 hour test at 10:00 A.M.								
10:30AM		223		13.5	457		O.G.	
11:00		225		13.5	457			
11:30		225		13.5	457			
12:00 N		225		13.5	457			
12:30PM		225		13.5	457			
1:00		225		13.5	457			
1:30		226		13.5	457			
2:00		227		13	448			
2:30		227		13	448			
3:00		227		13	448			
3:30		227		13	448			
4:00		227		13	448		J.H.	
4:30		227		13	448			
5:00		227		13	448			
5:30		227		13	448			
6:00		227		13	448			

64-41-307

OBSERVERS

D. E. Edwards
FOR OWNER

Otto Gutzmann, J. Hodges
FOR LAYNE TEXAS CO.

FORM NO. 25

FORM NO. 1202

LAYNE TEXAS COMPANY

HOUSTON -:- DALLAS

MATERIAL SETTING

REPORT NO. 7097
S. O. 2069-65
PAGE 1 OF 1
FILE NO. 3026
DATE 7/8/65

CUSTOMER LOCATION

FOR Texas City Refining Company

LOCATION WELL Texas City

SURVEY FIELD

COUNTY Galveston STATE Texas

OTHER LAND MARKS

WELL DATA

NAME WELL WELL NO. 3

ELEVATION DATUM

TYPE WELL Gravel-wall

SURFACE CASING CEMENTED Yes NO. SACKS 200+8%Gel

SIZE HOLE UNDERREAMED 30" DEPTH 644.59'

GRAVEL TYPE 112-113-165-131 NO. CU. YDS 55

TYPE SCREEN S.S. W.W. GAGE .045"

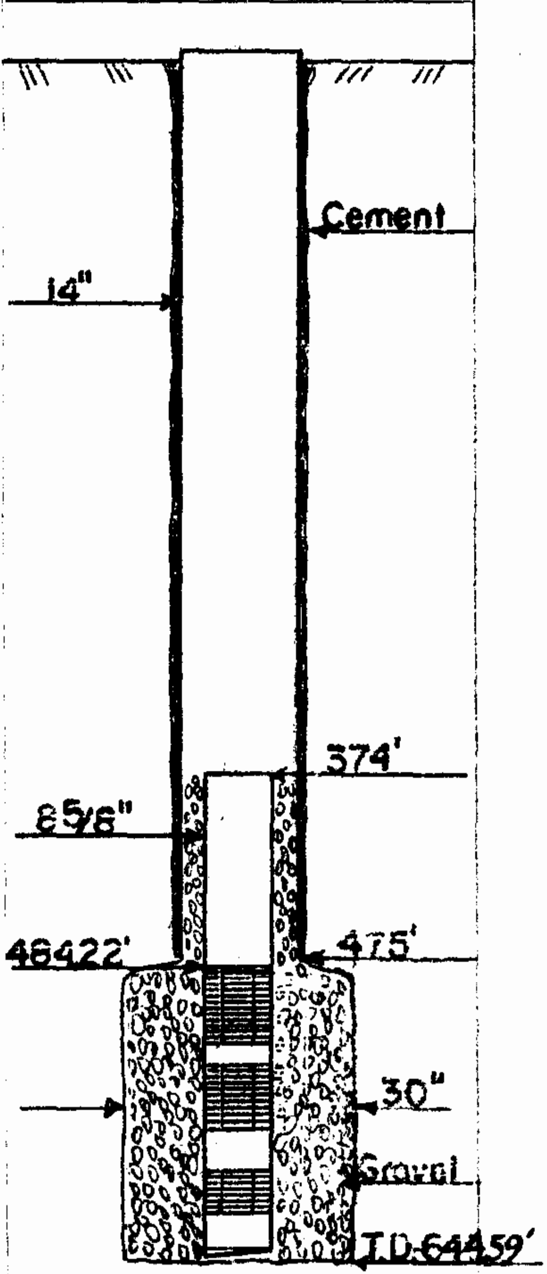
DRILLER O.Gutzmann RIG NO. 17

OTHER J. Hodges

DEPTH	LENGTH	SIZE. KIND. WEIGHT MATERIAL
+6'		14" O.D. surface casing 6' above ground
0		Surface
374.00'		Top of 8-5/8" O.D. liner
475.00'	481.00'	14" O.D. surface casing
484.22'	110.22'	8-5/8" O.D. blank liner
529.37'	45.15'	8-5/8" O.D. S.S. W.W. screen, .045" gage
544.28'	14.91'	8-5/8" O.D. blank liner
579.28'	35.00'	8-5/8" O.D. S.S. W.W. screen, .045" gage
604.24'	24.96'	8-5/8" O.D. blank liner
624.24'	20.00'	8-5/8" O.D. S.S. W.W. screen, .045" gage
642.24'	18.00'	8-5/8" O.D. blank liner
644.59'	2.35'	8-5/8" O.D. set nipple with wood wash plug and back pressure valve

Total depth 644.59.ft.

SKETCH



Log
2 pages)
attach.
64-~~33-900~~
41-307

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Texas Department of Health Laboratories
1100 West 49th Street
Austin, Texas 78756

TDWR ONLY
Organization No. ______ Lab No. 02
Work No. ______

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston
State Well No. 64-41-307
______ Well No. ______
Date Collected 05-20-74

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ______ Sample No. ☐ By ______
Source (type of well) ______ Owner ______
Date Drilled ______ Depth ______ ft. WBF ______
Producing intervals ______ Water level ______ ft. Sample depth ______ ft.
Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ______ °F 26 °C
Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use ______ Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
³☐ Manganese	01055		%Na ______
☐ Boron	01022		SAR ______
³☐ Total Iron	01045		RSC 9.6

☐ (other) ______ MG/L

Specific Conductance (micromhos/cm^3) 00095 1730

Diluted Conductance (micromhos/cm^3) x

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	628	
Sulfate	00945		
Chloride	00940	250	
Fluoride	00951		
Nitrate	71850		
pH	00403	8.1	Total

¹Dissolved Solids (residue at 180°C)	70300	
Phenolphthalein Alkalinity as CaCO$_3$	00415	
Total Alkalinity as CaCO$_3$	00410	
Total Hardness as CaCO$_3$	00900	36

²Nitrogen Cycle

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Ammonia - N	00610	
Nitrite - N	00615	
Nitrate - N	00620	
Organic Nitrogen	00605	

Analyst ______ Checked By ______

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

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Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-307

________ Well No. ________

Date Collected 04-23-73

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth ________ ft. WBF ________

Producing intervals ________ Water level ________ ft. Sample depth ________ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ________ °F 27 °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ________

SAR ________

RSC 9.8

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm^3) 00095 1690

Diluted Conductance (micromhos/cm^3) ________ X

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	632	
Sulfate	00945		
Chloride	00940	240	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.9	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as C aCO$_3$	00415		
Total Alkalinity as C aCO$_3$	00410		
Total Hardness as C aCO$_3$	00900		30
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.

[2] Nitrogen cycle requires separate sample.

[3] Total Iron and Manganese require separate sample.

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Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-307

________ Well No. ________

Date Collected 05-19-71

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth ________ ft. WBF ________

Producing intervals ________ Water level ________ ft. Sample depth ________ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas. est. Temperature ____°F ____°C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		

%Na ________

SAR ________

RSC 9.5

☐ (other) ________ MG/L

Specific Conductance (micromhos/cm^3) 00095 1630

Diluted Conductance (micromhos/cm^3) X

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	620	
Sulfate	00945		
Chloride	00940	240	
Fluoride	00951		
Nitrate	71850		
pH	00403	8.2	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as C aCO$_3$	00415		
Total Alkalinity as C aCO$_3$	00410		
Total Hardness as C aCO$_3$	00900		35
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ________ Checked By ________

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

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Organization No. ________ Lab No. 02

Work No. ________

CHEMICAL WATER ANALYSIS REPORT

County 084 Galveston

State Well No. 64-41-307

Well No. ________

Date Collected 04-08-70

Send report to:

Data Collection and Evaluation Section
Texas Department of Water Resources
P.O. Box 13087
Austin, Texas 78711

Location ________ Sample No. ☐ By ________

Source (type of well) ________ Owner ________

Date Drilled ________ Depth 624 ft. WBF ~~378~~ 379

Producing intervals ________ Water level ________ ft. Sample depth ☐☐☐☐ ft.

Sampled after pumping ________ hrs. Yield ________ GPM meas./est. Temperature ☐☐☐ °F ☐☐☐ °C

Point of collection ________ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use ________ Remarks ________

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ________ Date Received ________ Date Reported ________

		MG/L	ME/L
Silica	00955		
Calcium	00915		
Magnesium	00925		
Sodium	00929		
Total			
☐ Potassium	00937		
[3] ☐ Manganese	01055		
☐ Boron	01022		
[3] ☐ Total Iron	01045		
☐ (other) ________			

%Na ________

SAR ________

RSC 9.7

Specific Conductance (micromhos/cm3) 00095 1620

Diluted Conductance (micromhos/cm3) X

"☐" items will be analyzed if checked.

		MG/L	ME/L
Carbonate	00445	0	
Bicarbonate	00440	626	
Sulfate	00945		
Chloride	00940	240	
Fluoride	00951		
Nitrate	71850		
pH	00403	7.9	
Total			
[1] Dissolved Solids (residue at 180°C)	70300		
Phenolphthalein Alkalinity as C aCO3	00415		
Total Alkalinity as C aCO3	00410		
Total Hardness as C aCO3	00900		30
[2] Nitrogen Cycle			
Ammonia - N	00610		
Nitrite - N	00615		
Nitrate - N	00620		
Organic Nitrogen	00605		

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Analyst ________ Checked By ________

---

[1] The bicarbonate reported in this analysis can be converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure used in the computation of dissolved solids.
[2] Nitrogen cycle requires separate sample.
[3] Total Iron and Manganese require separate sample.

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Program No. ____

Proj. No. ____

CHEMICAL WATER ANALYSIS REPORT

County 0 8 4 KH Galveston

State Well No. 64-41-307

Well No. ____

Date Collected 05-07-69

By ____

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ____

Source (type of well) ____ Owner ____

Date Drilled ____ Depth 645 ft. WBF Gulf Coast

Producing intervals ____ Water level ____ ft.

Sampled after pumping ____ *hrs. Yield* ____ GPM meas. est. *Temperature* ____ °F 28 °C

Point of collection ____ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use IND Remarks ____

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ____ Date Received ____ Date Reported ____

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

%Na ____

SAR ____

RSC 9.3

☐ (other) ____ MG/L

Specific Conductance (micromhos/cm^3) 1490

Diluted Conductance (micromhos/cm^3) ____ X

	MG/L	ME/L
Carbonate		
Bicarbonate	602	
Sulfate		
Chloride	[illegible]	
Fluoride		
Nitrate		
pH	7.9	
Total		

1/ *Dissolved Solids (sum in MG/L)* ____

Phenolphthalein Alkalinity as C aCO$_3$ ____

Total Alkalinity as C aCO$_3$ ____

Total Hardness as C aCO$_3$ 27

2/ Nitrogen Cycle

Ammonia - N ____

Nitrite - N ____

Nitrate - N ____

Organic Nitrogen ____

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"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

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Analyst ____ Checked By ____

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Program No.

Proj. No.

CHEMICAL WATER ANALYSIS REPORT

084 KH Galveston
County

State Well No. 64-41-307

Well No.

Date Collected 05-14-68

By

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location

Source (type of well) Owner

Date Drilled Depth 645 ft. WBF Gulf Coast

Producing intervals Water level ft.

Sampled after pumping hrs. Yield GPM meas./est. Temperature °F °C

Point of collection Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use IND Remarks

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. Date Received Date Reported

	MG/L	ME/L
Silice		
Calcium		
Magnesium		
Sodium		
Total		

	MG/L
☐ Potassium	
☐ Manganese	
☐ Boron	
3/☐ Total Iron	

☐ (other) MG/L

%Na

SAR

RSC 96

Specific Conductance (micromhos/cm³) 1600

Diluted Conductance (micromhos/cm³) X

	MG/L	ME/L
Carbonate		
Bicarbonate	584	
Sulfate		
Chloride	225	
Fluoride		
Nitrate		
pH	8.4	
Total		

1/ Dissolved Solids (sum in MG/L)

Phenolphthalein Alkalinity as CaCO3

Total Alkalinity as CaCO3

Total Hardness as CaCO3 33

2/ Nitrogen Cycle

Ammonia - N

Nitrite - N

Nitrate - N

Organic Nitrogen

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"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total iron requires separate sample.

TWDBE-GW-50 (Rev. 7-1-71)

Analyst Checked By

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Program No. ______
Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

0 8 4 County KH Galveston

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

State Well No. 64-41-307
Well No. ______
Date Collected 05-17-67
By ______

Location ______
Source (type of well) ______ Owner Texas City Refinery
Date Drilled ______ Depth 645 ft. WBF Gulf Coast
Producing intervals ______ Water level ______ ft.
Sampled after pumping ______ hrs. Yield ______ GPM meas./est. Temperature ______ °F ______ °C
Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other
Use IND Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica		
Calcium		
Magnesium		
Sodium		
Total		
☐ Potassium		
☐ Manganese		
☐ Boron		
3/☐ Total Iron		

☐ (other) ______ MG/L

%Na ______
SAR ______
RSC 9.6

Specific Conductance (micromhos/cm³) 1640
Diluted Conductance (micromhos/cm³) ______ X

	MG/L	ME/L
Carbonate		
Bicarbonate	625	
Sulfate		
Chloride	238	
Fluoride		
Nitrate		
pH	7.4	
Total		
1/ Dissolved Solids (sum in MG/L)		
Phenolphthalein Alkalinity as C aCO₃		
Total Alkalinity as C aCO₃		
Total Hardness as C aCO₃		30
2/ Nitrogen Cycle		
Ammonia - N		
Nitrite - N		
Nitrate - N		
Organic Nitrogen		

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"☐" items will be analyzed if checked.

1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.
2/ Nitrogen cycle requires separate sample.
3/ Total Iron requires separate sample.

Analyst ______ Checked By ______

TWDBE-GW-50 (Rev. 7-1-71)

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1100 West 49th Street
Austin, Texas 78756

TWDBE-GW ONLY

Program No. ______

Proj. No. ______

CHEMICAL WATER ANALYSIS REPORT

084 KH Galveston
County

State Well No. 64-41-307

______ Wall No. ______

Date Collected 05-12-66

By ______

Send report to:

Ground Water Division
Texas Water Development Board
P.O. Box 13087
Austin, Texas 78711

Location ______

Source (type of well) ______ Owner Texas City Refinery

Date Drilled 1965 Depth 445 ft. WBF Gulf Coast

Producing intervals ______ Water level ______ ft.

Sampled after pumping ______ hrs. Yield ______ GPM meas. est. Temperature ☐☐☐ °F ☐☐☐ °C

Point of collection ______ Appearance ☐ clear ☐ turbid ☐ colored ☐ other

Use IND Remarks ______

(FOR LABORATORY USE ONLY)

CHEMICAL ANALYSIS

KEY PUNCHED

Laboratory No. ______ Date Received ______ Date Reported ______

	MG/L	ME/L
Silica	15	
Calcium	6	.
Magnesium	2	.
Sodium	338	.
Total		.
☐ Potassium	1.6	
☐ Manganese	.	%Na 96
☐ Boron	0.7	SAR 29
3/☐ Total Iron	1.6	RSC 9.5
☐ (other) ______ MG/L		

Specific Conductance (micromhos/cm³) 1520

Diluted Conductance (micromhos/cm³) X

"☐" items will be analyzed if checked.

	MG/L	ME/L
Carbonate		.
Bicarbonate	612	.
Sulfate	0	.
Chloride	200	.
Fluoride	1.4	.
Nitrate	1.0	.
pH	7.6	Total .
1/ Dissolved Solids (sum in MG/L)		869
Phenolphthalein Alkalinity as C aCO₃		
Total Alkalinity as C aCO₃		
Total Hardness as C aCO₃		25

2/ Nitrogen Cycle

Ammonia - N	.
Nitrite - N	.
Nitrate - N	.
Organic Nitrogen	.

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1/ The bicarbonate reported in this analysis is converted by computation (multiplying by 0.4917) to an equivalent amount of carbonate, and the carbonate figure is used in the computation of this sum.

2/ Nitrogen cycle requires separate sample.

3/ Total Iron requires separate sample.

Analyst ______ Checked By ______

TWDBE-GW-50 (Rev. 7-1-71)

REPORT NO 8273
S O 2180-69
PAGE 1 of 1
FILE NO 3405
DATE 1/8/70

LAYNE TEXAS COMPANY

HOUSTON -:- DALLAS

WATER WELL TEST

CUSTOMER LOCATION

TEST FOR Texas City Refining Company
LOCATION OF WELL 150' W. of Well #3
SURVEY
FIELD
COUNTY Galveston
STATE Texas
DESCRIPTION OF LAND MARKS

WELL DATA

NAME WELL
WELL NO. 3A
ELEVATION
DATUM
WELL SIZE 16" x 10-3/4" x 30" UR
TOTAL DEPTH 645'
TOP SCREEN 478'-508'
GRAVEL WELL Yes
STRAIGHT WELL
TYPE SCREEN S.S. W.W. Barlug
GAGE .045"
TEMPERATURE OF WATER
WATER CONDITION

WATER MEASURING DEVICE

ORIFICE SIZE 6"x5"
LENGTH 45'
OTHER

TEST PUMP DATA

DEPTH SETTING TOP OF BOWL 300'
LENGTH AIR LINE 300'
SIZE 1/4"
TYPE BOWL 10"
NO. STAGES 8
LENGTH BOWL
SUCTION LT 7'

SAND CONTENT Trace OZ PER 100 GAL.

ACTIVE STATIC HEAD AFTER PUMP STOPPED

5 MIN	217 FT.	20 MIN	212 FT.
10 MIN	214 FT.	25 MIN	211 FT.
15 MIN	213 FT.	30 MIN	211 FT.

S.L. before start 202 ft.

WATER SAMPLE TAKEN Yes
NO. SAMPLES 2
BACTERIOLOGICAL SAMPLE TAKEN
DRAWDOWN
SPECIFIC CAPACITY

DATE HOUR	AIR LINE GAGE	PUMPING LEVEL	DISCH PRESS	HEAD ON ORIFICE INCHES	GPM	RPM	OPERATOR	REMARKS Sand content
12/23/69 - Started 8 hr. test at 8:00 A.M.								
8:30AM	48	252		14	465	G.E.F.		1/4 oz.
9:00	48	252		14	465			1/4 oz.
10:00	46	254		13.5	457			1/8 oz.
11:00	45	255		13.5	457			Trace
12:00 N	44	256		13.5	457			"
1:00PM	44	256		13.5	457			"
2:00	43	257		13.5	457			"
3:00	42	258		13.5	457			"
4:00	42	258		13.5	457			"

OBSERVERS

D. E. Edwards
FOR OWNER

G. E. Ferguson
FOR LAYNE TEXAS CO.

FORM NO. 28

HGSD - Harris/Galveston Subsidence District

Map ID: 1

Well Number: HGSD1586

HGSD - Harris/Galveston Subsidence District

Source: Harris/Galveston/Fort Bend Subsidence Districts

Banks ID: 48167HGSD1586

Well Address: TX

Rel. Loc.: 0.37mi NW

Completion Date: 1942-01-01

Drill Depth: 691.0

Owner: UNION CARBIDE CORPORATION

Elevation: 6.56 ft (-5.22 ft)

Well Number:	1586
Correspondent:	
Correspondent Address:	P.O. Box 471, BLDG. 58
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77590
Begin Date:	1985-10-01
Status:	P
Permittee:	UNION CARBIDE CORPORATION

Map ID 10: HGSD

Map ID: 10 **Well Number: HGSD1423**	**HGSD - Harris/Galveston Subsidence District**	**Source: Harris/Galveston/Fort Bend Subsidence Districts** **Banks ID: 48167HGSD1423**
Well Address: TX		**Rel. Loc.: 0.53mi N**
Completion Date: 1943-01-01		**Drill Depth: 1050.0**
Owner: Valero Refining - Texas LP		**Elevation: 3.28 ft (-8.50 ft)**

Well Number:	1423
Correspondent:	
Correspondent Address:	P.O. Box 3429
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77592
Begin Date:	2024-10-01
Status:	O
Permittee:	Valero Refining - Texas LP

Map ID 12: HGSD

Map ID: 12 **Well Number: HGSD1426**	**HGSD - Harris/Galveston Subsidence District**	**Source: Harris/Galveston/Fort Bend Subsidence Districts** **Banks ID: 48167HGSD1426**
Well Address: TX		**Rel. Loc.: 0.58mi N**
Completion Date: 1970-01-01		**Drill Depth: 650.0**
Owner: Valero Refining - Texas LP		**Elevation: 3.28 ft (-8.50 ft)**

Well Number:	1426
Correspondent:	
Correspondent Address:	P.O. Box 3429
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77592
Begin Date:	2024-10-01
Status:	C
Permittee:	Valero Refining - Texas LP

Map ID 15: HGSD

Map ID: 15 **Well Number: HGSD1425**	**HGSD - Harris/Galveston Subsidence District**	**Source: Harris/Galveston/Fort Bend Subsidence Districts** **Banks ID: 48167HGSD1425**
Well Address: TX		**Rel. Loc.: 0.69mi N**
Completion Date: 1943-01-01		**Drill Depth: 1015.0**
Owner: TEXAS CITY REFINING, INC.		**Elevation: 0.00 ft (-11.78 ft)**

Well Number:	1425
Correspondent:	
Correspondent Address:	P.O. Box 1271
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77590
Begin Date:	1978-01-09
Status:	P
Permittee:	TEXAS CITY REFINING, INC.

Map ID 16: HGSD

Map ID: 16 **Well Number: HGSD3128**	**HGSD - Harris/Galveston Subsidence District**	**Source: Harris/Galveston/Fort Bend Subsidence Districts** **Banks ID: 48167HGSD3128**
Well Address: TX **Completion Date: 1973-01-01** **Owner: Galveston County**		**Rel. Loc.: 0.76mi W** **Drill Depth: 595.0** **Elevation: 6.56 ft (-5.22 ft)**

Well Number:	3128
Correspondent:	
Correspondent Address:	1912 Sealy
Correspondent City:	Galveston
Correspondent State:	TX
Correspondent Zip:	77550
Begin Date:	1983-10-01
Status:	5
Permittee:	Galveston County

Map ID: 20 **Well Number: HGSD1322**	**HGSD - Harris/Galveston Subsidence District**	**Source: Harris/Galveston/Fort Bend Subsidence Districts** **Banks ID: 48167HGSD1322**
Well Address: TX **Completion Date: 1942-01-01** **Owner: Blanchard Refining Company, LLC**		**Rel. Loc.: 0.83mi N** **Drill Depth: 1016.0** **Elevation: 3.28 ft (-8.50 ft)**

Well Number:	1322
Correspondent:	
Correspondent Address:	2401 5th Ave South
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77590
Begin Date:	2024-10-01
Status:	O
Permittee:	Blanchard Refining Company, LLC

Sites in Map ID 20 Cluster

Dataset	Well Name	Well Address	Page #
HGSD	Blanchard Refining Company, LLC	TX	147
HGSD	Blanchard Refining Company, LLC	TX	148

Map ID: 20 **Well Number: HGSD1324**	**HGSD - Harris/Galveston Subsidence District**	**Source: Harris/Galveston/Fort Bend Subsidence Districts** **Banks ID: 48167HGSD1324**
Well Address: TX **Completion Date: 1950-01-01** **Owner: Blanchard Refining Company, LLC**		**Rel. Loc.: 0.83mi N** **Drill Depth: 1013.0** **Elevation: 3.28 ft (-8.50 ft)**

Well Number:	1324
Correspondent:	
Correspondent Address:	2401 5th Ave South
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77590
Begin Date:	2024-10-01
Status:	2
Permittee:	Blanchard Refining Company, LLC

Sites in Map ID 20 Cluster

Dataset	Well Name	Well Address	Page #
HGSD	Blanchard Refining Company, LLC	TX	147
HGSD	Blanchard Refining Company, LLC	TX	148

Map ID: 22 **Well Number: HGSD1323**	**HGSD - Harris/Galveston Subsidence District**	**Source: Harris/Galveston/Fort Bend Subsidence Districts** **Banks ID: 48167HGSD1323**
Well Address: TX		**Rel. Loc.: 0.88mi N**
Completion Date: 1950-01-01		**Drill Depth: 749.0**
Owner: Blanchard Refining Company, LLC		**Elevation: 6.56 ft (-5.22 ft)**

Well Number:	1323
Correspondent:	
Correspondent Address:	2401 5th Ave South
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77590
Begin Date:	2024-10-01
Status:	O
Permittee:	Blanchard Refining Company, LLC

Map ID: 24

Well Number: HGSD1321

HGSD - Harris/Galveston Subsidence District

Source: Harris/Galveston/Fort Bend Subsidence Districts

Banks ID: 48167HGSD1321

Well Address: TX

Rel. Loc.: 0.99mi N

Completion Date: 1967-01-01

Drill Depth: 771.0

Owner: Blanchard Refining Company, LLC

Elevation: 6.56 ft (-5.22 ft)

Well Number:	1321
Correspondent:	
Correspondent Address:	2401 5th Ave South
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77590
Begin Date:	2024-10-01
Status:	O
Permittee:	Blanchard Refining Company, LLC

Map ID: 7

Well Number: HGSD1424

HGSD - Harris/Galveston Subsidence District

Source: Harris/Galveston/Fort Bend Subsidence Districts

Banks ID: 48167HGSD1424

Well Address: TX

Rel. Loc.: 0.48mi N

Completion Date: 1965-01-01

Drill Depth: 644.0

Owner: Valero Refining - Texas LP

Elevation: 6.56 ft (-5.22 ft)

Well Number:	1424
Correspondent:	
Correspondent Address:	P.O. Box 3429
Correspondent City:	Texas City
Correspondent State:	TX
Correspondent Zip:	77592
Begin Date:	2024-10-01
Status:	O
Permittee:	Valero Refining - Texas LP

End of HGSD Section

HIST - Historical Water Well

Map ID: 13		**Source: TCEQ**
Grid Number: 64-41-2G	**HIST - Historical Water Well**	**Banks ID: 4816700665**
Well Address: TX		**Rel. Loc.: 0.59mi W**
Completion Date: 1977-11-02		**Drill Depth: 598.0**
Owner: Florida Gas & Exploration		**Elevation: 3.28 ft (-8.50 ft)**

64-41-2F

Send original copy by
certified mail to the
Texas Water Development Board
P. O. Box 13087
Austin, Texas 78711

State of Texas

WATER WELL REPORT

For TWDB use only
Well No. 64-41-2G
Located on map 10.5
Received: 78 1

1) OWNER:
Person having well drilled Florida Gas + Explo. (Name) Address 2240 Milam Bldg (Street or RFD) HSt (City) TX (State)

Landowner ____ (Name) Address ____ (Street or RFD) ____ (City) ____ (State)

2) LOCATION OF WELL:
County GALVESTON, 2 miles in S (N.E., S.W., etc.) direction from Texas City (Town)

Locate by sketch map showing landmarks, roads, creeks, hiway number, etc.*

SEE MAP on
65-48-5T
G11

North ↑

(Use reverse side if necessary)

or

Give legal location with distances and directions from adjacent sections or survey lines.

Labor ____ League ____
Block ____ Survey ____
Abstract No. ____
(NW¼ NE¼ SW¼ SE¼) of Section ____

3) TYPE OF WORK (Check):
[✓ New Well] Deepening
Reconditioning Plugging

4) PROPOSED USE (Check):
~~Domestic~~ [✓ Industrial] Municipal
Irrigation Test Well Other

5) TYPE OF WELL (Check):
[✓ Rotary] Driven Dug
Cable Jetted Bored

6) WELL LOG:
Diameter of hole 6 1/2 in. Depth drilled 598 ft. Depth of completed well 598 ft. Date drilled 11-2-77
All measurements made from 0 ft. above ground level.

From (ft.)	To (ft.)	Description and color of formation material
0	3	fill
3	100	Clay
100	140	Sand
140	560	clay
560	598	Sand

(Use reverse side if necessary)

9) Casing:
Type: Old [✓ New] [✓ Steel] Plastic Other
Cemented from ____ ft. to ____ ft.

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Gage
4	0	577	40

10) SCREEN:
Type Mill Slot
Perforated [✓ Slotted]

Diameter (inches)	Setting From (ft.)	Setting To (ft.)	Slot Size
4	577	598	.20

7) COMPLETION (Check):
[✓ Straight wall] Gravel packed Other
Under reamed Open Hole

8) WATER LEVEL:
Static level 170 ft. below land surface Date 11-2-77
Artesian pressure ____ lbs. per square inch Date ____
Depth to pump bowls, cylinder, jet, etc., 400 ft. below land surface.

11) WELL TESTS:
Was a pump test made? [✓ Yes] No If yes, by whom? Air Comp
Yield: 55 gpm with ____ ft. drawdown after ____ hrs.
Bailer test ____ gpm with ____ ft. drawdown after ____ hrs.
Artesian flow ____ gpm
Temperature of water ____

12) WATER QUALITY:
Was a chemical analysis made? Yes [✓ No]
Did any strata contain undesirable water? Yes [✓ No.]
Type of water? ____ depth of strata ____

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

4816700665

00665001

Map ID 23: HIST

Map ID: 23		**Source: TCEQ**
Grid Number: 64-41-3E	**HIST - Historical Water Well**	**Banks ID: 4816700645**
Well Address: TX		**Rel. Loc.: 0.95mi NE**
Completion Date: 1981-02-06		**Drill Depth: 545.0**
Owner: Cockrell Oil		**Elevation: 3.28 ft (-8.50 ft)**

Sites in Map ID 23 Cluster

Dataset	Well Name	Well Address	Page #
HIST		TX	154
HIST		TX	156

Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 64-41-3E
Located on map YES
Received: RWB

1) OWNER Cockrell Oil (Name) Address Suite 999 Main Bldg. (Street or RFD) Houston, (City) Texas (State) 77002 (Zip)

2) LOCATION OF WELL: County Galveston, 3 miles in W (N.E., S.W., etc.) direction from LaMarque (Town)

Driller **must** complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map. ON 65-39-6X

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☒ Domestic ☐ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 2-6-81

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 1/2	Surface	545

7) BOREHOLE COMPLETION:
☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	Topsoil
3	83	Clay
83	105	Sand
105	446	Clay
446	545	Sand

#3

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.)		Gage Casing Screen
			From	To	
4	N	Steel	0	509	WW
4	N	Millslot Screen	509	530	20

CEMENTING DATA

Cemented from ______ ft. to ______ ft.
Method used ______
Cemented by ______ (Company or Individual)

9) WATER LEVEL:
Static level ______ ft. below land surface Date ______
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet ☐ Submersible ☐ Cylinder
☐ Other Airline
Depth to pump bowls, cylinder, jet, etc., 336 ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: 100 gpm with ______ ft. drawdown after ______ hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Orlen O'Day (Type or Print) Water Well Drillers Registration No. 786

ADDRESS P. O. Box 162 (Street or RFD) Pearland (City) Texas (State) 77581 (Zip)

(Signed) Orlen O'Day (Water Well Driller) O'Day Drilling Co., Inc. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79) DEPARTMENT OF WATER RESOURCES COPY 4816700645

00645001

Map ID: 23 **Source: TCEQ**

Grid Number: 64-41-3E **HIST - Historical Water Well** **Banks ID: 4816700644**

Well Address: TX **Rel. Loc.: 0.95mi NE**

Completion Date: 1980-10-17 **Drill Depth: 776.0**

Owner: Amoco **Elevation: 3.28 ft (-8.50 ft)**

Sites in Map ID 23 Cluster

Dataset	Well Name	Well Address	Page #
HIST		TX	154
HIST		TX	156

DOP

Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

ATTENTION OWNER: *Confidentiality Privilege Notice on Reverse Side*

For TDWR use only
Well No. 64-41-3E
Located on map YES
Received: RWB

1) OWNER Amoco (Name) Address P. O. Box 847 (Street or RFD) Sweeny, (City) Tx. (State) 77480 (Zip)

2) LOCATION OF WELL:
County Galveston 5 miles in W (N.E., S.W., etc.) direction from Texas City (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ________ Block No. ________ Township ________
Abstract No. ________ Survey Name ________
Distance and direction from two intersecting section or survey lines ________

☒ See attached map. ON 65-39-6X

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☐ Domestic ☒ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ________

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ________

6) WELL LOG:

Date drilled 10/17/80

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 3/4	Surface	776

7) BOREHOLE COMPLETION:
☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ________
If Gravel Packed give interval . . . from ________ ft. to ________ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	3	Top Soil
3	20	Clay
20	35	Sand
35	83	Clay
83	116	Sand
116	155	Clay
155	184	Sand
184	214	Clay
214	280	Sand & Clay
280	440	Clay
440	455	Sand
455	730	Clay
730	775	Sand

#3

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	Steel	0	738	WW
4	N	Steel Millslot	738	758	20

CEMENTING DATA
Cemented from ________ ft. to ________ ft.
Method used ________
Cemented by ________ (Company or Individual)

9) WATER LEVEL:
Static level 122 ft. below land surface Date 10/17/80
Artesian flow ________ gpm. Date ________

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbine ☐ Jet XXXX~~Submersible~~ ☐ Cylinder
☐ Other Air Line
Depth to pump bowls, cylinder, jet, etc., 315 ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer XXX☐ Jetted ☐ Estimated
Yield: 80 gpm with ________ ft. drawdown after ________ hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ________ Depth of strata ________
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Orlen O'Day (Type or Print) Water Well Drillers Registration No. 786

ADDRESS P. O. Box 162 (Street or RFD) Pearland, (City) Tx. (State) 77581 (Zip)

(Signed) Orlen O'Day (Water Well Driller) O'DAY DRILLING CO., INC. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

TDWR-0392 (Rev. 1-12-79)

DEPARTMENT OF WATER RESOURCES COPY

4816700644

00644001

Map ID: 3		**Source: TCEQ**
Grid Number: 64-41-3B	**HIST - Historical Water Well**	**Banks ID: 4816700643**
Well Address: TX		**Rel. Loc.: 0.43mi NW**
Completion Date: 1978-09-26		**Drill Depth: 582.0**
Owner: Amoco c/o Don Love, Inc.		**Elevation: 3.28 ft (-8.50 ft)**

End of HIST Section

RECEIVED AUG 30 1979 Texas Dept. of Water Resources

64-41-3B

Send original copy by
certified mail to the
Texas Department of Water Resources
P. O. Box 13087
Austin, Texas 78711

State of Texas
WATER WELL REPORT

For TDWR use only
Well No. 64-41-3B
Located on map [illegible]
Received: [illegible]

1) OWNER Amoco C/O Don Love, Inc. (Name) Address P. O. Box 12507 (Street or RFD) Houston (City) TX (State) 77017 (Zip)

2) LOCATION OF WELL:
County Galveston, 2 miles in S (N.E., S.W., etc.) direction from Texas City (Town)

Driller must complete the legal description to the right with distance and direction from two intersecting section or survey lines, or he must locate and identify the well on an official Quarter- or Half-Scale Texas County General Highway Map and attach the map to this form.

☐ Legal description:
Section No. ______ Block No. ______ Township ______
Abstract No. ______ Survey Name ______
Distance and direction from two intersecting section or survey lines ______

☒ See attached map. - Map on 64-41-9A

3) TYPE OF WORK (Check):
☒ New Well ☐ Deepening
☐ Reconditioning ☐ Plugging

4) PROPOSED USE (Check):
☐ Domestic ☒ Industrial ☐ Public Supply
☐ Irrigation ☐ Test Well ☐ Other ______

5) DRILLING METHOD (Check):
☒ Mud Rotary ☐ Air Hammer ☐ Driven ☐ Bored
☐ Air Rotary ☐ Cable Tool ☐ Jetted ☐ Other ______

6) WELL LOG:

Date drilled 9/26/78

DIAMETER OF HOLE

Dia. (in.)	From (ft.)	To (ft.)
6 1/2	Surface	570
3 7/8	570	582

7) BOREHOLE COMPLETION:
☐ Open Hole ☒ Straight Wall ☐ Underreamed
☐ Gravel Packed ☐ Other ______
If Gravel Packed give interval . . . from ______ ft. to ______ ft.

From (ft.)	To (ft.)	Description and color of formation material
0	2	Top Soil
2	102	Clay
102	113	Sand
113	480	Clay
480	489	Sand
489	553	Clay
553	562	Sand
562	563	Clay
563	582	Good Sand

(Use reverse side if necessary)

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mgf., if commercial	Setting (ft.) From	Setting (ft.) To	Gage Casing Screen
4	N	Galvanized	0	551	40
21/2	N	PVC	532	562	80
21/2	N	Everflo	562	582	12

CEMENTING DATA

Cemented from 20 Sacks ft. to ______ ft.
Method used Pressure
Cemented by O'Day Drilling Co. Inc. (Company or Individual)

9) WATER LEVEL:
Static level 163 ft. below land surface Date 9/26/78
Artesian flow ______ gpm. Date ______

10) PACKERS: Type Depth

11) TYPE PUMP:
☐ Turbin ☐ Jet ☒ Submersible ☐ Cylinder
☐ Other ______
Depth to pump bowls, cylinder, jet, etc., 210 210 ft.

12) WELL TESTS:
☐ Type Test: ☐ Pump ☐ Bailer ☒ Jetted ☐ Estimated
Yield: 35 gpm with ______ ft. drawdown after ______ hrs.

13) WATER QUALITY:
Did you knowingly penetrate any strata which contained undesirable water? ☐ Yes ☒ No
If yes, submit "REPORT OF UNDESIRABLE WATER"
Type of water? ______ Depth of strata ______
Was a chemical analysis made? ☐ Yes ☒ No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief.

NAME Orlen O'Day (Type or Print) Water Well Drillers Registration No. 786

ADDRESS P. O. Box 162 (Street or RFD) Pearland (City) Texas (State) 77581 (Zip)

(Signed) Orlen O'Day (Water Well Driller) O'DAY DRILLING CO., INC. (Company Name)

Please attach electric log, chemical analysis, and other pertinent information, if available.

*Additional instructions on reverse side.

TDWR-0392

4816700643

00643001

WW - Water Well

Map ID: 11 **Source: U.S. Geological Survey**

State ID: USGS292211094543301 **WW - Water Well** **Banks ID: USGS292211094543301**

Well Address: US **Rel. Loc.: 0.56mi N**

Completion Date: **Drill Depth: 1042.0**

Owner: USGS **Elevation: 3.28 ft (-8.50 ft)**

Agency Cd:	USGS
Site No:	292211094543301
Station Nm:	KH-64-41-305
Site Tp Cd:	GW

Sites in Map ID 11 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Texas City Refining Corp.	TX	18
WW	USGS	US	160

Map ID: 14		**Source: U.S. Geological Survey**
State ID: USGS292213094541401	**WW - Water Well**	**Banks ID: USGS292213094541401**
Well Address: US		**Rel. Loc.: 0.62mi N**
Completion Date:		**Drill Depth: 1015.0**
Owner: USGS		**Elevation: 3.28 ft (-8.50 ft)**

Agency Cd:	USGS
Site No:	292213094541401
Station Nm:	KH-64-41-303
Site Tp Cd:	GW

Sites in Map ID 14 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Texas City Refining Corp.	TX	30
WW	USGS	US	161

Map ID 19: WW

Map ID: 19		**Source: U.S. Geological Survey**
State ID: USGS292223094544401	**WW - Water Well**	**Banks ID: USGS292223094544401**
Well Address: US		**Rel. Loc.: 0.79mi N**
Completion Date:		**Drill Depth: 1017.0**
Owner: USGS		**Elevation: 6.56 ft (-5.22 ft)**

Agency Cd:	USGS
Site No:	292223094544401
Station Nm:	KH-64-41-310
Site Tp Cd:	GW

Sites in Map ID 19 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Marathon Oil Co.	TX	63
WW	USGS	US	162

Map ID 26: WW

Map ID: 26 **Source: U.S. Geological Survey**

State ID: USGS292233094541501 **WW - Water Well** **Banks ID: USGS292233094541501**

Well Address: US **Rel. Loc.: 0.99mi N**

Completion Date: 1967-08-01 **Drill Depth: 771.0**

Owner: USGS **Elevation: 3.28 ft (-8.50 ft)**

Agency Cd:	USGS
Site No:	292233094541501
Station Nm:	KH-64-33-912
Site Tp Cd:	GW

Sites in Map ID 26 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Marathon Oil Co	TX	80
WW	USGS	US	163

Map ID 6: WW

Map ID: 6		**Source: U.S. Geological Survey**
State ID: USGS292207094544001	**WW - Water Well**	**Banks ID: USGS292207094544001**
Well Address: US		**Rel. Loc.: 0.48mi N**
Completion Date: 1969-12-23		**Drill Depth: 645.0**
Owner: USGS		**Elevation: 3.28 ft (-8.50 ft)**

Agency Cd:	USGS
Site No:	292207094544001
Station Nm:	KH-64-41-312
Site Tp Cd:	GW

Sites in Map ID 6 Cluster

Dataset	Well Name	Well Address	Page #
GWS	Texas City Refining Co	TX	93
WW	USGS	US	164

End of WW Section

End of Water Well Details Section

Dataset Descriptions and Sources

Dataset	Source	Dataset Description	Update Schedule	Requested Date	Received Date	Update Date	Source Update Date
GWS - Groundwater Supply (TX)	Texas Water Development Board	This dataset contains water well records contained within Texas Water Development Board Groundwater Database.	Quarterly	2024-06-25	2024-06-25	2024-07-09	2024-06-25
HIST - Historical Water Well (TX)	TCEQ	This dataset contains all historical water well records searched from the TCEQ Public Water Well Viewer. Banks Environmental Data plots each well record based on location information found on the log.	Historical				
WW - Water Well (US)	U.S. Geological Survey	This dataset contains groundwater well records from the U.S. Geological Survey.	Quarterly	2024-05-14	2024-05-14	2024-06-11	2024-05-14
HGSD - Harris/Galveston Subsidence District (TX)	Harris/Galveston/Fort Bend Subsidence Districts	This dataset contains all groundwater well records compiled by Harris Galveston Subsidence District/Fort Bend Subsidence District.	Quarterly	2024-07-01	2024-07-02	2024-07-02	2024-07-02
PWS - Public Water Supply (TX)	TCEQ	This dataset contains a collection of records from Texas Water Districts, Public Drinking Water Systems and Water and Sewer Utilities who submit information to the TCEQ.	Quarterly	2024-07-01	2024-07-02	2024-07-02	2024-07-02
SDR - Submitted Drillers Report (TX)	Texas Water Development Board	This dataset contains water well records from the Texas Water Development Board Submitted Drillers Reports Database.	Quarterly	2024-07-01	2024-07-01	2024-07-01	2024-07-01

Disclaimer

The Banks Environmental Data Water Well Report was prepared from existing state water well databases and/or additional file data/records research conducted at the state agency and the U.S. Geological Survey. Banks Environmental Data has performed a thorough and diligent search of all groundwater well information provided and recorded. All mapped locations are based on information obtained from the source. Although Banks performs quality assurance and quality control on all research projects, we recognize that any inaccuracies of the records and mapped well locations could possibly be traced to the appropriate regulatory authority or the actual driller. It may be possible that some water well schedules and logs have never been submitted to the regulatory authority by the water driller and, thus, may explain the possible unaccountability of privately drilled wells. It is uncertain if the above listing provides 100% of the existing wells within the area of review. Therefore, Banks Environmental Data cannot fully guarantee the accuracy of the data or well location(s) of those maps and records maintained by the regulatory authorities.

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

Part B Application

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

Disclaimer:

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

Quick Start Instructions for Part B Application with Screening Tool

Go to screening sheet

View Entire Application

Screening Sheet for Industrial and Hazardous Waste Permitted Facilities.

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

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

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

Reset All Screening Questions

Jump to Table of Content(s) / Applicable Tables

Generate Application and Save

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

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

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

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

WMU- Waste Management Unit

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

Customized Part B Application

Form Availability:

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

Introduction:

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

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

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

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

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

Telephone Inquiries:

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

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

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

(512) 239 - 0272 (For non-combustion units) - Chemical New Source Review Permits Section, Air Permits Division

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

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

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

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

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

Application Review Prohibition:

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

Permit Issuance Prohibited [30 TAC 335.205]:

The TCEQ shall not issue a permit for:

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

305.50(a)(10)(E) ; and

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

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

Completing The Application and Electronic Checklist:

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

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

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

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

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

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

Groundwater Contamination:

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

Submittal:

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

For a new permit application or renewal, submit:

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

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

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

For a post-closure care permit submit:

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

TCEQ
Financial Administration Division;

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

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

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

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

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

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

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

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

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

6. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division;
7. pre-printed mailing labels of the adjacent landowners or an electronic mailing list on Compact Disk (CD) in MS Word format; and
8. Completed RCRA Part B Administrative and Technical Evaluation Electronic Checklist (Form #00136) on CD, DVD, or USB drive.

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

1. (if appropriate) an original updated Part A permit application plus three (3) full copies;
2. an original Part B application plus three (3) full copies, consisting of, at a minimum, Section I - Table I of the Part B plus replacement pages for the changed portions of the application that change as a result of the modification;
3. a description of the exact changes to be made to the permit conditions and supporting documents referenced by the permit;
4. an explanation of why the Class 2 modification is needed;
5. evidence of the public notice mailing and publication (after the public meeting, please submit a statement that the public meeting was held within the required timeframes);
6. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division; and
7. pre-printed mailing labels of the adjacent landowners or an electronic mailing list on diskette on Compact Disk (CD) in MS Word format.

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

1. (if appropriate) an original updated Part A permit application plus three (3) full copies;
2. an original Part B application plus three (3) full copies, consisting of, at a minimum, Section I - Table I of the Part B plus replacement pages for the changed portions of the application that change as a result of the modification;
3. a description of the exact changes to be made to the permit conditions and supporting documents referenced by the permit;
4. an explanation of why the Class 1[1] modification is needed;
5. a check for payment of permit application fees transmitted directly to the TCEQ Financial Administration Division; and
6. Completed RCRA Part B Administrative and Technical Evaluation Electronic Checklist (Form #00136) on CD, DVD, or USB drive, for applications involving the partial transfer of some permitted waste management units.

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

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

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

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

Application Revisions:

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

Waivers:

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

Designation of Material as Confidential:

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

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

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

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

Exposure Assessment:

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

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

a. Applicant-held pre-application public meeting

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

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

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

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

b. Pre-application meeting with TCEQ

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

c. Pre-application local review

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

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

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

Bilingual Notice Instructions:

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

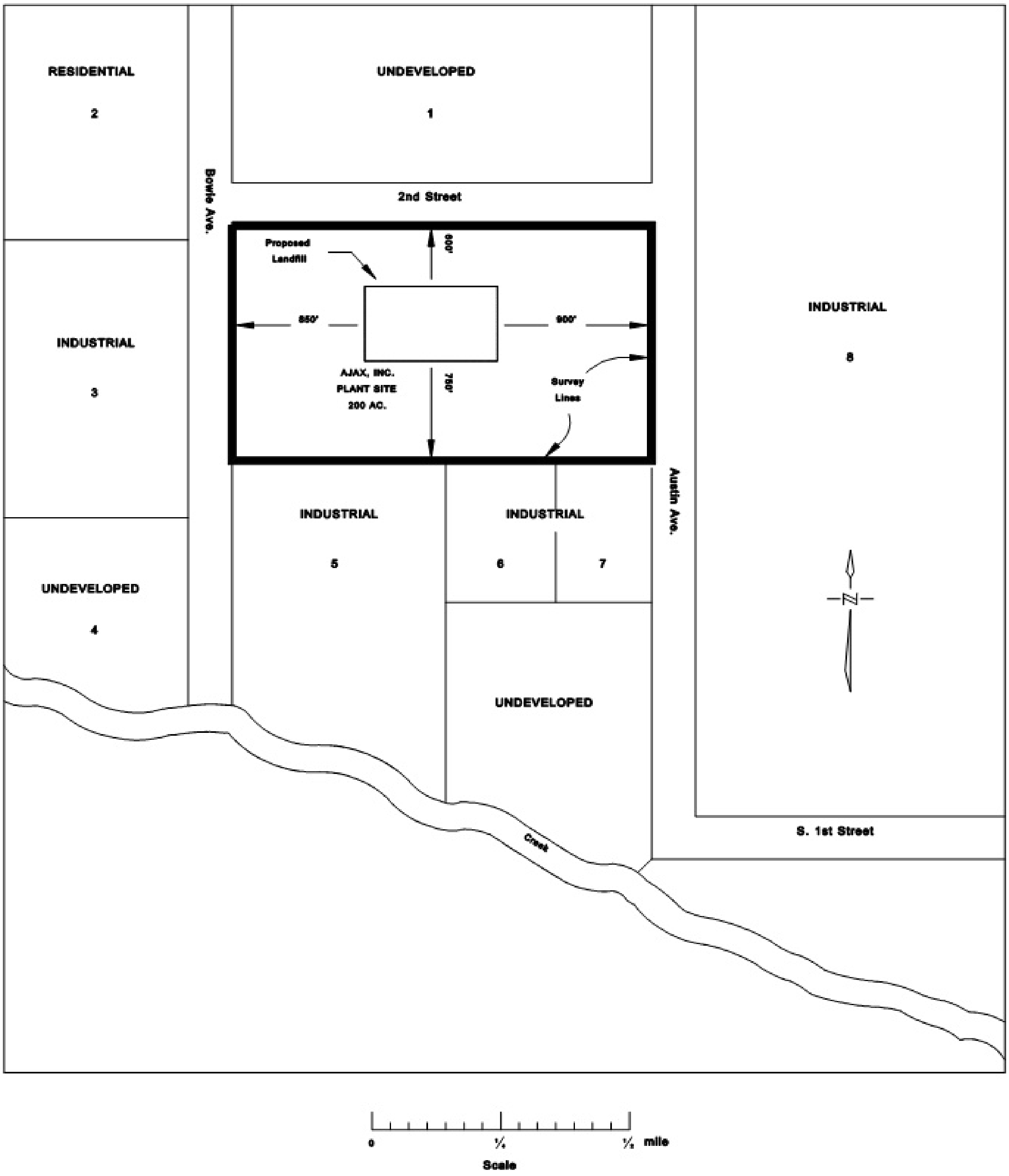
If it is determined that a bilingual notice is required, the applicant is responsible for ensuring that the publication in the alternate language is complete and accurate in that language. Electronic versions of the Spanish template examples are available from the TCEQ to help the applicant complete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

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

Landowners Cross-Referenced To Application Map

SAMPLE APPLICATION MAP

ALL ADJACENT LANDOWNERS SHALL BE IDENTIFIED



The persons identified below would be considered as affected persons.

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

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

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

4. MR & MRS TED GOLDEN MUSTARD
3210 AVENUE BLVD

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

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.

Plain Language Summary

Complete the following form(s) as applicable, and submit with any industrial hazardous waste, or industrial solid waste, permit application that is subject to 30 Texas Administrative Code §39.405(k) [applications for a Class 3 permit modification, permit amendment, permit renewals, and for a new permit].

Plain Language Summary Form - English

Plain Language Summary Form - Instructions

Plain Language Summary Form - Spanish

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

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

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

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

Signature Page for Application

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CP Table IVA - Compliance Monitoring Program Table of Detected Hazardous Constituents and the Groundwater Protection Standard

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

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Appendix III - Facility Management
Appendix III.A. - Compliance History and Applicant Experience
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Texas Commission on Environmental Quality
Industrial & Hazardous Waste Part B Permit Application

I. General Information

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

Provide responsive information in Appendix I.

a. Complete Table I - General Information

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

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

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

c. Signature on Application

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

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

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

II. Facility Siting Criteria

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

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

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

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

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

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

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

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

RESERVED

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

RESERVED

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

RESERVED

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

RESERVED

F. Flooding

1. Identify whether the facility is located within a 100-year flood plain [40 CFR 270.14(b)(11)(iii)]. This identification must indicate the source of data for such determination and include a copy of relevant documentation (e.g., flood maps, if used and/or calculations). The boundaries of the hazardous waste management facility must be shown on the flood plain map. If the facility is not subject to inundation as a result of a 100-year flood event, indicate that the facility is not within the 100-year flood plain, and do not complete the remainder of the Flooding section in Table II. An applicant for a proposed hazardous waste landfill, areal expansion of a hazardous waste landfill, or a commercial hazardous waste land disposal unit may not rely solely on flood plain maps prepared by the Federal Emergency Management Agency (FEMA) or a successor agency for this determination.
2. If the facility is located within the 100-year flood plain the applicant must provide information detailing the specific flooding levels and other events (e.g., Design Hurricane projected by Corps of Engineers) which impact the flood protection of the facility. Information shall also be provided identifying the 100-year flood level and any other special flooding factors (e.g., wave action) which must be considered in designing, construction, operating, or maintaining the facility to withstand washout from a 100-year flood.
3. State whether any flood protection devices exist at the facility (e.g., flood walls, dikes, etc.), designed to prevent washout from the 100-year flood.
   a. If Yes: provide in Section V an engineering analysis to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)]

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

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

   Include structural or other engineering studies showing the design of operational units (e.g., tanks, incinerators) and flood protection devices (e.g., flood walls, dikes) at the facility and how these will prevent washout. [40 CFR 270.14(b)(11)(iv)(B)]
4. If applicable, and in lieu of the flood protection devices from above, provide a detailed description of the procedures to be followed to remove hazardous waste to safety before the facility is flooded. [40 CFR 270.14(b)(11)(iv)(c)] The procedures should include:
   a. Timing of such movement relative of flood levels, including estimated time to move the waste, to show that such movement can be completed before flood waters reach the facility. Indicate which specific events shall be use to begin waste movement (e.g., Hurricane warning, Flash Flood watch, etc.);

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

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

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

G. Additional Information Requirements

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

   RESERVED

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

   RESERVED

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

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

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

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

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

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

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

7. If a surface impoundment or landfill (including post-closure) is to be permitted, provide exposure information to accompany this application and in accordance with 30 TAC 305.50(a)(8) and 40 CFR 270.10(j). This information will be considered separately from the TCEQ application completeness determination.

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

III.Facility Management

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

A. Compliance History and Applicant Experience

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

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

   RESERVED

B. Personnel Training Plan - RESERVED

C. Security

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

D. Inspection Schedule

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

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

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

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

If the owner or operator of a facility which contains a waste pile wishes to pursue an exemption from the groundwater monitoring requirements for that waste management unit, the inspection schedule must include examination of the base for cracking, deterioration, or other conditions that may result in leaks. The frequency of inspection must be based on the potential for the liner (base) to crack or otherwise deteriorate under the conditions of operation (e.g., waste type, rainfall, loading rates, and subsurface stability).

E. Contingency Plan - RESERVED

F. Emergency Response Plan - RESERVED

IV. Wastes and Waste Analysis

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

A. Waste Management Information - RESERVED

B. Waste Managed In Permitted Units

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

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

C. Sampling and Analytical Methods - RESERVED

D. Waste Analysis Plan - RESERVED

V. Engineering Reports

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

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

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

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

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

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

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

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

A. General Engineering Reports

1. General Information

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

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

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

2. Features to Mitigate Unsuitable Site Characteristics

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

3. Construction Schedules - RESERVED

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

B. Container Storage Areas -RESERVED

C. Tanks and Tank Systems -RESERVED

D. Surface Impoundments - RESERVED

E. Waste Piles -RESERVED

F. Land Treatment Units -RESERVED

G. Landfills -RESERVED

H. Incinerators -RESERVED

I. Boilers and Industrial Furnaces -RESERVED

J. Drip Pads -RESERVED

K. Miscellaneous Units -RESERVED

L. Containment Buildings -RESERVED

VI. Geology Report

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

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

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

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

A. Geology and Topography

1. Active Geologic Processes

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

B. Facility Groundwater

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 Sectior 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 aquife (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

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) fo 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:

Table VI.A.2. Description of Uppermost Aquifer

C. Exemption from Groundwater Monitoring for an Entire Facility

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 -RESERVED

VII. Closure and Post-Closure Plans

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

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

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

A. Closure -RESERVED

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

RESERVED

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.

For Landfills, and Waste Piles, Surface Impoundments, and Tanks Closed as a Landfill

1. Provide as-built plans and specifications for the final cover system, individually for each unit that is sealed, signed and dated by a licensed professional engineer with current Texas registration along with the Registered Engineering Firm's name and Registration Number would satisfy this requirement; Other as-built plans and specifications for the unit may be submitted upon request.
2. Complete the following tables, as applicable:

   a. 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.

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

   c. Table V.G.4. - Landfill Leachate Collection System used for the landfill.

   d. 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.

   e. Table V.E. 3 - Waste Pile Liner System and specify the type of containment/liner system.

   f. Table V.D.1 - Surface Impoundments and list the surface impoundments, waste(s) managed in each unit and the rated capacity or size of each unit.

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

h. Table V.C. Tanks and Tank Systems.

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.

E. Closure and Post-Closure Cost Summary

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

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

VIII. Financial Assurance

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

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

1. Financial Assurance for Closure

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

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

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

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

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

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

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

3. Financial Assurance for Corrective Action

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

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

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

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

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

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

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

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

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

1. Provide information required in 30 TAC 305.50(a)(4), as applicable to the application request.
2. Complete Table VIII.B. if requesting capacity expansion or new construction.
3. For new commercial hazardous waste management facility applications, a written statement signed by an authorized signatory per 30 TAC 305.44 explaining how the applicant intends to provide emergency response financial assurance per 30 TAC 305.50(a)(12)(C) or (D).
4. For renewal applications with no capacity expansion, please complete and submit the attached Financial Disclosure Letter.

Information for Applicants Subject to Financial Capability Requirements

Certain applications involving Hazardous Waste facilities are subject to review of the applicant's financial ability to construct, operate, and/or close the facility, perform post-closure care and corrective action at the facility in accordance with State law as specified in

Section 361.085 of the Texas Health and Safety Code. TCEQ refers to these reviews as financial capability reviews. This document summarizes and clarifies the information required in an application to meet the TCEQ requirements of 30 Texas Administrative Code (TAC) 305.50.

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

I. New Facilities, Facility Expansions and Permit Transfers

   A. Publicly traded Entities

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

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

      2. SEC Form 10-Q

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

      3. Explanation statement

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

      4. Construction capital cost estimates

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

   B. Privately held entities with audited financial statements

      1. Audited financial statements

         This portion of the requirement calls for complete copies of the audited financial statements for each of the most recent two fiscal years. If an audit has not been completed for one of the previous two years, a complete copy of the fiscal year end financial statement and federal tax return may be substituted in lieu of the audit not performed. The tax return must be certified by original signature of an authorized signatory as being a "true and correct copy of the return filed with the Internal Revenue Service." Financial statements must be prepared consistent with generally accepted accounting principles and include 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 als address how the closure, post-closure, corrective action, and liability coverage financial assurance requirements of Chapter 37, Subchapter P will be met (ie. which financial assurance mechanism is or will be used).

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

1. Financial Plan

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

2. Letters of opinion

   The submitted financial plan must be accompanied by original letters of opinio 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 operatin 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 b 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 assuranc requirements of Chapter 37, Subchapter P will be met (ie. which financial assurance mechanism is or will be used).

5. Construction capital cost estimates

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

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

1. Explanation statement

   This portion of the requirement calls for a statement signed by an authorized signatory [as described in 30 TAC30 305.44(a)] explaining in detail how the applicant demonstrates sufficient financial resources to construct, safely operate, properly close, perform post-closure, perform corrective action and provide adequate liability coverage for the facility. This statement must also address how the closure, post-closure, corrective action, and liability coverage financial assurance requirements of Chapter 37, Subchapter P will be met (ie. which financial assurance mechanism is or will be used).

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

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

II. Permit Renewals

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

IX. Releases from Solid Waste Units and Corrective Action

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

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

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

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

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

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

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

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

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

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

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

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

Upon approval of the BLRA/CMS Report by the TCEQ, the permittee shall submit a CMI Workplan to address all of the items for CMI Workplan contained in the U.S. EPA publication EPA/520-R-94-004, OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), May 1994. For projects conducted under TRRP, the risk assessment process shall be addressed in the *Affected Property Assessment Report* (APAR), and the evaluation of corrective measures shall be conducted as part of the remedy standard selection process provided in the *Response Action Plan* (RAP). If the CMI or RAP does not propose a permanent remedy, then a CMI Workplan or RAP shall be submitted as part of a new compliance plan application or as a modification/amendment application to an existing compliance plan. The workplan or RAP shall contain detailed final engineering design, monitoring plans, and schedules necessary to implement the selected remedy. Implementation of the corrective measures shall be addressed through a new and/or a modified/amended compliance plan. Upon installation of a corrective action system based upon the approved CMI Workplan or RAP, the permittee shall submit a CMI Report or RAP which includes as-built drawings of the corrective action system. To report the progress of the corrective measures, the permittee shall submit periodic CMI Progress Reports or Response Action Effectiveness Reports to the TCEQ in accordance with the schedule specified in the compliance plan. Upon completion of the corrective action requirements, the permittee shall submit CMI Report or Response Action Completion Reports for review and approval.

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

A. Preliminary Review Checklists

For Applications for a New Hazardous Waste Permit:

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

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

- Update the Preliminary Review Facility Checklist to include any newly identified SWMUs and/or AOCs that were not incorporated into the previous permit issuance (new, amendment, modification, or renewal), and to update the status of all previously identified SWMUs or AOCs which are incorporated into the existing permit under either Section IX - Corrective Action for Solid Waste Management Units, or Section XI - Compliance Plan. Status updates should include notes regarding whether the SWMU or AOC has been incorporated into a compliance plan, has received approval of no further action (NFA), has had changes in its corrective action status, or has had other determinations issued by the TCEQ. Include the date of the status change in the updated checklist;

- Complete the Preliminary Review Unit Checklists for any newly identified SWMUs or AOCs that were not incorporated into the previous permit issuance (new, amendment, modification, or renewal);

- Update the status on the Preliminary Review Unit Checklists for all previously identified SWMUs or AOCs that had not yet received TCEQ approval of NFA at the time of the previous permit issuance;

- Provide copies of the letters from the TCEQ approving NFA or other determinations tha 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 or the Preliminary Review Facility Checklist that the SWMUs or AOCs are addressed in

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

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

Complete Preliminary Review Facility Checklist (located in attachments)

Instructions for Preliminary Review Unit Checklist

Preliminary Review Facility Checklist

Preliminary Review Unit Checklist

X. Air Emission Standards -RESERVED

XI.Compliance Plan

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

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 a 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
    1. Table XI.E.1 Corrective Action Program Cost Estimate
    2. Table XI.E.2.e Groundwater Monitoring Cost Estimate
    3. Table XI.E.3. Financial Assurance Summary

CP Attachments:

A. Maps
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

CP Table VII - Reporting Requirements

CP Table VIII - Compliance Schedule

CP Table IX - Description of Uppermost Aquifer

Note to the Permittee: All responses to each item in Section XI of the application form should be submitted under Appendix XI- Compliance Plan. The applicant should use the PDF formatted Tables provided in the Part B application to include site-specific information that will become part of the final draft permit. For consistency, the PDF tables provided in the application are formatted to be accessible, and the agency will no longer accept site-specific tables created by the applicant. Do not delete any areas of the application form that are not applicable, submit answers to these areas with a response of either 'Reserved' or 'Not Applicable' in the Appendix XI. 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).

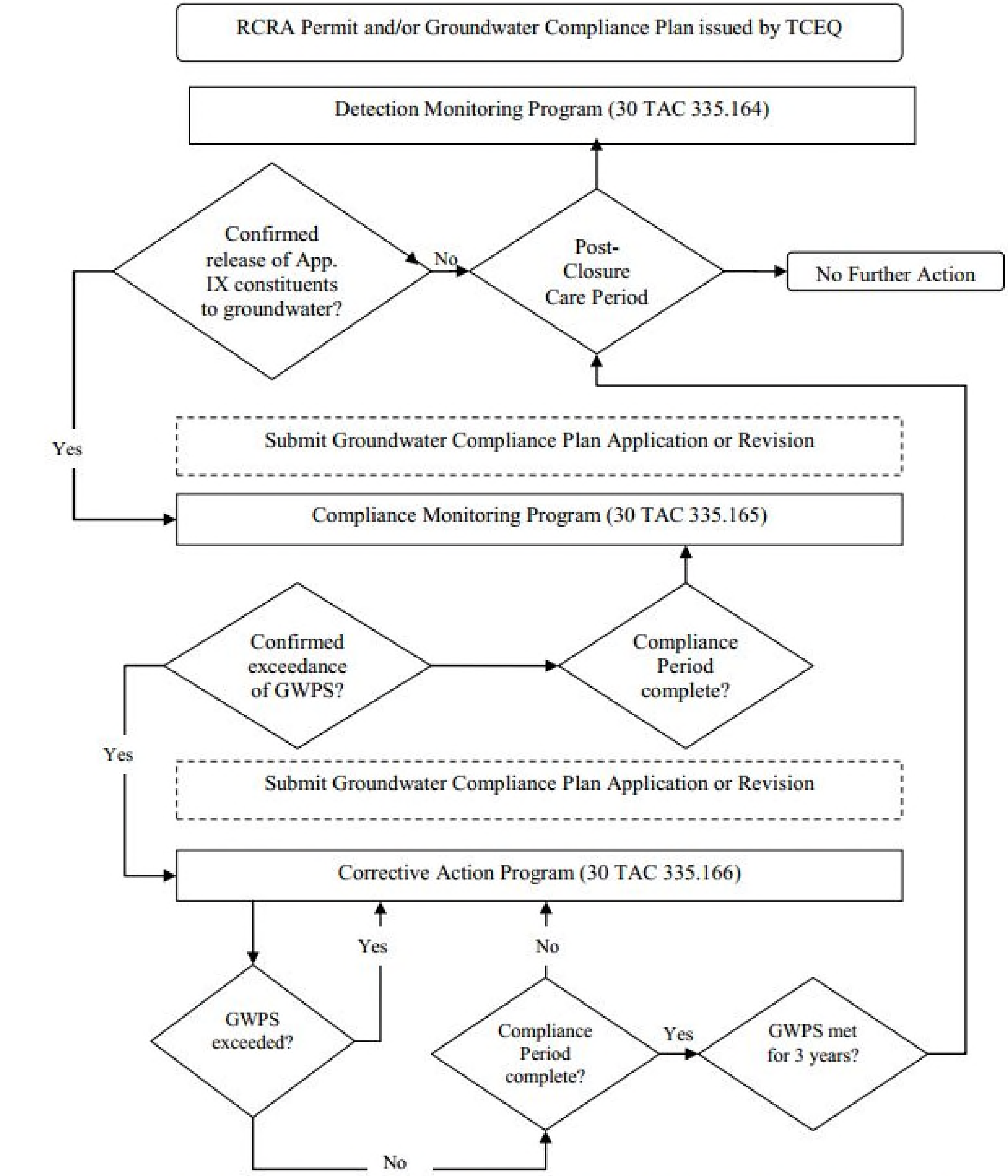
Figure 1 - Overview of Required Submittals And Revisions Associated with TCEQ Groundwater Compliance Plan Application

Type of Compliance Plan Application or Revision	Minimum Required Submittals				Additional Application Submittals Or Revisions					
				Part B, Section I	Section XI. A.	Section XI.B	Section XI.C	Section XI.D	Section XI.E	Attachment A
	Description of Modification	Public Notification Evidence	Fee Payment Evidence	General Information	Site-Specific Information	Groundwater Protection Standard	Compliance Monitoring Program	Corrective Action Program	Financial Assurance Cost Estimates	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:

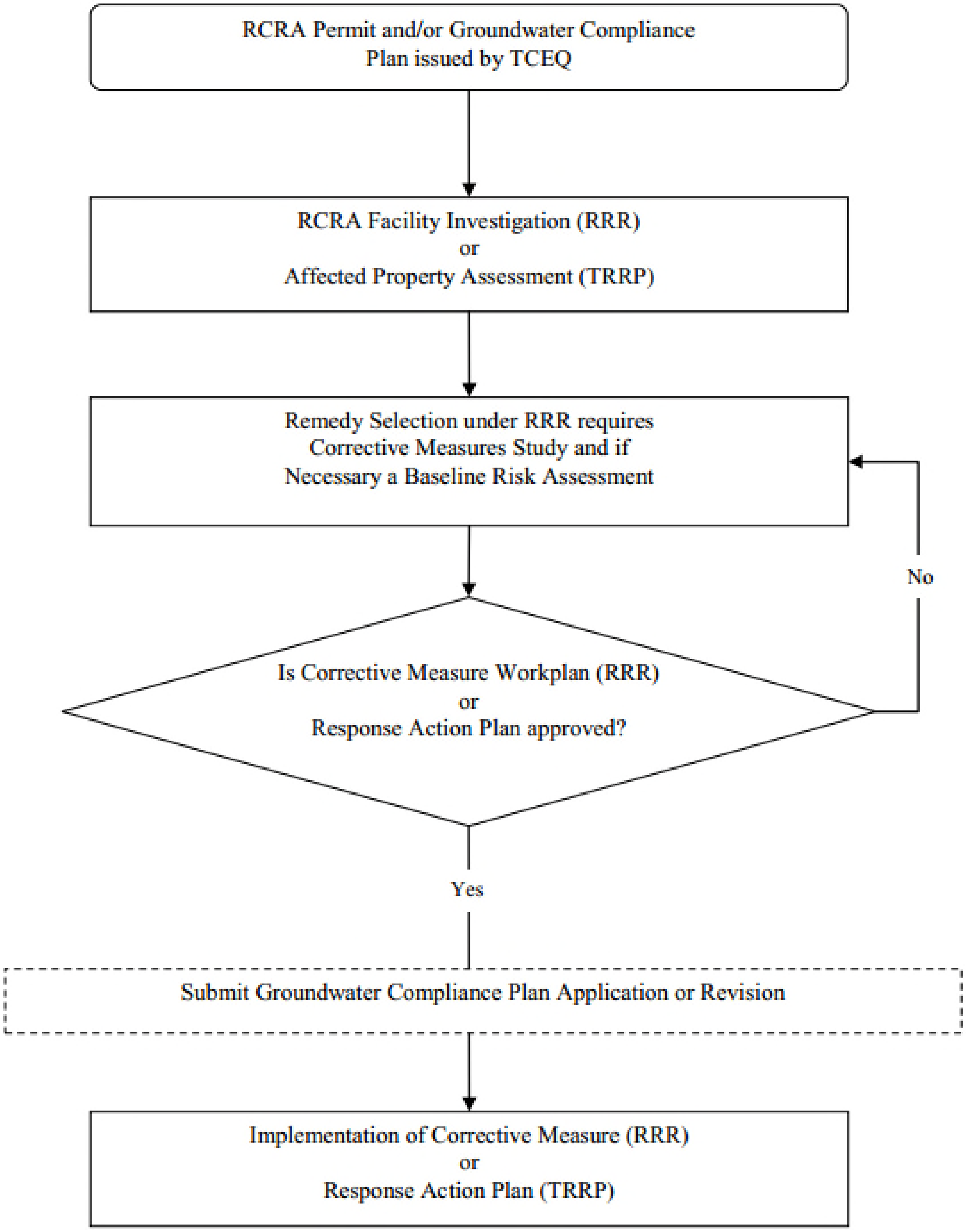
- ● Submittal of additional or revised information required.
- ○ No submittal of additional or revised information required.
- ■ Possible submittal of additional or revised information required

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;

   All CP Attachment A Maps should be provided in Appendix XI of the application.

   b. A 7.5 minute U.S.G.S. quadrangle topographic map showing the entire facility;

      NOTE: This information is supplemental only and is not intended to be included as figures in the final draft permit.
   c. All oversized (larger than 8.5" by 11") drawings submitted in accordance with A, 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.

      NOTE: This information is supplemental only and is not intended to be included as figures in the final draft 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 CP Table XI.A.1. - Facility History for Waste Management Units.

   All CP Attachment A Maps should be provided in Appendix XI of the application.

   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.

3. Facility History

   Based on the information provided in CP 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 CP 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.

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;

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;

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 x 10 -5 centimeters/second (30 TAC 350.4(a)40). Based on the information contained in the Geology Report, complete CP Table IX-Description of Uppermost Aquifer. CP Table IX will be come part of the Compliance Plan.

e. Present the geologic, stratigraphic and hydrogeological information; and

f. Maps indicating the lateral and vertical extent of the contamination for each stratigraphic unit affected, with supporting documentation.

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.

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.

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).

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.

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 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.

C. Compliance Monitoring Program

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.

        (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) Frequency of monitoring should be specified in CP Table VIII

(6) Provisions for reporting groundwater data at least on an annual basis should be specified in CP Table VII).

(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 the 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.

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).

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.

        (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.
        (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.

        (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).

- (5) Frequency of monitoring should be specified in CP Table VIII
- (6) Provisions for reporting groundwater data at least on an annual basis should be specified in CP Table VII)
- (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. Proposed methods of evaluating the effectiveness of the corrective action in the saturated and vadose zone.

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.
- (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.;
  - (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.

(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.

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.

(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.

   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)
    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.

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.

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. Please Complete the following tables, as applicable:

1. CP Table XI.E. - General Infomation
2. CP Table XI.E.1. - Corrective Action Program Cost Estimate
3. CP Table XI.E.2.e - Groundwater Monitoring Cost Estimat
4. CP Table XI.E.3. - Financial Assurance Summary

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;
    b. The hydrogeological characteristics of the facility and surrounding land;
    c. The quantity of groundwater r and the direction of groundwater flow;
    d. The proximity and withdrawal rates of groundwater users;
    e. The current and future uses of groundwater in the area;
    f. The existing quality of groundwater, including other sources of contamination and their cumulative impact on the groundwater quality;
    g. The potential for health risks caused by human exposure to waste constituents;
    h. The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and,
    i. The persistence and permanence of the potentially adverse effects.
2. 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);

b. The hydrogeological characteristics of the facility and surrounding land;
c. The quantity and quality of groundwater, and the direction of groundwater flow;
d. The patterns of rainfall in the region;
e. The proximity of the Regulated Unit to surface waters;
f. The current and future uses of surface waters in the area and any water quality standards established for those surface waters;
g. The existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality;
h. The potential for health risks caused by human exposure to waste constituents;
i. The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and,
j. 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 groundwateruality 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 wellseals, 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 wel 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 (Item 13) 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 the following information:

Table of Well Construction Details (Item 13)

- 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.

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 Cod (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. 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.

    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.

    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.

    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.

2. Prior to Purging Well
    a. 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.

b. 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.

c. 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.

3. 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.

b. 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.

c. The container type, size, and labeling method for each procedure performed should be referenced and/or tabulated in the SAP.

d. 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.

4. 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.

b. 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).

c. 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.

5. 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.

b. 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.

c. Chain of custody and shipping procedures should be described and intended to prevent misidentification of samples, to identify and prevent tampering o 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 a a constant 4°C and prevent breakage. Containers used for sample shipment should be sealed with the seal signed and dated by the sampler.

d. Disposal methods of contaminated equipment, wash water and purged groundwater should be described.

e. 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

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

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

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

   1. Process Analysis - $1,000.00.
   2. Management/Facility Analysis - $500.00.
   3. A facility unit(s) analysis of $500 per unit is charged for the following:
      a. each cell of a landfill (note that multiple cells that are identical in type and use are subject to a single $500 fee);
      b. tanks and container storage areas (note that multiple tanks and container storage areas that are identical in type and use are subject to a single $500 fee)
      c. identical in type and use means the following:
         (1) made of the same material and same design;
         (2) the same size/capacity within + 10%;
         (3) store the same waste (as identified by USEPA hazardous waste number - 40 CFR 261 Subparts C & D); and
         (4) have the same management characteristics (e.g., storage only).
      d. Each incinerator, boiler/industrial furnace unit, surface impoundment, waste pile, land treatment unit, drip pad, miscellaneous unit, or containment building.
   4. Site Evaluation - $100 per acre of surface used for hazardous waste management up to 300 acres. No additional fee thereafter. This shall be calculated as any acreage which will be permitted to manage hazardous waste. This shall include, for example, the entire area within the secondary containment of a tank farm, the area within a fence that surrounds individual units (other than the facility fence), or the area defined by the toe of the dike surrounding a landfill or impoundment, etc.
   5. An applicant shall also include with each initial application a fee of $50 to be applied toward the cost of providing the required notice. An additional notice fee of $15 is required with each application for renewal.

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

  1. A management/facility analysis fee of $500.
  2. The notice fee is $50.
  3. If a unit is added or a unit area is expanded for any purpose, $100 per additional acre is assessed, until the total additional acreage reaches 300 acres.
  4. If one or more of the following reports are added or are significantly revised, the process analysis fee of $1000 is assessed:
     a. waste analysis plan;
     b. site-specific or regional geology report;
     c. site-specific or regional geohydrology report;
     d. groundwater and/or unsaturated zone monitoring;
     e. closure and/or post-closure care plan; or
     f. RCRA Facility Assessments (RFAs), or corrective action reports;
     g. Alternate Concentration Limit (ACL) demonstration or Development of Protective Concentration Limits (PCLs);
     h. Regulated Unit Facility Assessment, Corrective Action (CA) work plans or reports for Regulated Units; and/or
     i. RCRA Facility Investigation (RFI)/Affected Property Assessment (APA), Remedy Selection, Corrective Measure Implementation (CMI)/Remedial Action Plan for solid waste management units, and/or areas of concern;
     j. Facility Operations Area (FOA).
  5. A unit analysis fee of $500 per unit is assessed if any of the following occur:
     a. if a unit is added (even if identical to units already in place, using the criteria discussed in A.3 above);
     b. if there are design changes in an existing unit; or
     c. if a unit status changes from closure to post-closure care;
     d. Changes in the number, location, depth, or design of wells approved in compliance plan or a permit (unless it is a replacement well);
     e. Changes in point of compliance and compliance monitoring program;
     f. Changes in Groundwater Protection Standards, indicator parameters, Alternate Concentration Limits or Protective Concentration Limits; and/or
     g. Changes in corrective action program.

C. The application fee for a minor amendment, a Class 1, or a Class 1[1] modification of a hazardous waste permit is $100 plus the notice fee of $50.

XIII. Confidential Material-RESERVED

Part B

Appendix I – General Information

Part B

Appendix I – General Information

Table 1 – General Information

Table I: General Information

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

Name[1]	Union Carbide Corporation, A Wholly Owned Subsidiary of The Dow Chemical Company
Address	2800 Loop 197 South
City, State	Texas City, TX
Zip Code	77590
Telephone Number	409-945-7411
Alternate Telephone Number	
Fax:	
TCEQ Solid Waste Registration No.	35921
EPA I.D. No.	TXD980626782
Permit No.	50264
County	Galveston
Regulated Entity Name	Union Carbide
Regulated Entity Reference Number (RN)	RN105087829
Customer Name	Union Carbide Corporation
Customer Reference Number:	CN601688781
Charter Number[2]	1335606
Previous or Former Names of the Facility (if applicable)	

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

☒ Same as Facility Operator?

Name	Union Carbide Corporation, A Wholly Owned Subsidiary of The Dow Chemical Company
Address	2800 Loop 197 South
City, State	Texas City, TX
Zip Code	77590
Telephone Number	409-945-7411
Alternate Telephone Number	
Fax:	

C. Facility Contact

1. Persons or firms who will act as primary contact:

Name, Title:	Michelle Vetterlein - Texas Waste Compliance and Permit Manager
Address	2800 Loop 197 South
City, State:	Texas City, TX
Zip Code	77590
Telephone Number	304-747-5308
Alternate Telephone Number	
E-mail	[redacted]
Fax:	

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

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

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

Name, Title:	CT Corporation System
Address	1999 Bryan St., STE 900
City, State:	Dallas, TX
Zip Code	75201-3136

3. Individual responsible for causing notice to be published:

Name:	Michelle Vetterlein
Address	2800 Loop 197 South
City, State:	Texas City, TX
Zip Code	77590
Telephone Number	304-747-5308
Alternate Telephone Number	
E-mail	[redacted]
Fax:	

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

Name	Moore Memorial Public Library
Address	1701 9th Ave. North

City, State	Texas City, TX
Zip Code	77590

D. Application Type and Facility Status

1. Application Type

☒ Permit
☐ New
☐ Interim status
☒ Renewal
☐ RD&D
☒ Compliance Plan

☒ Amendment
☐ Major
☒ Minor

☐ Modification
☐ Class 3
☐ Class 2
☐ Class 1[1]
☐ Class 1

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

4. Facility Status. Check all that apply

☐ Proposed

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

5. Is the facility within the Coastal Management Program boundary? Yes

6. Description of Application Changes

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

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

7. Total acreage of the facility being permitted: 90

8. Identify the name of the drainage basin and segment where the facility is located

River Segment 2437

River Basin Texas City Ship Channel

E. Facility Siting Summary:

Is the facility located or proposed to be located:

1. Within a 100-year floodplain?	Yes
2. in wetlands?	No
3. In the critical habitat of an endangered species of plant or animal?	No
4. On the recharge zone of a sole-source aquifer?	No
5. In an area overlying a regional aquifer?	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?[7] [30 TAC 335.202] If Yes: the TCEQ shall not issue a permit for this facility.	No
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? If Yes: provide a copy of the ordinance or order.	No

F. Wastewater and Stormwater Disposition

1. Is the disposal of any waste to be accomplished by a waste disposal well at this facility?	No
If Yes: List WDW Permit No(s):	
2. Will any point source discharge of effluent or rainfall runoff occur as a result of the proposed activities?	No

3. If Yes, is this discharge regulated by a TPDES or TCEQ permit?

☐ Yes

TCEQ Permit No.	
TPDES Permit No.	

☒ No

Date TCEQ discharge permit application filed	09/10/2006, 03/04/2020
Date TPDES discharge permit application filed:	

G. Information Required to Provide Notice

State Officials List [30 TAC 39]

State Senator	Mayes Middleton (State Senate District 11) P.O. Box 12068 Austin, Texas 78711 [redacted]

State Representative	Terri Leo Wilson (State House District 23) P.O. Box 2910 Austin, TX 78768 [redacted]
Local Officials List [30 TAC 39]	
Mayor	Mayor Dedrick Johnson Sr. 1801 9th Ave. N. Texas City, TX 77590 409-643-5901 [redacted]
Local Health Authority	Not Applicable - See County Health Department
County Judge	Judge Mark Henry 722 Moody Ave, Suite 200 Galveston, Texas 77550 409-762-8621 [redacted]
County Health Authority	Dr. Philip Keiser Galveston County Health District 9850 Emmett F. Lowry Expy, Texas City, TX 77591 409-938-7221 [redacted]
Based on the questions in the Bilingual Notice Instructions for this form, are you required to make alternate (Bilingual) notice for this application?	Yes
Bilingual Language(s):	Spanish
TCEQ Core Data Form Submitted?(see Section I Instructions, Item b.)	Yes
Has any information changed on the TCEQ Core Data Form since the last submittal?	Yes
Signature on Application Submitted? (see Section I Instructions, Item c)	Yes

1. Individual, Corporation, or Other Legal Entity Name - must match the Secretary of State's database records for the Facility)
2. 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.
3. 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 thi application [Section 361.087, Texas Health and Safety Code].
4. 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.
5. 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.

6. For confidential information 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".
7. 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

Part B

Appendix I – General Information

Description of Proposed Changes

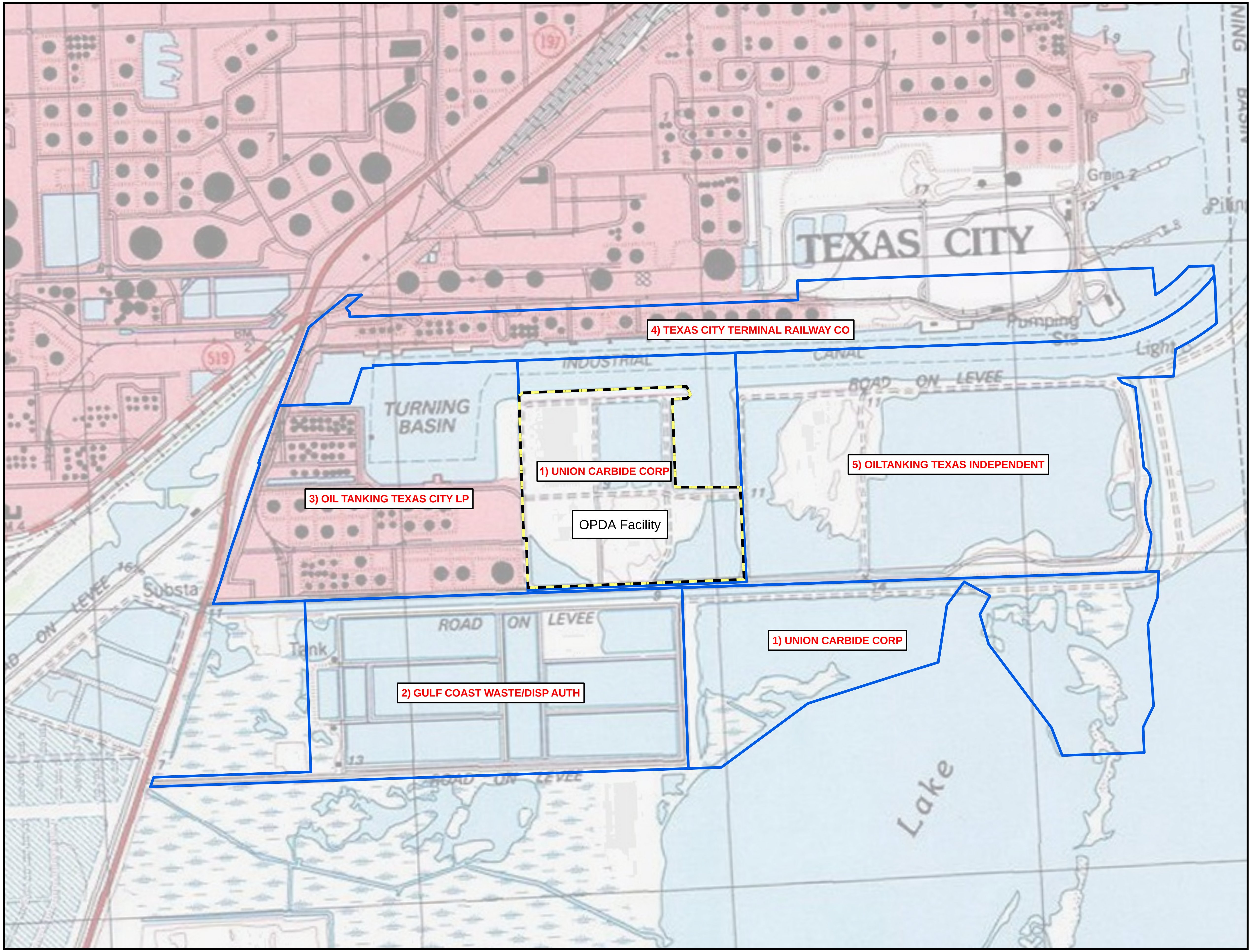
Table I.1-Description of Proposed Application Changes

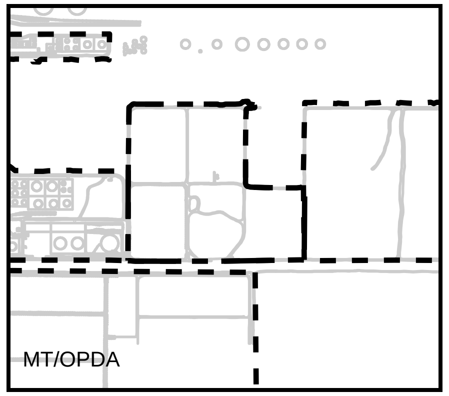
Permit/Compliance Plan Application Appendix/Section	Brief Description of Proposed Change	Modification or Amendment Type	Supporting Regulatory Citati
Part A and Part B RCRA Permit / Compliance Plan renewal	Application reflects current site operations	Renewal	30 TAC 305.65
Part B, Section I, II, III, IV, V, VII, VIII, IX, and XII	Administrative updates to contact information, adjacent landowners, facility security, compliance history, and post-closure care to reflect current site conditions.	Renewal	30 TAC 305.65
Park B, Section XI	Administrative updates to reflect current regulatory status and proposed updates to the groundwater corrective action program in the Compliance Plan.	Renewal	30 TAC 305.65

Part B

Appendix I – General Information

Adjacent Landowners





LEGEND

- Facility Boundary
- Surrounding Parcels

Reference: The displayed Digital Raster Graphic (DRG) includes portions of the United States Geological Survey 7.5 minute quadrangles of Virginia Point and Texas City (USGS, 1993).

0 300 600 1,200
Feet

Attachment B.I.G
Adjacent Owner Map

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

Dow
ARCADIS

T:_ENV\DOW\TEXAS_CITY\GIS\TCO_OPDA_APAR\TCO_OPDA_APAR\MAPFILES\GEC\TCO_OPDA_APAR\TCO_OPDA_APAR.APRX LS3621 10/22/2024 12:11 PM

Adjacent Landowners List

Union Carbide Corporation,
A Wholly Owned Subsidiary of The Dow Chemical Company
Off-Plant Disposal Area Facility
HW Permit No. 50264

Area 1	UNION CARBIDE CORP DOW CHEMICAL COMPANY TAX DEPT APB BLDG FLOOR 4-A 332 SH 332 E LAKE JACKSON, TX 77566
Area 2	GULF COAST WSTE/DISP AUTH BP PROPERTY TAX DEPT PO BOX 3092 HOUSTON, TX 77253-3092
Area 3	OILTANKING TEXAS CITY LP PROPERTY TAX DEPARTMENT 9805 KATY FRWY STE 400 HOUSTON, TX 77024-1269
Area 4	TEXAS CITY TERMINAL RAILWAY CO 2425 HIGHWAY 146 N TEXAS CITY, TX 77590-8811
Area 5	OIL TANKING TEXAS INDEPENDENT DEEPWATER EXPANSION LLC 9805 KATY FRWY STE 400 HOUSTON, TX 77024-1269

Part B

Appendix I – General Information

Core Data Form

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions on completing 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)*

CN 601688781

Follow this link to search for CN or RN numbers in Central Registry**

3. Regulated Entity Reference Number *(if issued)*

RN 105087829

SECTION II: Customer Information

4. General Customer Information | **5. Effective Date for Customer Information Updates** (mm/dd/yyyy)

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

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

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

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

Union Carbide Corporation

7. TX SOS/CPA Filing Number

8. TX State Tax ID (11 digits)

11314217305

9. Federal Tax ID (9 digits)

980626782

10. DUNS Number *(if applicable)*

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

Government: ☐ City ☐ County ☐ Federal ☐ Local ☐ 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 ☐ Other:

☐ Occupational Licensee ☐ Responsible Party ☐ VCP/BSA Applicant

15. Mailing Address:

3301 5th Avenue South

City Texas City **State** TX **ZIP** 77590 **ZIP + 4** 8121

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)*

(304) 747-5308		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected, a new permit application is also required.)*

☐ 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 Core 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.)*

Union Carbide Corporation

23. Street Address of the Regulated Entity: ***(No PO Boxes)***	2800 Loop 197 South						
	City	Texas City	**State**	TX	**ZIP**	77592	**ZIP + 4**
24. County	Harris						

If no Street Address is provided, fields 25-28 are required.

25. Description to Physical Location:	The Union Carbide Corporation, Texas City Site, is located on the east side of Loop 197, to the south of the Texas City Industrial Ship Channel in Texas City, Galveston County, Texas.

26. Nearest City	**State**	**Nearest ZIP Code**
Texas City	TX	77592

Latitude/Longitude are required and may be added/updated to meet TCEQ Core Data Standards. (Geocoding of the Physical Address may be used to supply coordinates where none have been provided or to gain accuracy).

27. Latitude (N) In Decimal:			**28. Longitude (W) In Decimal:**		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
29	21	27	94	54	20

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)
2869		325199	

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

Chemicals Manufacturing

34. Mailing Address:	3301 5th Avenue South							
	City	Texas City	**State**	TX	**ZIP**	77590	**ZIP + 4**	8121

35. E-Mail Address:	MVetterlein@dow.com

36. Telephone Number	**37. Extension or Code**	**38. Fax Number** *(if applicable)*
(304) 747-5308		( ) -

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
				35921/HW-50264
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Wastewater	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Michelle Veterlein	**41. Title:**	Texas Waste and ComplianceManager
42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(304) 747-5308		( ) -	[redacted]

SECTION V: Authorized Signature

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

Company:	The Dow Chemical Company	**Job Title:**	Senior Responsible Care Director
Name *(In Print):*	Casey Rhodes	**Phone:**	(281) 228- 2606
Signature:		**Date:**	02/11/2025

Part B

Appendix I – General Information

Part B Signature Page

Signature Page

I, Casey Rhodes, Responsible Care Director
(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: 01/31/2025

- -

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 Casey Rhodes
On this 31st day of January, 2025
My commission expires on the April 30 day of 2025, ______

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

Khloe Brennan

Khloe Brennan
My Commission Expires
04/30/2025
ID No. 129155313

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: ________________________

Part B

Appendix II – Facility Siting

Table II

Table II contains the following: Table II.A, Table II.B, Table II.C, Table II.D, Table II.E and Flooding from Section II. F of the Part B Application

Table II.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)	No
If Yes: the TCEQ shall not issue a permit for a new hazardous waste management facility or areal expansion of an existing facility into wetlands, pursuant to 30 TAC 335.205(a)(1).	
In the critical habitat of an endangered species of plant or animal?[6] [as applicable: 30 TAC 335.204(a)(8), (b)(10), (c)(9), (d)(9), and/or (e)(11)]	No
If Yes: submit in Section V information demonstrating that design, construction, and operational features will prevent adverse effects on such critical habitat.	
On the recharge zone of a sole-source aquifer?2 [30 TAC 335.204(a)(3), (b)(3), (c)(3), (d)(3), and/or (e)(3)]	No
If Yes: then for storage and processing facilities (excluding storage surface impoundments), submit in Section V information demonstrating that secondary containment is provided to preclude migration to groundwater from spills, leaks, or discharges.	
In an area overlying a regional aquifer? [as applicable: 30 TAC 335.204(a)(4), (b)(4), (c)(4), (d)(4), and/or (e)(4)]	No
If Yes: submit site-specific information in Section V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1).	
In areas where soil unit(s) are within five feet of the containment structure, or treatment zone, as applicable, that have a Unified Soil Classification of GW, GP, GM, GC, SW, SP, or SM, or a hydraulic conductivity greater than 10-5 cm/sec? [as applicable: 30 TAC 335.204(a)(5), (b)(5), (c)(5), (d)(5), and/or (e)(5)]	No
If Yes: provide additional information in Sections V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1)	
In areas of direct drainage within one mile of a lake at its maximum conservation pool level, if the lake is used to supply public drinking water through a public water system?[6] [as applicable: 30 TAC 335.204 (a)(6), (b)(7), (c)(6), and/or (e)(8)].	No
If Yes: provide information in Section V demonstrating compliance with 30 TAC 335.205(a)(1).	

In areas of active geologic processes, including but not limited to erosion, submergence, subsidence, faulting, karst formation, flooding in alluvial flood wash zones, meandering river bank cuttings, or earthquakes?[6] [as applicable: 30 TAC 335.204(a)(7), (b)(8) ,(c)(7), (d)(7), and/or (e)(9)]	Yes, See Below
Within 30 feet of the upthrown side or 50 feet of the downthrown side of the actual or inferred surface expression of a fault that has reasonably been shown to have caused displacement of shallow Quaternary sediments or of man-made structures?[6] [as applicable: 30 TAC 335.204(a)(9), (b)(12) ,(c)(11), (d)(11), and/or (e)(13)]	No
If Yes: specify in Section V the design, construction, and operational features that will prevent adverse effects resulting from any fault movement. If a fault is found to be present, the width and location of the actual or inferred surface expression of the fault, including both the identified zone of deformation and the combined uncertainties in locating a fault trace, must be determined by a qualified geologist or geotechnical engineer and reported in Section VI.	

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

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

Within 1000 feet of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park which is in use at the time the notice of intent to file a permit application is filed with the commission, or which is in use at the time the permit application is filed with the commission?	
If Yes: the TCEQ shall not issue a permit for a new hazardous waste land treatment unit or an areal expansion of an existing land treatment unit, pursuant to 30 TAC 335.204(b)(6) and 335.205(a).	
Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?	
If Yes: submit in Section V.F design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.	
If Yes: submit Section V.F design, construction and operational features, which will prevent adverse effects resulting from storm surge and erosion or scouring by water.	
On a barrier island or peninsula?	

If Yes: the TCEQ shall not issue a permit for a new hazardous waste land treatment unit or an areal expansion of an existing land treatment unit, pursuant to 30 TAC 335.204(b)(11) and 335.205(a)(1).

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

Is the waste pile located or proposed to be located:

Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?
If Yes: submit in Section V.E design, construction, and operational features on the facility which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.
If Yes: submit Section V.E design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
On a barrier island or peninsula?[6]
If Yes: the TCEQ shall not issue a permit for a new hazardous waste pile or an areal expansion of an existing waste pile, pursuant to 30 TAC 335.204(c)(10) and 335.205(a)(1).

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

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

Within 1000 feet of an area of active coastal shoreline erosion even though the area is protected by a barrier island or peninsula
If Yes: submit in Section V.D design, construction, and operational features of the facility which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.
If Yes: then submit in Section V.D design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.
On a barrier island or peninsula?[6]
If Yes: the TCEQ shall not issue a permit for a new hazardous waste storage surface impoundment or an areal expansion of an existing storage surface impoundment, pursuant to 30 TAC 335.204(d)(10) and 335.205(a)(1).

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

Is the landfill located or proposed to be located:

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?	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).	
(For commercial hazardous waste landfills) in the 100-year flood plain of a perennial stream that is delineated on a flood map adopted by the Federal Emergency Management Agency after September 1, 1985, as zone A1-99, VO, or V1-30?	
If Yes: the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(7) and 335.205(a)(1).	
Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?	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.	
Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barriers island or peninsula.	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.	
On a barrier island or peninsula?	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)(12) and 335.205(a)(1).	

Flooding (see Section II Instructions, Item F)

Is the facility within a 100-year flood plain?		Yes
Has a flood plain map been provided?		Yes
Has information about flooding levels and events, and other special flooding factors, been provided?[3]		Yes
Do any flood protection devices exist at the facility (e.g., flood walls, dikes, etc.) designed to prevent washout from the 100-year flood?[3]	No, See Below	
If Yes: provide in Section V an engineering analysis to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)][4]		
If No: the applicant shall provide in Section V a plan for constructing flood protection devices and a schedule including specific time frames for completion. Provide engineering analyses to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)][5]		
If applicable, and in lieu of the flood protection devices from above, was a detailed description of the procedures to be followed to remove hazardous waste to safety before the facility is flooded provided?[3, 6]	Not Applicable	
Additional Information Requirements (see Section II instructions, Item G): Submitted?	Yes	

1. Provide the source of information for all questions in the appendix.
2. Note: Land treatment facilities, waste piles, storage surface impoundments, and landfills may not be located on the recharge zone of a sole-source aquifer.
3. Only required to be submitted if the facility is subject to inundation as a result of a 100-year flood event.
4. 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)]
5. 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)]
6. 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 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)]

Part B

Appendix II.A.7 – Geotechnical Evaluation

OPDA Basins 3 and 5

GEOTECHNICAL INVESTIGATION
FLOODPLAIN EVALUATION
OFF PLANT DISPOSAL AREA BASINS 3 AND 5
UNION CARBIDE CORPORATION
TEXAS CITY, TEXAS

REPORT TO

UNION CARBIDE CORPORATION
TEXAS CITY, TEXAS

BY

NATIONAL SOIL SERVICES DIVISION
HOUSTON, TEXAS

MARCH 1985

psi
Professional Service Industries, Inc.
National Soil Services Division

Union Carbide Corporation
P. O. Box 471
Texas City, Texas 77590

Report No. 286-45093-3
March 5, 1985

Attention: Mr. J. L. Sandel

GEOTECHNICAL INVESTIGATION
FLOODPLAIN EVALUATION
OFF PLANT DISPOSAL AREA BASINS 3 AND 5
UNION CARBIDE CORPORATION
TEXAS CITY, TEXAS

Gentlemen:

We are pleased to submit our report on the geotechnical investigation for floodplain evaluation of Off Plant Disposal Area Basins 3 and 5, Texas City, Texas. This study was authorized by Mr. J. L. Sandel.

This report presents field and laboratory data and results of slope stability analyses for the dikes for floodplain evaluation. Eight copies of the report are being transmitted herewith.

We believe that results of this stability analyses on basins 3 and 5 are adequate for the proposed requirements. We appreciate the opportunity to perform this study. Please call upon us if you have any questions.

Very truly yours,

NATIONAL SOIL SERVICES DIVISION

N. Barakat

N. Barakat

Bandyopadhyay

S. S. Bandyopadhyay, Ph.D., P.E.,
Branch Manager

NB/SSB:ig
Copies submitted: 8

1714 Memorial Drive • Houston, TX 77007 • Phone: 713/224-2047

TABLE OF CONTENTS

SYNOPSIS

An exploration and evaluation of the soil conditions has been made on the site of the Off Plant Disposal Area, Basins 3 and 5, Texas City, Texas.

Eight borings in which undisturbed samples were extracted, have been drilled and laboratory tests were conducted on the soil samples. The data has been carefully analyzed in the light of the project information provided by Union Carbide Corporation.

The results of the exploration, floodplain and stability evaluation for basins 3 and 5 indicate that existing dikes should be raised to an elevation of 17.5 feet above MSL. Dike slopes of 1V:2H with a rip rap on the outer slope to dissipate wave energy are recommended.

Detailed analyses of subsurface conditions, hydrostatic and hydrodynamic forces, slope stability and other pertinent design recommendations are included herein.

INTRODUCTION

OPDA Basins 3 and 5 are located near Union Carbide Marine Terminal in Texas City, Texas. There are several other basins next to 3 and 5, and the basins are surrounded by a Barge Canal on the north side, engineering ditch on the south side and East Lagoon on the east side. The layout plan is shown on Plate 1.

This study was undertaken to provide an engineering analysis of the hydrodynamic and hydrostatic forces generated during a 100-year flood at the site and provide recommendations on improvement of dikes surrounding basins 1, 3 and 5 to withstand such forces and to prevent overtopping.

The recommendations submitted are based on the available soil information and the preliminary design details furnished by Union Carbide Corp. for the existing facility.

The soils engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been promulgated after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

This report has been prepared for the exclusive use of Union Carbide Corp. for the specific application to the Off Plant Disposal Area Ponds 3 and 5 in accordance with generally accepted soils and foundation engineering practice.

HYDRODYNAMIC AND HYDROSTATIC FORCES

A detailed analysis of Hydrodynamic and Hydrostatic forces generated during a 100-year flood was conducted by Dr. David R. Basco, Professor of Civil Engineering, Texas A & M University, Texas. A copy of his report is presented in Appendix B. A report containing confirmation of still-water storm surge elevation (S*) is presented in Appendix C.

DESCRIPTION OF SITE

Site Location

The site of the Off Plant Disposal Area Ponds 3 and 5 upon which this soils exploration has been made is located just south of the Industrial Barge Canal and west of Lake Institute in Texas City, Texas.

Site Topography, Drainage and Vegetation

The top of the dikes have elevations ranging from 11.7 to 13.9 feet above MSL. Presently, the dikes are accessible to automobiles. Generally, no vegetation exists on the dikes.

FIELD EXPLORATION

Scope

The field exploration to determine the engineering characteristics of the subsurface materials, included a reconnaissance of the project site, making the borings, and recovering undisturbed samples.

Subsurface conditions at the OPDA Ponds 3 and 5 were defined by eight undistrubed sample borings, CB-9 through CB-16, located in plan as shown on Plate 1. The borings were located by the driller by means of normal taping procedures, and are presumed to be accurate to within a few feet.

All eight undisturbed sample borings were drilled to a depth of 40 feet below the top of the existing dikes. The soils encountered are shown on the logs of borings, Plates 2 through 9 and a key to log terms and symbols is presented on Plate 10.

After completion of borings, the drill holes were grouted and the site cleaned as required.

Drilling and Sampling Procedures

The soil borings were performed with a truck mounted drilling rig equipped with a rotary head. For borings CB-9 through CB-16, samples were obtained continuously from the surface to a depth of ten feet and at five-foot intervals thereafter to boring completion depth. Undisturbed samples were obtained using thin-walled Shelby tube samplers in accordance with ASTM D-1587. The samples obtained by this procedure were extruded by a hydraulic ram and classified in the field. Representative samples were placed in quart containers and annular space in the quart containers was filled with wax to retain natural moisture content and to protect samples during delivery to the laboratory. Undisturbed samples were identified according to boring number and depth. Location and depth of the samples are shown on the logs of borings.

Field Tests and Measurements

Standard Penetration Tests in Cohesionless Soils: The standard penetration test and split-barrel sampling were conducted simultaneously using ASTM Specification D-1586 as a guide. The drilling tools were removed at regular intervals and soil samples were obtained with a standard split-tube sampler of known dimensions (2" O.D. and 1-3/8" I.D.) connected to an "AW" or "N" rod.

The sampler was first seated six inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer free-falling 30 inches. The number of blows required to drive the sampler each six-inch interval was recorded. The total number of blows necessary to drive the final foot (termed N-value) is designated as "penetration resistance". Representative portions of the soil samples obtained from each split-barrel sample were placed in glass jars, sealed and transported to the laboratory.

"Penetration resistance" values, when properly evaluated, provide an indication of the relative density of granular soils, i.e., loose, dense, etc. The "N" values are tabulated at respective sample depth on the boring logs and relative density characteristics are included in the soil strata description.

Hand Penetrometer Tests: Hand penetrometer tests were performed on firm to stiff soils in the field to provide additional shear strength data. This device has been correlated with the unconfined compression and therefore provides a more accurate indication of soil consistency as compared to visual classification. The penetrometer, a Soiltest Model CL-700, measures the force required to effect a one-quarter inch penetration into the undisturbed sample with a piston one-fourth of an inch in diameter. The results, expressed in terms of soil shear strength, are shown as open circles in the strength graph on the logs of borings.

Water Level Measurements: Drilling fluid was bailed from each borehole after completion of drilling and water level observations were made at different intervals during the course of the field operation. The last set of measurements was considered to be representative of static groundwater and the depth to groundwater is shown in each case on the boring logs. In relatively pervious soils, such as sandy soils, the indicated elevations are considered reliable ground water levels. In relatively impervious soils, the accurate determination of the ground water elevation may not be possible even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the ground water table, and volumes of water will depend on the permeability of the soils.

LABORATORY TESTING PROGRAM

In addition to the field investigations, a supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of the foundation materials necessary in analyzing the behavior of the proposed structure.

The samples were examined in our laboratory and are classified according to consistency, color and texture. These classification descriptions are based on visual observation of soil samples recovered for the borings and included in the soil strata description on the boring logs. No analytical tests were conducted.

Classification tests consisting of liquid and plastic limits, percent fines and moisture content determinations were performed to evaluate general uniformity of the soil conditions and shrink-swell potential of these soils. Results of these tests are tabulated on the boring logs at respective sample depth.

Undrained shear strength properties of cohesive soils were defined by unconfined compression tests on undisturbed samples. Results of these tests are plotted in the strength graph on the logs and are shown by solid circles. Drained strength properties of subsurface soils were defined by consolidated drained direct shear tests on undisturbed samples. Results of these tests are presented on Plate 11.

Moisture density relationship of subgrade soils was defined by standard proctor test (ASTM D-698). Plot of density as a function of molding moisture contents is shown on Plate 12. Pertinent features of the test are shown in the upper left and soil characteristics in the upper right.

All phases of the laboratory testing program were conducted in general accordance with applicable ASTM Specifications, and the procedures are outlined in Appendix A.

SUBSURFACE CONDITIONS

General

The type of subsurface materials encountered have been visually classified and are described in detail on the boring logs. The results of the field tests, water level observations, water content, Atterberg Limits, strength tests and unit weight determinations are presented on the boring logs. Representative samples of the soils were placed in sample jars, and are now stored in the laboratory for further analysis if desired. Unless notified to the contrary, all samples will be disposed of after three months.

The stratification of the soils, as shown on the boring logs, represents the soil conditions in the actual boring locations, and other variations may occur between the borings. Lines of demarcation represent the approximate boundary between the soil types, but the transition may be gradual.

Description of Foundation Materials

A typical profile to be found upon this site consists of an upper layer of shells and gravel with calcareous nodules, two feet in thickness, with underlying strata of clay, silty clay and silt. A detailed description of the soils will be found on the accompanying logs of soil borings.

The surface of the OPDA dikes is covered with shells and gravels, approximately two feet in thickness forming the roadbed. The roadbed is underlain by a stratum of stiff tan and light gray clay with silt and sand seams and pockets of shells and calcareous nodules. This stratum extends to depths of six to 20 feet below the existing ground surface. The natural water content of this soil ranges from 20 to 45 percent. The results of the limit tests on selected samples indicate that the material is medium in plasticity with a liquid limit of approximately 36 and plasticity index of approximatelfy 21. Shear strengths of 300 to 1400 psf were obtained in this stratum from unconfined compression tests on this soil.

The third stratum consists of stiff dark and light gray silty clay. The thickness of this stratum ranges from 12 to 22 feet. The natural water content of this stratum ranges from 19 to 48 percent. Shear strengths of 400 to 1400 psf were obtained from unconfined compression tests on this stratum.

The fourth stratum consists of soft light gray and tan silt with clay seams and pockets and calcareous nodules and has a thickness range from six to 27 feet in different borings. The natural water content of this soil ranges from 18 to 35 percent. Shear strengths of 400 to 1400 psf were obtained from unconfined compression tests on this stratum.

Groundwater Observations

The average groundwater level, as measured in borings CB-9 through CB-16, appeared to be at depths ranging from 5.5 feet to 10.4 feet below the top surface of the dikes.

It is to be noted that groundwater levels in this site may vary due to seasonal conditions and recent rainfall or temperature affects.

ANALYSES AND RECOMMENDATIONS

General

This study was initiated to provide an engineering analysis of the hydrodynamic and hydrostatic forces generated during a 100-year flood at the site and evaluate the stability of the dikes of OPDA Ponds 3 and 5 after the dikes are raised to higher elevation for protection against the flood. In his report entitled "Dike Design: Crown Elevation and Erosional Occurrence", Dr. Dave Basco recommended dike crown elevation of 17.5 feet above MSL with a dike slope of 1V:2H. He also recommended to put rip rap protection on the outer slopes. Based on these recommendations, four typical sections of the modified dikes are presented on Plate 13.

Slope Stability Analysis

The purpose of stability analysis is to determine the factor of safety of a potential failure surface. The factor of safety is defined as a ratio between the resisting force and the driving force, both applied along the failure surface. When the driving force due to weight is equal to the resisting force due to shear strength, the factor of safety is equal to 1 and failure is imminent.

Based on the results of this study and the surveyed cross-section, slope stability analyses of the critical cross section of the dikes were made.

There are two ways to analyzing the stability of slopes: total stress analysis and effective stress analysis. Total stress analysis is based on the undrained shear strength, and is usually used for determining short-term stability. Effective stress analysis is based on the drained shear strength and is used for long-term stability.

From the surveyed cross-sections a critical cross section was chosen as shown on Plate 16. Based on the field and laboratory studies, appropriate strength parameters for both short-term and long-term conditions are identified and used in the analysis. The appropriate soil parameters are presented on Plate 16.

Three basic scenarios were initially considered for stability evaluations:

(1) Short term conditions - Basins 3 and 5 are almost empty with 100-year flood water level (one-foot freeboard) on the outside slope.

(2) Steady seepage condition (long term condition) - Engineering ditch is almost empty and basins 3 and 5 and full of water/ sludge (two feet freeboard) and dikes saturated.

(3) Steady seepage condition - Engineering ditch and basins 3 and 5 are almost empty.

(4) Basins 3 and 5 are empth and a 100-year flood occurs that reaches near the top of the dike. Rapid drawdown of the tide is then considered.

Stability analyses were made considering the first three criteria and short term and long term factors of safety were presented on Plate 16.

The fourth criteria was not considered because rapid drawdown cannot occur in fine grained soils unless the tide stays for a long period of time. Occasional flooding for a few days or weeks will not have any detrimental drawdown effects on the outer slopes.

The search routing searches for a critical center when the safety factor for all surrounding centers are high. The detailed results of the stability analyses along with graphical representation are presented on Plate 16. The factors of safety for the analyzed section were found to be 1.50 for the short term criteria one, 1.40 for the long,term criteria two and 1.50 for the long term, criteria three.

Factors of safety of 1.4 and above are generally considered safe. Since the critical dike has factors of safety of 1.4 and above for both short term and long term conditions, they are considered safe.

Resistance to Piping and Cracking

Based on correlation with classification data, dike materials will have good resistance to piping and cracking. Results of the standard compaction test with dike soil indicate that in-situ density of the dike soils range from 108 to 115 percent of the maximum standard density and is considered satisfactory.

Dike Construction

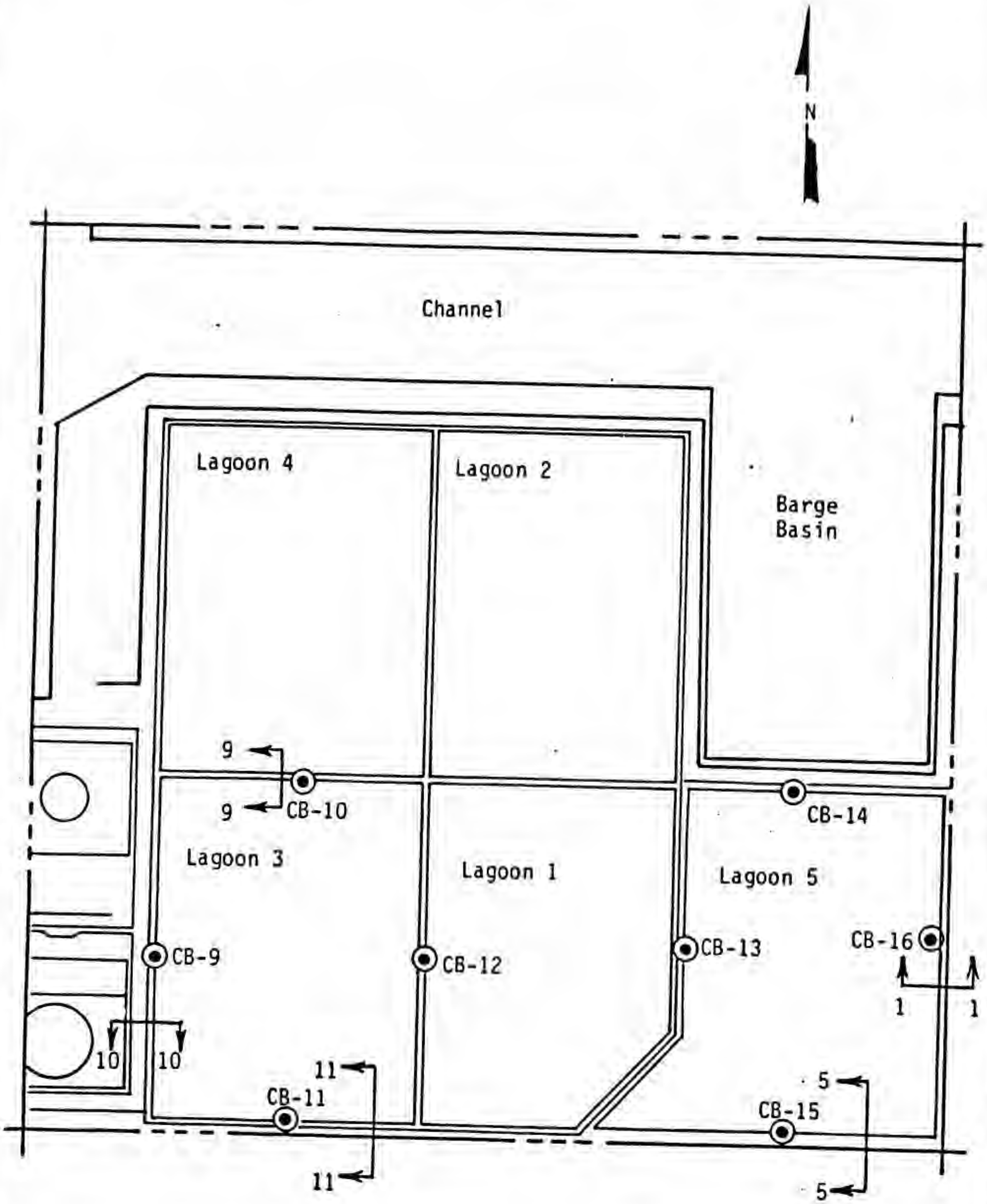
Dredge material present on the north side of Lake Institute areas will be suitable for development of dikes. However, it is estimated that additional borrow material from outside will be required to build all dikes to required elevation.

The dike section must have minimum permeability for product retention. It is therefore recommended that sandy clays with a liquid limit not greater than 35 and plasticity index not greater than 18 be used for dike material. The fill should be placed in uniform lifts nine to 12 inches thick and compacted to a density of about 95% of standard proctor. Placement moisture content can be allowed to range from three percent below to three percent above optimum provided a uniform fill is developed and bond between layers is adequate. Placement of accessible dry fill should not be allowed since dry layers are difficult to process, compact and bond.

Site preparation should include clearing of brush followed by scarifying and compaction of the topsoil and compaction of the subgrade prior to placement of the dike fill. The section should be over built slightly and the slopes graded to the specified ratio. This procedure will insure that loose uncompacted zones are not present near the face of the slope.

A rip rap approximately 12 inches thick, should be placed on the outer slopes to dissipate wave energy. Impermeable quarry stone material, six to 12 inches in diameter, or concrete blocks may be used for rip rap. The rip rap material can be randomly placed, provided an approximate thickness of 12 inches is achieved on the slopes.

ILLUSTRATIONS



OPDA LAGOON AREA

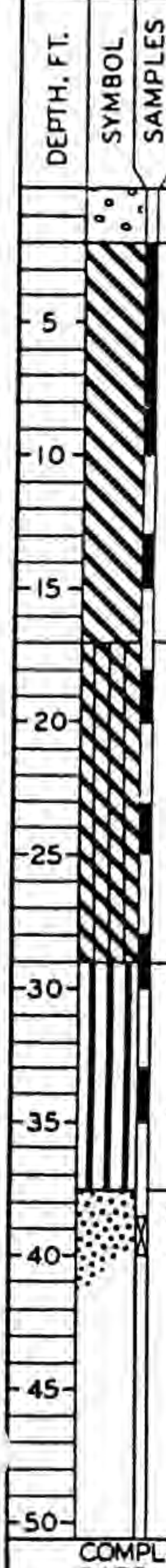
PLAN OF BORINGS

NFS / NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

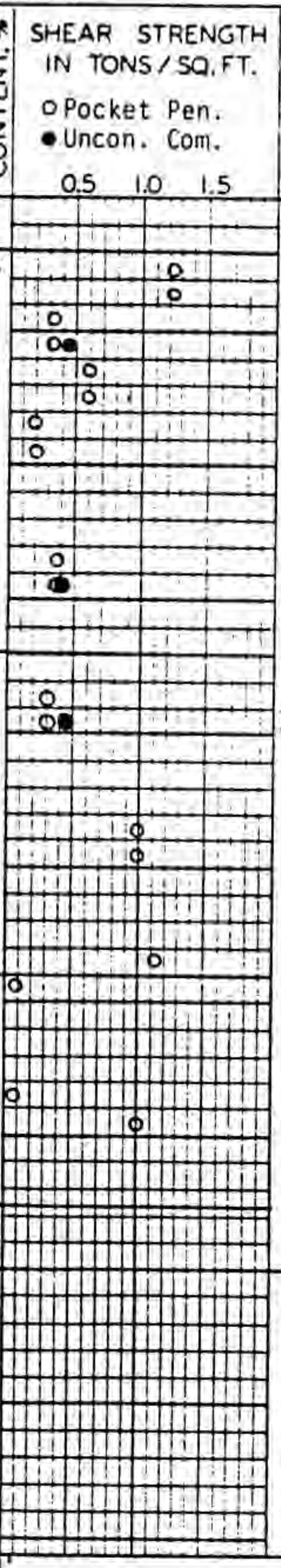
LOG OF BORING NO. CB-9

DIKE STABILITY
OPDA UNION CARBIDE - TEXAS CITY, TEXAS

TYPE BORING: Undisturbed Sample & Split-spoon
LOCATION: See Plate 1



SOIL DESCRIPTION SURF. ELEV.:	BLOWS PER FT.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	UNIT DRY WT. LB/CU FT.
Shells and gravel					
Firm dark gray and light gray clay w/sand seams and pockets				28	94
- w/calcareous nodules below 15'				36	85
Firm tan and light gray silty clay w/calcareous nodules				19	105
- very stiff below 25'					
Soft tan and light gray silt w/clay seams and pockets and calcareous				23	
				26	
- very soft below 35'					
Dense light gray sand	62				



COMPLETION DEPTH: 40'
DATE: July 30, 1984

DEPTH TO WATER: 10'
DATE: 7/31/84

NATIONAL SOIL SERVICES
HOUSTON, TEXAS

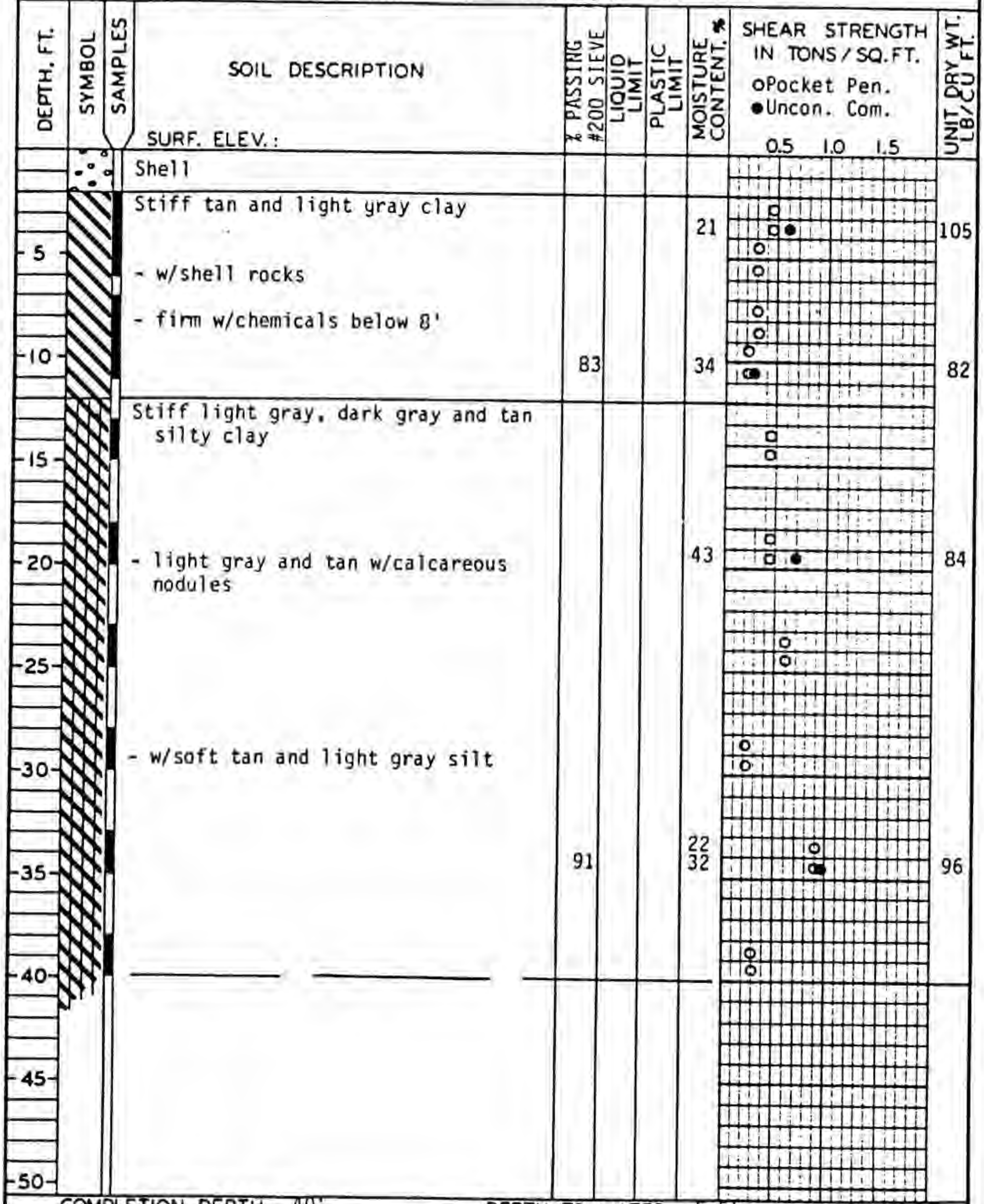
LOG OF BORING NO. CB-10

DIKE STABILITY

OPDA UNION CARBIDE - TEXAS CITY, TEXAS

TYPE BORING: Undisturbed Sampèe

LOCATION: See Plate 1



SOIL DESCRIPTION SURF. ELEV.:	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	UNIT DRY WT. LB/CU FT.
Shell					
Stiff tan and light gray clay				21	105
- w/shell rocks					
- firm w/chemicals below 8'					
	83			34	82
Stiff light gray, dark gray and tan silty clay					
- light gray and tan w/calcareous nodules				43	84
- w/soft tan and light gray silt					
	91			22 32	96

COMPLETION DEPTH: 40'

DATE: July 30, 1984

DEPTH TO WATER: 5.5'

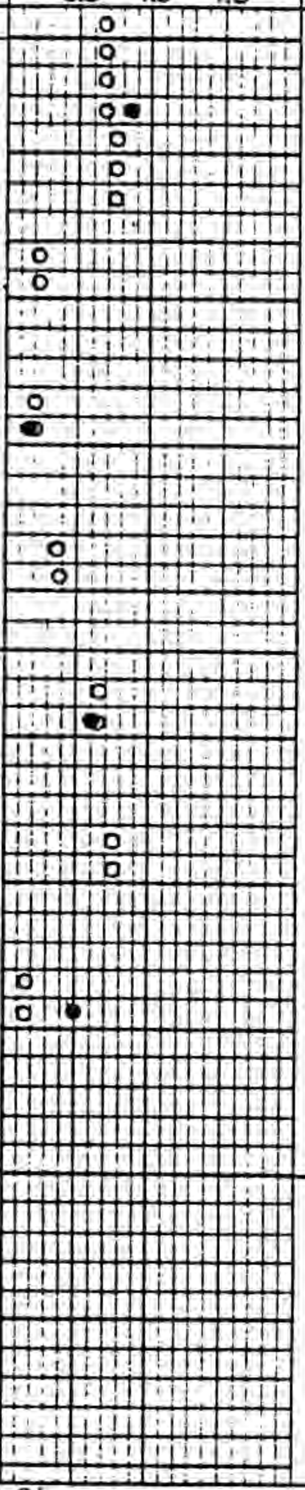
DATE: 7/31/84

NATIONAL SOIL SERVICES
HOUSTON, TEXAS

LOG OF BORING NO. CB-11

DIKE STABILITY
OPDA UNION CARBIDE - TEXAS CITY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plate 1



DEPTH, FT.	SYMBOL	SAMPLES	SOIL DESCRIPTION SURF. ELEV.:	BLOWS PER FT.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	UNIT DRY WT. LB/CU FT.
			Shell					
			Stiff tan and brown clay w/sand seams and pockets				23	101
5								
			- soft below 8'					
10							33	83
15							45	73
20								
			Stiff light gray and tan silt w/clay seams and pockets					
25							32	97
30								
35			- becoming soft below 35'				33	95
40								
45								
50								

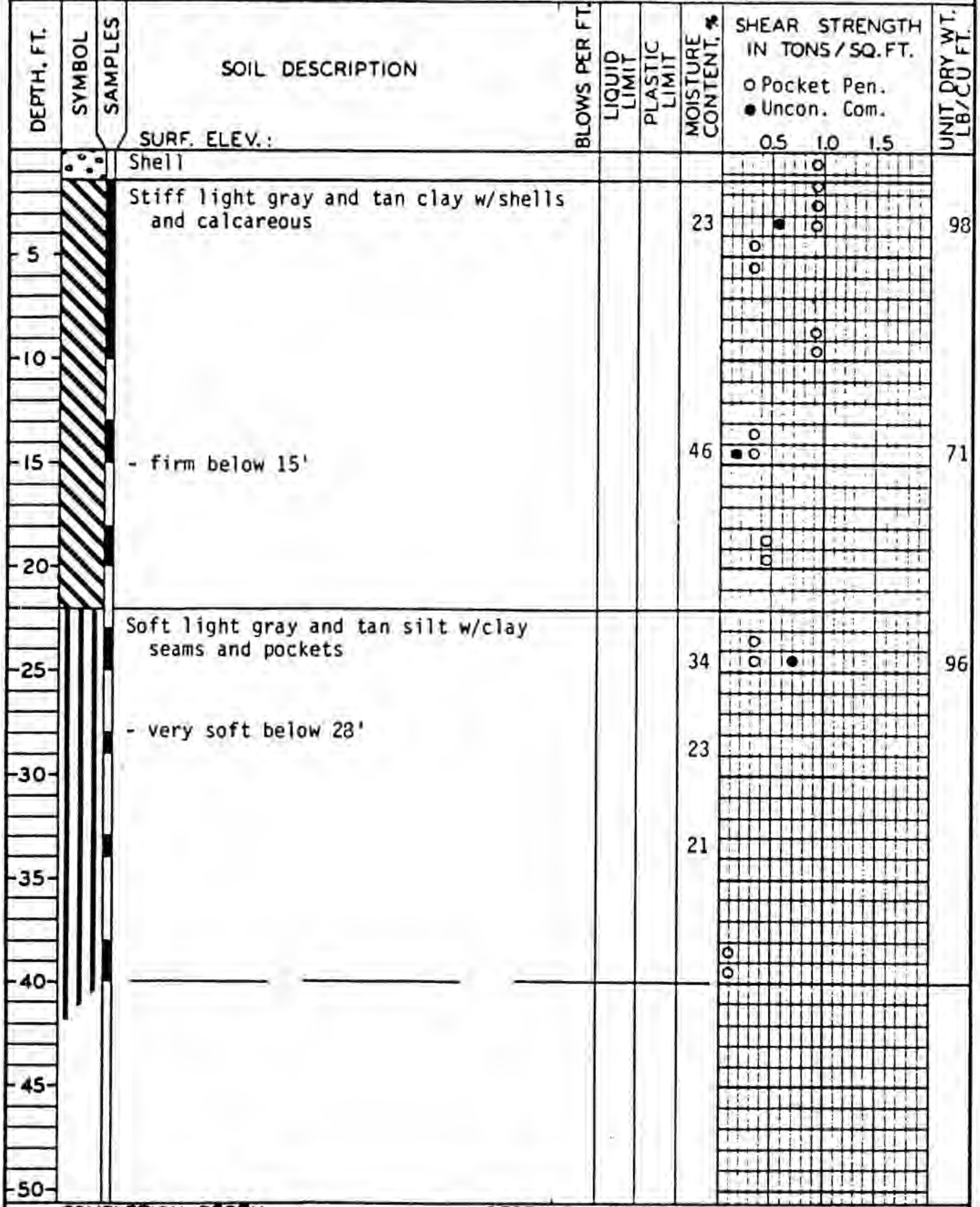
COMPLETION DEPTH: 40' DEPTH TO WATER: 10.2'
DATE: August 3, 1984 DATE: 8/6/84

NATIONAL SOIL SERVICES
HOUSTON TEXAS

LOG OF BORING NO. CB-12

DIKE STABILITY
OPDA UNION CARBIDE - TEXAS CITY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plate 1



SOIL DESCRIPTION	MOISTURE CONTENT, %	UNIT DRY WT. LB/CU FT.
Shell		
Stiff light gray and tan clay w/shells and calcareous	23	98
- firm below 15'	46	71
Soft light gray and tan silt w/clay seams and pockets	34	96
- very soft below 28'	23	
	21	

COMPLETION DEPTH: 40'
DATE: July 31, 1984

DEPTH TO WATER: 6.5'
DATE: 8/1/84

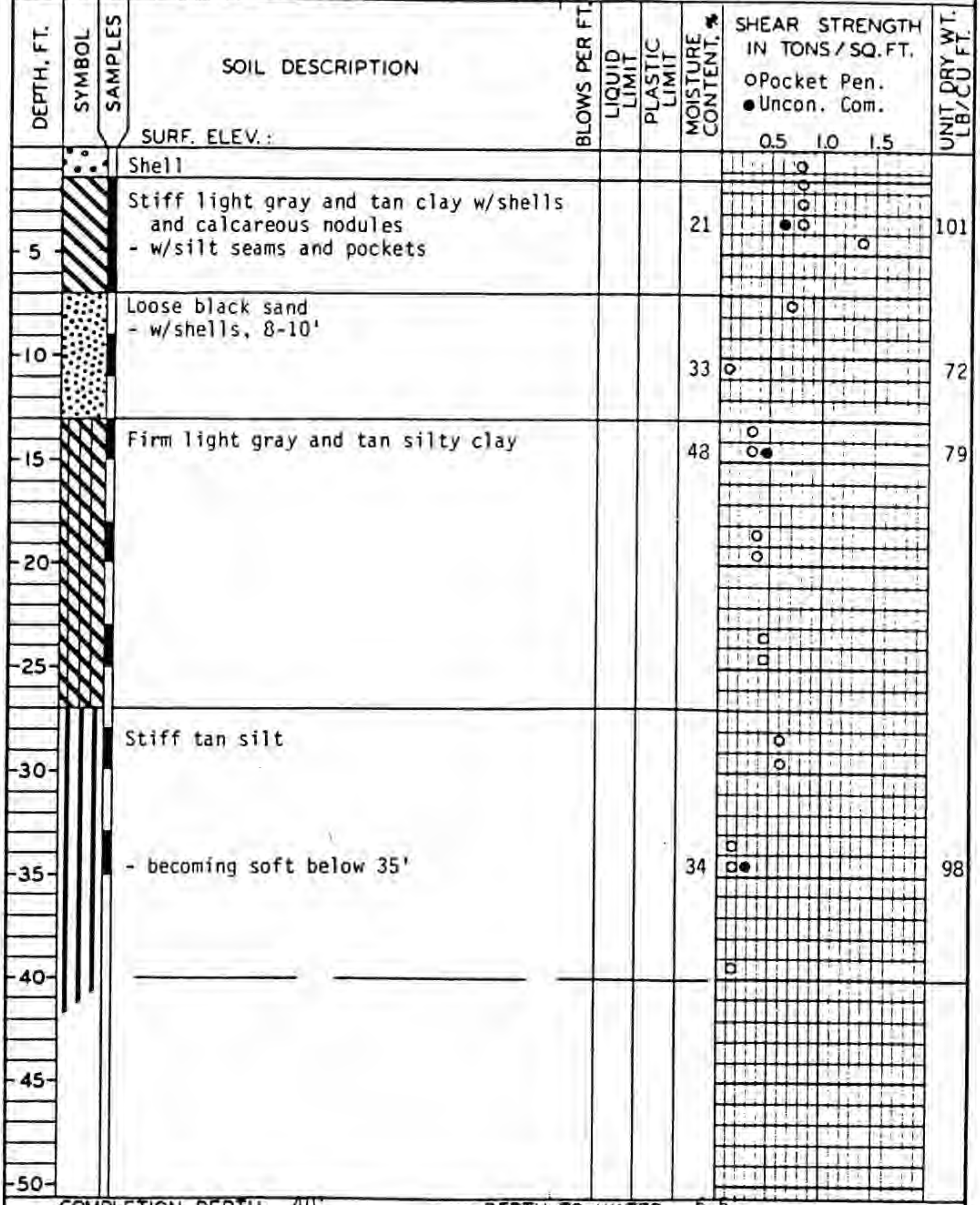
NATIONAL SOIL SERVICES

LOG OF BORING NO. CB-13

DIKE STABILITY

OPDA UNION CARBIDE - TEXAS CITY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plate 1



SOIL DESCRIPTION SURF. ELEV.:	BLOWS PER FT.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	UNIT DRY WT. LB/CU FT.
Shell					
Stiff light gray and tan clay w/shells and calcareous nodules - w/silt seams and pockets				21	101
Loose black sand - w/shells, 8-10'				33	72
Firm light gray and tan silty clay				48	79
Stiff tan silt - becoming soft below 35'				34	98

COMPLETION DEPTH: 40'

DATE: July 31, 1984

DEPTH TO WATER: 6.5'

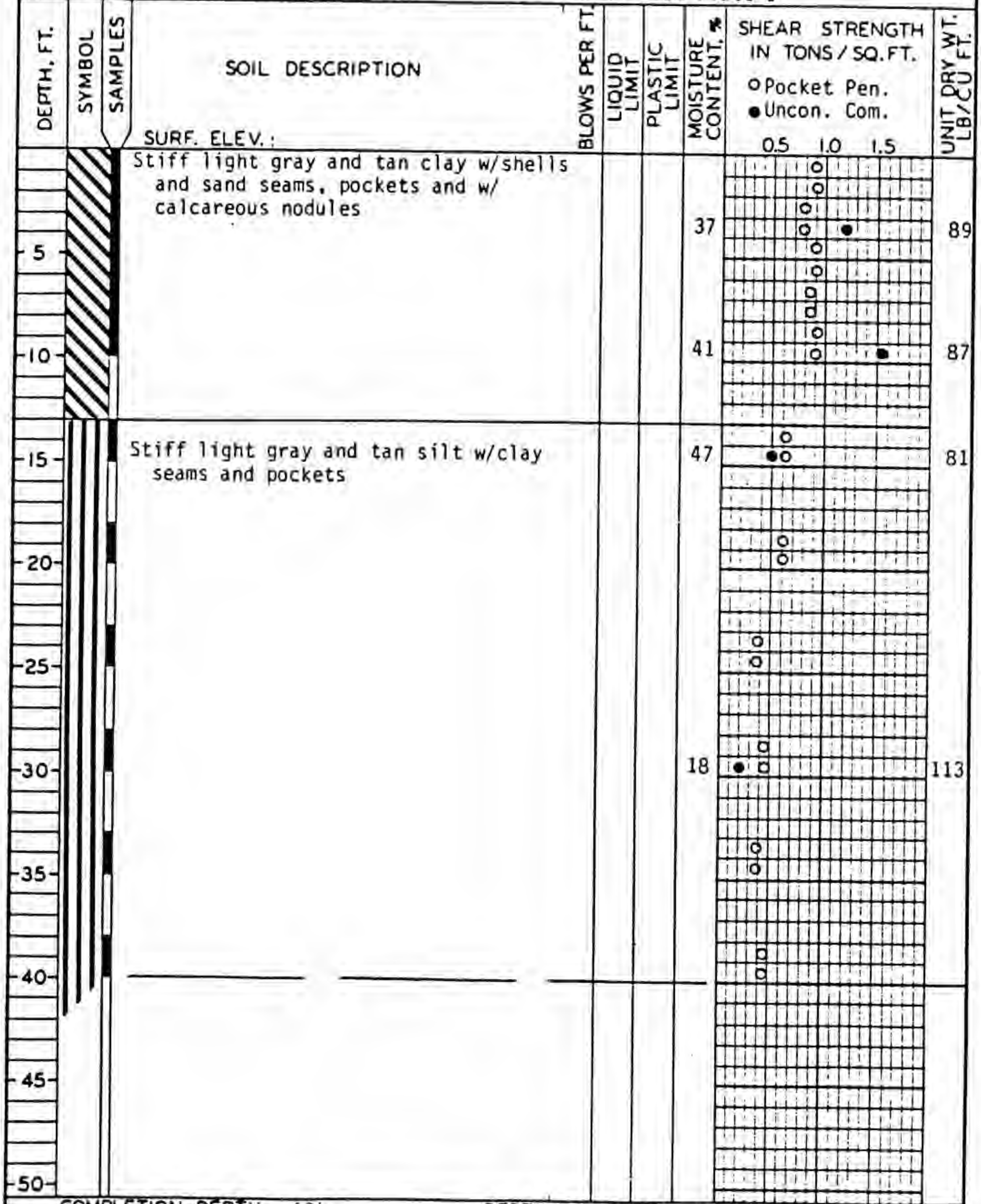
DATE: 7/31/84

NATIONAL SOIL SERVICES

LOG OF BORING NO. CB-14

DIKE STABILITY
OPDA UNION CARBIDE - TEXAS CITY, TEXAS

TYPE BORING: Undisturbed Sample
LOCATION: See Plate 1



SOIL DESCRIPTION SURF. ELEV.:	BLOWS PER FT.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	UNIT DRY WT. LB/CU FT.
Stiff light gray and tan clay w/shells and sand seams, pockets and w/ calcareous nodules				37	89
				41	87
Stiff light gray and tan silt w/clay seams and pockets				47	81
				18	113

COMPLETION DEPTH: 40'
DATE: August 1, 1984

DEPTH TO WATER: 8.5'
DATE: 8/1/84

NATIONAL SOIL SERVICES

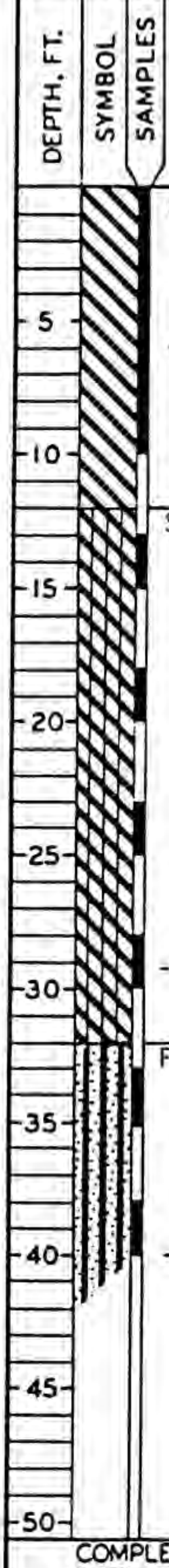
LOG OF BORING NO. CB-15

DIKE STABILITY
OPDA UNION CARBIDE - TEXAS CITY, TEXAS

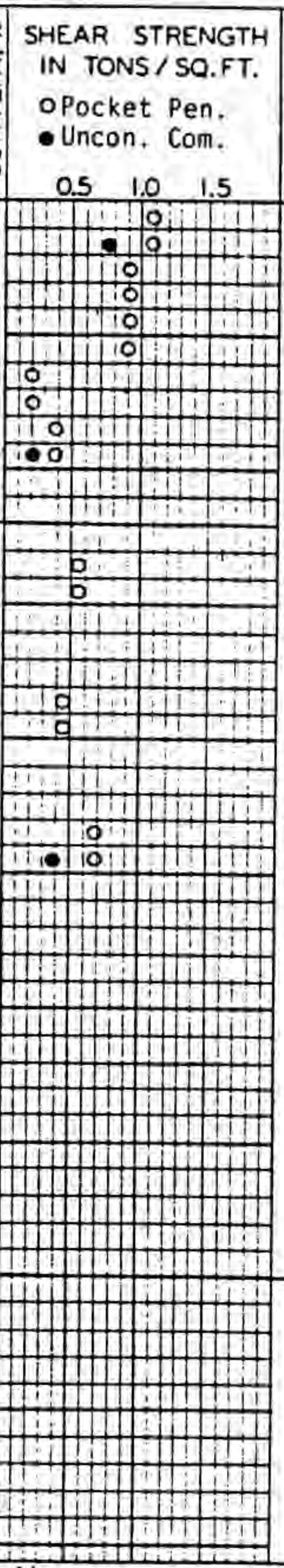
TYPE BORING: Undisturbed Sample

LOCATION: See Plate 1

SURF. ELEV.:



SOIL DESCRIPTION	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	UNIT DRY WT. LB/CU FT.
Very stiff dark gray and light gray clay w/silt seams and pockets				20	101
- soft below 6'				45	69
Stiff dark gray and light gray silty clay				26	97
- very stiff w/clay seams and pockets below 29'					
Firm tan sandy silt	35				



COMPLETION DEPTH: 40'
DATE: August 3, 1984

DEPTH TO WATER: 10.4'
DATE: 8/3/84

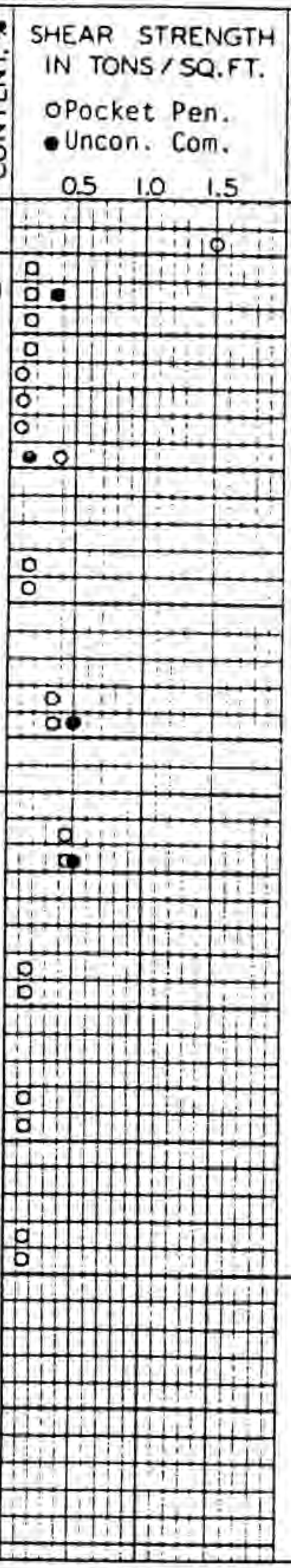
NATIONAL SOIL SERVICES

LOG OF BORING NO. CB-16

DIKE STABILITY
OPDA UNION CARBIDE - TEXAS CITY, TEXAS

TYPE BORING: Undisturbed Sample LOCATION: See Plate 1

SOIL DESCRIPTION SURF. ELEV.:	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	UNIT DRY WT. LB/CU FT.
Shell and gravel					
Soft light gray and tan silty clay w/calcareous nodules				30	89
- very soft below 7'					
				41	78
				42	83
Soft light gray and tan silt		89		25 35	

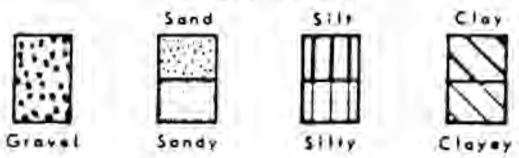


COMPLETION DEPTH: 40'
DATE: August 1, 1984

DEPTH TO WATER:
DATE:

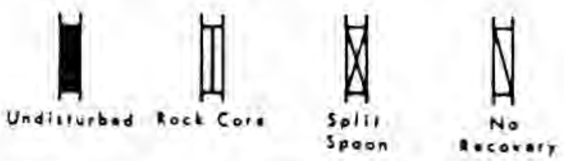
KEY TO SOIL CLASSIFICATIONS AND SYMBOLS

SOIL TYPE



Predominant type shown heavy

SAMPLE TYPE



TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS

(Major portion retained on No. 200 sieve)

Includes (1) clean gravels and sands described as fine, medium or coarse, depending on distribution of grain sizes and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests or estimated from resistance to sampler penetration.

Penetration Resistance Blows/Foot **	Descriptive Term	Relative Density *
0 - 9	Loose	0 to 40%
10 - 29	Medium dense	40 to 70%
30 - 50	Dense	70 to 90%
Over 50	Very dense	90 to 100%

* From tests on undisturbed sand sample

** 140# hammer; 30-inch drop

Relative density is also used to describe condition of low plasticity (P I <10) fine grained soils such as sandy silts.

FINE GRAINED SOILS

(Major portion passing No. 200 sieve)

Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests for soils with plasticity indices ≥ 10.

Descriptive Term	Shear Strength Tons/Sq. Ft.
Very soft	less than 0.13
Soft	0.13 to 0.25
Firm	0.25 to 0.50
Stiff	0.50 to 1.00
Very stiff	1.00 to 2.00
Hard	2.00 to higher

Note: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or shrinkage cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

Fissured	- containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical
Sensitive	- pertaining to cohesive soils that are subject to appreciable loss of strength when remolded
Laminated	- composed of thin layers of varying color and texture
Interbedded	- composed of alternate layers of different soil types
Calcareous	- containing appreciable quantities of calcium carbonate
Well graded	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Poorly graded	- predominately of one grain size, or having a range of sizes with some intermediate size missing

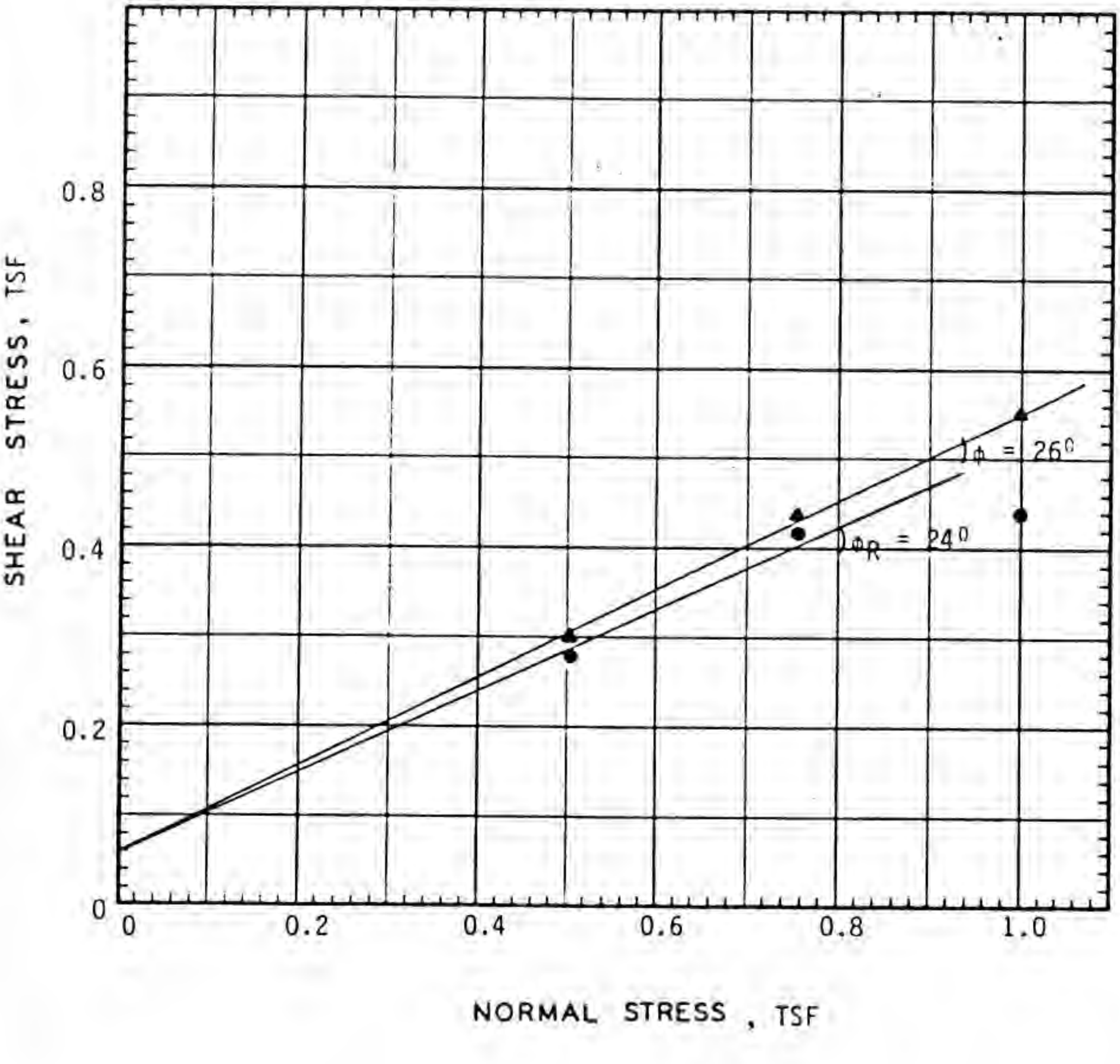
Slickensided - having inclined planes of weakness that are slick and glossy in appearance.

Degree of slickenside development:

Slightly slickensided	- slickensides are present at intervals of 1-2 feet and soil does not easily break along these planes.
Moderately slickensided	- slickensides are spaced at intervals of 1-2 feet and soil breaks easily along these planes.
Extremely slickensided	- slickensides are spaced at intervals 4-12 inches, are continuous and interconnected. Soil breaks easily along the slickensides. Resulting size of broken pieces three to six inches.
Intensely slickensided	- slickensides are spaced at intervals of less than four inches and are continuous in all directions. Soil breaks down along planes into nodules 1/4 - 2 inch in size.

BORING NO. CB-10
DEPTH FT. 10
MOISTURE CONTENT
BEFORE 33.4 %
AFTER 36.9 %
UNIT DRY WEIGHT 83 PCF

ANGLE OF SHEAR, 26 (°)
COHESION, c = 0.06 TSF

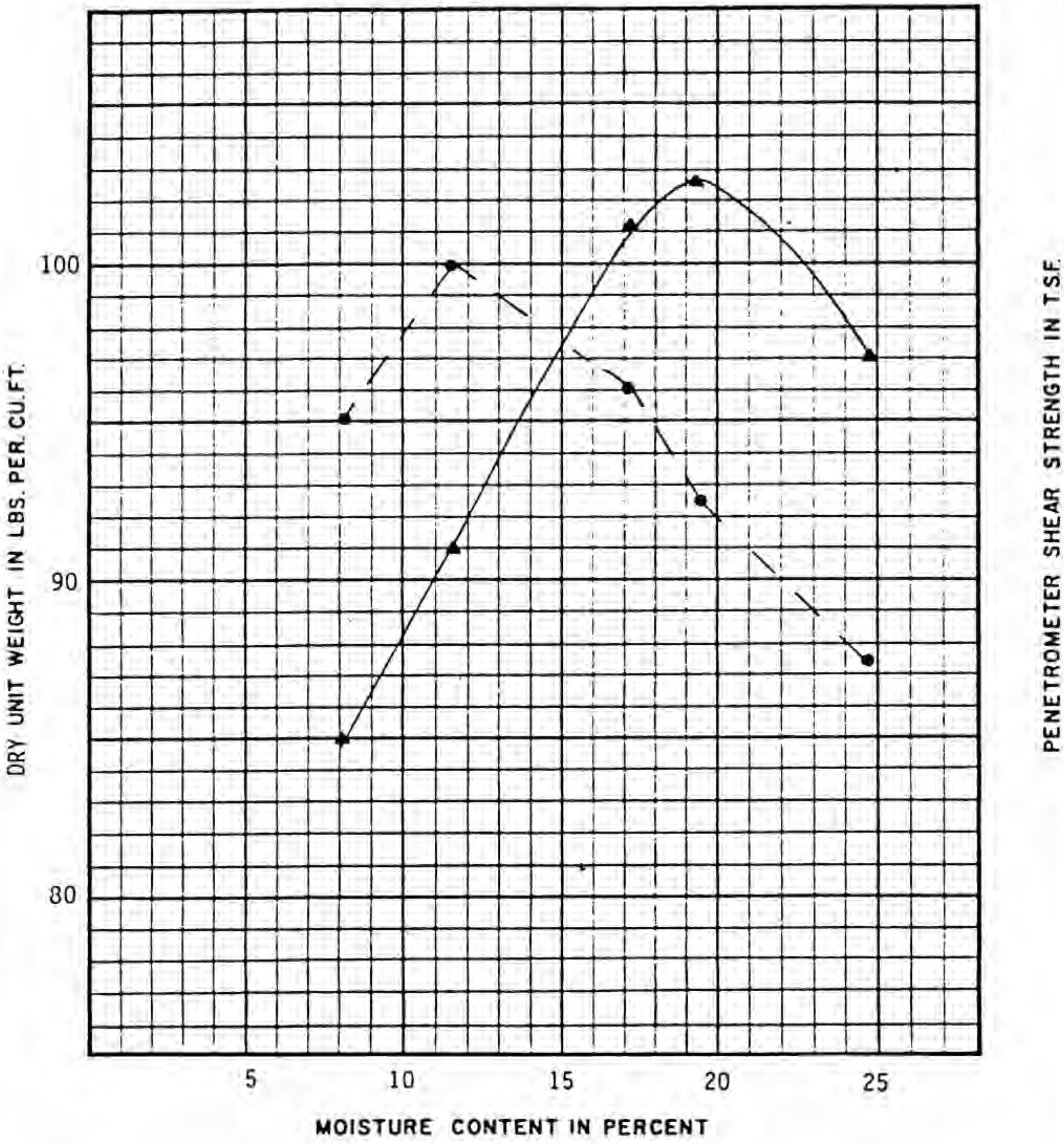


SHEAR TEST RESULTS

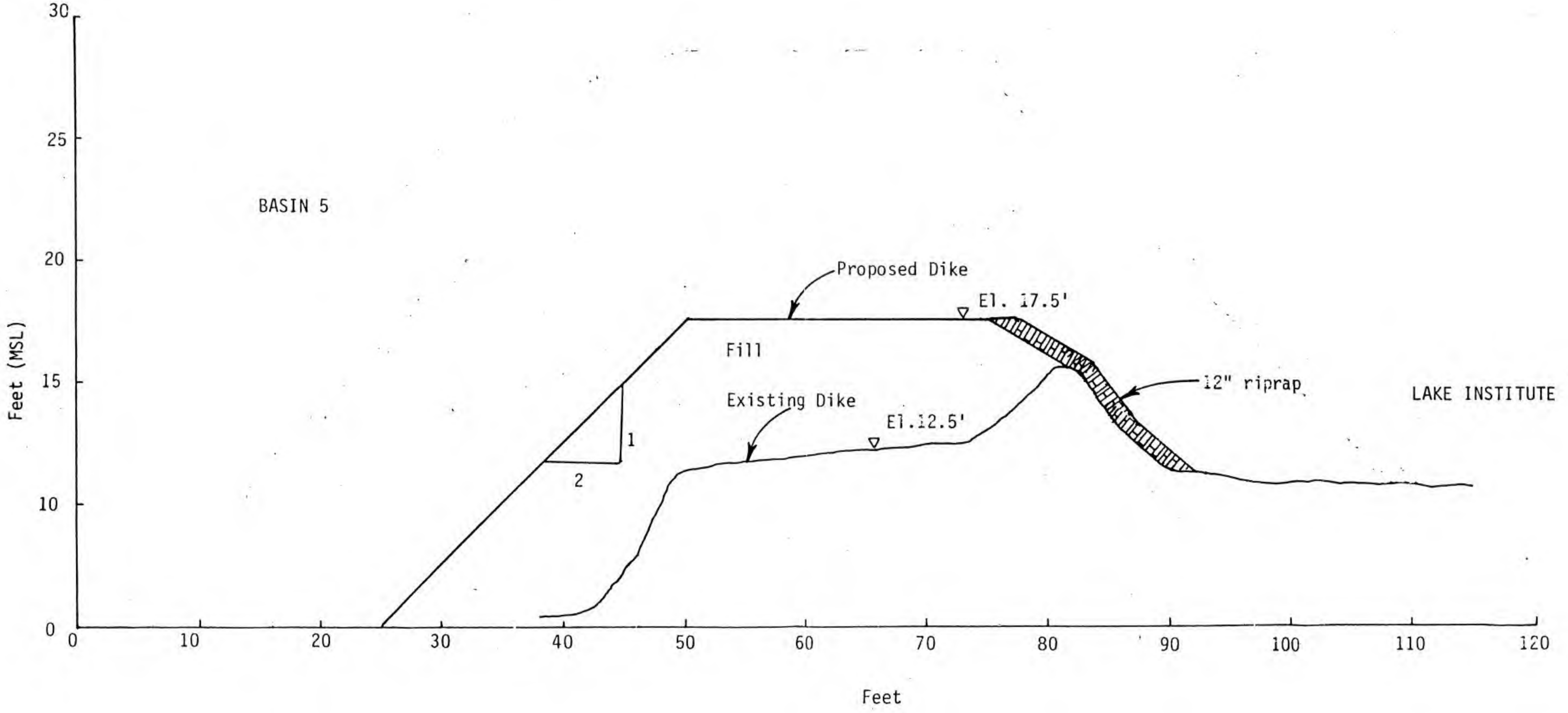
PROJECT:
TEST METHOD: D698 Method A
MOLD: 1/30 ft^3
HAMMER: 5.5 lb.
DROP: 12"
BLOWS: 25/layer
LAYERS: 3

SAMPLE: Mixed samples, 0-6'
DESCRIPTION:

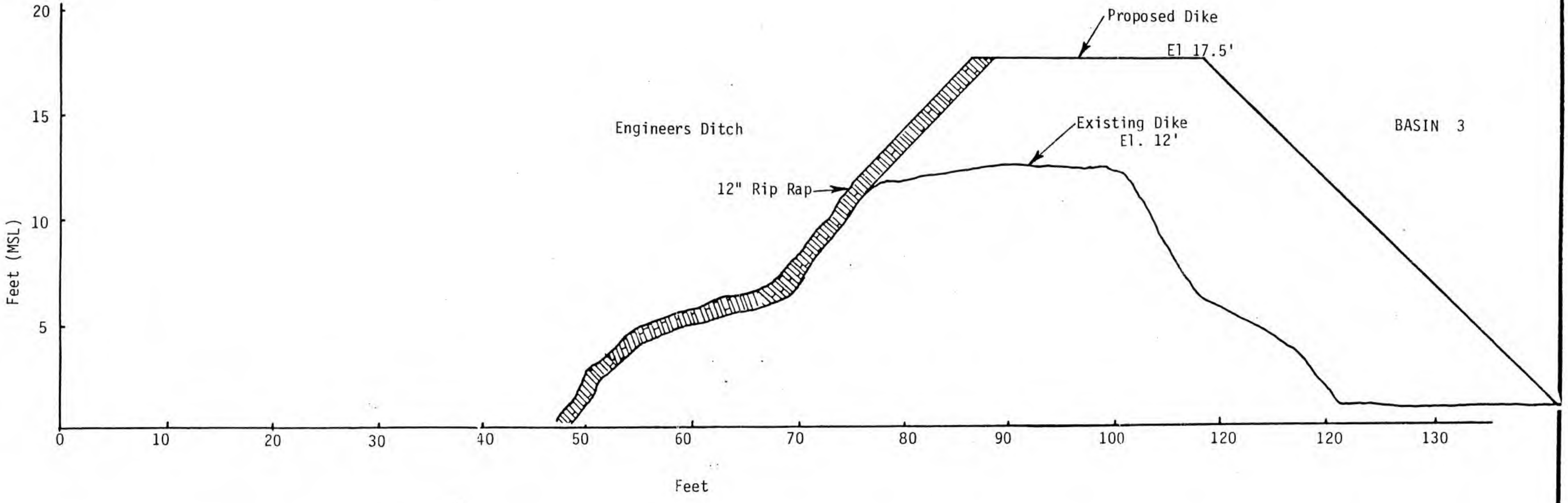
LIQUID LIMIT:
PLASTICITY INDEX:
OPTIMUM MOISTURE: 19.4 %
MAX. UNIT DRY WT: 102.8 **LBS./CU.FT.**



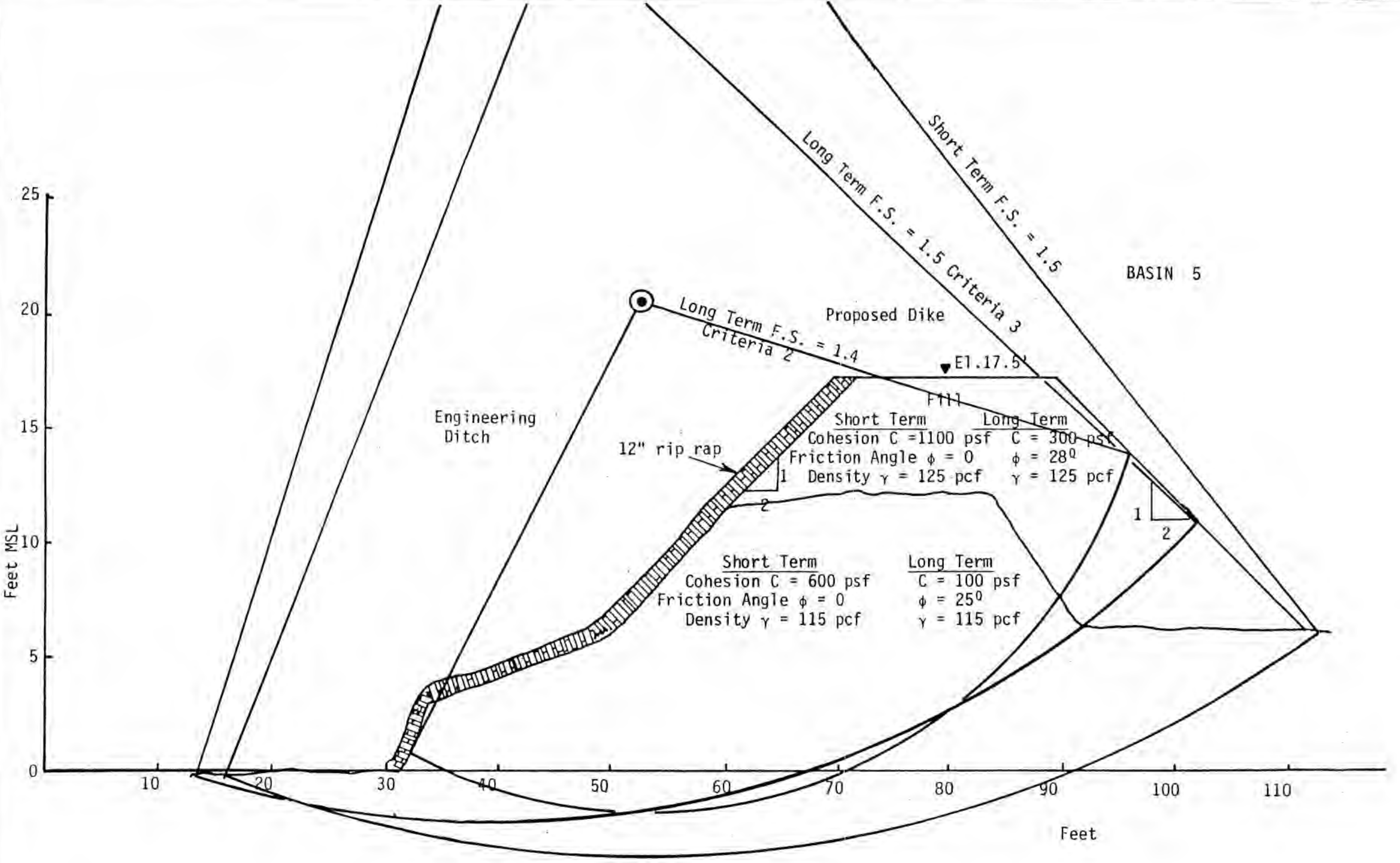
OPTIMUM MOISTURE TEST



SECTION 1-1
OPDA
EAST SIDE OF LAGOON 5



SECTION 11-11
OPDA
SOUTH SIDE OF LAGOON 3



SECTION 5-5
OPDA
SOUTH SIDE OF LAGOON 5

PLATE 16

APPENDIX B

DIKE DESIGN:

CROWN ELEVATION AND EROSIONAL CURRENTS

for

Professional Service Industries, Inc.
National Soil Services Division
1714 Memorial Drive
Houston, TX 77007
Dr. S. S. Bandy, P.E.

under contract to

Union Carbide Corporation
Solvents and Intermediates Division
P.O. Box 471 Texas City, TX 77590
Mr. Joe L. Sandel, P.E.
Mr. Alan Booth

Background

The Off Plant Disposal Area (OPDA) Basins No. 1, No. 3 and No. 5 lie just south of the Industrial Barge Canal in Texas City, Texas. Review of the Texas City Flood Insurance Rate Map Pond No. 485514 0050C published by the Federal Insurance Administration (FIA) indicates that these basins lie in Zone V19 (EL 14) of the 100-yr flood plain and are subject to wave action. The Base Flood Elevation includes the still-water, storm surge elevation plus the wave crest elevation above the National Geodetic Vertical Datum (i.e. the Mean Sea Level, MSL datum of 1929).

State of Texas regulations governing surface impoundments and hazardous waste management plans require certification. This report is part of the application for dike certification and presents an engineering analysis of the hydrodynamic forces and their effects at the site as a consequence of a 100-yr flood*.

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*The probability is 1% in any one year that hurricans strength conditions will create the designated Base Flood Elevations given on the FIA maps. The corresponding recurrence interval is 100 years.

Objectives

The specific objectives of this report are to:

1. Utilize existing information to develop design wave characteristics (height, period) and design water depths needed in dike design.
2. Determine and recommend and esign dike crown elevation.
3. Determine erosional current strengths and recommend type of slope protection.

Existing Information - Summary

The location of the OPDA Basins No. 1, No. 3 and No. 5 are shown in Fig. 1. The area lies just south and east of the Texas City, Texas - Hurricane Flood Protection dike and floodwall. This flood protection system was built in the 1960's by the U.S. Army, Corps of Engineers. It is instructive to review the storm surge, wave height, wave runup and design dike crown elevations as employed by the COE. In the 1970's a diked dredge spoil containment area was also constructed by the COE. Its location is roughly shown in Fig. 1 and acts to reduce wave heights generated by winds with a due easternly fetch.

Corps Design Memorandum

Hydrologic investigation are found in Corps, Galveston D.O. (1963)* for the Texas City, Texas flood mitigation project. Mention is made of a reported storm surge in Galveston Bay of over 15 feet above mean sea level and was believed to include some wave and wave runup effects.

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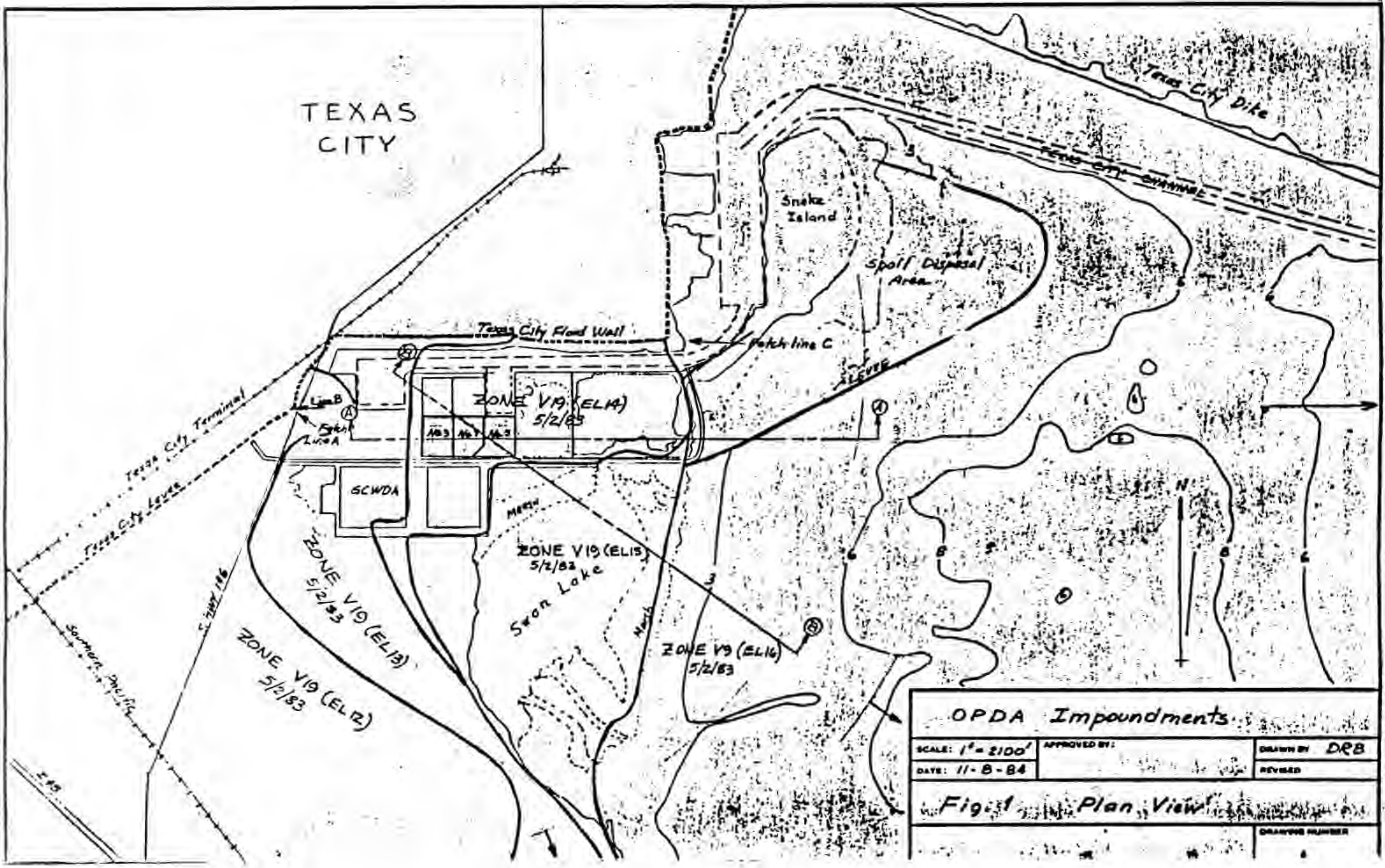
*See Appendix-I for list of references



OPDA Impoundments

SCALE: 1" = 2100'

DATE: 11-8-84

APPROVED BY:

DRAWN BY DRB

REVISED

Fig. 1 Plan View

DRAWING NUMBER

Records of storm tides at Galveston are available since 1847 and were employed in a storm tide frequency tabulation. The 100-yr recurrence level produced a 15.1 ft storm surge. U.S. Weather Bureau and the then Beach Erosion Board technical memorandum were also employed to develop a design hurricane that produced a storm surge (hypothetical) of 15.8 ft. at the 100-yr return period. A compromise hurricane tide of 15 ft. above mean sea level was adopted for design.

The most severe wind and wave conditions for the several reaches of the protecting levee and seawall structures were developed. The key fetch lines of interest are shown on Fig. 1 and results summarized in Table I.

TABLE I Wave Characteristics and Runup (Corps, Galv. D.O., 1963)

Fetch Line on Fig. 1 (1)	Applic. Sta. No. (2)	Winds Ave. Wind Vel. (mph) (3)	Winds Fetch Length (miles) (4)	Ave. Depth of Water (feet) (5)	Sign Wave Height H_S (feet) (6)	Runup of 1 on 6 Smooth Slope Runup Factor R/Ho (7)	Runup of 1 on 6 Smooth Slope Runup R (feet) (8)	Runup of 1 on 6 Smooth Slope Max. Elev. (feet) (9)	Design Dike Elev. msl (feet) (10)	Remarks (11)
A	560+00±	82	7.0	18.0	6.7	0.87	6.35	21.4	22	Applic.
B	560+00±	92	20.0	16.2	6.6	0.87	6.18	21.2	22	"
C	575+00±	93	10.5	21.5	8.0	0.87	7.57	22.6	22	Not Appli

The design crown elevation was equal to the maximum storm surge of the design hurricane, 15 ft. above MSL plus the estimated runup of the significant wave approaching from the most critical direction on a smooth 6H:1V dike slope. It was recognized that waves greater than the significant waves would over top the dike so that wave overtopping volumes were calculated and interior drainage plans included.

No erosional currents were estimated but all levee slopes were required to have grass turf on both sides for erosion protection. Levees located in the bay were also required to be riprapped "as may be required" uo to elevation 5 ft for protection against waves at normal periods.

Additional information on the levee design can be found in Corps, Galveston D.O. (1962), (1964).

Tetra Tech, Inc.

The Texas City, Texas Flood Insurance Rate maps were prepared for the Federal Insurance Administration (FIA) under the Federal Emergency Management Agency (FEMA) by Tetra Tech, Inc. Pasadena, California. For this purpose, the Coastal Flooding Storm Surge Model was employed which was originally developed for FEMA (Tetra Tech, Inc. 1980). As mentioned above, the elevations shown on the rate map include the still-water, storm surge elevation at the 100-yr return level (S*) plus the wave crest elevation (n_c).

To ascertain the storm surge still-water elevation, the engineers who conducted the computer simulations at Tetra Tech were contacted. It was determined from Tetra Tech's file reports that for the area of concern and at the grid scale of the computer model (T hautical mile) the still-water storm surge elevation at the 100-yr recurrence period (S*) was 11.5 ft. (S. Schluchter, personal comm., Nov. 1, 1984). Written confirmation of this value has bee requested at the time of this report.

Although an essential part of the computer simulation, velocity information was not available.

A copy of Tetra Tech's final report on their Texas City, Texas sutdy was requested from the Denton, Texas District Office of the FIA but was not available at the time of this report.

Union Carbide and Other Maps

A complete list of maps, charts and drawings employed is given in Appendix -II. Some care is needed whtn using the vertical elevations since not all bench marks are referenced to mean seal level datum. This is especially true with those maps by Price Engng. Inc. and S.I.P., Inc. for Union Carbide. The drawings made by D Engineers, Inc. (1984) are expressly for this project and were employed in this study since all vertical elevations have been referenced to mean sea level (J. Sandel, personal comm., Nov. 13, 1984).

Storm Surge Elevation - Design Value

The establishment of the still-water storm surge elevation at the 100-yr return period is a key aspect of dike design. The FEMA numerical model for estimating potential coastal flooding from hurricanes (Tetra Tech, Inc., 1980) is the accepted standard method. The accuracy is designed at the ± 0.5 ft. level. The FEMA model uses a large number of synthetic hurricanes and joint probability methods for the statistical distributions of the storm parameters. The methodology has recently been reviewed by a select panel of scientists for the National Research Council (national Academy of Sciences, 1983). Although some technical flaws were uncovered that have sense been corrected, the NAS report concluded that "...its overall approach is sound and within the present state of the art."

The corps of Engineers Design Memorandum (Corps, Galveston D.O., 1963) used a 15 ft level for design. Other surge predictions are available that also estimate higher elevations as discussed in Appendix - III. (Tetra Tech, Inc., date unknown). Because all these other methods may include wave action effects, and use inadequate record lengths or unknown methods for the prediction, it is concluded that the results of the FEMA model and joint probability method should be used for this study.

$$\boxed{\begin{aligned} S^* &= 11.5 \text{ feet above MSL} \\ &= \text{the still-water storm tide elevation at the site above local sea level datum for the 100-yr flood.} \end{aligned}} \qquad (1)$$

Local Water Depth - Design Value

For wave attack on the dikes, two critical fetch lines were considered. These are shown on Fig. 1 as sections A-A and B-B. Using the maps in Appendix -II. These cross-sections are shown in Fig. 2 with distorted vertical scale.

The most critical approach angle is across lower Galveston Bay from the southeast and over Swan Lake to attack the dike at the southeastern corner. From section B-B, the design local water depth at the dike toe, d_s is estimated as

$$\boxed{d_s = 10 \text{ ft}} \qquad (20)$$

Wave Characteristics - Design Values

The methodology to calculate wave action effects associated with coastal storm surges has been developed for FEMA by a NAS panel of scientists and coastal engineers (National Academy of Sciences, 1977). These methods are somewhat less rigorous than those proposed in the Shore Protection Manual (1984) of the Corps of Engineers but are consistent with the uncertainty involved in the basic data being used (i.e. topographic, bathymetic, and still-water height of surge and storm waters) to estimate the resulting wave height.

This basic equation adopted for base flood elevation is

$$z_W = S_* + 0.7\ H_*$$

where:

Z_W = the total 100-yr. base flood elevation at the site (this is the elevation appearing on the FIA flood rate maps)

and,

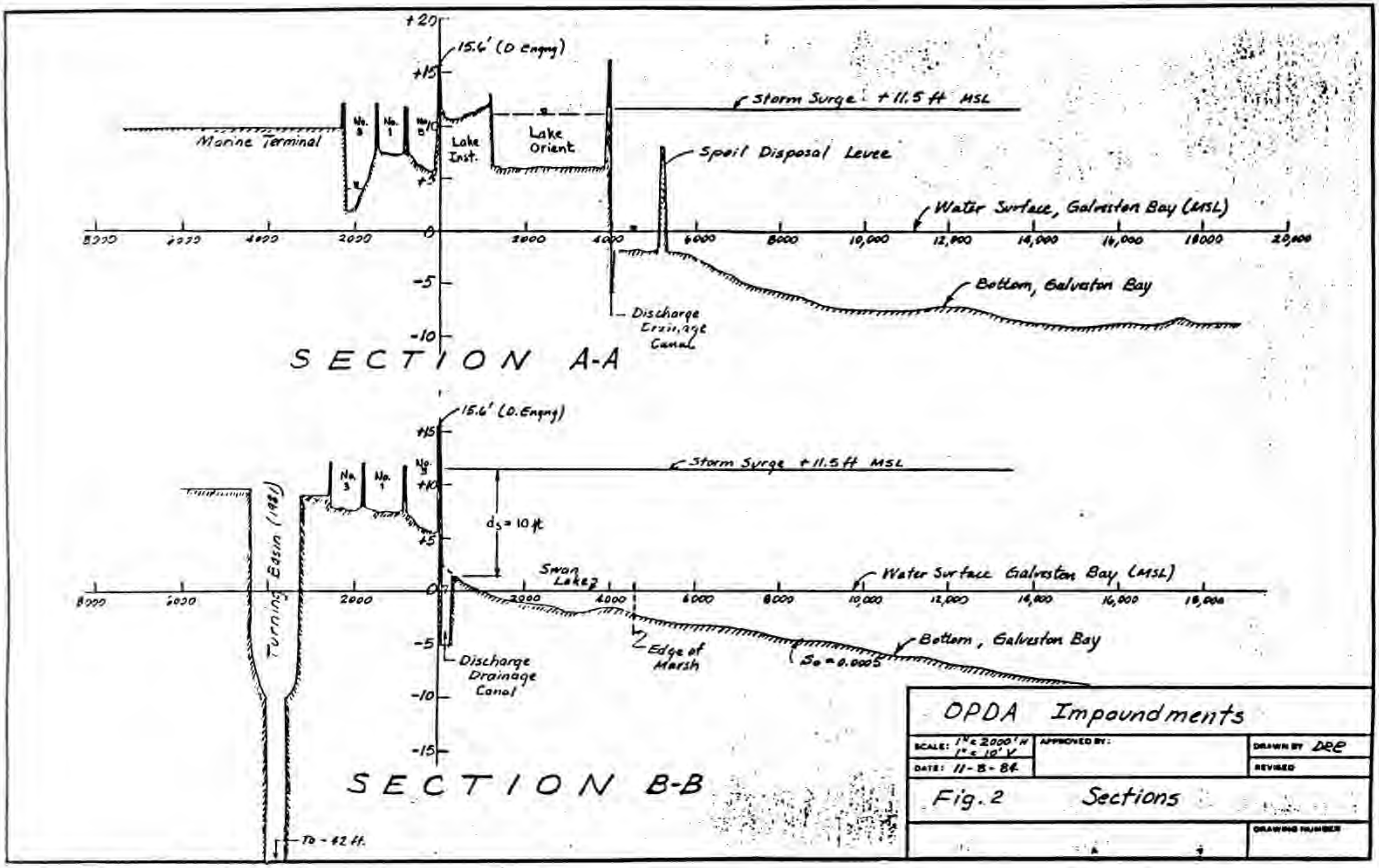
H_* = the wave height at the site

The method to calculate H_* takes into account effects of

(1) local storm surge for the n-yr water depths
(2) all types of stationary obstructions
(3) wind fetch distance, and
(4) wind fields from the n-yr storm event.

A number of fetch lines (transects) are employed to calculate the highest local wave height. Details for using the method are found in (FEMA, 1981b).

Using the results from the FEMA/FIA Insurance Rate Maps for Texas City - Texas and the panel in the study area gives the following results for wave height, H_*.



SECTION A-A

SECTION B-B

OPDA Impoundments

SCALE: 1" = 2000' H
1" = 10' V

APPROVED BY:

DRAWN BY DRE

DATE: 11-8-84

REVISED

Fig. 2 Sections

DRAWING NUMBER

TABLE II - Wave Heights, H_*

FEMA/FIA Base Flood Elev. (MSL) Z_w, ft	Design Still-water Storm Surge S_*,ft	Diff. ($0.7H_*$) ft.	Wave Heights H_*, ft	Remarks
15.	11.5	3.5	5.0	For applicable region see Fig. 1
14.	11.5	2.5	3.6	
13.	11.5	1.5	2.1	
12.	11.5	0.5	0.7	

Wave Height - Design Value

To make an independent analysis would require duplication of the efforts of the Tetra Tech study (Table II) and/or a completely separate analysis using wind fields associated with a 100-yr event and the SPM (1984). Such an extensive effort was felt unjustified in light of the acceptable, available data to calculate H_* in Table II.

In 1963, the Corps calculated significant wave height values of about 65. ft ± in the region (Table I). This was prior to the construction of the outlying spoil disposal dike which acts like a wave barrier. In addition, the water depths employed were much larger than those present from Eqn.(1) above.

Since the region with Z_w = 15 ft. is near the southeast corner of the proposed dike and in lieu of the above for design purposes:

$$\boxed{H_* = H_S = 5.0 \text{ ft.}} \qquad (3)$$

and this design wave is assumed to be the significant wave height with a 100 yr- recurrence interval at the site.

Wave Period - Design Value

Actual wind-induced waves represent a composite spectrum of waves of different periods and associated amplitudes. In (NAS, 1981b) the wave period is not considered explicitly.

From the Shore Protection Manual (1984) and the simplified wave prediction models, the wave periods range from 2.3 - 4.2 seconds for winds from 50 - 100 mph in water depths from 5 - 20 feet. The average water depth, d along section B-B is:

d = storm surge depth + Galveston Bay average depth
$d = 11.5\text{ ft} + 6.5\text{ ft } (\underline{+})$
$d = 18\text{ ft.}$

and the fetch distance along Section B-B is approximately $x = 3_{*}10^4$ ft. For design purposes, with d = 18 ft gives:

$$T = 3\text{-}4 \text{ seconds} \qquad (4)$$
$$= \text{the design wave period(s)}$$

Deep Water Wave Height - Design Value

Assuming shallow water wave theory applicable* so that the wave celerity, c

$$c \simeq \sqrt{g\ (d+n)} \ = \ \frac{L}{T}$$

gives an average wave length, L for 3-4 second waves of about 90 ft. Hence:

$$d/l \simeq 18/90 = 0.2$$

---

*When $d/L_o = \frac{2\pi d}{T^2} = \frac{2\pi(10)}{32.17(4)^2} = 0.122$, $H/H_o' = 0.91\underline{7}$, $H_o' = 5.45$ ft checks okay.

From the SPM (1984) wave tables, this gives

$$d/L_o = 0.170$$

and $$H/H_o' = 0.913$$

hence $$H_o' = 5.0/0.913 \doteq 5.45 \text{ ft.}$$

For design purposes use:

$$\boxed{\begin{aligned} H_o' &= 5.45 \text{ ft} \\ &= \text{the significant, deep water wave height} \end{aligned}} \qquad (5)$$

Summary - Obsective No. 1

$$\boxed{\begin{aligned} S_* &= 11.5 \text{ ft} \\ d_s &= 10 \text{ ft} \\ H_s &= 5.0 \text{ ft} \\ H_o' &= 5.45 \text{ ft} \\ T &= 3\text{-}4 \text{ sec} \end{aligned}} \qquad (6)$$

Dike Crown Elevation - Design Recommendation

The dike crown elevation depends on the storm surge, still-water elevation plus the wave runup plus the required freeboard as schematically depicted in Fig. 3. The Shore Protection Manual (1984)

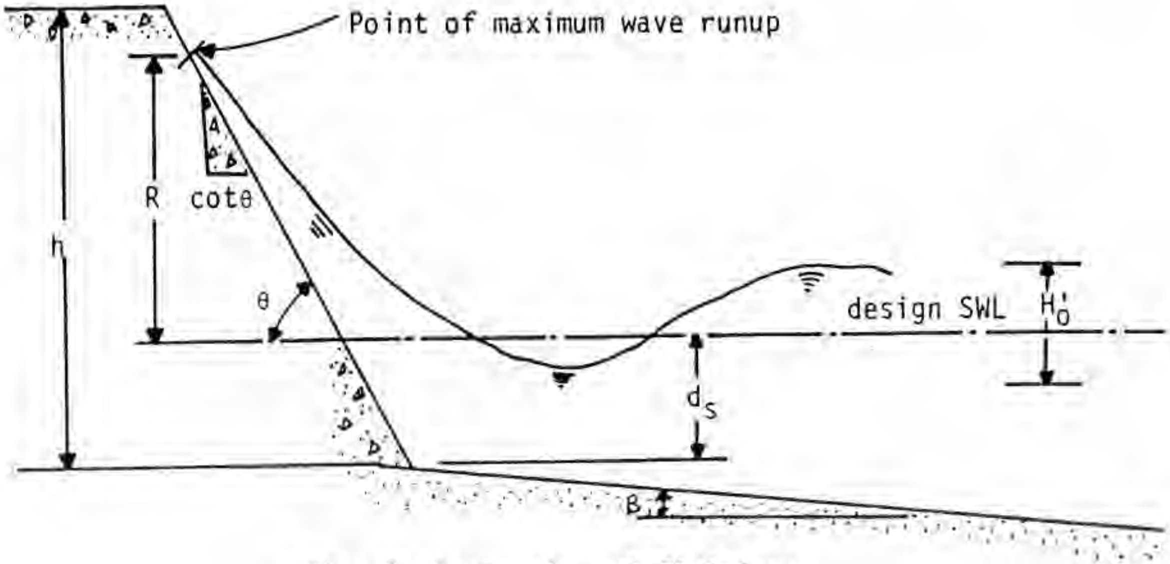


Fig. 3 Schematic - Definitions

procedures and design curves are employed to determine wave runup, R.

Wave Runup - Regular (Monochromatic) Waves

Wave runup is strongly dependent on dike slope (1/cotθ) and experimentally determined values normalized as R/H_0' using the deep water significant wave height, H_0'.

Results are plotted against the ratio

$$\frac{H_0'}{gT^2} = 0.0188 \ (T = 3 \text{ sec})$$

$$= 0.0106 \ (T = 4 \text{ sec})$$

and the latter value governs since it gives the largest R values.

1. Smooth, Impermeable Slopes

Table III - Wave Runup on Smooth Slopes

	$ds/H_0' = 2.0$ (Fig. 7-11)			$ds/H_0' = 0.8$ (Fig. 7-10)			
$C_0+\theta$	R/H_0'	R ft	Fig.7-13 R corrected, ft. (K correction)	R/H_0'	R ft	Fig. 7-13 R,corrected, ft. (K,correction)	Remarks
1.5	2.0	10.9	12.6(1.16)	1.85	10.1	11.7(1.16)	Smooth Slopes
2.0	1.7	9.3	10.7(1.15)	1.5	8.2	9.4(1.15)	
2.5	1.4	7.6	8.6(1.13)	1.35	7.4	8.4(1.13)	
3.0	1.2	6.5	7.3(1.12)	1.15	6.3	7.1(1.12)	
5.0	0.74	4.03	4.3(1.07)	0.65	3.5	3.8(1.07)	

For our case

$$\frac{ds}{H_0'} = \frac{10}{5.45} = 1.83$$

So that linear interpolation gives

Table IV - Interpolated Values - Smooth

COT θ	R ft
1.5	12.4
2.0	10.4
2.5	8.6
3.0	7.3
5.0	4.2

Smooth Slopes

2. Roughened, Riprap Slopes

Riprap on slopes greatly roughens the surface to dissipate wave energy and significantly reduces the maximum runup. Hydraulic model studies have not been conducted but Fig. 7-15 is recommended to estimate the percent reduction of runup resulting from adding riprap.

From Fig. 7-15 (p. 7-26) for wave runup on impermeable, quarrystone (rip rap) entering with $H_o'/gT^2 = 0.0106$ for $ds/H_o' = 1.83$ gives when $COT\theta = 1.5$.

$$(R/H_o')_{riprap} = 0.7$$

From the above interpolated value

$$(R/H_o')_{smooth} = 2.0$$

The reduction in runup in general is therefore

$$\frac{(R/H_o')_{riprap}}{(R/H_o')_{smooth}} = \frac{0.7}{2.0} = 0.35$$

This gives

Table V - Interpolated Values - Roughened

$COT\theta$	$R_{2.0}$	$R_{0.8}$	R,H (d/H_o'=1.83)
1.5	4.4	4.1	4.4
2.0	3.7	3.3	3.7
2.5	3.0	2.9	3.0
3.0	2.6	2.5	2.6
5.0	1.5	1.3	1.5

Roughened Slopes

Wave Runup - Irregular Waves

Limited information is presently available for predicting the runup of irregular, spectrums of wind - generated waves on structure slopes. The SPM (1984) assumes a Rayleigh distribution relationship between wave runup, R_p for an arbitrary probability and R_s for the wave runup with the significant wave height. Hence, from Fig. 7-23

$$\frac{R_{0.1}}{R_S} = 1.07 \qquad (7)$$

and

$$\frac{R_{0.01}}{R_S} = 1.52$$

where $R_{0.1}$ = the wave runup for the wave height $H_{0.1}$ with a 10% exceeded frequency.

$R_{0.01}$ = the wave runup for the wave height $H_{0.01}$ with a 10% exceedence frequency.

for example, if $H_S = H_{1/3} = 5.0$ ft., then $H_{0.01} = 1.52\ (5.0)$

$$H_{0.01} = 7.6 \text{ ft.}$$

and since $d_s = 10$ ft.,

$$\gamma = \frac{7.6 \text{ ft}}{10 \text{ ft}} = 0.76$$

and obviously this very high wave is very near the limiting wave height/ depth ratio at wave breaking for solitary waves, $\gamma_b = 0.78$. Hence, the wave breaking criteria also limits the highest possible wave at the site.

The values in Tables IV and V are R_S or significant runup values and $R_{0.1}$ and $R_{0.01}$ values can be readily computed from Egn(s) 7.

Dike Crown Elevations (DCEL)

The dike crown elevation (DCEL) is equal to the sum of the storm surge elevation above mean sea level plus the estimated wave runup plus the minimum free board allowable.

The Texas Department Water Resources guidelines for Surface Impoundments recommends (TDWR, 1984, p.20)

$$\boxed{\text{Freeboard} = 2 \text{ ft minimum at all times}} \qquad (8)$$

therefore

$$\boxed{DCEL = 11.5\ R + 2.0} \qquad (9)$$

or $DCEL = 13.5 + R$

Using the R values in Tables IV and V and Eqns (7) and (9) gives the results shown in Fig. 4 for dike crown elevations at a wide range of wave probabilities and dike slopes.

The Corps of Engineers, Texas City dike in this area has a 6:1 slope and is at DCEL = 22 ft above MSL. Its design is based on the significant wave height and wave overtopping is permitted. The surface is a grassy, smooth slope.

Wave Overtopping

The goal is to prevent dike overtopping resulting from normal or abnormal operations, overfilling, wind and wave action; rainfall, runon, etc. (TDWR, 1984).

Design Philosophy

The design wave probability is selected at 0.1 to reduce the chance for wave overtopping. To use the 0.01 or 1% highest wave was felt to be over designed in lieu of the freeboard requirement. However, in all cases the runup elevation at the 0.01 probability level must still be below the 0.1 crown elevation to prevent wave overtopping.

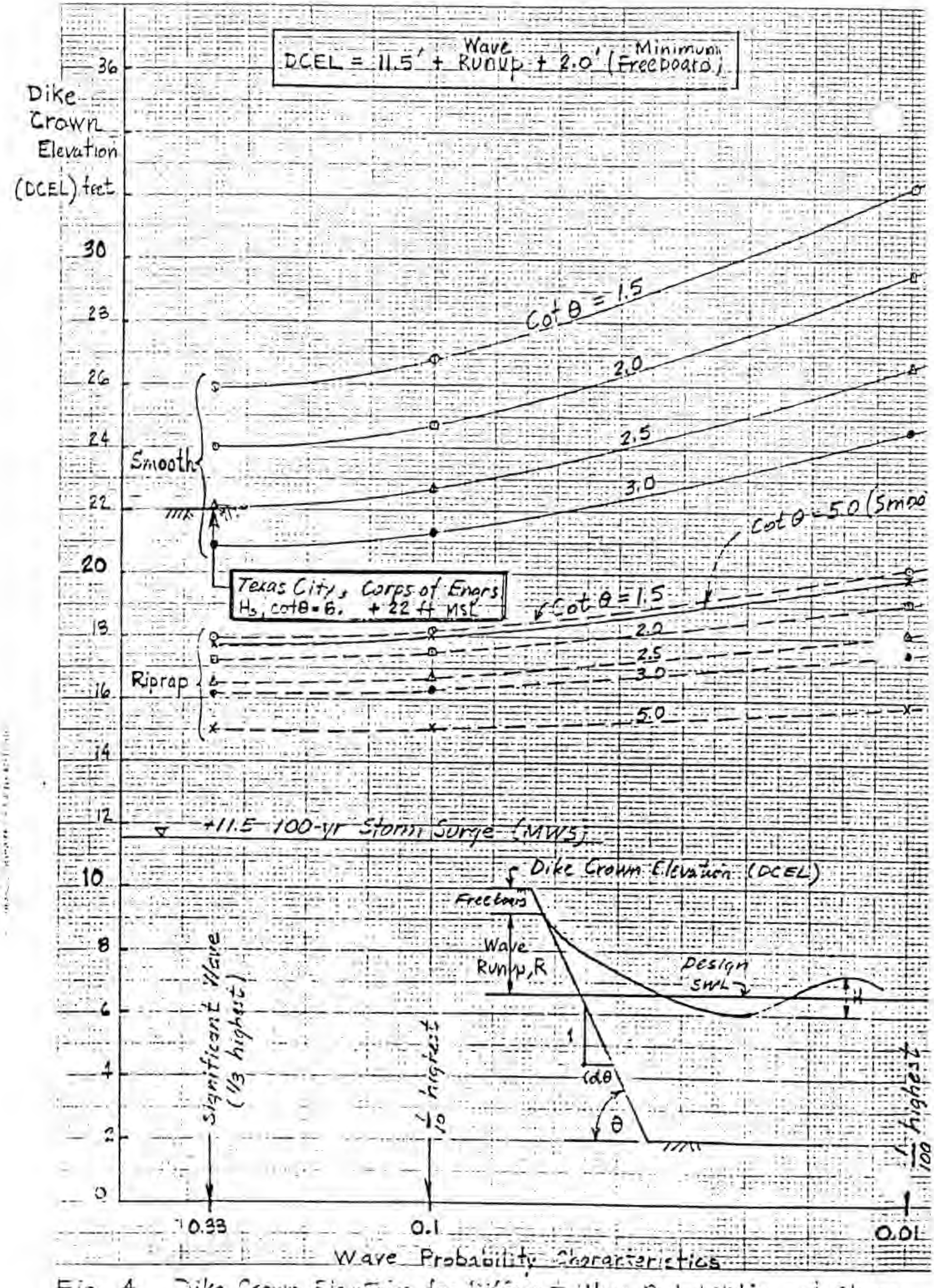


Fig. 4 Dike Crown Elevations for Different Wave Probabilities and Slopes

-1

For example, consider the case with COTθ = 2.

a) Roughened slope

$$DCEL_{0.1} = 17.5 \text{ ft (MSL)}$$

yet the elevation of runup at the 0.01 level

$$REL_{0.01} = 17.1 \text{ ft.}$$

so that 0.4 ft freeboard remains

whereas,

b) Smooth slope

$$DCEL_{0.1} = 24.7$$

$$REL_{0.01} = 27.5$$

so that an additional 2.8 ft (minimum) is needed to prevent overtopping.

In short

$$\boxed{\begin{array}{l} DCEL_{0.1} = 11.5 + R_{0.1} + 2.0 \\ REL_{0.01} \le DCEL_{0.1} \end{array}} \qquad (10)$$

Dike Crown Elevation - Recommended Design

The selection of the design dike crown elevation involves criteria other than hydraulic. These other criteria may include but are not limited to such items as structural stability during construction or final dike slope stability and consolidation of the foundation and dike materials.

Riprap on the slope significantly decreases the maximum runup. Based upon the methods described above and due to the significant increase in required dike elevation for smooth slopes, it is recommended that a ripraped dike be used.

Recommended Design - Objective No. 2

Dike Slope COTθ	Maximum Dike Crown El. DCEL, Ft (MSL)	Dike Surface
1.5	18.2	Riprap
2.0	17.5	Riprap
2.5	16.7	Riprap

The critical wave attack zone is on the southeast corner which is directly exposed to hurricane generated wind waves over the 5-6 mile fetch in lower Galveston Bay and over the deepest approach water depths, 10-15 ft.

Waves coming from other directions will be smaller due to a number of factors such as shorter fetch distances or frontal land barriers that cause bottom firction or wave breaking. This means that not all sides of the proposed dike may need riprap protection. A detailed analysis of the extent of riprap protection around the four sides was beyond the intended scope of the present study. Such an analysis is possible and could demonstrate a considerable savings in the amount of riprap material needed for construction.

Erosional Currents

Local velocities during the design storm are difficult to determine. The numerical storm surge model gives depth averaged mean components over one nautical mile square grids. This information was not available for this study (although stored in the Tetra Tech data base). It could serve as boundary data for a refined grid model (physical or numerical).

As an alternate approach, a maximum local drainage velocity near the dike was estimated as follows:

From Fig. 1 and other maps, the major directions of flow out of region of interest were determined. This drainage takes place after the storm surge peaks and can produce the maximum rate of water surface change, $(\Delta h/\Delta t)$.

The shortest and most direct route is almost due East toward the Galveston Inlet. Some water also leaves Galveston Bay through the narrower Galveston Channel in a southeasternly direction. Finally, a small amount could also slowly drain out to West Galveston Bay (San Luis Pass). This pattern is typical of flow in a rapid expansion which would also develop a backflow out of the southwest into the region of interest. This assummed pattern is sketched in Fig. 5.

The darkened area in Fig. 5 is assummed to rise uniformly and has a surface area, A_{surf}

$$A_{surface} = 23,125,000\ ft^2$$

The average water depth, d_{ave} in this area is estimated as

$$d_{ave} = 5.0\ ft.$$

The maximum water surface rise rate, $(\Delta h/\Delta t)$ max is estimated from Appendix - III (Fig. 2A) which was the verification study

$$(\frac{\Delta h}{\Delta t}) = 4\ ft/hour$$

The total volumetric flowrate, $Q_{max} = (\frac{\Delta h}{\Delta t})_{max} \cdot A_{surface}$

$$= 4 \cdot 23,125,000$$

$$Q = 25,700\ ft^3/sec$$

The mean exit velocity, $\overline{V}$ is taken at the critical cross-sectional area (Section I-I in fig. 5). The width, W here is 1900 ft.

For the following water depths we obtain

Water Depth Ft.	Area ft^2	$\nabla = Q/A$ ft/sec	Remarks
7.0 (deep)	13,000	1.9	All appear
5.0 (med.)	9,500	2.7	reasonable.
3.0 (shallow)	5,700	4.5	

Erosional Currents - Objective No. 3

There will be no significant erosional currents during the rise or fall of the storm surge between the diked area and the Texas City Flood Wall. Model studies are not required.

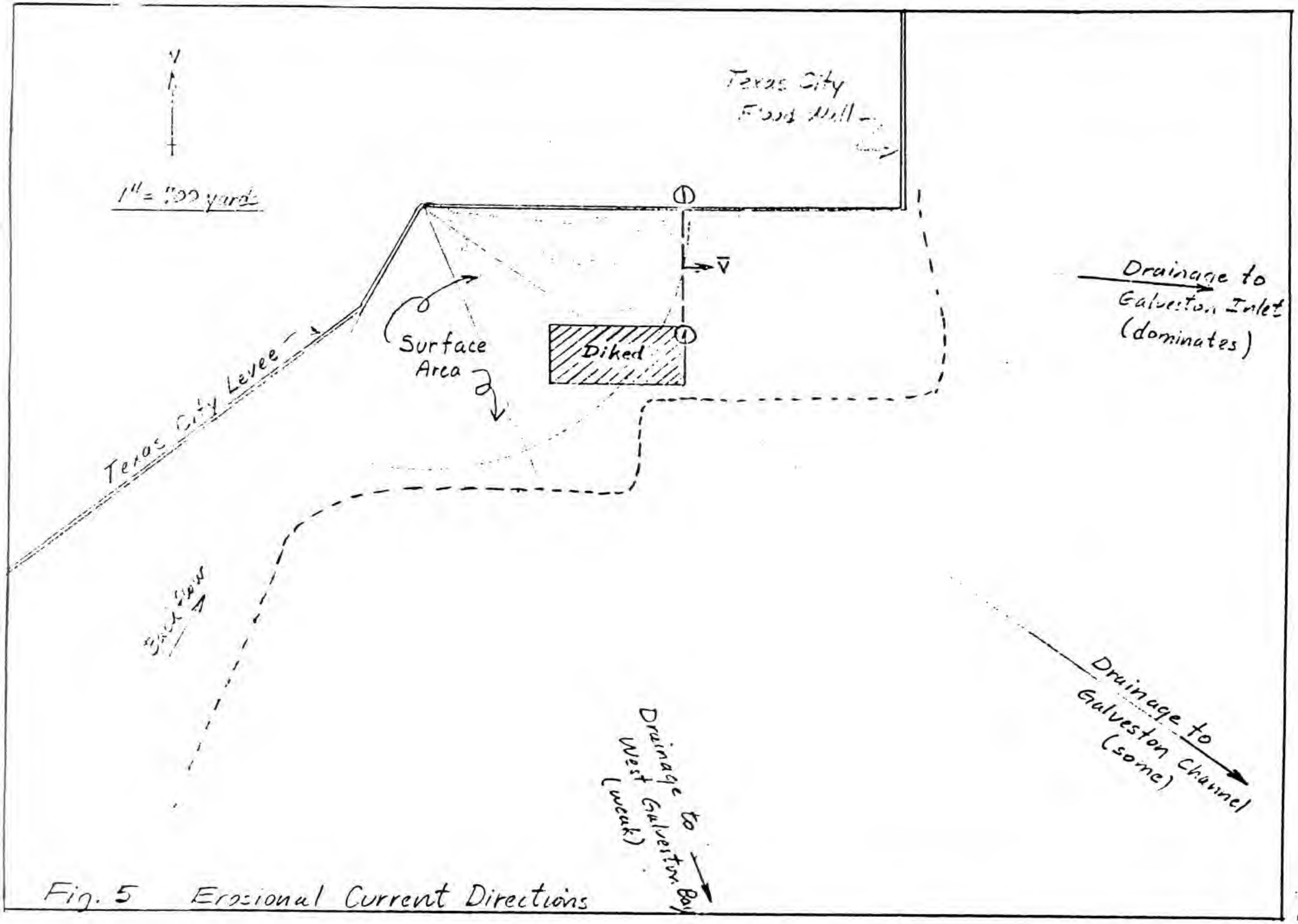


Fig. 5 Erosional Current Directions

APPENDIX - I List of References

Corps, Galveston D.O., 1963 "Texas City, Texas - Hurricane-Flood Protection", Design Memo No. 1 - Hydrology, August (revised).

Corps, Galveston D.O., 1964 "Texas City, Texas Hurricane - Flood Protection", Design Memo No. 12 - Levee and Wall Texas City Docks to HWY Loop 197, December.

Corps, Galveston D.O., 1962 "Texas City, Texas Hurricane - Flood Protection, Design Memo No. 3 - General Design, May.

FEMA, 1981a "Users Manual for Wave Height Analysis", prepared for Federal Insurance Administration, Feb. (revised).

FEMA, 1981b "Floodplain Management: Ways of Estimating Wave Heights in Coastal High Hazard Areas in the Atlantic and Gulf Coast Regions", TD-3, April.

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National Academy of Sciences, 1983 "Evaluation of the FEMA Model for Estimating Potential Coastal Flooding From Hurricanes and Its Application to Lee County, Florida", prepared for the NRC.

Sandel, J., 1984 personal communication, Nov. 13 (U.C., Texas City, engineering)

Schluchter, S., 1984 personal communications, Oct. 24, Nov. 1 (Tetra Tech, engineering)

Shore Protection Manual, 1984, Volume II, U.S. Army, Corps of Engineering, CERC (Wash. D.C.)

TDWR, 1984 "Waste Containment Design Guidelines", Texas Dept. Water Resources, No. 0376, Section E, p.20

Tetra Tech, Inc., 1980 "Coastal Flooding Storm Surge MOdel", Part 1 - Methodology; Part 2 - Users Manual; Part 3 - Codes, for FEMA, November.

Tetra Tech, Inc., 1983 "Galveston Bay Storm Surge Predictions: Response to FEMA Comments", prepared for FEMA, January.

APPENDIX - II List of Maps

Union Carbide

1. MAA 569 Index No. 515 GS00 1.1 Scale 1" = 300', no date, showing location of waste disposal basins.
2. 1075207 Plan and Sections for Property Improvement
3. DWG No. 739099 By S.I.P., Inc., Houston, #7 Dock and General Site Expansion (June 1975)
4. DWG No. 741271 by Price Engineering, Houston, Lake Institute
   Part 1 - Plot Plan (Oct. 1976)
   Part 2 - Sections (Oct. 1976)

Corps of Engineers, Galveston D.O.

1. Prelim. Dwg., Dredging, Texas City Turning Basin and Industrial Canal, Plan & Sections (Aug. 1978) shows new hydraulically constructed levee.
2. Final Plan Dwgs., Texas City, Hurricane Flood Protection Concrete Floodwall Sta. 504+99 - Sta. 538+55 (may 1973)

D Engineers, Inc.

1. Lake Institute, Field Traverse and Point Layout, 1" = 100' (1-26-84)
2. OPDA, Cross-sections of levees at lagoons 1 through 5, Field Data, 1" = 100' (10-15-85 rev.)
3. OPDA, Levee Cross Sections (10-12-84) 2 sheets.

USGS

1. Houston, Texas 1:250,000 (1965)
2. Virginia Point, Texas 1:24000 (1954) 5 ft contour

NOAA

Galveston Bay Entrance, Galveston and Texas City Harbors, No. 11324, 1125,000, soundings in feet at MLLW (Jan. 1984).

FEMA/FIA

Texas City, Texas Flood Insurance Rate Map - Panel No. 485514 0050C, (date unknown).

Appendix-III.
BASCO

Galveston Bay Storm Surge Predictions:
Response to FEMA Comments
January 1983

BACKGROUND

In 1978 Tetra Tech was awarded a contract to study Galveston and Chambers Counties in Texas. The surge model was set up, and calibrated and verified using tide gauge and highwater mark data for these two counties and for the Galveston Bay area. Surge simulations for the determination of flood frequencies in Galveston Bay were performed at that time. Later, under a contract modification, Tetra Tech was to supply flood elevations for the Harris County portion of Galveston Bay, based on simulations that had already been performed. The results of the surge simulations in the Harris County area of Galveston Bay were reviewed and judged to be appropriate. Flood elevations in some of the sloughs and bayous of Harris County were determined through the use of the one-dimensional surge model.

CALIBRATION/VERIFICATION OF MODEL

In the surge model verification/calibration procedure for the Galveston Bay Study, the highest priority was assigned to match surge histories obtained from recording tide gages. After the predicted surge histories were matched with tide gage records, high water marks were compared with predicted peak surge values. For the Galveston Bay surge study, both tide gage records and high water marks for Hurricane Carla (U.S. Army Corps of Engineers, 1962) were used for calibration and verification.

Tide Gage Records

The surge model was verified using records from the 6 recording gages in the Galveston Bay area (Figure 1). A comparison of observed versus predicted peak elevations is presented in Table 1. A typical comparison of observed and predicted surge histories is shown in Figure 2. As shown in Table 1, the average percent difference between the observed and predicted maximum surge values is nearly zero.

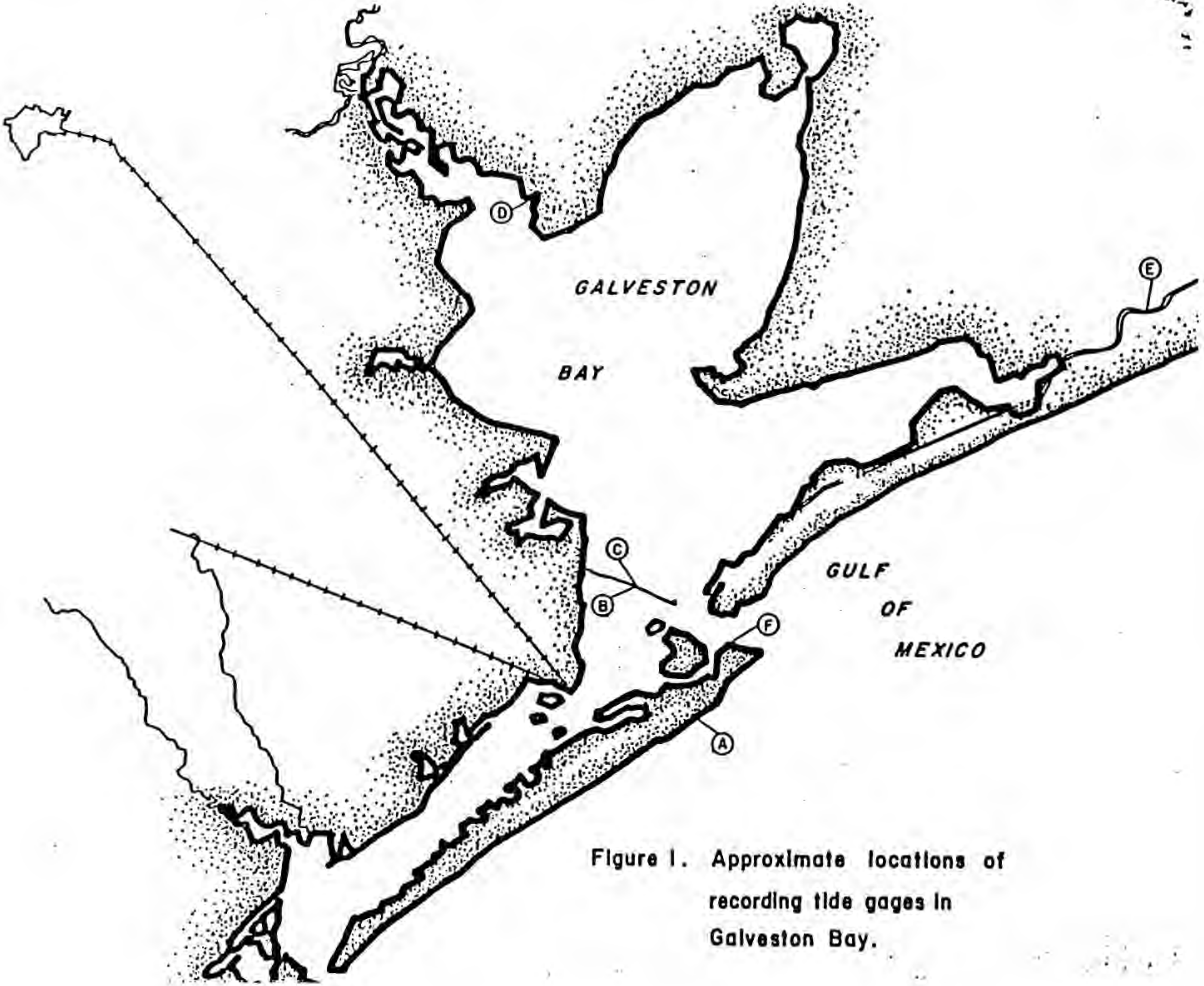

Figure I. Approximate locations of recording tide gages in Galveston Bay.

Table 1
Comparison of Predicted and Observed Maximum Surge Elevations at Sites with Recording Tide Gages

Location	Map Location	Maximum Elevation		Percent Difference
		Observed	Predicted	
Pleasure Pier, Galveston, Texas	A	9.3	9.0	-3.2%
Texas City Dike - South	B	9.5	9.7	+2.1%
Texas City Dike - North	C	9.7	9.7	0.0%
Humble Docks, Baytown, Texas	D	13.6	12.5	-8.1%
Mud Bayou Bridge, High Island, Texas	E	8.9	9.5	+6.7%
Fort Point, Galveston, Texas	F	9.0	9.1	+1.1%
		Average Percent Difference		-0.2%

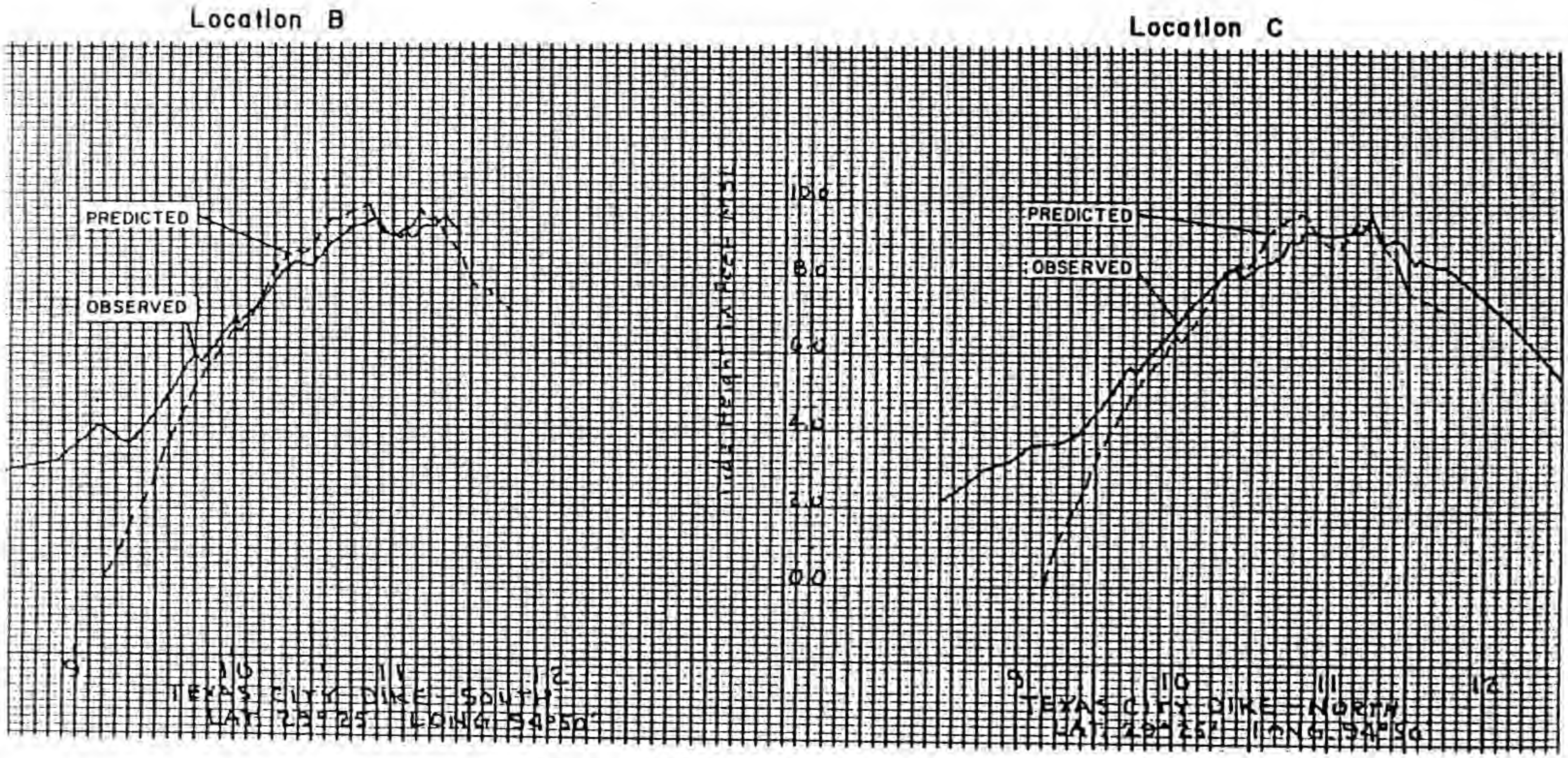

Figure 2. Comparison of observed and predicted surge histories, Texas City Dike, map locations B and C. See U.S. Army Corps of Engineers (1962).

During the calibration process, adjustments were made to the friction factors used in the numerical model in an attempt to match tide gauge records. However, it must be realized that the idealized wind field incorporated into the numerical model is based on synoptic records, and may not adequately represent the actual wind field at all points in the study area. Also, the storm tracks are not precisely known. Hence, adjustments to coefficients may produce an apparent agreement for a particular storm which is not generally applicable. Therefore, it is never possible to achieve exact agreement between the gage records and predicted surge histories.

High Water Marks

After completing the calibration/verification procedure described in the previous paragraphs, peak surge elevations were compared with observed high water marks. For the purposes of this study, high water marks include tidal crest gage readings and driftline elevations as well as marks observed on trees and buildings. While some marks agreed with the predicted surge values, others were on the order of two feet higher than predicted values. After a careful review of the high water marks, it was decided that it would not be reasonable to match predicted surge elevations with high water marks for the following reasons:

1. Elevations of high water marks are very variable. Since the duration of high surge for Hurricane Carla was about a day, such large variable over short distances are not expected. Locations which have two or more conflicting high water marks in close proximity include:

    - Clear Lake: 10.4' and 14.2'
    - Dickinson Bay: 11.4' and 13.6'
    - Turtle Bay: 12.4' and 13.4'

    Each of these water bodies are small bays located off of the larger Galveston Bay.

2. The elevations of highwater marks in the Harris County region (northwest Galveston Bay) vary from 11.5 feet to 16.4 feet, compared to predicted surge values which range from 11 to 13 feet. The highest elevations (15 feet and 16.4 feet) were observed on the shoreline of the Bay. During this hurricane, the predominant wind direction was from the southeast, with wind velocity exceeding 50 mph for a duration of over 24 hours. The wave activity and small scale topographic effects might have contributed to these high elevations. The computer model estimates the storm surge behavior and does not include the added effects associated with much finer-scale wave phenomena. Highwater marks, even those found in buildings, will have some wave influence. Therefore, while most highwater marks were matched, it was recognized that some inaccuracies exist in the data and no attempt was made to match all highwater marks.

3. When wave height calculations are added to predicted stillwater surge levels for Hurricane Carla, the combined elevations are substantially higher than the surge levels alone. The 100-year flood elevations, including wave height, for Harris County range from 13 to 19 feet, compared to the stillwater elevations of 11 to 13 feet. Thus, the observed highwater marks (11.5 to 16.4 feet) are bracketed by the stillwater and the combined stillwater/wave height elevation calculations.

After considering these points, it was decided not to attempt to further adjust input parameters to match predicted surge elevations with high water marks. Instead, high water marks are bracketed by surge predictions and surge plus wave height calculations.

The commonly used lakewind model was used for the Galveston Bay study to adjust wind speeds as a storm moves inland. At the time, the lakewind model was believed the best available method. Since then, more detailed wind reduction schemes have become available, and are being used in the studies in North Carolina, and Flagler and St. Johns Counties in Florida. Had these methods been available for the Galveston Bay study, it is possible that higher surge values could have been produced in Harris County.

HISTORICAL DATA

The reliability of the records for the hurricanes of 1900 and 1915 are in question. The surge model was not verified with these events. However, these storms were included in the statistical analyses of storm parameters.

Statistically, it is possible for two or more rare events to occur over a relatively short time interval or even within the same year. For example, during 1979 in Galveston County, a record breaking storm occurred in July (tropical storm Claudette) which brought rain that exceeded the 500-year event. Later in September of that same year, rainfall in excess of the 100-year event occurred.

Available records show that in 1900 and 1915 storms produced surges in the Harris County area higher than 16 feet. The accuracy of these data are in question. First, a different reference datum might have been used when siting these elevations. Second, it is not clear whether these records include wave height, but it is likely that they do. Since complete records of these storms are not available, computer model verification of the 1900 and 1915 storms is not feasible.

According to the report "Hurricane Surge Frequency Estimated for the Gulf Coast of Texas" (T.M. 26), the estimated returned intervals for 1900, 1915, and 1961 hurricanes are 280 years, 8 years, and 289 years, respectively. The 1915 hurricane has a return rate of every 8 years, yet, it brought as much flood as the 1900 and 1961 hurricanes did. As you can see, surge return estimate did not directly associate with those of the storm. In addition to the hurricane strength, the storm track also governs the surge elevations for any particular location. Therefore, in our opinion, it is not proper to assign any probability to a hurricane.

DISPARITY WITH EXISTING STUDIES

Two other sources of surge predictions are available, the U.S. Army Corps of Engineers and the National Weather Service. Both sources are useful for order-of-magnitude estimates where detailed studies have not been performed. Tetra Tech believes that the FEMA joint probability methodology provides more detailed and accurate surge predictions.

While we do not have detailed information relating to the National Weather Service predictions, Mr. Fry of Dewberry and Davis has suggested:

> "The National Weather Service predicts an extreme storm with tides in excess of fifteen feet will occur about once each twenty-five years somewhere on the Upper Texas Coast (Public Affairs Comment, The University of Texas at Austin, August 1981). Even though this prediction includes the effects of tides, this would still be a substantially lower recurrence interval for the same surge elevation when compared to your results."

This suggests that if 15' occurs once every 25 years somewhere on the coast, then at a particular site the recurrence rate for 15' elevations will be much longer than 25 years, perhaps greater than 100 years.

In T.M. 26, existing records were used to estimate the long term recurrence intervals for surge, while the joint probability method was used in Tetra Tech study. In T.M. 26, the elevations are based on an analysis of tide gage data for the open coast with a linear extrapolation to Baytown in Harris County. The extrapolation is based on a numerical simulation for one storm only.

The open coast procedure in T.M. 26 works well if two basic conditions are satisfied: a) the length of record is adequate, and b) the statistical distribution of the flood levels is known. These conditions are rarely satisfied for major floods. Estimates of the 100-year flood from about 50 years of record will yield a very wide degree of uncertainty in the results. Hence, this technique is deemed inadequate due to the paucity of historical data available to establish reliable statistics for any given location. It can be shown (Appendix B, Coastal Flooding Handbook, Part I) that statistical fluctuations subject an estimate of surge heights from a limited sample (of tide gauge records, say) to an intolerable uncertainty. For the numerical example of Appendix B, the uncertainty occurs primarily as a vulnerability to a large overestimate.

The following conclusions are quoted directly from Section VI, Conclusion of the T.M. 26 report:

> "The hurricane and surge frequency estimates presented, although considered adequate for the present, are subject to extensive improvement upon availability of additional events. A reasonable degree of conservatism has been employed throughout the analysis to account for limited insight of the probable frequencies. The Texas open-coast surge frequencies are considered more reliable than those in estuaries because more surge records were available for deriving the surge frequency relationships."

Furthermore, this report used an analytical approach in deriving the surge elevations while Tetra Tech employed a hydrodynamic model to simulate surge height for the open coast and Galveston Bay. The former procedure has been superseded by the latter standard FEMA methodology.

REFERENCES

1. U.S. Army Corps of Engineers, Hurricane Carla, September 9-12, 1961, Galveston District, 1962.

2. Bodine, B.R., "Hurricane Surge Frequency Estimated for the Gulf Coast of Texas," U.S. Army Corps of Engineers, T.M. No. 26, February 1969.

APPENDIX C

Basco

FLOOD INSURANCE STUDY

CITY OF TEXAS CITY, TEXAS
GALVESTON COUNTY

PROOF

NOVEMBER 2, 1982

Federal Emergency Management Agency

COMMUNITY NUMBER - 485514

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FIGURES

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EXHIBITS

PUBLISHED SEPARATELY;

FLOOD INSURANCE STUDY
CITY OF TEXAS CITY, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the City of Texas City, Galveston County, Texas, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of the information will be to maintain the City of Texas City in the regular program of flood insurance by the Federal Emergency Management Agency, (FEMA). The City of Texas City had been converted to the regular program on November 20, 1970. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3 (d & e). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Tetra Tech, Inc. for the Federal Emergency Management Agency, under Contract No. H-4788. This study was completed in December 1979.

1.3 Coordination

The following organizations were contacted for coordination in the development of this study: City of Texas City; County of Galveston; Greater Texas City-La Margue Chamber of Commerce; Houston-Galveston Area Council; National Oceanic and Atmospheric Administration (NOAA); Texas Highway Department; Texas State Department of Water Resources; U.S. Army Corps of Engineers, Galveston District (COE); U.S. Geological Survey (USGS); U.S. Soil Conservation Service (SCS).

The State Coordinator was involved with this study through the Denton Regional Office of the Federal Emergency Management Agency.

On June 3, 1982, the results of this study were reviewed at a final coordination meeting. All changes resulting from the meeting have been included in this report. The study was acceptable to the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Texas City, Galveston County, Texas. The area of study is shown on the Vicinity Map (Figure 1).

The analysis includes coastline flooding due to hurricane-induced storm surge. Both the open coast surge and its inland propogation were studied; in addition, the added effects of wave heights were also considered. The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through 1985.

2.2 Community Description

The City of Texas City is located in the southeastern portion of Texas, in the northeastern region of Galveston County, approximately 41 miles southeast of Houston and approximately 10 miles northwest of Galveston. It occupies an area of approximately 67.1 square miles on the southwest shore of Galveston Bay. The study area is bounded on the north by unincorporated areas of Galveston County, on the east by Galveston Bay, and on the south and west by incorporated areas of the City of La Marque.

Texas City was incorporated as a city in 1911. The U.S. Bureau of the Census recorded the 1970 population of Texas City at 38,908, which represented a 21.3 percent increase over the 1960 census of 32,065 (Reference 1). The 1975 population was recorded at 40,939. The current permanent population is estimated to be about 45,000 (Reference 2), which represents an increase of approximately 16 percent over the 1970 level. It is estimated that the population of Texas City will increase to 58,500 by the year 1985 (Reference 3).

In the city's developed area, residential sections are generally located in the north central and western portions; the major commercial section is located in the east central part; major industrial development is located in the southern and central parts of the city between La Marque and the bay. Leading industries in the area are petrochemical plants, oil refineries, oil storage facilities, the deepwater port and terminal facilities, and commercial fishing.

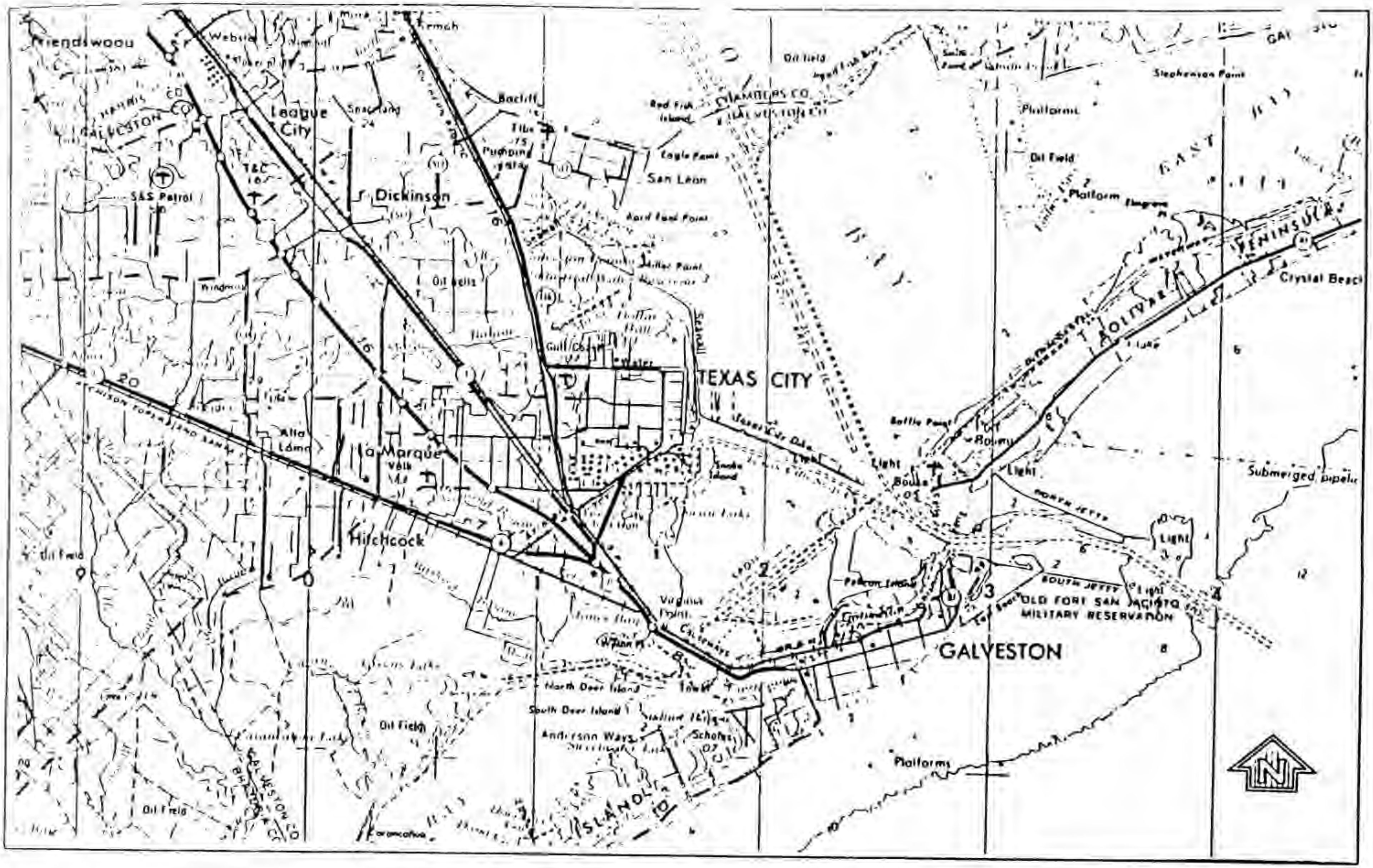


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TEXAS CITY, TX

(GALVESTON CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

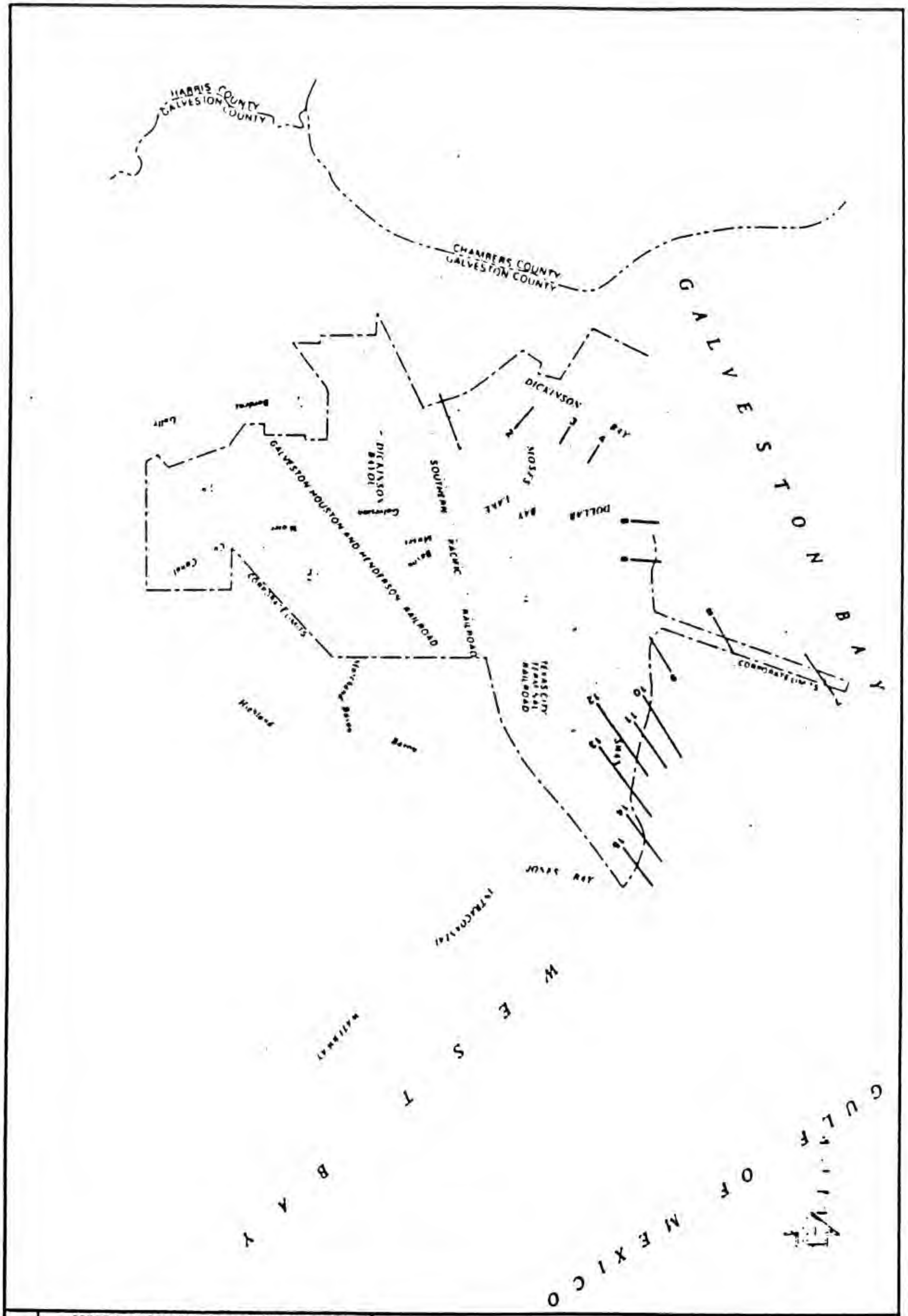


FIGURE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TEXAS CITY, TX

(GALVESTON COUNTY)

TRANSECT LOCATION MAP

FLOODING SOURCE	TRANSECTS	PANELS	STILLWATER ELEVATIONS				FLOOD HAZARD FACTOR[1]	ZONE[1]	BASE FLOOD ELEVATION[2] (FEET NGVD)
			10-YR	50-YR	100-YR	500-YR			
Galveston Bay/ Dickinson Bayou	1	0010,0014,0015, 0030,0035	4.9	9.0	10.6	13.6	060	A12^{3}	11-12
Galveston Bay	2-4	0014,0015,0018	4.9 4.9	9.0 9.0	10.6 10.6	13.6 13.6	090 070	V18 A14^{3}	13-16 12-13
	5	0040	4.9	9.0	10.6	13.6	090	V18	16
	6	0040	4.9	9.5	11.0	13.9	095	V19	14-16
	7	0057,0061	4.9	9.5	11.0	13.9	095	V19	16
	8	0045	4.9	9.5	11.0	13.9	095	V19	16
	9	0040	4.9	9.5	11.0	13.9	095	V19	14-15
	10	0055	4.9	9.5	11.0	13.9	095	V19	14-16
	11-14	0055	5.3 5.3	9.9 9.9	11.5 11.5	14.6 14.6	095 070	V19 A14^{3}	14-16 12-13
	15	0050,0055	5.3 5.3	9.9 9.9	11.5 11.5	14.6 14.6	095 070	V19 A14^{3}	14-16 12-13

[1] Includes the effects of Wave Action, where applicable.

[2] Due to map scale limitations, Base Flood Elevations (BFEs) shown on the Flood Insurance Rate Map may represent average elevation for the zone depicted.

[3] Average Weighted Value

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF TEXAS CITY, TX

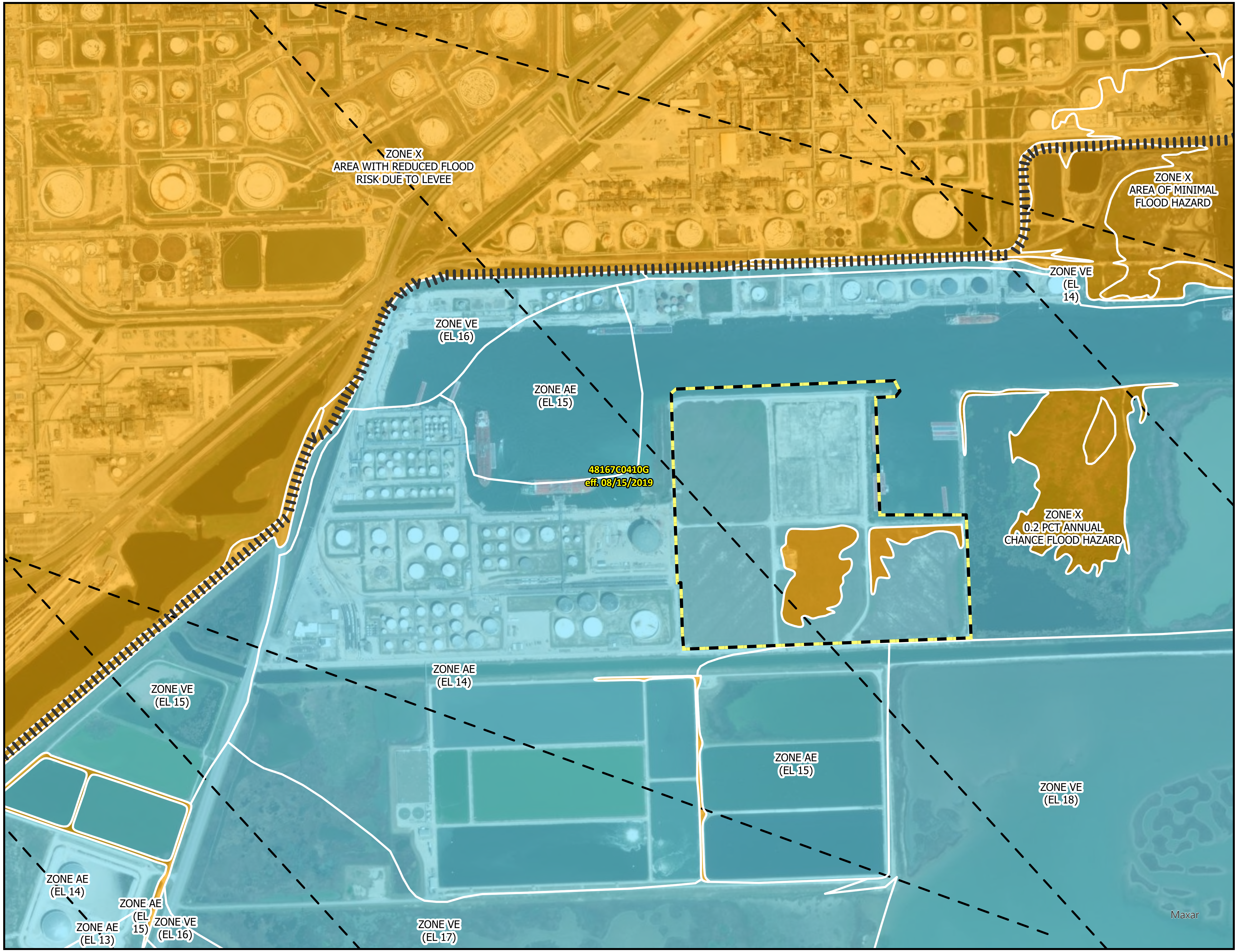
(GALVESTON CO.)

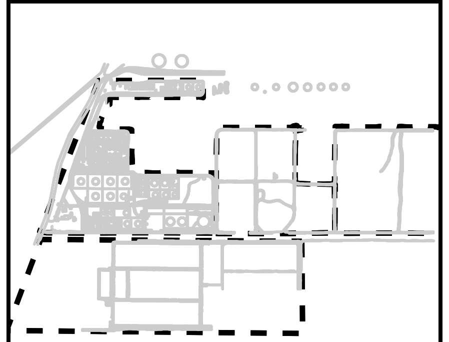
COASTAL FLOOD INSURANCE ZONE DATA

GALVESTON BAY/ DICKINSON BAYOU-GALVESTON BAY

Part B

Appendix II.F – Floodplain Map





Legend

🟦 Without Base Flood Elevation (BFE) Zone A, V, A99 With BFE or Depth Zone AE, AO, AH, VE, AR

🟧 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

- - Channel, Culvert, or Storm Sewer

▮▮▮▮ Levee, Dike, or Foodwall

▭ Facility Boundary

Note: Floodplain data downloaded from FEMA.gov website.

0 500 1,000
Feet

Appendix II.F
Floodplain Map

Union Carbide Corporation
A Wholly Owned Subsidiary of
The Dow Chemical Company,
Texas City Operations
December 2024

N

Dow
ARCADIS

T:_ENV\DOW\TEXAS_CITY\GIS\TCO_OPDA_APAR\TCO_OPDA_APAR\MAPFILES\GEC\TCO_OPDA_APAR\TCO_OPDA_APAR.APRX MGI01044 09/23/2024 11:51 AM

Part B

Appendix III – Facility Management

Part B

Appendix III – Facility Management

Compliance History

Appendix III.A
Compliance History – List of Dow Facilities in Texas

1. Union Carbide Corporation
   A Wholly Owned Subsidiary of The Dow Chemical Company
   2800 Loop 197 South
   Texas City, Texas 77592

2. Union Carbide Corporation
   A Wholly Owned Subsidiary of The Dow Chemical Company
   3301 5th Avenue South
   Texas City, Texas 77590-8121

3. Union Carbide Corporation
   A Wholly Owned Subsidiary of The Dow Chemical Company
   Highway 185 N
   Seadrift, Texas 77983

4. The Dow Chemical Company, La Porte Operations
   550 Independence Parkway South
   La Porte, TX 77572-0685

5. The Dow Chemical Company, Texas Operations (Plants A, B, and Oyster Creek)
   2301 North Brazosport Blvd.
   Freeport, TX 77541-3257

6. Rohm and Haas Chemicals LLC
   A Wholly Owned Subsidiary of The Dow Chemical Company
   Bayport Plant
   13300 Bay Area Boulevard
   La Porte, TX 77571

7. Rohm and Haas Texas Inc.
   A Wholly Subsidiary of The Dow Chemical Company
   1900 Tidal Road
   Deer Park, TX 77536

8. Rohm and Haas Texas Inc.
   A Wholly Subsidiary of The Dow Chemical Company
   Lone Star Plant
   1800 Tidal Road
   Deer Park, TX 77536

9. The Dow Chemical Company, Sabine River Operations
   3055 Farm to Market (FM) Road 1006
   Orange, Texas 77630

Part B

Appendix III – Facility Management

Facility Security

Appendix III.C
Facility-Wide Security

Table of Contents

1.0 Facility Security

The OPDA facility is inactive and is protected by a fence located on the west facility boundary and natural barriers including the Industrial Ship Canal, Hurricane Outflow Canal, and Galveston Bay on the north, south, and east facility boundaries, respectively. The fence is a six-foot high chain-link fence topped with barbed wire that separates the OPDA facility from the adjacent Oiltanking facility.

The waste management units are located within the OPDA facility boundary and there is only one entrance gate to the facility. The entrance gate is locked and only authorized personnel are allowed to enter the OPDA facility. There are warning signs posted at the entry points to the waste management units. The signs are visible from all angles of approach to the waste management units and are legible from a distance of twenty-five (25) feet.

Tables/Figures/Drawings for Facility-Wide Security

Tables

None

Figures

None

Drawings

None

Appendices to Facility-Wide Security

None

Part B

Appendix III – Table III.D. Inspection Schedule

Table III.D- Inspection Schedule

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
Visual Inspection and Repair of Soil Covers in OPDA Basins 3 and 5	Detect and correct surface fissures, ponding, evidence of leakage, signs of erosion.	Semiannual
Visual Inspection and Repair of Asphalt/ Concrete Cover for South Phase Separation Organic Pit and North Phase Separation Organic Pit	Detect and correct surface fissures and damages on the cover.	Semiannual
Inspection and Repair of Site Drainage Systems in OPDA Basins 3 and 5	Prevent and remove obstructions, minimize erosion.	Semiannual
Inspection and Repair of Security at the OPDA Facility	Prevent uncontrolled access, replace missing signs.	Semiannual
Inspection and Repair of Monitoring Equipment at the OPDA Facility	Repair damage to wells. Maintain sample equipment operable.	Semiannual

Part B

Appendix IV – Waste and Waste Analysis

Table IV.B. - Wastes Managed In Permitted Units

No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
1	Aqueous waste with low other toxic organics	D001, D018	2010102H
2	Aqueous waste with low other toxic organics (phenol)	U188	2011102H
3	Concentrated aqueous solution of other organics from the pollution abatement tank system	D001, D035, U002, U031, U112, U140, U161	2018207H
4	Inorganic wastewater treatment sludge	D018, D028, D035	2063504H

Part B

Appendix V – Engineering Reports

Table V.D.1. - Surface Impoundments

Permit Unit No.	Surface Impoundment	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions	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)	Unit Status
1	OPDA Basin 5	05	4	61.1 million gallons	990'x1031' 18.76 surface acres	Estimated 15 feet	NA	No	Closed as Landfill
2	OPDA Basin 3	09	4	59.9 million gallons	990'x760' 17.27 surface acres	Estimated 15 feet	NA	No	Closed as Landfill
3	South Phase Separation Organic Pit	18	1,2,3	85,000 gallons	0.06 surface acres	Estimated 15 feet	NA	No	Closed as Landfill
4	North Phase Separation Organic Pit	02	1,2,3	85,000 gallons	0.06 surface acres	Estimated 15 feet	NA	No	Closed as Landfill

1. From Table IV.B, first column
2. Dimensions should be provided as average length, width and depth, also included the surface acreage for the unit.

Part B

Appendix VII – Closure and Post-Closure Plans

Attachment B.VII.C.2

Post-Closure Care Plan

Union Carbide Corporation (UCC)
Off-Plant Disposal Area (OPDA)
Texas City, Texas

OPDA Post-Closure Care Plan

1.0 Introduction

This post-closure care plan (PCCP) has been prepared to provide guidance to the Union Carbide Corporation (UCC), a wholly owned subsidiary of The Dow Chemical Company, for post-closure care of four Hazardous Waste Management Units (HWMUs) at the Off-Plant Disposal Area (OPDA) facility in Texas City, Texas. The four HWMUs have been closed under Resource Conservation and Recovery Act (RCRA). **Figure 1** shows the locations of the HWMUs at the OPDA. The PCCP is prepared in accordance with the requirements of 40 CFR §264 Subpart G and 30 TAC §335.169). The PCCP is applicable for the following HWMUs at the OPDA:

- OPDA Basin No. 3 (Permitted Unit No. 2, NOR No. 9)
- OPDA Basin No. 5 (Permitted Unit No. 1, NOR No. 5)
- North Phase Separation Organic Pit (Permitted Unit No. 4, NOR No. 2)
- South Phase Separation Organic Pit (Permitted Unit No. 3, NOR No.18)

The four HWMUs were certified as closed on March 25, 1987 in accordance with the Closure Plans approved by Texas Water Commission (TWC). Post-closure soil covers which consist of a minimum of two feet clay and 1 foot topsoil were placed on the closed Basins No. 3 and No. 5 in 2005 to meet the post closure requirements of Permit No. HW-50264. To facilitate the soil cover construction, an asphalt/concrete cover was placed on the top of the closed North and South Phase Separation Organic Pits (Permitted Units No. 3 and No. 4) and the surrounding area prior to the soil cover construction to establish a construction equipment laydown area. The soil and asphalt/concrete cover at the HWMUs have been and will continue to be maintained during and after the post-closure period, in a manner that minimizes the need for maintenance, and minimizes or eliminates the potential for hazardous waste and hazardous constituents to contaminate the ground water, surface water, or the atmosphere.

1.1 Post-Closure Care Period

According to Permit No. 50264, the post-closure care period for the four HWMUs will extend for a period of 30 years after certification of final closure. The HWMUs were certified as closed on March 25, 1987 so the post-closure care period ended on March 25, 2017.

1.2 Post-Closure Use of the Site

The closed HWMUs will remain within the property boundary of the UCC OPDA facility in Texas City, Texas. Consequently, UCC will retain control of post closure use of the units. UCC currently plans to dedicate the units to open space. Any future use of the units will neither disturb nor promote disturbance of either the cover or the function of the groundwater corrective action and monitoring program included in Section XI of the Part B Permit Renewal Application.

2.0 Security Provisions

The UCC OPDA facility in Texas City, Texas is an inactive facility. The facility is protected by a fence located on the west facility boundary and natural barriers including the Industrial Ship Canal, Hurricane Outflow Canal, and Galveston Bay on the north, south, and east facility boundaries, respectively. The fence is a six-foot high chain-link fence topped with barbed wire that separates the OPDA facility from the adjacent Oiltanking facility.

The HWMUs are located within the OPDA facility boundary and there is only one entrance gate to the facility. The entrance gate is locked and only authorized personnel are allowed to enter the OPDA facility. There are warning signs posted at the entry points to the HWMUs. The signs are visible from all angles of approach to the HWMUs and are legible from a distance of twenty-five (25) feet. The signs read:

DANGER

UNAUTHORIZED PERSONNEL KEEP OUT

TCEQ PERMIT UNIT NO. 1, 2, 3, AND 4

3.0 Post-Closure Inspection Activities

As a means of determining the integrity and effectiveness of the final covers, monitoring wells, security devices, etc., the following items will be inspected semiannually during the post closure care period. An inspection log is maintained, and the inspection schedule is provided in **Table 1**.

3.1 Cover Settlement

The surface contours of the soil covers may change after placement of the cover because of settlement. Some settlement is generally not a concern unless it causes excessive cracking of cover surface or unless it results in depressions of the surface which may pond water. The surface will be inspected and repaired, as necessary, in areas in which ponded water is observed following storms. The possibility of settlement will be visually checked during semiannual inspections. Any concern will be noted on the inspection log, and action will be taken by making additional checks to determine whether there is a problem or by repairing the area of concern.

Reference benchmarks near the HWMUs will be protected and maintained for surveying purposes.

3.2 Cover Vegetation

UCC will maintain a vegetative cover on the surface of the soil covers placed on the basins. The vegetative cover will be inspected semiannually and, when necessary, mowed during the growing season from April to October. For estimating the post closure cost, it was assumed that the soil covers will be mowed at least four times per year. Deep-rooted weeds, bushes, and saplings will not be permitted to grow on the surface. UCC will protect the surface from disturbances like heavy vehicle traffic which could damage the cover. If damage to portions of the vegetative cover occurs, UCC will reseed and fertilize to re-establish the vegetative cover.

Animal burrowing could disturb the cover vegetation and the integrity of the soil cover. If this situation occurs, it will be corrected as it is discovered. UCC will perform visual inspections on a semiannual basis to identify potential animal borrows.

3.3 Cover Erosion

The slopes of the soil covers will have gentle grades (2% to 5% slope) which will help to minimize erosion. The covers have been or will be vegetated, which will further reduce erosion potential. UCC will also inspect the surface of the closed HWMUs for evidence of erosion. Minor erosion will be documented, but not repaired, since correction of minor erosion rills will cause more surface disturbance than the rills potentially could. Excessive erosion could damage the integrity of the cover, however, and this erosion will be repaired in a manner consistent with cover placement techniques. Inspections for erosion will be conducted semiannually.

3.4 Asphalt/Concrete Cover

The asphalt/concrete cover area, which overlies Permitted Unit Nos. 3 and 4, is located within SWMU Basin No. 1 and was used as the construction equipment laydown area during construction of the soil covers for HWMU Basins No. 3 and No. 5. Inspections will be conducted semiannually, and repairs will be made as necessary to maintain the integrity of the asphalt/concrete cover.

3.5 Drainage Systems

UCC will keep cover drainage systems at the closed HWMUs free from obstructions and excessive erosion. Inspections will be performed semiannually, and deficiencies will be noted. Action will be taken to correct deficiencies as necessary.

3.6 Security

The chain-link security fence at the west facility boundary will be inspected semiannually. Any problems with the fence will be corrected by facility personnel. Warning signs around the closed HWMUs will be inspected semiannually for proper placement and legibility. Deficiencies in the signs will be corrected or the signs will be replaced.

4.0 Post-Closure Maintenance Activities

Maintenance activities can be grouped into two categories, planned and unplanned. Planned maintenance activities will be performed on a regularly scheduled basis. Unplanned maintenance activities will be performed as needed with the frequency being dictated by unacceptable conditions observed during the routine inspections. Planned and unplanned maintenance activities will include the following:

- Stormwater drainage systems will be maintained in good functional condition;
- If evidence of ponding, settling, subsidence or disruption of established drainage patterns is observed, or discovered during site inspection, additional cover materials or vegetation, if applicable, will be applied to maintain proper slope and cover integrity;

- If damage to the vegetative cover is discovered, the areas will be reseeded, fertilized, and/or watered as needed until the covers are re-established;
- If damage to the asphalt/concrete cover is discovered, repairs will be made to maintain the integrity of the asphalt/concrete cover;
- If subsidence or damage to a benchmark is observed during the site inspection, repairs will be made and the benchmark will be returned to its original elevation;
- The facility fence and gate will be maintained in good condition;
- Missing or illegible signage will be replaced; and
- Routine and other maintenance activities are performed as needed. If an inspection reveals that a maintenance activity is required to correct a problem, that action will be implemented as soon as practicable.

5.0 Post-Closure Groundwater Corrective Action and Monitoring Program

Groundwater corrective action and monitoring program has been implemented at the OPDA facility since 1993 and will be continued in accordance with the requirements of Permit No. 50264.

6.0 Amendment of Plan

The post-closure plan will be maintained and updated as necessary by the Site Responsible Care Leader.

The post-closure care contact is:

Site Responsible Care Leader
Union Carbide Corporation
Texas City Operations
Texas City, Texas 77592
409-948-5672

7.0 Post-Closure Care Cost Estimate

The post-closure cost estimates for HWMUs are included in Table 2, respectively. The post-closure care costs were estimated by assuming a 10-year post closure care period for the HWMUs (the post closure care ended in 2017).

8.0 Reporting

The post closure care activities conducted at the OPDA facility will be documented in the Annual Groundwater Monitoring Report and submitted to TCEQ as required by Permit No. 50264.

Additionally, post-closure care notices and certifications required by 40 CFR §264.119 through §264.120 will be performed.

Tables/Figures for OPDA Post-Closure Care Plan

Tables

Figures

Tables

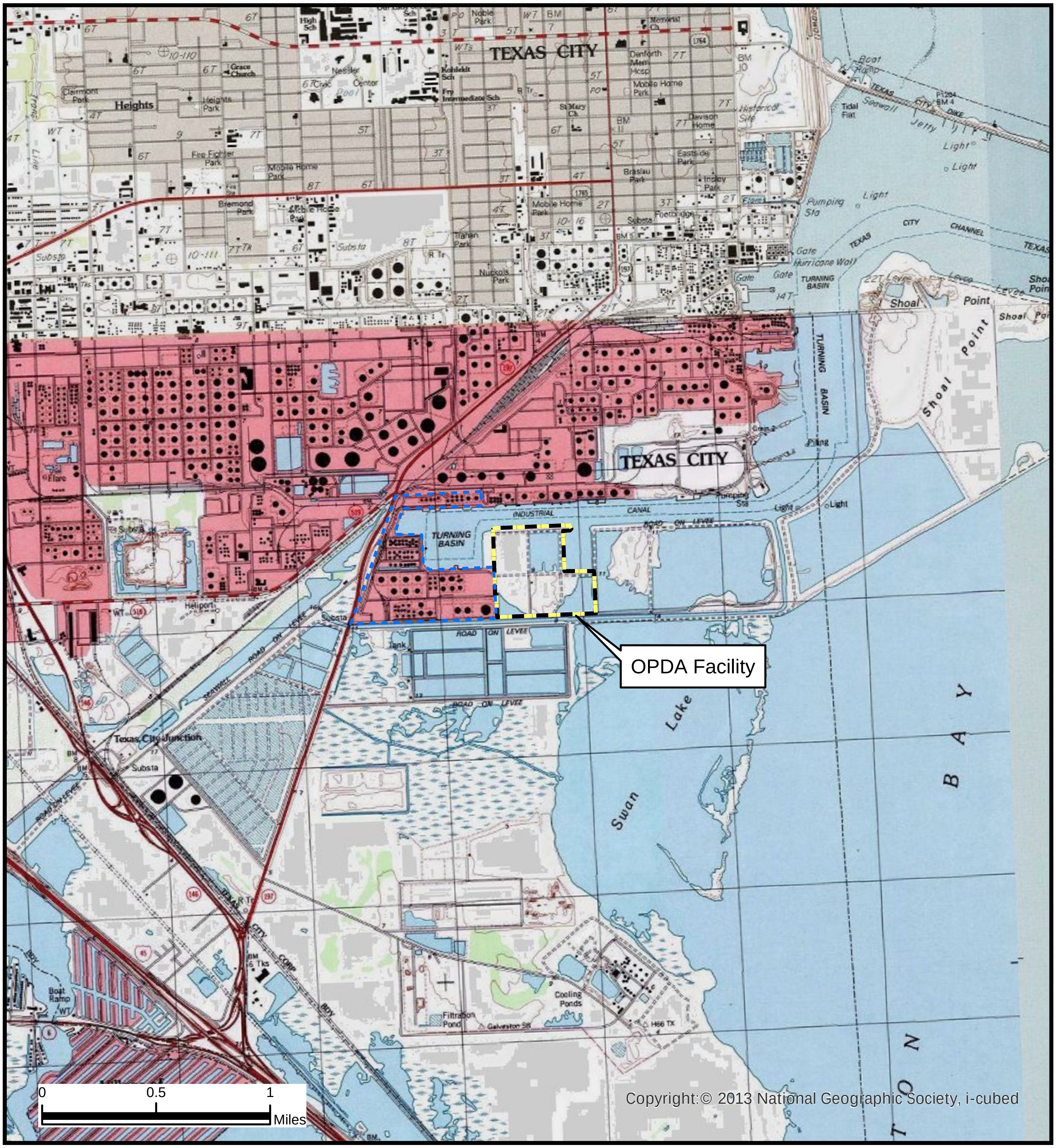
Table 1. - Inspection Schedule

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Inspection Frequency
Visual Inspection and Repair of Soil Covers in OPDA Basins 3 and 5	Detect and correct surface fissures, ponding, evidence of leakage, signs of erosion.	Semiannual
Visual Inspection and Repair of Asphalt/Concrete Cover for South Phase Separation Organic Pit and North Phase Separation Organic Pit	Detect and correct surface fissures and damages on the cover	Semiannual
Inspection and Repair of Site Drainage Systems in OPDA Basins 3 and 5	Prevent and remove obstructions, minimize erosion.	Semiannual
Inspection and Repair of Security at the OPDA Facility	Prevent uncontrolled access, replace missing signs.	Semiannual
Inspection and Repair of Monitoring Equipment at the OPDA Facility	Repair damage to wells. Maintain sample equipment operable.	Semiannual

Table 2 - Unit Post-Closure Cost Estimate

Task	Cost
Four Closed HWMUs (Basin 3, Basin 5, North and South Phase Separation Pits)	
Mobilization/Demobilization	$3,000
Inspections	$1,200
Mowing (4 times per year)	$10,080
Clearing, 0.5% of total area	$800
Repair of Compacted Clay	$8,000
Import and Place Topsoil	$5,000
Seeding	$1,200
Reporting & Administrative	$3,000
subtotal	**$32,280**
Contingency (10% minimum)	**$3,228**
Total Unit Post-Closure Care Cost x 10 yrs.	**$355,080 (in 2024 Dollars)**

Figures



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Key Map
NTS

LEGEND

- ▭ OPDA Facility Boundary
- - - - Oiltanking Texas City, L.P. Facility Boundary

Reference: The displayed Digital Raster Graphic (DRG) includes portions of the United States Geological Survey 7.5 minute quadrangles of Virginia Point and Texas City (USGS, 1993).

Figure 1
Site Map

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

Permit No. 50264

Permittee: Union Carbide Corporation

Table VII.D. - Unit Post-Closure Cost Estimate

Task	Cost
Four Closed HWMUs (Basin 3, Basin 5, North and South Phase Separation Pits	
Mobilization/Demobilization/Inspections	$4,200.00
Mowing (4 times per year)	$10,080.00
Clearing, 0.5% of total area	$800.00
Repair of Compacted Clay	$8,000.00
Import and Place Topsoil, Seeding	$6,200.00
Reporting & Administrative	$3,000.00
Subtotal	$32,280.00
Contingency (10% minimum)	$3,228.00
Year(s) of Post-Closure	10
Total Unit Closure Cost (Annual Cost X Years of Post-Closure) Year 2,024	$355,080.00

The estimates listed above were derived from the following sources:
Contractor estimates

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

Existing Unit Closure Cost Estimate	
Unit	Cost
Four Closed HWMUs (Basin 3 and 5, North and South Phase Separation Pits)	$355,080.00
Total Existing Unit Post-Closure Cost Estimate[1]	$355,080.00

Proposed Unit Post-Closure Cost Estimate	
Unit	Cost
Total Proposed Unit Post-Closure Cost Estimate	

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.

Part B

Section VIII – Financial Assurance

Part B

Appendix VIII – Financial Assurance

Financial Assurance Information

December 18, 2024 **FedEx # 7701 3595 2792**

Martin Torres, Manager
Industrial and Hazardous Waste Permits Division, MC-130
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Re: Financial Disclosure Letter for Union Carbide Corporation – Texas City Operations
Off-Plant Disposal Area (OPDA) Facility Renewal
Hazardous Waste Permit / Compliance Plan No. 50264
Industrial Solid Waste Registration No. 35921
EPA ID No. TXD980626782
CN601688781 / RN105087829

Dear Mr. Torres:

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 Union Carbide Corporation, Off-Plant Disposal Area (OPDA) Facility has sufficient financial resources.

In keeping with the above law and rule requirements I hereby certify that Union Carbide Corporation OPDA Facility is adequately capitalized and has sufficient financial resources to perform corrective action for the above-referenced facility in a safe manner, and in compliance with the permit and all applicable rules.

The Union Carbide Corporation OPDA currently provides a liability coverage through a financial test for liability financial assurance mechanisms set out in 30 TAC, Chapter 37, Subchapter C to meet Union Carbide Corporation OPDA Facility's financial assurance obligations.

I am authorized to make these statements on behalf of the Union Carbide Corporation OPDA Facility. I understand that the TCEQ may request additional information as part of their review.

Sincerely,

Casey Rhodes
Senior Responsible Care Director

cc: Michelle Vetterlein / Dow (electronic)
Donnie Belote / Dow (electronic)
Richard Trevino / Arcadis (electronic)

March 20, 2024

Mark Stoebner
Texas Commission on Environmental Quality
Financial Assurance Unit, MC-184
12100 Park 35 Circle
Austin, TX 78753

FINANCIAL ASSURANCE FOR UNION CARBIDE CORPORATION

Dear Mark:

Enclosed for your review and approval is the Union Carbide Corporation's 2024 Letter from Chief Financial Officer and supporting documentation to meet the financial assurance requirements of the Texas Commission on Environmental Quality. The following documentation is included:

- Letter from Chief Financial Officer
- Independent Accountants' Report
- Bloomberg bond rating printout
- Form 10-K for Union Carbide Corporation for year ending December 31, 2023

If you have any questions, please contact me at the number below.

Kind regards,

Rebecca J. Crowder

Rebecca J. Crowder
Senior Paralegal, Core Legal Practices
The Dow Chemical Company
Global Dow Center
2211 H.H. Dow Way
Midland, Michigan 48674
Phone: 989-636-5023
Email: [redacted]

Enclosures

Union Carbide Corporation
A Subsidiary of The Dow Chemical Company

March 20, 2024

Texas Commission on Environmental Quality
Attention: Executive Director
12100 Park 35 Circle
Austin, TX 78753

LETTER FROM CHIEF FINANCIAL OFFICER

Dear Sir or Madam:

I am the Chief Financial Officer of Union Carbide Corporation, 7501 State Highway 185 North Seadrift, TX 77983. This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure, post closure, or corrective action as specified in 30 Texas Administrative Code (TAC) Chapter 37 (relating to Financial Assurance).

The firm identified above is the owner or operator of the following facilities for which liability coverage for both sudden and nonsudden accidental occurrences is being demonstrated through the financial test specified in 30 TAC §37.541 (relating to Financial Test for Liability):

EPA ID# **REGION 6**	**NAME/ADDRESS**	
SWR No. 30129	Union Carbide Corporation PO Box 186 Port Lavaca, TX 77979	**Sudden = $7,000,000** **Nonsudden = $8,000,000**
SWR No. 30689	Union Carbide Corporation Texas City Main Plant PO Box 471 Highway 146, Gate 18, Bldg. 63 Texas City, TX 77592	**Sudden = $7,000,000** **Nonsudden = $8,000,000**
SWR No. 35921	Union Carbide Corporation Texas City MT/OPDA PO Box 471 3301 5th Avenue South Texas City, TX 77592-0471	**Sudden = $7,000,000** **Nonsudden = $8,000,000**

The firm identified above guarantees, through the guarantee specified in 30 TAC §37.551 (relating to Corporate Guarantee for Liability), liability coverage for both sudden and nonsudden accidental occurrences at the following facilities owned or operated by the following:

None.

1. The firm identified above owns or operates the following facilities in Texas for which financial assurance for closure, post closure, or corrective action or liability coverage is demonstrated through a financial test specified in 30 TAC Chapter 37. The current cost estimates covered by the test are shown for each facility:

REGION 6

SWR No. 30129	Union Carbide Corporation PO Box 186 Port Lavaca, TX 77979	**Closure = $3,552,000** **Post-Closure = $2,663,200** **Corrective Action = $3,483,900**
SWR No. 30689	Union Carbide Corporation Texas City Main Plant PO Box 471 Highway 146, Gate 18, Bldg. 63 Texas City, TX 77592	**Closure = $50,200** **Post-Closure = $503,800** **Corrective Action = $13,561,000**
SWR No. 35921	Union Carbide Corporation Texas City MT/OPDA PO Box 471 3301 5th Avenue South Texas City, TX 77592-0471	**Post-Closure = $275,000** **Corrective Action = $3,031,000** **TRRP Closure = $1,350,000**

2. The firm identified above guarantees, through a corporate guarantee specified in 30 TAC Chapter 37, the cost for closure, post closure, corrective action, or liability coverage of the following facilities owned or operated by the guaranteed party. The current cost estimates so guaranteed are shown for each facility:

None.

3. In States where TCEQ is not administering the financial requirements of 30 TAC Chapter 37, this firm, as owner, operator, or guarantor, is demonstrating financial assurance for the closure, post closure, or corrective action of the following facilities through the use of a test equivalent to a financial test specified in 30 TAC Chapter 37. The current cost estimates covered by such a test are shown for each facility:

REGION 2

PRD980594618	Penuelas Technology Park LLC Firm Delivery Penuelas, PR 00624	**Closure = $1,958,100** **Post-Closure = $19,245,600** **Corrective Action = $803,100**
N/A	Rail Road North Area 300 Ridge Road Piscataway, NJ 08854	**Post-Closure: $718,815**

REGION 3

WVD000739722	Union Carbide Corporation PTO 31350 First Avenue South Nitro, WV 25143	**Post-Closure = $2,844,000**
WVD060682291	Union Carbide Corporation Technology Park 3200 Kanawha Turnpike South Charleston, WV 25303	**Corrective Action = $4,701,664**

WVD005005509	Union Carbide Corporation Institute Operations Facility Route 25 Institute, WV 25112	**Corrective Action = $5,595,100**
2014-0004247 2014-0013348 2014-0004250	Aboveground Storage Tanks South Charleston & Institute, WV	**Total Amount = $451,100**

REGION 4

GAD981235294	Union Carbide Corporation 5954 Harrietts Bluff Road Woodbine, GA 31569	**Post-Closure = $13,266,802** **Corrective Action = $2,582,924**

REGION 6

LAD041581422	Union Carbide Corporation PO Box 50 Hahnville, LA 70057	**Post-Closure = $3,015,800**

REGION 7

KSD980688733	UNISON Transformer Services, Inc. 3126A Brinkerhoff Road Kansas City, KS 66115	**Closure = $162,800** **Corrective Action = $1,678,900 (EPA)** **Corrective Action= $3,560,700 (State)**

4. The firm identified above owns or operates the following facilities for which financial assurance for closure, post closure, or corrective action, is not demonstrated either to TCEQ, a federal agency or a State through the financial test or any other financial assurance mechanisms specified in 30 TAC Chapter 37 or equivalent State mechanisms. The current cost estimates not covered by such financial assurance are shown for each facility:

None.

5. This firm is the owner or operator or guarantor of the following facilities for which financial assurance is being demonstrated under other EPA regulations or state programs authorized by EPA through a financial test or guarantee. The following amounts have not been included in Paragraphs 1 through 4.
   - (a) Municipal solid waste management facilities under 30 TAC Chapter 330, 40 CFR part 258 or equivalent: None.
   - (b) Underground injection control facilities under 30 TAC Chapter 331, 40 CFR part 144 or equivalent: None.
   - (c) Petroleum underground storage tank facilities under 30 TAC Chapter 334, and 40 CFR part 280 or equivalent: None.
   - (d) PCB storage facilities under 40 CFR part 761 or equivalent: None.
   - (e) Hazardous waste treatment, storage, and disposal facilities under 30 TAC Chapter 335, 40 CFR parts 264 and 265 or equivalent: $39,221,300.

30 TAC 335/Equivalent:
REGION 6

GD0911971	Amerchol Corporation PO Box 1450 Highway 43 South Greensburg, LA 70441	**Closure = $500,800**

GD0891324	Union Carbide Corporation Taft Plant Louisiana Highway 18 Hahnville, LA 70057	**Closure = $32,446,300** **Post-Closure = $6,274,200**

(f) Additional environmental obligations not shown above: $33,284,269.

REGION 2

NJD980529713	Reich Farm Superfund Site 1579 Lakewood Road Route 9 Toms River, NJ 08753	**Corrective Action = $10,588,900**

REGION 3

MDD980705164	Maryland Sand & Gravel Route 40 Elkton, MD 21921	**Corrective Action = $115,352**
WVD047989207	Fike Chemical W. 19th Street Nitro, WV 25143	**Corrective Action = $3,137,000**

REGION 4

C-89-231-R	Aberdeen Pesticides Dump Superfund Site Aberdeen, Moore County, NC	**Post Remedial Monitoring = $748,500**

REGION 5

V-W-14-C-004	Union Carbide Corporation Gary Development Landfill Site 479 Cline Avenue Gary, IN	**Response Costs = $113,000**
OHD980612147	Union Carbide Corporation State Route 7 Marietta, OH 45750	**Corrective Action = $18,000,000**
V-W-98-C-447	Union Carbide Corporation Fields Brook Superfund Site Ashtabula, OH	**Post-Closure = $18,385**
199-CV-731	Bofors Nobel Superfund Site 5025 Evanston Ave. Muskegon, MI	**Response Costs = $563,132**

Total (a) - (f) $ 72,505,569.

This owner has not received an adverse opinion, a disclaimer of opinion, or a going concern qualification from an independent auditor on its financial statements for the latest completed fiscal year.

This firm is required to file a Form 10K with the Securities and Exchange Commission (SEC) for the latest fiscal year. The fiscal year of this firm ends on December 31. The figures for the following items marked with an asterisk are derived from this firm's independently audited, year-end financial statements for the latest completed fiscal year, ended December 31, 2023.

PART B. CLOSURE, POST CLOSURE, CORRECTIVE ACTION, AND LIABILITY COVERAGE

ALTERNATIVE II

1.	Sum of current closure, post closure, and corrective action cost estimates (total of all cost estimates listed above)	$161,561,074
2.	Amount of annual aggregate liability coverage to be demonstrated	$15,000,000
3.	Sum of lines 1 and 2	$ 176,561,074
4.	Current bond rating of most recent issuance and name of rating service	BBB (S&P)
5.	Date of issuance of bond	October 2, 1996
6.	Date of maturity of bond	October 1, 2096
*7.	Tangible net worth (if any portion of the current cost estimates is included in total liabilities you may add that portion to this line)	$2,158,000,000
*8.	Total assets in the U.S. (Required only if less than 90% of assets are located in the U.S.)	$ N/A

		YES	NO
9.	Is line 7 at least $10 million?	X	
10.	Is line 7 at least 6 times line 3?	X	
*11.	Are at least 90% of assets located in the U.S.? (If not, complete line 12)	X	
12.	Is line 8 at least 6 times line 3?		

I hereby certify that the wording of this letter is identical to the wording specified in 30 TAC §37.651 as such regulations were constituted on the date shown immediately below.

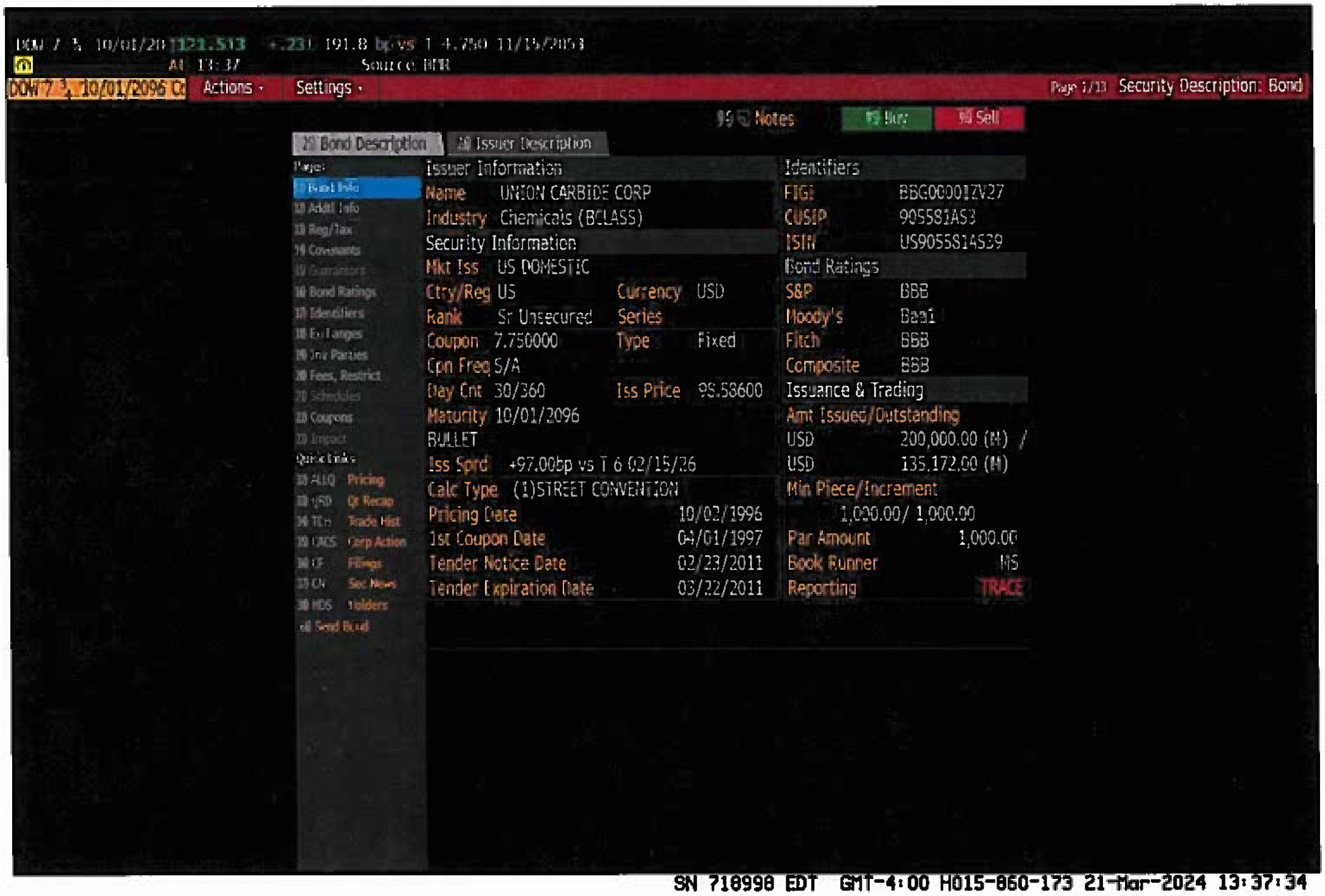
Ignacio Molina
Vice President, Treasurer,
and Chief Financial Officer
Union Carbide Corporation

March 20, 2024

cc:

Joshua Mcfarlain, via [redacted]
Mark Stoebner, [redacted]com
Fran Falcon, The Dow Chemical Company, FQFalcon@dow.com
[redacted]

NOTE: Please direct all correspondence related to this letter to Ryan Weiss, 1790 Building, 633 Washington Street, Midland, MI 48674. Phone (989) 636-8101 or [redacted]



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At 13:37 Source BMR
DOW 7 ¾ 10/01/2096 Corp

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Name UNION CARBIDE CORP
Industry Chemicals (BCLASS)

Security Information
Mkt Iss US DOMESTIC
Ctry/Reg US
Currency USD
Rank Sr Unsecured
Series
Coupon 7.750000
Type Fixed
Cpn Freq S/A
Day Cnt 30/360
Iss Price 99.58600
Maturity 10/01/2096
BULLET
Iss Sprd +97.00bp vs T 6 02/15/26
Calc Type (1)STREET CONVENTION
Pricing Date 10/02/1996
1st Coupon Date 04/01/1997
Tender Notice Date 02/23/2011
Tender Expiration Date 03/22/2011

Identifiers
FIGI BBG00001ZV27
CUSIP 905581AS3
ISIN US905581AS39

Bond Ratings
S&P BBB
Moody's Baa1
Fitch BBB
Composite BBB

Issuance & Trading
Amt Issued/Outstanding
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USD 135,172.00 (M)
Min Piece/Increment
1,000.00/ 1,000.00
Par Amount 1,000.00
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INDEPENDENT ACCOUNTANT'S REPORT

To the Board of Directors
Union Carbide Corporation
Seadrift, Texas

We have performed the procedures included in the Texas Administrative Code, Title 30, Chapter 37 related to Union Carbide Corporation ("UCC")'s compliance with the financial test option as of December 31, 2023 (the "specified requirements"), included in the accompanying CFO letter dated March 20, 2024 from Mr. Ignacio Molina, Vice President, Treasurer, and Chief Financial Officer of UCC to the Texas Commission on Environmental Quality (the "CFO Letter"). UCC's Management is responsible for its compliance with those specified requirements.

UCC has agreed to and acknowledged that the procedures performed are appropriate to meet the intended purpose of assisting users in determining whether the entity complied with the specified requirements for the year ended December 31, 2023. The procedures performed are specified in the financial test option as of December 31, 2023, included in the accompanying CFO Letter.

We make no representations regarding the appropriateness of these procedures either for the purpose for which our report has been requested or for any other purpose. Accordingly, this report may not be suitable for either the purpose of which this report has been requested or for any other purpose. The procedures performed may not address all the items of interest to a user of this report and may not meet the needs of all users of this report and, as such, users are responsible for determining whether the procedures performed are appropriate for their purposes.

The procedures and associated findings are as follows:

> We recomputed from, or reconciled to, the audited financial statements of Dow as of and for the year ended December 31, 2023, on which we have issued our report dated January 31, 2024, the information included in Items 7, 8, and 11 under the caption "Alternative II" in the accompanying CFO Letter referred to above and noted no differences.

We were engaged by UCC to perform this agreed-upon procedures engagement and conducted our engagement in accordance with attestation standards established by the American Institute of Certified Public Accountants. We were not engaged to and did not conduct an examination or review engagement, the objective of which would be the expression of an opinion or conclusion, respectively, on compliance with the financial test option as of December 31, 2023, included in the accompanying CFO Letter. Accordingly, we do not express such an opinion or conclusion. Had we performed additional procedures, other matters might have come to our attention that would have been reported to you.

We are required to be independent of UCC and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements related to our agreed-upon procedures engagement.

This report is intended solely for the information and use of the board of directors and management of UCC and the Texas Commission on Environmental Quality, and is not intended to be, and should not be, used by anyone other than these specified parties.

Deloitte & Touche LLP

March 20, 2024

ORIGIN ID:MBSA (989) 636-2735
ELESSA TREVINO-ALCOCK
THE DOW CHEMICAL COMPANY
GLOBAL DOW CENTER - CLP
2211 HH DOW WAY
MIDLAND, MI 48674
UNITED STATES US

SHIP DATE: 20MAR24
ACTWGT: 0.50 LB
CAD: 104415749/INET4700

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TO **EXECUTIVE DIRECTOR**
TX COMMISSION ON ENVIRONMENTAL QUAL
12100 PARK 35 CIRCLE

AUSTIN TX 78753
(989) 636-2735 REF: FACC 0000077398
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PO: DEPT:

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MORGAN MILES

2211 H.H. DOW WAY

MIDLAND, MI 48674
UNITED STATES US

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ACTWGT: 0.50 LB
CAD: 104415749/INET4700

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TO MARK STOEBNER
TEXAS COMMISSION ON ENVIRONMENTAL Q
12100 PARK 35 CIRLCE

AUSTIN TX 78753
(989) 636-2735
INV:
PO:

REF: FACC0000077398

DEPT:

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Part B

Section IX – Releases from Solid Waste Units and Corrective Action

Preliminary Review Unit Checklist

Facility:	Off-Plant Disposal Area	City	Texas City, TX
ISW Reg. No:	35921	Date	Nov 21, 2024
Permit No.	50264	Reviewer:	Arcadis
EPA ID No.	TXD980626782		

Waste Management Unit(s):

A. NOR No.:	009
B. Description:	OPDA Basin No. 3
C. Dates of Operation:	1952 to 1986
Wastes Managed:	D018, D025, D035
Evidence of Release:	Yes
Pollutant Dispersal Pathways:	Soil and Groundwater
Summary:	RCRA-regulated unit. One of the four hazardous waste management units (HWMUs) that were certified as closed on March 25, 1987 in accordance with the Closure Plans approved by Texas Water Commission (TWC). Post-closure soil covers consisted of two feet clay and 1 foot topsoil were placed on the closed Basin No. 3. The soil cover at this HWMU has been maintained during and after the post-closure period.
Recommended Action:	Post-closure care required within Permit. Release to groundwater addressed in corrective action portion of the Compliance Plan. Groundwater recovery wells were installed across site. Corrective action and groundwater monitoring since 1993.
A. NOR No.:	005
B. Description:	OPDA Basin No. 5
C. Dates of Operation:	1966 to 1986
Wastes Managed:	D018, D025, D035
Evidence of Release:	Yes
Pollutant Dispersal Pathways:	Soil and Groundwater
	RCRA-regulated unit. One of the four hazardous waste management units (HWMUs) that were certified as

Summary:	closed on March 25, 1987 in accordance with the Closure Plans approved by Texas Water Commission (TWC). Post-closure soil covers consisted of two feet clay and 1 foot topsoil were placed on the closed Basin No. 5. The soil cover at this HWMU has been maintained during and after the post-closure period.
Recommended Action:	Post-closure care required within Permit. Release to groundwater addressed in corrective action portion of the Compliance Plan. Groundwater recovery wells were installed across site. Corrective action and groundwater monitoring since 1993.
A. NOR No.:	002
B. Description:	North Phase Separation Organic Pit
C. Dates of Operation:	1978 to 1986
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	Yes
Pollutant Dispersal Pathways:	Soil and Groundwater
Summary:	RCRA-regulated unit. One of the four hazardous waste management units (HWMUs) that were certified as closed on March 25, 1987 in accordance with the Closure Plans approved by Texas Water Commission (TWC). To facilitate closure during basin closure, an asphalt/concrete cover was placed on the top of the closed North and South Phase Separation Organic Pits (Permitted Units No. 3 and No. 4) and the surrounding area prior to the OPDA basin construction to establish a construction equipment laydown area. The asphalt/ concrete cover at this HWMU has been maintained during and after the post-closure period.
Recommended Action:	Post-closure care required within Permit. Release to groundwater addressed in corrective action portion of the Compliance Plan. Groundwater recovery wells were installed across site. Corrective action and groundwater monitoring since 1993.
A. NOR No.:	018
B. Description:	South Phase Separation Organic Pit
C. Dates of Operation:	1978 to 1986
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	Yes

Pollutant Dispersal Pathways:	Soil and Groundwater
Summary:	RCRA-regulated unit. One of the four hazardous waste management units (HWMUs) that were certified as closed on March 25, 1987 in accordance with the Closure Plans approved by Texas Water Commission (TWC). To facilitate closure during basin closure, an asphalt/concrete cover was placed on the top of the closed North and South Phase Separation Organic Pits (Permitted Units No. 3 and No. 4) and the surrounding area prior to the OPDA basin construction to establish a construction equipment laydown area. The asphalt/concrete cover at this HWMU has been maintained during and after the post-closure period.
Recommended Action:	Post-closure care required within Permit. Release to groundwater addressed in corrective action portion of the Compliance Plan. Groundwater recovery wells were installed across site. Corrective action and groundwater monitoring since 1993.
A. NOR No.:	012
B. Description:	OPDA Basin No. 1
C. Dates of Operation:	1952 to 1980
Wastes Managed:	D001, D002, D018, D035, U002, U031, U112, U113, U115, U140, U159, U161, U188, U240, U359
Evidence of Release:	Yes
Pollutant Dispersal Pathways:	Soil and Groundwater
Summary:	TRRP Remedy Standard B was implemented in accordance with the RAP approved on Dec. 7, 2011 for OPDA Basins No. 1, 2, and 4. Response action included installation of a soil cover and restriction to prevent direct exposure to waste and affected soil remaining in basins. Basin 1 construction activities started July 2013 and were completed February 2024. The TCEQ approved RACR documenting closure on Aug. 8, 2014.
Recommended Action:	Release to groundwater addressed in corrective action portion of the Compliance Plan. Groundwater recovery wells were installed across site. Corrective action and groundwater monitoring since 1993.
A. NOR No.:	010
B. Description:	OPDA Basin No. 2
C. Dates of Operation:	1952 to 1975
Wastes Managed:	NA

Evidence of Release:	Yes
Pollutant Dispersal Pathways:	Soil and Groundwater
Summary:	TRRP Remedy Standard B was implemented in accordance with the RAP approved on Dec. 7, 2011 for OPDA Basins No. 1, 2, and 4. Response action included installation of a soil cover and restriction to prevent direct exposure to waste and affected soil remaining in basins. Basin 2 construction activities started November 2014 and were completed December 2017. The TCEQ approved RACR documenting closure on May 8, 2018.
Recommended Action:	Release to groundwater addressed in corrective action portion of the Compliance Plan. Groundwater recovery wells were installed across site. Corrective action and groundwater monitoring since 1993.
A. NOR No.:	007
B. Description:	OPDA Basin No. 4
C. Dates of Operation:	1952 to 1975
Wastes Managed:	NA
Evidence of Release:	Yes
Pollutant Dispersal Pathways:	Soil and Groundwater
Summary:	TRRP Remedy Standard B was implemented in accordance with the RAP approved on Dec. 7, 2011 for OPDA Basins No. 1, 2, and 4. Response action included installation of a soil cover and restriction to prevent direct exposure to waste and affected soil remaining in basins. Basin 4 construction activities started February 2014 and were completed October 2014. The TCEQ approved RACR documenting closure on April 15, 2015.
Recommended Action:	Release to groundwater addressed in corrective action portion of the Compliance Plan. Groundwater recovery wells were installed across site. Corrective action and groundwater monitoring since 1993.
A. NOR No.:	008
B. Description:	Lake Institute
C. Dates of Operation:	1966 to 2004
Wastes Managed:	NA

Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI documented that soil concentrations were below RRS 2 criteria. No further action approved by TCEQ per Compliance Plan issued on June 30, 2004. TCEQ's closure letter (dated August 9, 2004) documented acknowledgement of deed recordation.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	003
B. Description:	Lake Gimber
C. Dates of Operation:	1958 to 2004
Wastes Managed:	NA
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil and groundwater.
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI documented that soil concentrations compared to RRS standards. Monitoring wells also installed. No further action approved by TCEQ per Compliance Plan issued on June 30, 2004. Unit transferred to Oiltanking. Administratively closed per TCEQ approval letter dated May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	028
B. Description:	Rack 5 Sump
C. Dates of Operation:	1972 to 2004
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	No
Pollutant Dispersal Pathways:	Groundwater
	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). Soil sampling not required per RFI work plan. Groundwater data did not indicate a release from this

Summary:	unit. No further action approved by TCEQ per Compliance Plan issued on June 30, 2004. Unit transferred to Oiltanking. Administratively closed per TCEQ approval letter dated May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	050
B. Description:	Rack 10 Sump
C. Dates of Operation:	1972 to 2004
Wastes Managed:	NA
Evidence of Release:	No
Pollutant Dispersal Pathways:	None
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI documented no RRS 2 exceedances in soil. Groundwater data did not indicate a release from this unit. No further action approved by TCEQ per Compliance Plan issued on June 30, 2004. Unit transferred to Oiltanking. Administratively closed per TCEQ approval letter dated May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	013
B. Description:	Dock 62 Dumpster Tank
C. Dates of Operation:	1985 to 2017
Wastes Managed:	D001, D035, U002, U031, U112, U140, U161
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.

A. NOR No.:	021
B. Description:	Dock 62 Building 305 Sump
C. Dates of Operation:	1970 to 2004
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	022
B. Description:	Dock 62 Sump
C. Dates of Operation:	1976 to 2004
Wastes Managed:	D001, D002, D035
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	048
B. Description:	Dock 62 Drum Storage Area

C. Dates of Operation:	1985 to 2004
Wastes Managed:	D001, D007, D018, D028, D035, F003, F005, U113
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	020
B. Description:	Tank 952 Sump
C. Dates of Operation:	1976 to 2004
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Unit subject to TRRP/APAR. APAR approved December 28, 2016. RACR for Remedy Standard A closure approved January 24, 2019. Restrictive covenant filed on July 15, 2019. TCEQ acknowledged/approved August 2, 2019.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	019
B. Description:	Dock 63 Slop Tank
C. Dates of Operation:	1970 to 2004
Wastes Managed:	NA

Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	023
B. Description:	Dock 63 Sumps
C. Dates of Operation:	1976 to 2004
Wastes Managed:	D001, D002
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	044
B. Description:	North Surface Water Collection Sump North of Dock 62 (Tank 904 Sump)
C. Dates of Operation:	1972 to 2004
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
	Investigated as part of Phase I RFI Report for Marine

Summary:	Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	051
B. Description:	Dock 63 Slop Tank Sump
C. Dates of Operation:	1970
Wastes Managed:	NA
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	039
B. Description:	Building 309 Sump
C. Dates of Operation:	1966
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Soil assessment showed unit not subject to TRRP/APAR submission. Dow submitted

	request for closure of unit on April 26, 2017. Approved for closure and NFA by the TCEQ on May 3, 2017.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	043
B. Description:	Lightering Pad Area System Sump
C. Dates of Operation:	Unknown to 2019
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	No
Pollutant Dispersal Pathways:	Soil
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed in 2015. Unit subject to TRRP/APAR. APAR approved December 28, 2016. Restrictive covenant filed August 26, 2019. TCEQ acknowledged/approved September 11, 2019.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	064
B. Description:	Settling Pond
C. Dates of Operation:	Unknown to 2004
Wastes Managed:	NA
Evidence of Release:	Yes
Pollutant Dispersal Pathways:	Soil and Groundwater
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed. Unit went through APAR/RAP/RACR progress. TRRP Remedy Standard A closure approved by TCEQ on March 25, 2010.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.
A. NOR No.:	085

B. Description:	Tank 948 Pond
C. Dates of Operation:	Unknown to 2004
Wastes Managed:	D001, D002, D018, D035
Evidence of Release:	Yes
Pollutant Dispersal Pathways:	Soil and Groundwater
Summary:	Investigated as part of Phase I RFI Report for Marine Terminal / Off-Plant Disposal Area (completed in 1997). RFI completed from 1997 to 2002. Unit transferred to Oiltanking. Supplement APA activities completed. Unit went through APAR/RAP/RACR progress. TRRP Remedy Standard A closure approved by TCEQ on March 25, 2010.
Recommended Action:	None. No further action approved. No additional monitoring required for this unit.

Part B

Appendix XI – Compliance Plan

Part B

Appendix XI – Compliance Plan

P.G. Certification Page

Professional Geoscientist Certification

For the purposes of this Resource Conservation and Recovery Act (RCRA) Part B Permit Application, the information contained in the Section XI.A.4 (Site Geology, Hydrogeologic Conditions, and Relationship to Surface Water) and supporting items found in Section XI have been reviewed by a professional geologist. This is to certify that I have working knowledge of the information presented in the Part B Section XI (Compliance Plan) Permit Application and have found that this information is consistent with accepted principles and practice and adequately reflects site conditions.

Richard J Trevino, P.G. (Texas)	12485	April 30, 2025
Professional Geoscientist	Geoscientist License number	License Expiration date
	12-9-24	
Signature	Date	
(713) 953-4704	(361) 563-6266	[redacted]
Office phone number	Mobile phone number	E-mail

Seals, as applicable:

RICHARD J TREVINO
GEOLOGY
12485

12-9-24

Texas Geoscience Firm Number 50158

Part B

Appendix XI – Compliance Plan

Table XI.A.1 – Facility History for Waste Management Units

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)
OPDA Basin #3 (Regulated Unit)	Surface Impoundment	009	1952	D018 D028 D035	59,900,000 Gals (17.3 Acres)	30,000,000 Gals	1986	1986	03/25/1987	Yes
OPDA Basin #5 (Regulated Unit)	Surface Impoundment	005	1966	D018 D028 D035	61,100,000 Gals (18.8 Acres)	30,000,000 Gals	1986	1986	03/25/1987	Yes
North Phase Separation Organic Pit (Regulated Unit)	Surface Impoundment	002	1978	D001 D002 D018 D035	85,000 Gals (0.06 Acres)	0	1986	1986	03/25/1987	Yes
South Phase Separation Organic Pit (Regulated Unit)	Surface Impoundment	018	1978	D001 D002 D018 D035	85,000 Gals (0.06 Acres)	0	1986	1986	03/25/1987	Yes
OPDA Basin #1	Landfill	012	1952	D001 D002 D018 D035 U002 U031	70,000,000 Gals (16.3 Acres)	70,000,000 Gals	1980	2014	08/08/2014	Yes

				U112 U113 U115 U140 U159 U161 U188 U240 U359						
OPDA Basin #2	Surface Impoundment	010	1952	NA	60,000,000 Gals (17 Acres)	50,000,000 Gals	1975	2018	5/18/2018	Yes
OPDA Basin #4	Surface Impoundment	007	1952	NA	60,600,000 Gals (17 Acres)	30,000,000 Gals	1975	2015	4/15/2015	Yes
Lake Institute	Surface Impoundment	008	1966	NA	580 Acre feet	580 Acre feet	Unknown	2004	4/27/2004	No
OPDA Phase Separation System	Wastewater Treatment Plant	077	1994	D001 D018 D028 D029 D040 D043	NA	NA	Active	NA	NA	No
OPDA Groundwater Recovery NAPL Collection Tank	Tank	193	2007	D001 D018 D028 D029 D040 D043	NA	NA	Active	NA	NA	No
Lake Gimber	Wastewater Treatment Plant	003	1958	NA	1,100,000 Gals	NA	2004	NA	6/30/2004	No (No further action approved by TCEQ on 6/30/2004)
Rack 5 Sump	Sump	028	1972	D001 D002 D018 D035	700 Gals	NA	2004	NA	6/30/2004	No (No further action approved by TCEQ on 6/30/2004)

Rack 10 Sump	Sump	050	1972	NA	560 Gals	NA	2004	NA	6/30/2004	No (No further action approved by TCEQ on 6/30/2004)
Dock 62 Dumpster Tank	Tank	013	1985	D001 D035 U002 U031 U112 U140 U161	1,200 Gals	NA	2004	NA	May 3, 2017	No (Approved for closure and NFA by the TCEQ on May 3, 2017.)
Dock 62 Building 305 Sump	Sump	021	1970	D001 D002 D018 D035	700 Gals	NA	2004	NA	May 3, 2017	No (Approved for closure and NFA by the TCEQ on May 3, 2017.)
Dock 62 Sump	Sump	022	1976	D001 D002 D035	850 Gals	Na	2004	NA	May 3, 2017	No (Approved for closure and NFA by the TCEQ on May 3, 2017.)
Dock 62 Drum Storage Area	Storage Area	048	1985	D001 D007 D018 D028 D035 F003 F005 U113	220 Gals	NA	2004	NA	May 3, 2017	No (Approved for closure and NFA by the TCEQ on May 3, 2017.)
Tank 952 Sump	Sump	020	1976	D001 D002 D018 D035	700 Gals	NA	2004	NA	August 2, 2019	No (RACR for Remedy Standard A closure approved January 24, 2019.

										Restrictive covenant filed on July 15, 2019. TCEQ acknowledged/ approved August 2, 2019.)
Dock 63 Slop Tank	Tank, Above Grade	019	1970	NA	85,000 Gals	NA	2004	NA	May 3, 2017	No (Approved for closure and NFA by the TCEQ on May 3, 2017.)
Dock 63 Sumps	Sump	023	1976	D001 D002	560 Gals	NA	2004	NA	May 3, 2017	No (Approved for closure and NFA by the TCEQ on May 3, 2017.)
North Surface Water Collection Sump North of Dock 62 (Tank 904 Sump)	Sump	044	1972	D001 D002 D018 D035	560 Gals	NA	2004	NA	May 3, 2017	Approved for closure and NFA by the TCEQ on May 3, 2017.)
Dock 63 Slop Tank Sump	Sump	051	1970	NA	850 Gals	NA	2004	NA	May 3, 2017	No (Approved for closure and NFA by the TCEQ on May 3, 2017.)
Building 309 Sump	Sump	039	1966	D001 D002 D018 D035	560 Gals	NA	2004	NA	May 3, 2017	No (Approved for closure and NFA by the TCEQ on May 3,

										2017.)
Lightering Pad Area System Sump	Sump	043	NA	D001 D002 D018 D035	560 Gals	NA	2004	NA	September 11, 2019	No (APAR approved December 28, 2016. Restrictive covenant filed August 26, 2019. TCEQ acknowledged/ approved September 11, 2019.)
Settling Pond	Surface Impoundment	064	NA	NA	NA	NA	1994	March 25, 2010	March 25, 2010	Yes (TRRP Remedy Standard A closure approved on 3/25/2010)
Tank 948 Pond	Surface Impoundment	085	NA	D001 D002 D018 D035	960 Gals	NA	1975	July 12, 2006	March 25, 2010	Yes (TRRP Remedy Standard A closure approved on 3/25/2010)

Footnotes:

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 RCRA-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. The 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.

Part B

Appendix XI – Compliance Plan

CP Tables

CP Tables I, II, III, IIIA, IV, IVA, V, VI, VII, VIII, IX

CP Table I: Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring

A. Corrective Action[1] (30 TAC Section 335.166)

Unit Name	Notice of Registration (NOR) Number, if applicable
Reserved	

B. Compliance Monitoring[1] (30 TAC Section 335.165)

Unit Name	Notice of Registration (NOR) Number, if applicable
Reserved	

C. Corrective Action[2] (30 TAC Section 335.167)

Unit Name	Notice of Registration (NOR) Number, if applicable	Unit Type (SWMU or AOC)
Reserved		

D. Alternative Corrective Action[3] (30 TAC Section 335.151)

Unit Name	Notice of Registration (NOR) Number, if applicable	Unit Type (RCRA-regulated unit, SWMU, or AOC)
OPDA Basin No. 3	009	RCRA-regulated unit
OPDA Basin No. 5	005	RCRA-regulated unit
North Phase Separation Organic Pit	002	RCRA-regulated unit
South Phase Separation Organic Pit	018	RCRA-regulated unit
OPDA Basin No. 1	012	SWMU
OPDA Basin No. 2	010	SWMU
OPDA Basin No. 4	007	SWMU

E. Facility Operations Area (FOA)[4] (30 TAC Section 335.156 and Chapter 350 Subchapter G)

Unit Name	Notice of Registration (NOR) Number, if applicable	Unit Type (RCRA-regulated unit, SWMU, or AOC)
Reserved		

Footnotes:

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 a RCRA-regulated unit(s) and from one or more SWMUs and/or AOCs.

4. List the RCRA-regulated units, SWMUs, and/or AOCs which are located within the FOA boundary that are subject to Corrective Action.

   List the RCRA-regulated units, SWMUs, and/or AOCs which are located outside of the FOA boundary and are subject to Compliance Monitoring and/or Corrective Action separately in CP Table I.A., I.B., I.C., or I.D. as appropriate.

CP Table II: Solid Waste Management Units and/or Areas of Concern Addressed in Permit Section XI.H. for which Corrective Action Applies Pursuant to 30 TAC Section 335.167

Unit Name[3]	NOR Number, if applicable	SWMU or AOC	Affected Media[1]	Date Program Requirement and Remedy Standard Completed[2]
OPDA Basin No. 1	012	SWMU	Soil and Groundwater	TRRP Remedy Standard B completed. RACR approved by TCEQ on August 8, 2014.
OPDA Basin No. 2	010	SWMU	Soil and Groundwater	TRRP Remedy Standard B completed. RACR approved by TCEQ on May 8, 2018.
OPDA Basin No. 4	007	SWMU	Soil and Groundwater	TRRP Remedy Standard B completed. RACR approved by TCEQ on April 15, 2015.
Lake Institute	008	SWMU	No	Closed on 04/27.2004 (No further action approved by TCEQ per Compliance Plan issued on June 30, 2004)
Lake Gimber	003	SWMU	No	No further action approved by TCEQ per Compliance Plan issued on June 30, 2004)
Rack 5 Sump	028	SWMU	No	No further action approved by TCEQ per Compliance Plan issued on June 30, 2004)
Rack 10 Sump	050	SWMU	No	No further action approved by TCEQ per Compliance Plan issued on June 30, 2004)
Dock 62 Dumpster Tank	013	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.
Dock 62 Building 305 Sump	021	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.
Dock 62 Sump	022	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.
Dock 62 Drum Storage Area	048	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.
Tank 952 Sump	020	SWMU	Soil	RACR for Remedy Standard A closure approved January 24, 2019. Restrictive covenant filed on July 15, 2019. TCEQ acknowledged/approved August 2, 2019.
Dock 63 Slop Tank	019	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.
Dock 63 Sumps	023	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.
North Surface Water Collection Sump North of Dock 62 (Tank 904 Sump)	044	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.

Unit Name[3]	NOR Number, if applicable	SWMU or AOC	Affected Media[1]	Date Program Requirement and Remedy Standard Completed[2]
Dock 63 Slop Tank Sump	051	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.
Building 309 Sump	039	SWMU	Soil	Approved for closure and NFA by the TCEQ on May 3, 2017.
Lightering Pad Area System Sump	043	SWMU	Soil	APAR approved December 28, 2016. Restrictive covenant filed August 26, 2019. TCEQ acknowledged/approved September 11, 2019.
Settling pond	064	SWMU	Soil and Groundwater	TRRP Remedy Standard A closure approved by TCEQ on March 25, 2010.
Tank 948 Pond	085	SWMU	Soil and Groundwater	TRRP Remedy Standard A closure approved by TCEQ on March 25, 2010.

SWMU = Solid Waste Management Unit; AOC = Area of Concern; NOR = Notice of Registration

Footnotes:

1. Specify the affected media [i.e., soil, groundwater (GW), surface water (SW), or sediment (SED)].
2. For each SWMU or AOC which has completed the Corrective Action Program objectives, specify the Remedy Standard (or Risk Reduction Standard) that was completed, the date of the Commission's No Further Action (NFA) approval letter for all affected media of concern, and the land use used to obtain NFA.
3. For sites with an authorized Facility Operations Area (FOA), list all SWMUs and/or AOCs located within the FOA boundary and outside of the FOA boundary that are subject to Corrective Action at the site.

   Please separate the SWMUs and/or AOCs that are located within the FOA boundary from the SWMUs and/or AOCs that are located outside of the FOA boundary.

Notes:

a) CP Table II lists SWMUs and/or AOC which have been identified in the RCRA Facility Assessment (RFA) Report as having a release(s) or potential releases of hazardous waste, hazardous constituents, or other chemicals of concern. The Permittee is thus required to meet Corrective Action objectives in accordance with Permit Section XI.H. and 30 TAC Section 335.167.

b) The Permittee shall update CP Table II when a new SWMU and/or AOC which requires Corrective Action is identified.

c) The Permittee shall also update CP Table II when the Corrective Action status of an affected media for a SWMU or AOC has changed as outlined in Footnote No. 2.

d) SWMUs and/or AOCs shall not be deleted from this table when the Corrective Action objectives have been completed and a NFA determination has been approved for the SWMU and/or AOC. In accordance with Permit Section XI.H., CP Table II is intended to be a historical record of the facility's corrective actions and to reflect when the Corrective Action objectives have been met for each SWMU/AOC.

e) There may be cases in which the Permittee fulfills the Corrective Action objectives for soils at a SWMU/AOC, but long-term monitoring and corrective action may be necessary to meet the groundwater Corrective Action objectives. In such instances, the SWMU/AOC would be listed in CP Table I.C and would be subject to all applicable provisions of this Compliance Plan. If a release from a SWMU/AOC is commingled with a RCRA-regulated unit, then the unit and the SWMU/AOC would be listed in CP Table I.D. In accordance with Permit Section XI.H, once the Corrective Action objectives for groundwater are completed, then the Permittee shall modify or amend the Compliance Plan to reassign the SWMU/AOC in CP Table I.C (or CP Table I.D) to CP Table II. CP Table II should reflect the new status of the SWMU/AOC and include the Remedy Standard (or Risk Reduction Standard) that was completed, the date of the NFA approval letter for all affected media of concern, and the land use used to obtain NFA.

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** Groundwater Protection Standards (mg/L) at the POC$^{1, 3}$		**Column C** Groundwater Protection Standards (mg/L) at the POE, APOE, or FBOC$^{2, 3}$	
OPDA -30 ft MSL aquifer (Class 3 Groundwater)	Arsenic	1.0	$^{GW}GW_{Class3}$		
	Barium	200.0	$^{GW}GW_{Class3}$		
	Chromium	10.0	$^{W}GW_{Class3}$		
	Cobalt	24.0	$^{GW}GW_{Class3}$		
	Copper	130.0	$^{GW}GW_{Class3}$		
	Lead	1.5	$^{GW}GW_{Class3}$		
	Zinc	730.0	$^{GW}GW_{Class3}$		
	Nickel	49.0	$^{GW}GW_{Class3}$		
	Selenium	5.0	$^{GW}GW_{Class3}$		
	Thallium	0.20	$^{GW}GW_{Class3}$		
	4,4'-DDD	0.380	$^{GW}GW_{Class3}$		
	Aldrin	0.0054	$^{GW}GW_{Class3}$		
	alpha-BHC	0.014	$^{GW}GW_{Class3}$		
	delta-BHC	0.051	$^{GW}GW_{Class3}$		
	Dieldrin	0.0057	$^{GW}GW_{Class3}$		
	Endosulfan I	4.90	$^{GW}GW_{Class3}$		
	Endosulfan II	15.0	$^{GW}GW_{Class3}$		
	Endrin	0.20	$^{GW}GW_{Class3}$		
	Acetone (2-propanone)	2200	$^{GW}GW_{Class3}$		
	Benzene	0.50	$^{GW}GW_{Class3}$		
	Carbon disulfide	240.0	$^{GW}GW_{Class3}$		
	Chlorobenzene	10.0	$^{GW}GW_{Class3}$		
	Chloroform	8.0	$^{GW}GW_{Class3}$		
	Cis-1,2-Dichloroethylene	7.0	$^{GW}GW_{Class3}$		
	Dichloroethane, 1,1-	490	$^{GW}GW_{Class3}$		
	Dichloroethane, 1,2-	0.50	$^{GW}GW_{Class3}$		
	Dichloroethylene, 1,1-	0.70	$^{GW}GW_{Class3}$		
	Dichloroethylene, trans-1,2-	10.0	$^{GW}GW_{Class3}$		
	Dichloropropane, 1,2-	0.50	$^{GW}GW_{Class3}$		

Unit Name	**Column A** Hazardous Constituents	**Column B** Groundwater Protection Standards (mg/L) at the POC[1, 3]		**Column C** Groundwater Protection Standards (mg/L) at the POE, APOE, or FBOC[2, 3]	
	Dichloropropene, trans-1,3-	0.91	$^{GW}GW_{Class3}$		
	Ethyl benzene	70.0	$^{GW}GW_{Class3}$		
	Methyl ethyl ketone (2-butanone)	1500	$^{GW}GW_{Class3}$		
	Methylene chloride (dichloromethane)	0.50	$^{GW}GW_{Class3}$		
	Pentanone, 4-methyl-2-	200	$^{GW}GW_{Class3}$		
	Styrene	10.0	$^{GW}GW_{Class3}$		
	Tetrachloroethane, 1,1,2,2-	0.460	$^{GW}GW_{Class3}$		
	Tetrachloroethylene	0.50	$^{GW}GW_{Class3}$		
	Toluene	100.0	$^{GW}GW_{Class3}$		
	Trans-1,2-dichloroethylene	10.0	$^{GW}GW_{Class3}$		
	Trichloroethane, 1,1,2-	0.50	$^{GW}GW_{Class3}$		
	Trichloroethylene	0.50	$^{GW}GW_{Class3}$		
	Trichloropropane, 1,2,3-	0.003	$^{GW}GW_{Class3}$		
	Vinyl Acetate	2400	$^{GW}GW_{Class3}$		
	Vinyl chloride	0.20	$^{GW}GW_{Class3}$		
	Xylenes	1000.0	$^{GW}GW_{Class3}$		
	Acenaphthene	150.0	$^{GW}GW_{Class3}$		
	Acenaphthylene	150.0	$^{GW}GW_{Class3}$		
	Acetophenone	240.0	$^{GW}GW_{Class3}$		
	Aminobiphenyl, 4-	0.015	$^{GW}GW_{Class3}$		
	Anthracene	730.0	$^{GW}GW_{Class3}$		
	Benz-a-anthracene	0.91	$^{GW}GW_{Class3}$		
	Benzo-a-pyrene	0.020	$^{GW}GW_{Class3}$		
	Benzo-b-fluoranthene	0.91	$^{GW}GW_{Class3}$		
	Benzo-g,h,i-perylene	73.0	$^{GW}GW_{Class3}$		
	Benzo-k-fluoranthene	9.1	$^{GW}GW_{Class3}$		
	Bis (2-chloroethyl) ether	0.083	$^{GW}GW_{Class3}$		
	Bis (2-ethyl-hexyl) phthalate	0.60	$^{GW}GW_{Class3}$		
	Chrysene	91.0	$^{GW}GW_{Class3}$		

Unit Name	**Column A** Hazardous Constituents	**Column B** Groundwater Protection Standards (mg/L) at the POC$^{1, 3}$		**Column C** Groundwater Protection Standards (mg/L) at the POE, APOE, or FBOC$^{2, 3}$	
	Cresol, 0- (2-methylphenol)	120.0	$^{GW}GW_{Class3}$		
	Cresol, m- (3-methylphenol)	120.0	$^{GW}GW_{Class3}$		
	Dichlorobenzene, 1,2-	60.0	$^{GW}GW_{Class3}$		
	Dichlorobenzene, 1,3-	73.0	$^{GW}GW_{Class3}$		
	Dichlorobenzene, 1,4-	7.50	$^{GW}GW_{Class3}$		
	Dichlorodisopropyl ether, 2,2'- (Bis(2-chloroisopropyl) ether)	1.30	$^{GW}GW_{Class3}$		
	Dimethylphenol, 2,4-	49.0	$^{GW}GW_{Class3}$		
	Di-n-butyl phthalate	240.0	$^{GW}GW_{Class3}$		
	Di-n-octyl phthalate	24.0	$^{GW}GW_{Class3}$		
	Fluoranthene	98.0	$^{GW}GW_{Class3}$		
	Methylnaphthalene, 2-	9.80	$^{GW}GW_{Class3}$		
	Naphthalene	49.0	$^{GW}GW_{Class3}$		
	Phenanthrene	73.0	$^{GW}GW_{Class3}$		
	Phenol	730.0	$^{GW}GW_{Class3}$		
	Pyrene	73.0	$^{GW}GW_{Class3}$		
	Pyridine	2.40	$^{GW}GW_{Class3}$		
OPDA -100 ft MSL aquifer (Class 2 Groundwater)	Arsenic	0.01	$^{GW}GW_{Ing}$		
	Barium	2.0	$^{GW}GW_{Ing}$		
	Chromium	0.10	$^{GW}GW_{Ing}$		
	Cobalt	0.24	$^{GW}GW_{Ing}$		
	Copper	1.30	$^{GW}GW_{Ing}$		
	Lead	0.015	$^{GW}GW_{Ing}$		
	Nickel	1.30	$^{GW}GW_{Ing}$		
	Selenium	0.05	$^{GW}GW_{Ing}$		
	Thallium	0.002	$^{GW}GW_{Ing}$		
	Zinc	7.30	$^{GW}GW_{Ing}$		
	4,4'-DDD	0.0038	$^{GW}GW_{Ing}$		
	Aldrin	0.00005	$^{GW}GW_{Ing}$		
	alpha-BHC	0.00014	$^{GW}GW_{Ing}$		

Unit Name	**Column A** Hazardous Constituents	**Column B** Groundwater Protection Standards (mg/L) at the POC[1, 3]		**Column C** Groundwater Protection Standards (mg/L) at the POE, APOE, or FBOC[2, 3]	
	delta-BHC	0.00051	$^{GW}GW_{Ing}$		
	Dieldrin	0.00006	$^{GW}GW_{Ing}$		
	Endosulfan I	0.049	$^{GW}GW_{Ing}$		
	Endosulfan II	0.15	$^{GW}GW_{Ing}$		
	Endrin	0.002	$^{GW}GW_{Ing}$		
	Acetone (2-propanone)	22.0	$^{GW}GW_{Ing}$		
	Benzene	0.005	$^{GW}GW_{Ing}$		
	Carbon disulfide	2.40	$^{GW}GW_{Ing}$		
	Chlorobenzene	0.100	$^{GW}GW_{Ing}$		
	Chloroform	0.08	$^{GW}GW_{Ing}$		
	Cis-1,2-Dichloroethylene	0.07	$^{GW}GW_{Ing}$		
	Dichloroethane, 1,1-	4.90	$^{GW}GW_{Ing}$		
	Dichloroethane, 1,2-	0.005	$^{GW}GW_{Ing}$		
	Dichloroethylene, 1,1-	0.007	$^{GW}GW_{Ing}$		
	Dichloroethylene, trans-1,2-	0.100	$^{GW}GW_{Ing}$		
	Dichloropropane, 1,2-	0.005	$^{GW}GW_{Ing}$		
	Dichloropropene, trans-1,3-	0.0091	$^{GW}GW_{Ing}$		
	Ethyl benzene	0.70	$^{GW}GW_{Ing}$		
	Methyl ethyl ketone (2-butanone)	15.0	$^{GW}GW_{Ing}$		
	Methylene chloride (dichloromethane)	0.005	$^{GW}GW_{Ing}$		
	Pentanone, 4-methyl-2-	2.0	$^{GW}GW_{Ing}$		
	Styrene	0.1	$^{GW}GW_{Ing}$		
	Tetrachloroethane, 1,1,2,2-	0.00460	$^{GW}GW_{Ing}$		
	Tetrachloroethylene	0.005	$^{GW}GW_{Ing}$		
	Toluene	1.00	$^{GW}GW_{Ing}$		
	Trans-1,2-dichloroethylene	0.1	$^{GW}GW_{Ing}$		
	Trichloroethane, 1,1,2-	0.005	$^{GW}GW_{Ing}$		
	Trichloroethylene	0.005	$^{GW}GW_{Ing}$		

Unit Name	**Column A** Hazardous Constituents	**Column B** Groundwater Protection Standards (mg/L) at the POC[1, 3]		**Column C** Groundwater Protection Standards (mg/L) at the POE, APOE, or FBOC[2, 3]	
	Trichloropropane, 1,2,3-	0.00003	$^{GW}GW_{Ing}$		
	Vinyl acetate	24.0	$^{GW}GW_{Ing}$		
	Vinyl chloride	0.002	$^{GW}GW_{Ing}$		
	Xylenes	10.0	$^{GW}GW_{Ing}$		
	Acenaphthene	1.50	$^{GW}GW_{Ing}$		
	Acenaphthylene	1.50	$^{GW}GW_{Ing}$		
	Acetophenone	2.40	$^{GW}GW_{Ing}$		
	Aminobiphenyl, 4-	0.00015	$^{GW}GW_{Ing}$		
	Anthracene	7.30	$^{GW}GW_{Ing}$		
	Benz-a-anthracene	0.0091	$^{GW}GW_{Ing}$		
	Benzo-a-pyrene	0.0002	$^{GW}GW_{Ing}$		
	Benzo-b-fluoranthene	0.0091	$^{GW}GW_{Ing}$		
	Benzo-g,h,i-perylene	0.73	$^{GW}GW_{Ing}$		
	Benzo-k-fluoranthene	0.091	$^{GW}GW_{Ing}$		
	Bis (2-chloroethyl) ether	0.00083	$^{GW}GW_{Ing}$		
	Bis (2-ethyl-hexyl) phthalate	0.006	$^{GW}GW_{Ing}$		
	Chrysene	0.91	$^{GW}GW_{Ing}$		
	Cresol, 0- (2-methylphenol)	1.2	$^{GW}GW_{Ing}$		
	Cresol, m- (3-methylphenol)	1.2	$^{GW}GW_{Ing}$		
	Dichlorobenzene, 1,2-	0.600	$^{GW}GW_{Ing}$		
	Dichlorobenzene, 1,3-	0.730	$^{GW}GW_{Ing}$		
	Dichlorobenzene, 1,4-	0.075	$^{GW}GW_{Ing}$		
	Dichlorodisopropyl ether, 2,2'- (Bis(2-chloroisopropyl) ether)	0.013	$^{GW}GW_{Ing}$		
	Dimethylphenol, 2,4-	0.490	$^{GW}GW_{Ing}$		
	Di-n-butyl phthalate	2.4	$^{GW}GW_{Ing}$		
	Di-n-octyl phthalate	0.240	$^{GW}GW_{Ing}$		
	Fluorene	0.980	$^{GW}GW_{Ing}$		
	Methylnaphthalene, 2-	0.098	$^{GW}GW_{Ing}$		
	Naphthalene	0.490	$^{GW}GW_{Ing}$		

Unit Name	**Column A** Hazardous Constituents	**Column B** Groundwater Protection Standards (mg/L) at the POC[1, 3]		**Column C** Groundwater Protection Standards (mg/L) at the POE, APOE, or FBOC[2, 3]	
	Phenanthrene	0.730	$^{GW}GW_{Ing}$		
	Phenol	7.3	$^{GW}GW_{Ing}$		
	Pyrene	0.730	$^{GW}GW_{Ing}$		
	Pyridine	0.024	$^{GW}GW_{Ing}$		

Notes:

a) If the Corrective Action Program (Provision XI.E.) does not apply to the RCRA-regulated units, SWMUs, or AOCs at the facility, delete the contents of the table and add "Reserved" to the first row of CP Table III.

b) CP Table III represents the long list of hazardous constituents that are reasonably expected to be in, or derived from, the waste placed in each RCRA-regulated unit, SWMU, and/or AOC listed in the table. CP Table III also lists the hazardous constituents that have been historically detected in the groundwater for each RCRA-regulated unit, SWMU, and/or AOC. These hazardous constituents are monitored in accordance with Provision XI.F.3.c.(1).

c) In accordance with Provision XI.D.6., the Groundwater Protection Standards (GWPS) must be met before the Corrective Action Program can be terminated for the RCRA-regulated unit, SWMU, and/or AOC.

d) If applicable, "Appendix IX" can be used in Column A for a unit instead of listing each chemical of concern (COC). The Permittee may petition the Executive Director for the deletion of a specific COC from the Appendix IX analysis if the Permittee can demonstrate that the COC was never used in the facility's operations nor was disposed of in the unit.

e) Attenuation monitoring point (AMP) wells, corrective action system (CAS) wells, and corrective action observation (CAO) wells should not be listed in CP Table III. These wells should only be depicted in the CP Attachment A maps. Once an AMP, CAS, or CAO well meets its respective attenuation action levels (AALs) or GWPS, then the Permittee may propose to discontinue monitoring that well without modification to the Permit. If the AMP, CAS, or CAO well is listed in CP Table III, then any proposed change to the well would require modification to the Permit. Changes to the wells depicted in the CP Attachment A maps can be approved in the Groundwater Monitoring Report required by CP Table VII and Provision XI.G.3 and become a part of the Permit by reference.

f) POC = point of compliance; POE = point of exposure; APOE = alternate point of exposure (only applicable for an authorized plume management zone [PMZ]); and FBOC = Facility Operation Area (FOA) Boundary of Compliance (only applicable for an authorized FOA).

Footnotes:

1. Use Column B to specify the GWPS assigned at the POC for a RCRA-regulated unit subject to Corrective Action or for a SWMU/AOC subject to the Risk Reduction Rules. Put "N/A" if not applicable.

2. Use Column C to specify the GWPS assigned at the POE, APOE (PMZ only), or FBOC (authorized FOA only). Put "N/A" if not applicable.

3. For each COC, include the appropriate GWPS designation to demonstrate that the Corrective Action Program objectives are being achieved either under the Risk Reduction Rules (RRR) pursuant to 30 TAC Chapter 335 <u>or</u> the Texas Risk Reduction Program (TRRP) pursuant to 30 TAC Chapter 350. The RRR and TRRP GWPS designations and definitions may not be combined pursuant to 30 TAC Section 350.2(m).

   ACL = alternative concentration limit; PCL = protective concentration level; RSA = Remedy Standard A; RSB = Remedy Standard B

<u>RRR GWPS Designations and Definitions</u>

MSC	ACL pursuant to 30 TAC Section 335.160(b) based upon the groundwater Medium-Specific Concentration (MSC), Residential (or Industrial) Risk Reduction Standard No. 2 (or No. 3) specified in 30 TAC Section 335 Subchapter S.
MCL	ACL pursuant to 30 TAC Section 335.160(b) based upon the Groundwater Maximum Contaminant Level (MCL) specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subparts B and G.
SMCL	ALC pursuant to 30 TAC Section 335.160(b) based upon the Groundwater Secondary Maximum Contaminant Level (SMCL) specified in 40 CFR Part 143, National Secondary Drinking Water Regulations.
AL	ACL pursuant to 30 TAC Section 335.160(b) based upon the Action Level (AL) specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subpart I.
BKG	Background as determined in accordance with <u>Provision XI.F.1</u>.
ND	Non-detectable at the practical quantitation limit (PQL) as determined by the analytical methods of the most recent edition of EPA SW-846, and as listed in the July 8, 1987, edition of the Federal Register and later editions. The PQL is the lowest concentration of an analyte in groundwater that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions.

<u>TRRP GWPS Designations and Definitions</u>

$^{GW}GW_{Ing}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater ingestion PCL determined under RSA or RSB (Residential or Commercial/Industrial) for Class 1 or Class 2 groundwater. 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 30 TAC Section 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 1x10E-4) and hazard index criteria (less than or equal to 10) when there are more than 10 carcinogenic and/or more than 10 noncarcinogenic chemicals of concern within a source medium.
$^{GW}GW_{Class3}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is

	based upon the groundwater PCL determined under RSA or RSB (Residential or Commercial/Industrial) for Class 3 groundwater. 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.
$^{\text{Air}}\text{GW}_{\text{Inh-V}}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the inhalation of volatile constituents from groundwater PCL determined under RSA or RSB (Residential or Commercial/Industrial) for Class 1, 2, or 3 groundwater. 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.
$^{\text{SW}}\text{GW}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater-to-surface water PCL determined under RSA or RSB (Residential or Commercial/Industrial). 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.
$^{\text{SED}}\text{GW}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater-to-sediment PCL determined under RSA or RSB (Residential or Commercial/Industrial). 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.
$^{\text{ECO}}\text{GW}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater PCL protective of ecological receptor(s) determined under RSA or RSB (Residential or Commercial/Industrial). 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.
BKG	Background as determined in accordance with Provision XI.F.1.
ND	Non-detectable at the method quantitation limit (MQL) as determined by the analytical methods of the most recent edition of EPA SW-846 and as listed in the July 8, 1987, edition of the Federal Register and later editions. The MQL is defined in 30 TAC Section 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 the Groundwater Protection Standard

Unit Name	**Column A** Hazardous Constituents	**Column B** Groundwater Protection Standards (mg/L) at the POC[1, 3]		**Column C** Groundwater Protection Standards (mg/L) at the POE, APOE, or FBOC[2, 3]	
OPDA -30 ft MSL aquifer (Class 3 Groundwater)	Benzene	0.50	$^{GW}GW_{Class3}$		
	Dichloroethane, 1,2-	0.50	$^{GW}GW_{Class3}$		
	Dichloropropane, 1,2-	0.50	$^{GW}GW_{Class3}$		
	Trichloroethane, 1,1,2-	0.50	$^{GW}GW_{Class3}$		
	Trichloroethylene	0.50	$^{GW}GW_{Class3}$		
	Vinyl Chloride	0.20	$^{GW}GW_{Class3}$		
	Bis(2-chloroethyl) ether	0.083	$^{GW}GW_{Class3}$		
OPDA -100 ft MSL aquifer (Class 2 Groundwater)	Benzene	0.005	$^{GW}GW_{Ing}$		
	Dichloroethane, 1,2-	0.005	$^{GW}GW_{Ing}$		
	Dichloropropane, 1,2-	0.005	$^{GW}GW_{Ing}$		
	Trichloroethane, 1,1,2-	0.005	$^{GW}GW_{Ing}$		
	Trichloroethylene	0.005	$^{GW}GW_{Ing}$		
	Vinyl chloride	0.002	$^{GW}GW_{Ing}$		
	Bis(2-chloroethyl) ether	0.00083	$^{GW}GW_{Ing}$		

Notes:

a) If the Corrective Action Program (Provision XI.E.) does not apply to the RCRA-regulated units, SWMUs, or AOCs at the facility, delete the contents of the table and add “Reserved” to the first row of CP Table IIIA.

b) CP Table IIIA represents the short list of hazardous constituents (i.e., indicator parameters) developed from CP Table III and are monitored on a frequency specified in CP Table VIII to verify that the ground water protection standards (GWPS) are met.

c) In accordance with Provision XI.D.6, the GWPS must be met before the Corrective Action Program can be terminated for the RCRA-regulated unit, SWMU and/or AOC.

d) If applicable, “Appendix IX” can be used in Column A for a unit instead of listing each chemical of concern (COC). The Permittee may petition the Executive Director for the deletion of a specific COC from the Appendix IX analysis if the Permittee can demonstrate that the COC was never used in the facility’s operations nor was disposed of in the unit.

e) Attenuation monitoring point (AMP) wells, corrective action system (CAS) wells, and corrective action observation (CAO) wells should not be listed in CP Table IIIA. These wells should only be depicted in the CP Attachment A maps. Once an AMP, CAS, or CAO well meets its respective attenuation action levels (AALs) or GWPS, then the Permittee may propose to discontinue monitoring that well without modification to the Permit. If the AMP, CAS, or CAO well is listed in CP Table IIIA, then any proposed change to the well would require modification to the Permit. Changes to the wells depicted in the CP Attachment A maps can be approved in the Groundwater Monitoring Report required by CP Table VII and Provision XI.G.3 and become a part of the Permit by reference.

f) POC = point of compliance; POE = point of exposure; APOE = alternate point of exposure (only applicable for an authorized plume management zone [PMZ]); FBOC = Facility Operations Area (FOA) Boundary of Compliance (only applicable for an authorized FOA).

Footnotes:

1. Use Column B to specify the GWPS assigned at the POC for a RCRA-regulated unit subject to Corrective Action or for a SWMU/AOC subject to the Risk Reduction Rules. Put “N/A” if not applicable.

2. Use Column C to specify the GWPS assigned at the POE, APOE, or FBOC. Put “N/A” if not applicable.

3. For each COC, include the appropriate GWPS designation to demonstrate that the Corrective Action Program objectives are being achieved either under the Risk Reduction Rules (RRR) pursuant to 30 TAC Chapter 335 or the Texas Risk Reduction Program (TRRP) pursuant to 30 TAC Chapter 350. The RRR and TRRP GWPS designations and definitions may not be combined pursuant to 30 TAC Section 350.2(m).

   ACL = alternative concentration limit; PCL = protective concentration level; RSA = Remedy Standard A; RSB = Remedy Standard B

RRR GWPS Designations and Definitions

MSC	ACL pursuant to 30 TAC Section 335.160(b) based upon the groundwater Medium-Specific Concentration (MSC), Residential (or Industrial) Risk Reduction Standard No. 2 (or No. 3) specified in 30 TAC Section 335 Subchapter S.
MCL	ACL pursuant to 30 TAC Section 335.160(b) based upon the groundwater Maximum Contaminant Level (MCL) specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subparts B and G.
SMCL	ALC pursuant to 30 TAC Section 335.160(b) based upon the groundwater Secondary Maximum Contaminant Level (SMCL) specified in 40 CFR Part 143, National Secondary Drinking Water Regulations.
AL	ACL pursuant to 30 TAC Section 335.160(b) based upon the Action Level (AL) specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subpart I.
BKG	Background as determined in accordance with Provision XI.F.1.
ND	Non-detectable at the practical quantitation limit (PQL) as determined by the analytical methods of the most recent edition of EPA SW-846 and as listed in the

July 8, 1987, edition of the Federal Register and later editions. The PQL is the lowest concentration of an analyte in groundwater that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions.

TRRP GWPS Designations and Definitions

$^{GW}GW_{Ing}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater ingestion PCL determined under RSA or RSB (Residential or Commercial /Industrial) for Class 1 or Class 2 groundwater. 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 30 TAC Section 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 1x10E-4) and hazard index criteria (less than or equal to 10) when there are more than 10 carcinogenic and/or more than 10 noncarcinogenic chemicals of concern within a source medium.
$^{GW}GW_{Class3}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater PCL determined under RSA or RSB (Residential or Commercial /Industrial) for Class 3 groundwater. 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.
$^{Air}GW_{Inh-V}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the inhalation of volatile constituents from groundwater PCL determined under RSA or RSB (Residential or Commercial /Industrial) for Class 1, 2, or 3 groundwater. 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 Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater-to-surface water PCL determined under RSA or RSB (Residential or Commercial/Industrial). 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 Section 335.160(b)and 30 TAC Chapter 350 which is based upon the groundwater-to-sediment PCL determined under RSA or RSB (Residential or Commercial/Industrial). 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 Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater PCL protective of ecological receptor(s) determined under RSA or RSB (Residential or Commercial/Industrial). 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.
BKG	Background as determined in accordance with Provision XI.F.1.

ND	Non-detectable at the method quantitation limit (MQL) as determined by the analytical methods of the most recent edition of EPA SW-846 and as listed in the July 8, 1987, edition of the Federal Register and later editions. The MQL is defined in 30 TAC Section 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

Unit Name	Column A Hazardous Constituents	Column B Concentration Limits (mg/L)[1, 2]	
Reserved			

Notes:

a) If there are no RCRA-regulated units subject to the Compliance Monitoring Program pursuant to 30 TAC Section 335.165, delete the contents of the table and add "Reserved" to the first row of CP Table IV.

b) CP Table IV represents the long list of hazardous constituents that are reasonably expected to be in, or derived from, waste placed in a RCRA-regulated unit but may not be detected in the groundwater above the chemical of concern's (COC) concentration limit.

c) If applicable, "Appendix IX" can be used in Column A for a RCRA-regulated unit instead of listing each COC. The Permittee may petition the Executive Director for the deletion of a specific COC from the Appendix IX analysis if the Permittee can demonstrate that the COC was never used in the facility's operations nor was disposed of in the unit.

d) CP Table IV chemicals of concern (COCs) are to be monitored annually in accordance with Provision XI.F.3.c(2)(b). Any CP Table IV COCs detected in the groundwater at a concentration greater than the COC's concentration limit should be added to CP Table IVA through permit modification or amendment.

Footnotes:

1. Use Column B to specify the concentration limit assigned at the point of compliance (POC).

2. For each COC, include the appropriate concentration limit designation according to either the Risk Reduction Rules (RRR) pursuant to 30 TAC Chapter 335 or the Texas Risk Reduction Program (TRRP) pursuant to 30 TAC Chapter 350. The RRR and TRRP concentration limit designations and definitions may not be combined pursuant to 30 TAC Section 350.2(m).

RRR Concentration Limit Designations and Definitions

ND	Non-detectable at the practical quantitation limit (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. The PQL is the lowest concentrations of analytes in groundwater that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions.
BKG	Background as determined in accordance with Provision XI.F.1.

TRRP Concentration Limit Designations and Definitions

ND	Non-detectable at the method quantitation limit (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. The MQL is defined in 30 TAC Section 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.
BKG	Background as determined in accordance with Provision XI.F.1.

CP Table IVA: Compliance Monitoring Program Table of Detected Hazardous Constituents and the Groundwater Protection Standard

Unit Name	**Column A** Hazardous Constituents	**Column B** Groundwater Protection Standards (mg/L)[1, 2]	
Reserved			

Notes:

a) If there are no RCRA-regulated units subject to the Compliance Monitoring Program pursuant to 30 TAC Section 335.165, delete the contents of the table and add "Reserved" to the first row of CP Table IVA.

b) CP Table IVA represents the short list of hazardous constituents released from a RCRA-regulated unit which are detected in the groundwater above the concentration limits specified in CP Table IV, Column B.

c) CP Table IVA chemicals of concern (COCs) are monitored in accordance with the frequency specified in CP Table VIII to verify the groundwater protection standards (GWPS) are met.

Footnotes:

1. Use Column B to specify the GWPS assigned at the point of compliance (POC).

2. For each COC, include the appropriate GWPS designation that applies to verify the Compliance Monitoring Program objectives are being achieved either under the Risk Reduction Rules (RRR) pursuant to 30 TAC Chapter 335 or the Texas Risk Reduction Program (TRRP) pursuant to 30 TAC Chapter 350. The RRR and TRRP GWPS designations and definitions may not be combined pursuant to 30 TAC Section 350.2(m).

   ACL = alternative concentration limit; PCL = protective concentration level; RSA = Remedy Standard A; RSB = Remedy Standard B.

RRR GWPS Designations and Definitions

MSC	ACL pursuant to 30 TAC Section 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 Section 335 Subchapter S.
MCL	ACL pursuant to 30 TAC Section 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	ACL pursuant to 30 TAC Section 335.160(b) based upon the Groundwater Secondary Maximum Contaminant Level specified in 40 CFR Part 143, National Secondary Drinking Water Regulations.
AL	ACL pursuant to 30 TAC Section 335.160(b) based upon the Action Level (AL) specified in 40 CFR Part 141, National Primary Drinking Water Regulations Subpart I.
BKG	Background as determined in accordance with Provision XI.F.1.
ND	Non-detectable at the practical quantitation limit (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. The PQL is the lowest concentrations of analytes in groundwater that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions.

TRRP GWPS Designations and Definitions

$^{GW}GW_{Ing}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater ingestion PCL determined under RSA or RSB (Residential or Commercial/Industrial) for Class 1 or Class 2 groundwater. 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 30 TAC Section 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 1x10E-4) and hazard index criteria (less than or equal to 10) when there are more than 10 carcinogenic and/or more than 10 noncarcinogenic chemicals of concern within a source medium.
$^{GW}GW_{Class3}$	ACL pursuant to 30 TAC Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater PCL determined under RSA or RSB (Residential or Commercial/Industrial) for Class 3 groundwater. 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 Section 335.160(b) and 30 TAC Chapter 350 which is based upon the inhalation of volatiles from groundwater PCL determined under RSA or RSB (Residential or Commercial/Industrial) for Class 1, 2, or 3 groundwater. 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 Section 335.160(b) and 30 TAC Chapter 350 which is

	based upon the groundwater-to-surface water PCL determined under RSA or RSB (Residential or Commercial/Industrial). 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 Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater-to-sediment PCL determined under RSA or RSB (Residential or Commercial/Industrial). 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 Section 335.160(b) and 30 TAC Chapter 350 which is based upon the groundwater PCL protective of ecological receptor(s) determined under RSA or RSB. 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.
BKG	Background as determined in accordance with Provision XI.F.1.
ND	Non-detectable at the method quantitation limit (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. The MQL is defined in 30 TAC Section 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 V: Designation of Wells

Point of Compliance (POC) Wells

Unit Name	Well Numbers
Zone III Wells (-30 ft MSL aquifer)	OP-84-111P-A
	OP-84-115P-A
	OP-84-116P-A
	OP-84-120P-A
	OP-84-123P-A
	OP-84-124P-A
	OP-87-364W-A
	OP-87-369W-A
	OP-88-373W-A
	OP-93-484W-A
	OP-93-485W-A
	OP-93-486W-A
	OP-93-487W-A
Zone V Wells (-100 ft MSL aquifer)	OP-88-377W-B

Point of Exposure (POE) Wells

Unit Name	Well Numbers
RESERVED	

Alternate Point of Exposure (APOE) Wells

Unit Name	Well Numbers
RESERVED	

Background Wells

Unit Name	Well Numbers
RESERVED	

FOA Boundary of Compliance (FBOC) Wells

Unit Name	Exposure Pathway	Well Numbers
RESERVED		

Note:
Attenuation monitoring point (AMP) wells, corrective action system (CAS) wells, and corrective action observation (CAO) wells required by Permit Section XI.B.2. should not be listed in CP Table V. These wells should only be depicted in the CP Attachment A maps. Once an AMP, CAS, or CAO well meets its respective attenuation action levels (AALs) or GWPS, then the Permittee may propose to discontinue monitoring that well without modification to the Permit. If the AMP, CAS, or CAO well is listed in CP Table V, then any proposed change to the well would require modification to the Permit. Changes to the wells depicted in the CP Attachment A maps can be approved in the Groundwater Monitoring Report required by Provision XI.G.3. and CP Table VII and become a part of the Permit by reference.

CP Table VI: Compliance Period and Post Closure Period for RCRA-Regulated Units

OPDA RCRA-Regulated Units	Year or Number of Years
Year Waste Management Activities Initiated	1952 (OPDA Basin No. 3)
Year Closed	1987 (OPDA Basin No. 3)
Compliance Period	35 Years
Compliance Period Begin Date	1993
Compliance Period End Date	2028
Post Closure Care Period	30 Years
Post Closure Care Period Begin Date	1987
Post Closure Care Period End Date	2017

The OPDA RCRA-Regulated Units include OPDA Basin No. 3 (NOR No. 9); OPDA Basin No. 5 (NOR No. 5); North Phase Separation Organic Pit (NOR No.2); and South Phase Separation Organic Pit (NOR No. 18). The Compliance Period was based upon the oldest RCRA-regulated Unit identified at the OPDA. OPDA Basin No. 3 was initially put into operation in 1952 and was closed in 1987 according to the Compliance Plan application.

CP Table VII: Reporting Requirements

Item	Program	Reporting Frequency	Requirements
1.	All programs	Annually by January 21st	Each report shall be certified by a qualified engineer and/or geoscientist.
2.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	A table of all modifications and amendments made to this Compliance Plan with their corresponding approval dates by the Executive Director (or the Commission) and a brief description of each action;
3.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	A summary of any activity and/or response actions implemented since the last reporting period within an area subject to an institutional control.
4.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Tabulation of well casing elevations in accordance with CP Attachment C;
5.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Provide a certified well installation diagram for any new monitoring well installed or replaced during the reporting period. Provide the certification for all wells plugged and abandoned during the reporting period;
6.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Recommendation for any changes to the program;
7.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Any other items requested by the Executive Director;

Item	Program	Reporting Frequency	Requirements
8.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Prepare water table maps from the groundwater data collected pursuant to Permit Section XI. F. and reported in accordance with Provision XI.G.3. The Permittee shall also include in the report an evaluation of the following parameters: a. Development and maintenance of a cone of depression during operation of the groundwater recovery system(s), if applicable; b. Direction and gradient of groundwater flow; c. Effectiveness of hydrodynamic control of the contaminated groundwater zone during operation of the groundwater recovery system(s), if applicable; and d. Estimation of the rate and direction of groundwater contamination migration.
9.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	The Permittee shall submit the groundwater monitoring report required by Provision XI.G.3. to each recipient listed in Provision XI.J.3. The report must include all applicable information listed in this table (CP Table VII: Reporting Requirements) for the reporting period. If both Corrective Action and Compliance Monitoring Programs are authorized, then the report shall contain the applicable information required for both programs.
10.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Discuss the Corrective Action System(s) authorized under Provision XI.B.3. that was in operation during the reporting period. Provide a narrative summary of the evaluations made for each system for the preceding reporting period in accordance with Permit Sections XI.E., XI.F., and XI.G. The reporting periods shall be January 1st through June 30th and July 1st through December 31st for the Corrective Action Program, unless an alternative schedule is approved by the Commission. The reporting period for the Compliance Monitoring Program shall be based on the calendar year.
11.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Discuss the method(s) used to manage recovered/purged groundwater in accordance with Provision XI.B.8. The Permittee shall maintain this information as part of the facility's operating record and make it available for inspection upon request.

Item	Program	Reporting Frequency	Requirements
12.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Provide an updated table and map of all monitoring and corrective action system wells. The wells to be sampled shall be those wells proposed in the Compliance Plan Application referenced in Provision I.B. and any changes subsequently approved by the Executive Director pursuant to Provisions XI.B.2. and XI.B.3. Provide in chronological order a list of those wells which have been added to, or deleted from, the groundwater monitoring program and remediation systems since original issuance of the Compliance Plan. Include the date of the Commission's approval for each well;
13.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Provide the results of the chemical analyses, submitted in a tabulated format acceptable to the Executive Director, which clearly indicates each chemical of concern (COC) that exceeds the Groundwater Protection Standard (GWPS) or Concentration Limit. Copies of the original laboratory report(s) which contain the appropriate quality control and quality assurance data and the detection limit for each COC shall be provided if requested by the Executive Director;
14.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Tabulation of all water level elevations, depth to water measurements, and total depth of well measurements collected since the previous groundwater monitoring report was submitted as required by Provisions XI.F.3.d.(1) and XI.F.3.d.(4). Also include in the table an evaluation of the silt accumulated in each well and clearly indicate the wells which require corrective action for silt accumulation as required by Provision XI.F.3.d.(4).;
15.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Provide potentiometric surface maps showing the elevation of the water table at the time of sampling, delineation of the radius of influence of the Corrective Action System, and the direction of groundwater flow gradients outside any radius of influence;
16.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Tabulation of all data evaluation results pursuant to Provision XI.F.4. Include the compliance status of each well regarding the Corrective Action objectives, GWPS, and/or Concentration Limits;

Item	Program	Reporting Frequency	Requirements
17.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Provide an updated summary as required by CP Table VIII;
18.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Provide a summary of any changes made to the groundwater monitoring program and/or Corrective Action Program. Include a summary of well inspections, repairs, and any operational difficulties;
19.	Corrective Action and/or Compliance Monitoring	Annually by January 21st	Include a notation of the presence or absence of light and/or dense non-aqueous phase liquids (NAPLs) in each well during each sampling event. Provide a tabulation of the depth and thickness of the NAPL, if detected, for each well;
20.	Corrective Action only	Annually by January 21st	Provide quarterly tabulations of the quantities of recovered groundwater and NAPLs, and graphs of monthly recorded flow rates versus time for the corrective action recovery wells in operation during the reporting period. Also provide a narrative summary which describes and evaluates the NAPL recovery program;
21.	Corrective Action only	Annually by January 21st	Tabulation of the total contaminant mass recovered from each groundwater recovery system in operation during the reporting period;
22.	Corrective Action only	Annually by January 21st	Provide maps of the area(s) where GWPSs are exceeded. Depict the concentrations of CP Table IIIA COCs, and any newly detected CP Table III COCs, as isopleth contours or discrete concentrations if isopleth contours cannot be inferred. Clearly delineate the area(s) where concentrations of COCs exceed the GWPS. Depict the boundary of the plume management zone (PMZ), if applicable;
23.	Corrective Action only	Annually by January 21st	Provide maps and tables which include the extent and thickness of detected light and/or dense NAPLs;

Item	Program	Reporting Frequency	Requirements
24.	Corrective Action only	Annually by January 21st	Annually provide a Corrective Measures Implementation (CMI) Progress Report or Response Action Effectiveness Report (RAER) in accordance with Provision XI.H.6. The Permittee must also include a narrative summary of the status of the approved final corrective measures conducted in accordance with the approved CMI Workplan or Response Action Plan and must demonstrate that the requirements of Provisions XI.H.6 and XI.H.7. are being met. The CMI Progress Report must include: a) A summary of the response actions taken since the last reporting period; b) An estimate of the percentage of the response action(s) which has been completed; c) An estimate in years of the additional time necessary to complete the response action(s); d) A determination whether sufficient progress is being made to complete the response actions within a reasonable timeframe; and e) Any other reasonable information required by the Executive Director. The RAER must include: f) The information required by Title 30 Texas Administrative Code (TAC) Section 350.93; or g) The Permittee may complete and submit the RAER Form (TCEQ Form 10327/RAER). The required CMI Progress Report/RAER may be submitted as a separate section in the groundwater monitoring report required by Provisions XI.G.3. Alternatively, the required elements of the CMI Progress Report/RAER may be incorporated within the groundwater monitoring report, but each requirement must be clearly identified within the groundwater monitoring report.

Item	Program	Reporting Frequency	Requirements
25.	Corrective Action only	Annually by January 21st	The Permittee must include a narrative summary of the status of each Solid Waste Management Unit (SWMU) and/or Area of Concern (AOC) subject to the requirements of Permit Section XI.H. The Permittee must also discuss the Interim Corrective Measures (ICM) Program for each applicable SWMU and/or AOC and document that the objectives of Provision XI.H.8.b. are being achieved.
26.	PMZ	Not Applicable	Provide a summary evaluating the effectiveness of the Corrective Action system in controlling migration beyond the downgradient boundary and vertical limit of the PMZ to achieve the GWPS. The summary shall include an evaluation of whether the attenuation action levels are exceeded at their respective attenuation monitoring points pursuant to 30 TAC Sections 350.33(f)(4)(A) and 350.33(f)(4)(D)(ii);
27.	PMZ	Not Applicable	Provide an estimate of the percentage of the response action which has been completed within the PMZ;
28.	PMZ	Not Applicable	Include an estimate in years of the additional time necessary to complete the response actions for the PMZ;
29.	PMZ	Not Applicable	Provide a determination whether sufficient progress is being made to achieve the selected remedy standard within a reasonable time frame given the circumstance of the affected property within the PMZ.
30.	Facility Operations Area (FOA) only	Not Applicable	Provide additional reporting requirements to fulfill the requirements of 30 TAC Section 350.134 and 30 TAC Section 350.135. These requirements include, but are not limited to: a. Provide an average of both lost workday injury case rates and injury incidence rates for the most recent three (3) year period compared to the most recent specific industry national average published by the Bureau of Labor Statistics; b. Document that the worker health and safety program meet the requirements of the Occupational Safety and Health Administration (OSHA) by providing records of the OSHA compliance history or the results of the most recent audit of the health and safety programs by the OSHA or a third party certified professional

Item	Program	Reporting Frequency	Requirements
			industrial hygienist and safety specialist. An audit is required anytime there is a significant change to the health and safety program, or at a minimum every three (3) years, the results of which indicate the program is satisfactory; c. Document a compliance history ranking of average or better for the TCEQ; d. Document the pollution prevention program that has a goal of prevention of releases of COCs to environmental media within the FOA; e. Provide a statement that the program required in 30 TAC Section 350.134(a)(7) to protect workers within the FOA from environmental media having concentrations of COCs greater than protective concentration levels (PCLs) or action levels based on the health and safety program is still in effect. In addition, the Permittee shall provide, for the preceding year, an updated map delineating areas where the Soil Response Action Plan has been implemented pursuant to 30 TAC Section 350.135(a)(5); f. Document there have not been any significant outstanding non-compliance issues resulting from inspections for compliance with the RCRA permit or Order, if any; g. Document areas of ecological impact identified within the FOA and procedures for responding to these identified ecologically impacted areas on a continual basis. Review any ecologically impacted areas annually and report any new ecological impacts within thirty (30) days of verification of impact; h. Document activity associated with tracking and responding to releases to soil and groundwater above reportable quantities, which occur within the FOA after the issuance of the Compliance Plan, in accordance with 30 TAC Section 350.135(a)(7); i. Document any NAPL occurrences and any procedure(s) used to address known NAPLs and any NAPLs identified during the operational life of the FOA. This should

Item	Program	Reporting Frequency	Requirements
			include any previously discovered NAPL occurrences; and j. Provide documentation that access is restricted to the FOA.

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 days	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 groundwater monitoring report required by Provision XI.G.3. and CP Table VII. 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 is to be completed or submitted (if this date can be determined.)
B.	60 days	30 TAC §335.163(4) and Provision XI.F.2.	Submit to the Executive Director for review and approval a Sampling & Analysis Plan (SAP) unless the SAP has been submitted with the application and referenced in Provision I.B.
C.	During the first thirty (30) days of each first and third quarter	30 TAC §335.166	Corrective Action monitoring shall be conducted on a semiannual basis for the RCRA-regulated units listed in CP Table I.A. which are subject to the Corrective Action Program.
D.	During the first thirty (30) days of each first and third quarter	30 TAC §335.165	Compliance Monitoring shall be conducted on a semiannual basis for the RCRA-regulated units listed in CP Table I.B. which are subject to the Compliance Monitoring Program.
E.	During the first thirty (30) days of each first and third quarter	30 TAC §335.167	Corrective Action monitoring shall be conducted on a semiannual basis for the solid waste management units (SWMUs) and/or areas of concern (AOCs) listed in CP Table I.C. which are subject to the Corrective Action Program.

Item	**Compliance Schedule** (from the date of issuance of the Compliance Plan unless otherwise specified)	**Regulatory Citation**	**Requirement**
F.	During the first thirty (30) days of each first and third quarter	30 TAC §335.151	Alternative Corrective Action monitoring shall be conducted on a semiannual basis for the RCRA-regulated units, SWMUs, and/or AOCs listed in CP Table I.D. which are subject to the Corrective Action Program.
G.	During the first thirty (30) days of each first and third quarter	30 TAC Section 335.156 and Chapter 350	FOA Corrective Action monitoring shall be conducted on Choose an item. basis for the RCRA-regulated units, SWMUs, and/or AOCs listed in CP Table I.E., which are located within the FOA Boundary and are subject to the Corrective Action Program.
H.	Not Applicable	30 TAC §350.31(g) and §350.33(f) (4)(C)(i)	If a plume management zone (PMZ) has been authorized, submit to the Executive Director proof of compliance with the institutional control requirements which provides notice of the existence and location of the PMZ and which prevents exposure to groundwater from this zone until such a time when the concentrations of the chemicals of concern are less than the groundwater protection standards (GWPS) listed on CP Table III.
I.	Not Applicable	30 TAC §350.33(k)	If a PMZ has been authorized, after an unexpected event occurs which indicates that additional response actions will be required at an affected property.

Notes:

1. Please note that Corrective Action monitoring is conducted on semiannual basis unless a less frequent monitoring schedule is approved based on plume stability and achievement of Corrective Action objectives.

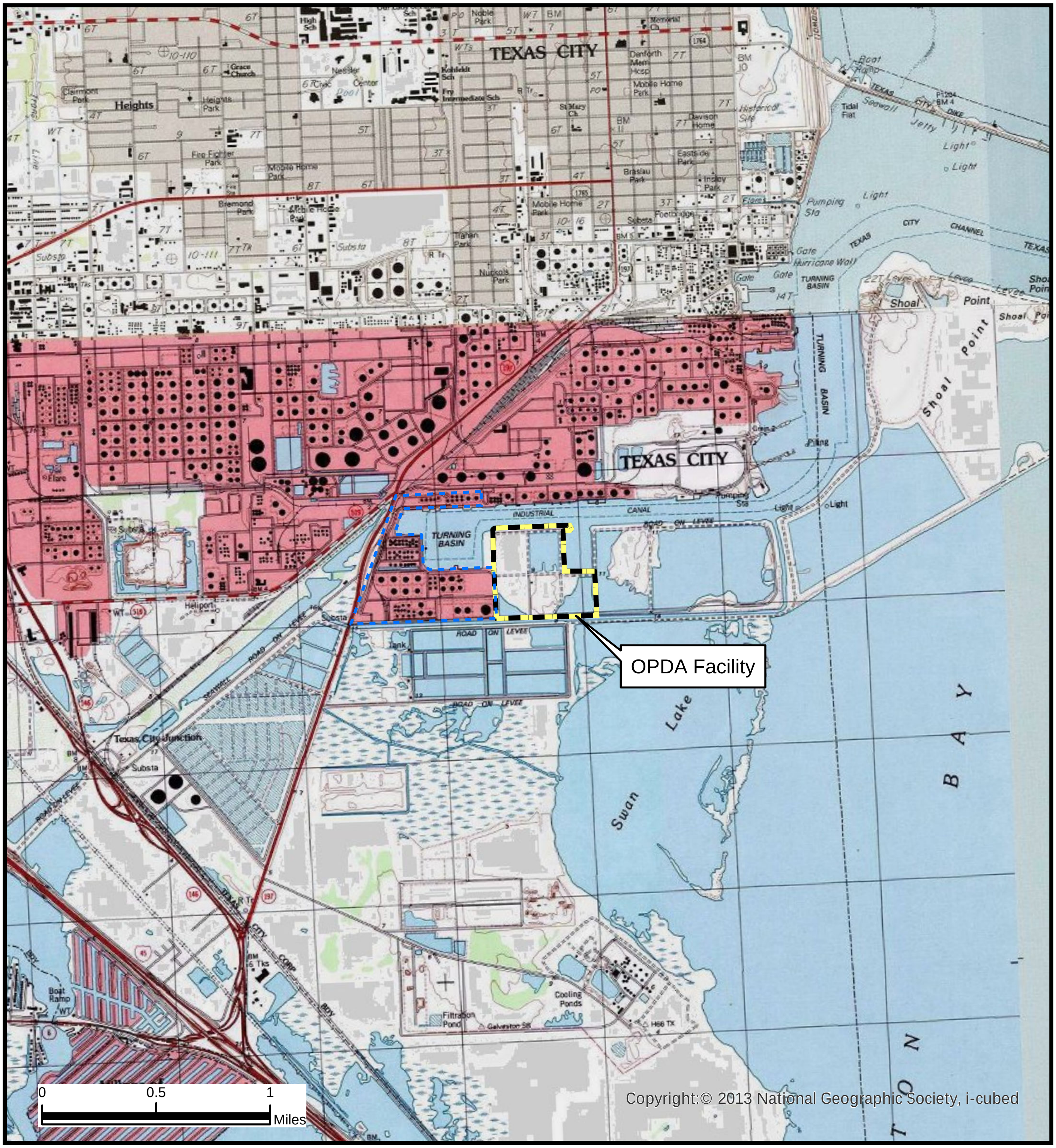
CP Table IX: Description of Uppermost Aquifer

The term "Uppermost Aquifer" as referenced in this Compliance Plan refers to the **Zone III, the –30 ft MSL aquifer, consists of silty sand, sand, and silt. It is the uppermost aquifer beneath the OPDA and is laterally continuous beneath most of the OPDA and becomes discontinuous beneath the Basin 2 at the northeast corner. This zone ranges in thickness from 0 to 30 feet beneath the OPDA with an average thickness of 20 feet. It is underlain by Zone IV. The top of Zone III dips slightly to the south with elevations ranging from –10 to –15 ft MSL. The base of Zone III dips to the south and also the west over Basins 3 and 4. The aquifer then pinches out as it passes the boundary to the former Marine Terminal area. Groundwater flow is divided across the central portion of the site that causes groundwater to flow generally towards the northeast in Basins 2 and 4, and towards the south-southwest near Basins 1, 3, and 5. The groundwater flow generally trended northward in the direction of the Texas City Industrial Ship Channel (north of the divide) and to the south toward the Gulf Coast Waste Disposal Authority Facility (south of the divide).**

Part B

Appendix XI – Compliance Plan

CP Attachment A Figures



Key Map
NTS

LEGEND

▭ OPDA Facility Boundary

╍╍ Oiltanking Texas City, L.P. Facility Boundary

Reference: The displayed Digital Raster Graphic (DRG) includes portions of the United States Geological Survey 7.5 minute quadrangles of Virginia Point and Texas City (USGS, 1993).

CP Attachment A
Sheet 1 of 3
Facility Site Map

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

DOW

ARCADIS

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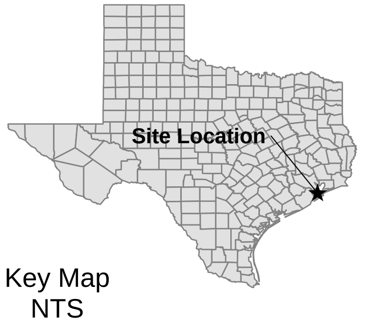

Key Map
NTS

LEGEND

▨ OPDA Facility Boundary

▬ ▬ Oiltanking Texas City, L.P. Facility Boundary

Reference: The displayed Digital Raster Graphic (DRG) includes portions of the United States Geological Survey 7.5 minute quadrangles of Virginia Point and Texas City (USGS, 1993).

CP Attachment A
Sheet 1 of 3
Facility Site Map

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

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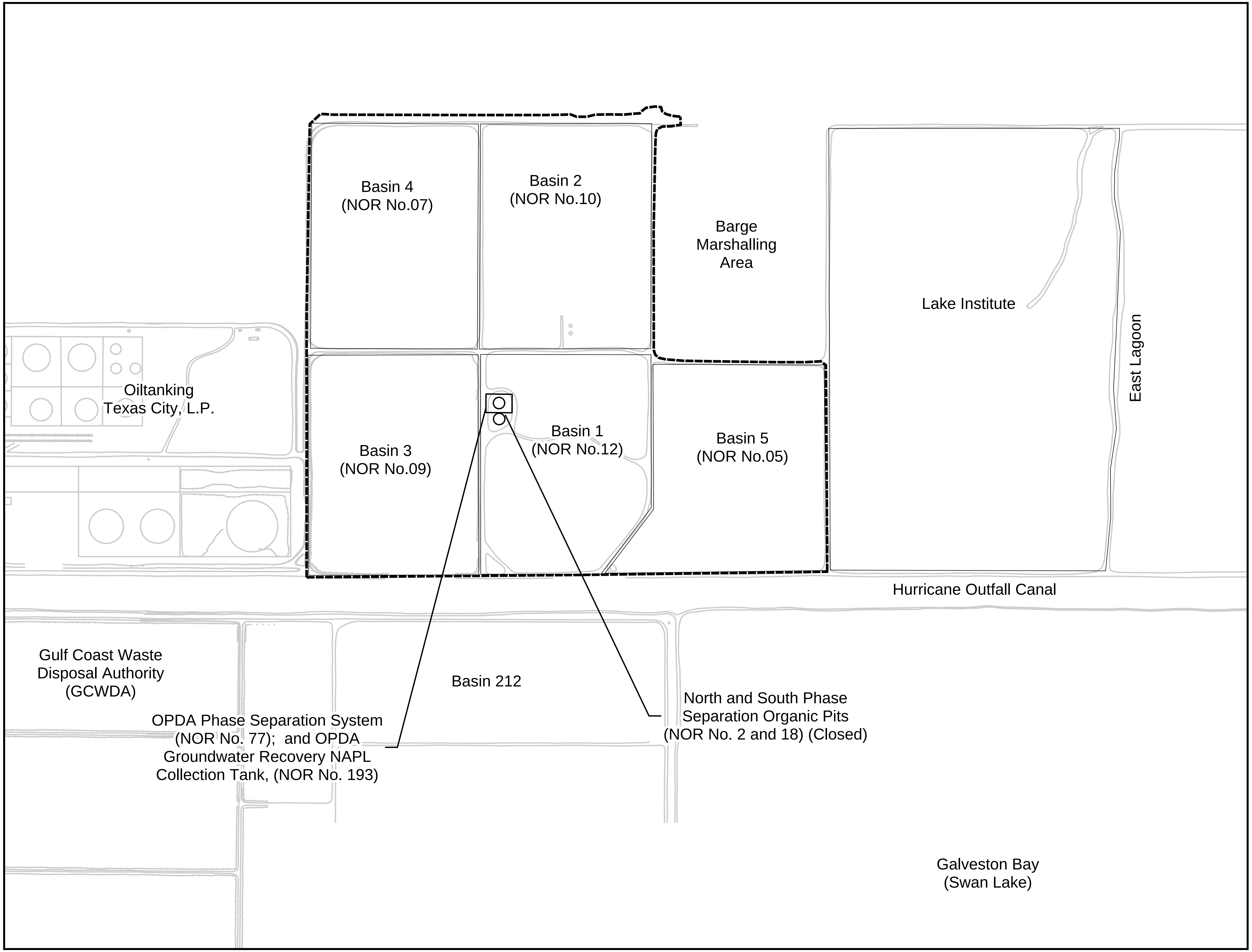

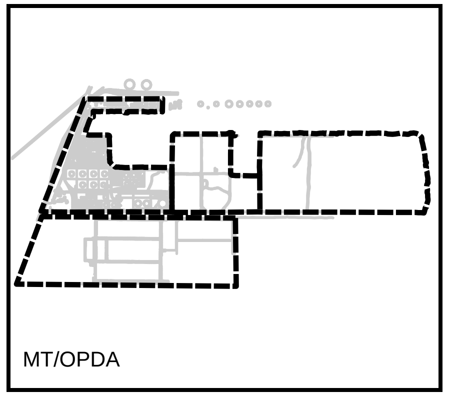

Legend

- - -	OPDA Facility Boundary
☐	Notice of Registration (NOR) Unit Boundary

Notes:
1. Active NOR units located on OilTanking were transferred to OilTanking when the property was sold on July 1, 2004. See CP Table II for regulatory status.
2. SWMUs and Regulated Units (with NOR No. shown) on OPDA facility is listed in the CP Table 1 and Table II.

0 300 600
Feet

CP Attachment A
Sheet 2 of 3
Locations of SWMUs

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

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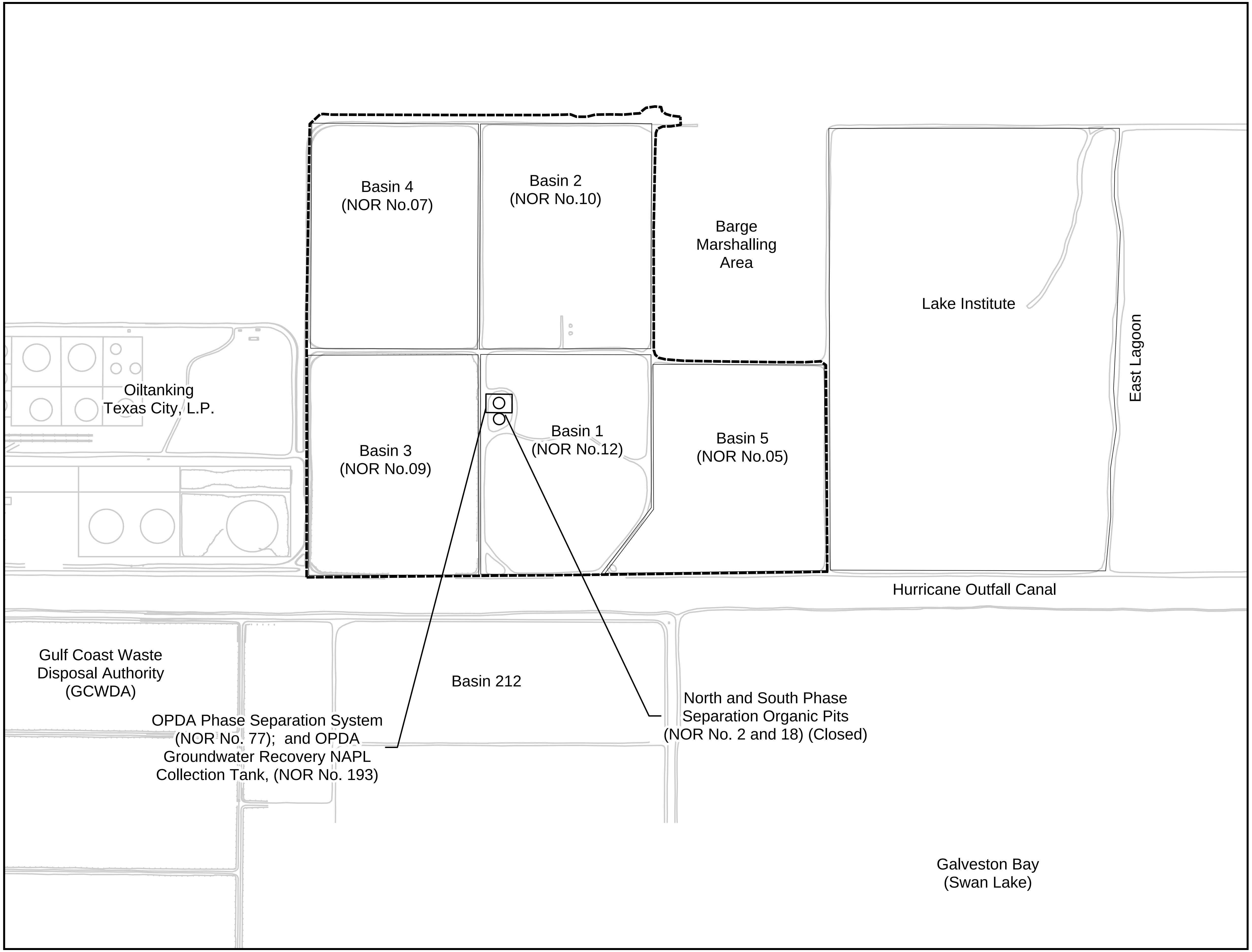

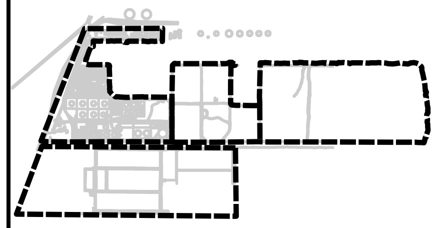
MT/OPDA

Legend

- - - OPDA Facility Boundary

☐ Notice of Registration (NOR) Unit Boundary

Notes:
1. Active NOR units located on OilTanking were transferred to OilTanking when the property was sold on July 1, 2004.
See CP Table II for regulatory status.
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0 300 600
Feet

CP Attachment A
Sheet 2 of 3
Locations of SWMUs

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

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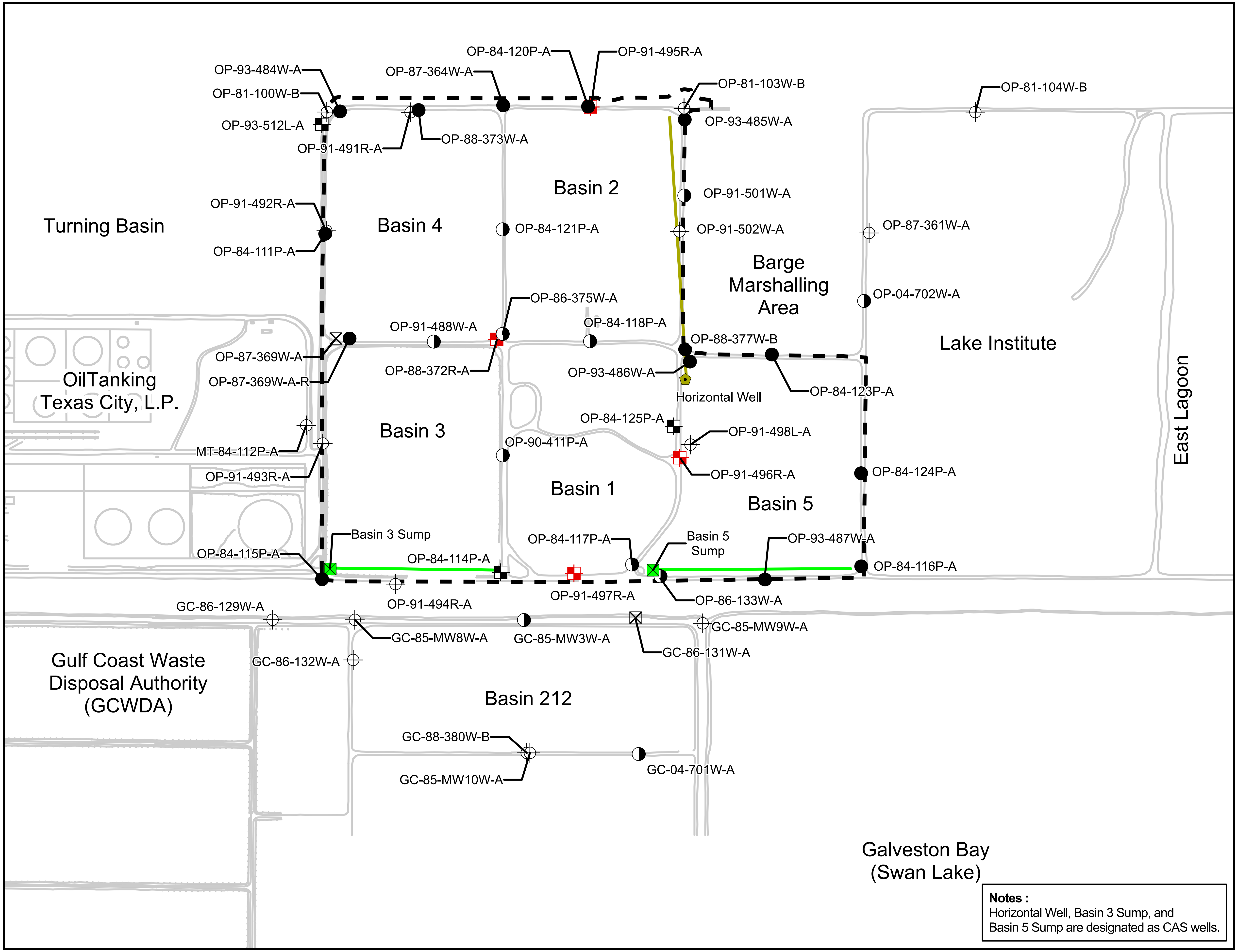
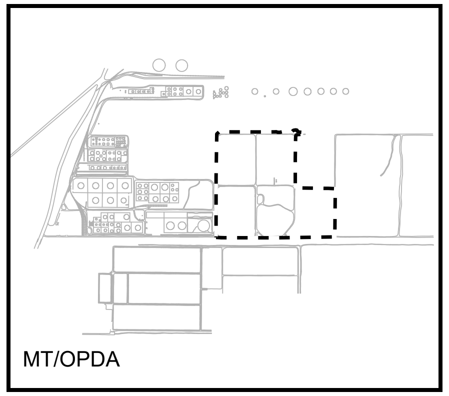


Notes :
Horizontal Well, Basin 3 Sump, and
Basin 5 Sump are designated as CAS wells.



Legend

- ◑ Corrective Action Observation (CAO) Well
- ▚ Corrective Action System (CAS) Well
- ● Point of Compliance (POC) Well
- ⊕ Potentiometric Surface Observation (PSO) Well
- ☒ Plugged Well
- 🟥 Corrective Action System (CAS) Recovery Well
- ⬠ Horizontal Well
- 🟩 Soil Cap Underdrain Line and Sump
- - - OPDA Facility Boundary

0 250 500
Feet

CP Attachment A
Sheet 3 of 3
Proposed Groundwater
Corrective Action
and Monitoring Network
Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

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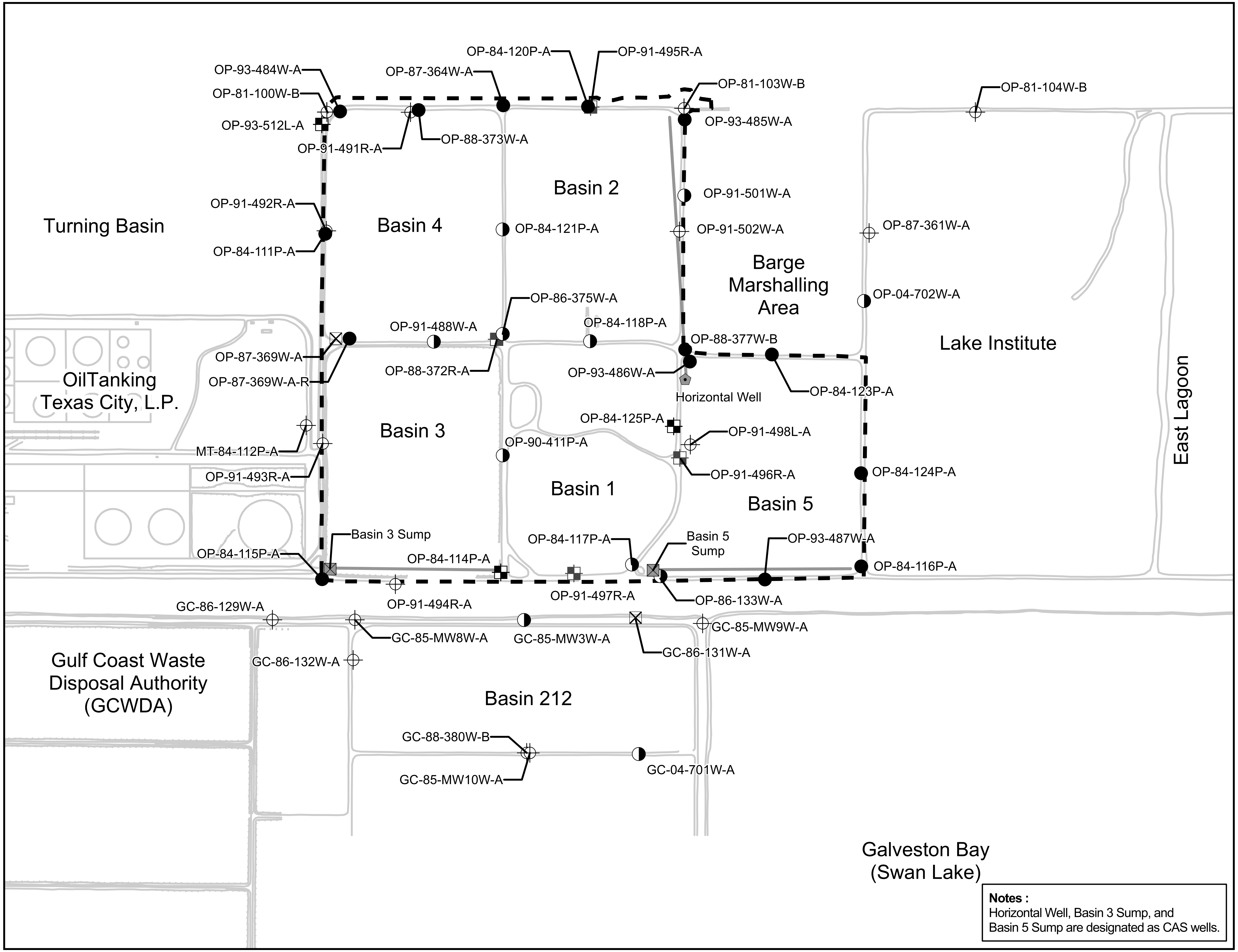
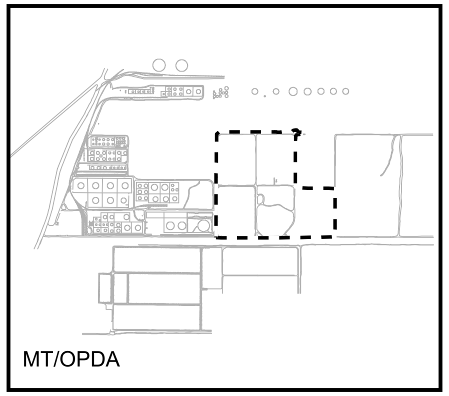


Notes :
Horizontal Well, Basin 3 Sump, and Basin 5 Sump are designated as CAS wells.



Legend

- ◐ Corrective Action Observation (CAO) Well
- ▚ Corrective Action System (CAS) Well
- ● Point of Compliance (POC) Well
- ⊕ Potentiometric Surface Observation (PSO) Well
- ☒ Plugged Well
- ▩ Corrective Action System (CAS) Recovery Well
- ⬟— Horizontal Well
- ⊠— Soil Cap Underdrain Line and Sump
- - - - OPDA Facility Boundary

0 250 500
Feet

CP Attachment A
Sheet 3 of 3
Proposed Groundwater
Corrective Action
and Monitoring Network
Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

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Part B

Appendix XI – Compliance Plan

CP Attachment B

Well Design and Construction Specifications

Well Construction Details
Off-Plant Disposal Area
Union Carbide Corporation
Texas City, Texas

ARCADIS

	Historical Survey Information			Top of Casing Elevation (ft. MSL)	Ground Surface Elevation (ft. MSL)	Ground elevation May 2001 (ft. MSL)	Top of Bentonite		Top of Filter sand		Screen Interval				Monitoring Well Total Depth (ft.)	Total Boring Depth (1) (ft.)	Casing and Screen Type	Screen Slot Size (inches)		MWell Depth Plus Casing Stickup (ft)
Well Number	North (-)South	E a s t (-)West	Completion Date				Depth (ft.)	Elevation (ft- MSL)	Depth (1) (ft.)	Elevation (ft- MSL)	Depth (ft.)(1)		Elevation (ft. MSL)						Stick-up	
											From	To	From	To						
OP-81-100W-B	574.416	3301.931	3/14/1981	14.44	12.07	11.80	99.8	-88.00	101.8	-90.00	103.6	124.0	-91.80	-112.20	124.0	203.0	B	0.010	NA	NA
OP-81-102W-B	576.479	3302.412	2/14/1981	12.80	11.31	10.99	97.8	-86.81	99.8	-88.81	101.8	137.4	-90.81	-126.41	137.4	280.0	B	0.010	NA	NA
OP-81-103W-B	573.498	3303.440	7/31/1981	13.51	11.77	11.53	105.5	-93.97	108.5	-96.97	110.5	130.7	-98.97	-119.17	130.7	135.0	B	0.010	NA	NA
OP-81-104W-B	579.578	3306.456	8/11/1981	14.06	12.24	12.00	96.0	-84.00	98.0	-86.00	100	128.5	-88.00	-116.50	128.5	130.0	B	0.010	NA	NA
OP-84-111P-A	-3256.660	9419.830	1/17/1984	12.61	10.68	10.50	27.0	-16.50	30.0	-19.50	32.0	52.0	-21.50	-41.50	52.0	57.0	F	0.010	NA	NA
OP-84-114P-A	-4687.830	10162.090	1/30/1984	13.02	11.70	11.49	18.0	-6.51	21.0	-9.51	24.0	44.0	-12.51	-32.51	44.0	50.0	F	0.010	NA	NA
OP-84-115P-A	-4716.890	9406.440	1/31/1984	13.70	10.94	10.65	21.0	-10.35	23.0	-12.35	25.0	45.0	-14.35	-34.35	45.0	50.0	F	0.010	NA	NA
OP-84-116P-A	-4662.690	11686.260	3/15/1984	14.12	12.36	12.15	26.0	-13.85	29.0	-16.85	30.0	47.0	-17.85	-34.85	47.0	47.0	F	0.010	NA	NA
OP-84-117P-A	-4654.790	10717.330	3/16/1994	13.96	11.20	11.04	20.0	-8.96	23.0	-11.96	26.0	46.0	-14.96	-34.96	47.0	47.0	F	0.010	NA	NA
OP-84-118W-A	-3710.980	10539.620	3/19/1984	15.46	12.95	10.76	15.0	-4.24	22.0	-11.24	22.0	42.0	-11.24	-31.24	42.0	45.0	F	0.010	NA	NA
OP-84-120P-A	-2718.770	10531.170	6/21/1984	13.10	10.95	10.60	24.0	-13.40	27.0	-16.40	29.0	42.0	-18.40	-31.40	42.0	50.0	F	0.010	NA	NA
OP-84-121P-A	-3237.980	10170.180	6/29/1984	12.84	10.88	10.75	22.0	-11.25	25.0	-14.25	27.0	42.0	-16.25	-31.25	42.0	50.0	F	0.010	NA	NA
OP-84-123P-A	-3767.070	11308.510	7/2/1984	13.70	11.99	11.97	19.0	-7.03	21.0	-9.03	22.0	42.0	-10.03	-30.03	42.0	45.0	F	0.010	NA	NA
OP-84-124P-A	-4269.120	11685.670	7/4/1984	13.66	10.92	10.70	19.0	-8.30	21.0	-10.30	22.0	42.0	-11.30	-31.30	42.0	45.0	F	0.010	NA	NA
OP-84-125P-A	-4070.840	10893.270	10/10/1984	11.62	8.92	9.12	18.0	-8.88	21.0	-11.88	22.0	42.0	-12.88	-32.88	45.0	45.0	F	0.010	NA	NA
GC-86-129W-A	-4888.340	9197.070	8/19/1986	10.35	8.93	8.18	9.0	-0.82	16.0	-7.82	19.0	39.0	-10.82	-30.82	39.0	39.5	C	0.010	NA	NA
GC-86-130W-A	-4889.770	9792.620	8/20/1986	8.67	7.17	6.82	13.9	-7.08	16.6	-9.78	18.5	31.5	-11.68	-24.68	31.5	31.5	C	0.010	NA	NA
GC-86-131W-A	-4879.620	10732.270	8/20/1986	4.36	2.69	2.48	16.0	-13.52	19.0	-16.52	20.0	32.0	-17.52	-29.52	32.0	32.0	C	0.010	NA	NA
GC-86-132W-A	-5058.230	9538.200	8/21/1986	15.89	14.47	14.05	21.5	-7.45	24.0	-9.95	26.0	52.5	-11.95	-38.45	52.5	53.0	C	0.010	NA	NA
OP-86-133W-A	-4704.340	10837.640	8/26/1986	12.59	11.33	10.91	20.0	-9.09	25.0	-14.09	26.0	44.0	-15.09	-33.09	44.0	44.0	C	0.010	NA	NA
OP-87-364W-A	-2713.740	10172.240	10/13/1987	13.88	11.63	11.51	14.0	-2.49	16.0	-4.4	18.0	38.0	-6.49	-26.49	43.5	43.5	C	0.010	NA	NA
OP-87-369W-A	-3700.020	9464.810	10/39/87	13.40	11.38	11.10	23.0	-11.90	27.0	-15.4	29.0	48.5	-17.90	-37.40	54.0	54.0	C	0.010	NA	NA
OP-88-372R-A	-3699.760	10134.300	3/14/1988	13.55	11.80	11.50	25.0	-13.50	25.5 Y	-13.96	27.0	43.0	-15.50	-31.50	48.0	48.0	G	0.004	NA	NA
OP-88-373W-A	-2733.890	9814.630	3/2/1988	14.25	11.01	10.80	18.0	-7.20	21.5 Y	-10.74	26.5	39.0	-15.70	-28.20	44.0	44.0	G	0.004	NA	NA
OP-86-375W-A	-3680.080	10165.370	3/17/1988	13.14	11.32	NA	24.0	-12.68	25.0	-13.68	28.0	43.0	-16.68	-31.68	48.0	48.0	C	0.010	NA	NA
OP-88-377W-B	NA	NA	12/6/1988	13.31	NA	10.94	85.0	-74.06	92.0	-78.69	103.5	153.5	-92.56	-142.56	161.0	161	B	0.010	NA	NA
OP-88-379W-B	NA	NA	12/13/1988	14.07	NA	11.55	85.0	-73.45	90.0	-75.93	102.0	127.0	-90.45	-115.45	134.5	150	B	0.010	NA	NA
GC-88-380W-B	NA	NA	12/27/1988	8.02	8.17	7.81	74.0	-66.19	80.0	-71.98	98.5	135.5	-90.69	-127.69	142.5	159.6	B	0.010	NA	NA
OP-89-406W-B	NA	NA	11/30/1989	13.49	10.71	10.51	87.2	-76.69	95.2	-81.71	104.2	119.2	-93.69	-108.69	124.5	127.0	B	0.010	NA	NA
OP-89-407W-B	NA	NA	11/27/1989	14.72	11.72	11.43	99.2	-87.77	104.2	-89.48	117.0	127.0	-105.57	-115.57	132.0	140.0	B	0.010	NA	NA
OP-90-411P-A	-4193.340	10170.640	5/7/1991	14.19	11.35	11.10	18.0	-6.90	20.0	-9.71	22.0	42.0	-10.90	-30.90	44.0	44.0	C	0.010	NA	NA
MT-91-474W-A	-1799.820	8812.970	5/16/1991	8.8	6.00	5.79	20.5	-14.71	23.5	-17.5	25.4	35.4	-19.61	-29.61	40.9	41	B	0.010	2.8	43.7
MT-91-475W-A	-2073.540	8540.080	5/3/1991	8.68	5.70	5.45	20	-14.55	23	-17.3	25.5	35.5	-20.05	-30.05	41	45	B	0.010	3.0	44.0
MT-91-476W-A	-1817.240	7845.100	4/30/1991	9.18	6.31	5.81	20	-14.19	22	-15.7	23.4	58.4	-17.59	-52.59	63.9	65	B	0.010	2.9	66.8
MT-91-477W-A	-2044.290	7608.350	5/9/1991	7.9	5.42	4.96	16	-11.04	18	-12.6	19.6	47.1	-14.64	-42.14	52.6	55	B	0.010	2.5	55.1
MT-91-478W-A	-2769.820	7204.120	5/10/1991	9.68	7.03	6.83	20	-13.17	22	-15	23.6	41.1	-16.77	-34.27	46.6	47	B	0.010	2.7	49.3
MT-91-479W-A	-3004.330	6865.300	5/11/1991	10.08	7.56	7.25	19	-11.75	21.5	-13.9	22.4	32.4	-15.15	-25.15	37.9	40	B	0.010	2.5	40.4
MT-91-480W-A	-3528.400	7076.370	4/26/1991	8.88	5.97	6.04	17	-10.96	22	-16	23.5	48.5	-17.46	-42.46	54	55	B	0.010	2.9	56.9
MT-91-482W-A	-3591.400	8242.660	4/24/1991	12.47	9.94	9.89	16	-6.11	17.5	-7.6	19.7	39.7	-9.81	-29.81	39.2	45.2	B	0.010	2.5	41.7
MT-91-483W-A	-4658.270	9093.510	11/10/1983	13.21	11.01	10.55	21	-10.45	23	-12	24.7	42.2	-14.15	-31.65	47.7	55	B	0.010	2.2	49.9
OP-93-484W-A	-2736.490	9434.650	11/16/1993	14.73	12.03	12.33	26.6	-14.27	29.7	-17.37	31.8	41.8	-19.47	-29.47	42.3	42.3	B	0.010	2.7	45.0
OP-93-485W-A	-2725.020	10927.360	11/11/1993	14.09	11.72	11.41	14.4	-2.99	16.5	-5.09	18.8	28.8	-7.39	-17.39	29.3	30	B	0.010	2.4	31.7
OP-93-486W-A	-3737.470	10940.350	11/10/1993	13.43	11.00	10.92	29.8	-18.88	32.2	-21.28	34.2	44.2	-23.28	-33.28	44.7	45	B	0.010	2.4	47.1
OP-93-487W-A	-4721.200	11208.690	11/18/1993	13.30	10.91	10.73	27.9	-17.17	30.0	-19.27	32.5	42.5	-21.77	-31.77	43.0	43.0	B	0.010	2.4	45.4
OP-91-488W-A	-3712.650	9864.120	11/18/1991	13.28	10.97	10.59	14.0	-3.41	16.5	-5.91	21.5	41.5	-10.91	-30.91	44.0	44.0	C	0.010	2.4	46.4
OP-91-491R-A	-2742.920	9780.500	10/10/1991	12.88	10.15	10.97	19	-8.03	21	-10.03	26	38	-15.03	-27.03	43.0	43.0	A	0.010	2.7	45.7
OP-91-492R-A	-3244.060	9424.450	10/2/1991	12.36	10.51	10.63	21.0	-10.37	23.0	-12.37	28.0	43.0	-17.37	-32.37	48.0	49.0	A	0.010	1.9	49.9
OP-91-493R-A	-4143.360	9409.460	10/7/1991	13.40	11.59	11.46	23	-11.54	25	-13.54	30	65	-18.54	-53.54	70.0	73.5	A	0.010	1.8	71.8
OP-91-494R-A	-4737.570	9716.850	10/14/1991	14.53	12.16	12.10	20.0	-7.90	22.0	-9.90	27.5	39.5	-15.40	-27.40	44.5	44.5	A	0.010	2.4	46.9
OP-91-495R-A	-2715.670	10545.340	10/15/1991	14.19	11.11	10.88	14.0	-3.12	16.0	-5.12	21.0	36.0	-10.12	-25.12	41.0	41.0	A	0.010	3.3	44.3
OP-91-496R-A	-4200.880	10926.750	9/26/1991	13.79	11.10	10.95	22.0	-11.05	24.0	-13.05	31.0	43.0	-20.05	-32.05	48.0	48.0	A	0.010	2.6	50.6
OP-91-497R-A	-4687.130	10472.710	9/24/1991	12.26	10.77	10.77	22.0	-11.23	25.0	-14.23	30.0	55.0	-19.23	-44.23	60.0	65.0	A	0.010	1.5	61.5
OP-91-501W-A	-3095.050	10938.230	10/21/1991	13.98	11.53	11.15	18.8	-7.65	21.0	-9.85	25.5	43	-14.35	-31.85	43.0	43.0	C	0.010	2.5	45.5
OP-93-512L-A	-2734.210	9442.520	11/16/1993	14.54	12.32	12.40	2.0	10.40	3.5	8.90	3.5	13.5	8.90	-1.10	14.5	14.5	C	0.010	2.2	16.7
MT-97-532W-A	-2238.650	7150.360	9/28/1998	9.41	6.21	5.84	11.0	-5.16	12.0	-6.16	15.0	25.0	-9.16	-19.16	25.0	40.0	F	0.010	3.2	28.2
MT-97-533W-A	-2080.160	8150.710	2000	9.17	5.80	5.46	15.0	-9.54	16.0	-10.54	21.0	34.0	-15.54	-28.54	34.0	40.0	F	0.010	NA	NA
MT-98-550W-Aa	-2315.990	7226.870	9/28/1998	8.54	5.62	5.67	8	-2.33	10.0	-4.33	12.5	17.5	-6.83	-11.83	17.5	18.0	C	0.010	2.9	20.4
MT-97-550W-Ab	-2314.820	7229.210	9/28/1998	8.95	5.98	5.58	20.0	-14.42	24.0	-18.42	26.0	36.0	-20.42	-30.42	36.0	40.0	C	0.010	2.5	38.5
MT-97-567W-A	-2372.790	6997.560	9/24/1998	8.08	5.51	5.06	11.0	-5.94	13.0	-7.94	15.0	25.0	-9.94	-19.94	25.0	27.0	C	0.010	2.6	27.6
MT-97-568W-A	-2211.200	7058.800	9/24/1998	8.02	5.23	4.79	10.0	-5.21	12.0	-7.21	14.0	24.0	-9.21	-19.21	24.0	26.0	C	0.010	2.8	26.8

Well Construction Details
Off-Plant Disposal Area
Union Carbide Corporation
Texas City, Texas

	Historical Survey Information			Top of Casing	Ground Surface	Ground elevation	Top of Bentonite		Top of Filter sand		Screen Interval				Monitoring Well	Total Boring	Casing and	Screen Slot		MWell Depth Plus
	North	East		Elevation	Elevation	May 2001	Depth	Elevation	Depth (1)	Elevation	Depth (ft.)(1)		Elevation (ft. MSL)		Total	Depth (1)	Screen	Size		Casing
Well Number	(-)South	(-)West	Completion Date	(ft. MSL)	(ft. MSL)	(ft. MSL)	(ft.)	(ft- MSL)	(ft.)	(ft- MSL)	From	To	From	To	Depth (ft.)	(ft.)	Type	(inches)	Stick-up	Stickup (ft)
MT-97-569W-A	-2093.380	7223.710	9/25/1998	9.08	6.04	5.60	10.0	-4.40	12.0	-6.40	14.0	24.0	-8.40	-18.40	24.0	26.0	C	0.010	3.0	27.0
MT-97-570W-A	-2369.300	7210.720	9/25/1998	7.74	4.61	4.67	19.0	-14.33	23.0	-18.33	25.0	35.0	-20.33	-30.33	35.0	36.0	C	0.010	3.1	38.1
MT-00-622W-A	NA	NA	2000	NA	NA	11.20		11.20		11.20			11.20	11.20					NA	NA
MT-01-651W-A	-2928.740	7736.170	11/29/2001	10.69	7.61	7.61	6	1.61	8	-0.39	10	20	-2.39	-12.39	20	20	C	0.010	3.0	23.0
MT-01-652W-A	-2404.880	7208.460	11/29/2001	7.19	4.40	4.40	30	-25.60	32	-27.60	34	44	-29.60	-39.60	45	45	C	0.010	3.0	48.0
MT-01-653W-A	-1904.720	8298.360	12/11/2001	9.61	6.60	6.60	16	-9.40	18	-11.40	20	30	-13.40	-23.40	30	35	C	0.010	3.0	33.0
MT-01-658W-A	-1940.680	8029.930	12/10/2001	9.13	6.40	6.40	31	-24.60	33	-26.60	35	45	-28.60	-38.60	45	49	C	0.010	3.0	48.0
MT-01-659W-A	-2049.240	8362.940	12/10/2001	5.08	5.40	5.40	22	-16.60	24	-18.60	26	36	-20.60	-30.60	36	40	C	0.010	3.0	39.0
MT-01-660W-A	-2038.380	8727.230	12/11/2001	7.66	4.80	4.80	24.5	-19.70	26.5	-21.70	28.5	38.5	-23.70	-33.70	38.5	45	C	0.010	3.0	41.5
MT-02-687W-A	-2450.070	7178.530	6/10/2002	7.94	4.90	NA	26	-21.10	28	-23.10	30	40	-25.10	-35.10	40	45	C	0.010	3.0	43.0
MT-02-688W-A	-1846.410	8287.800	6/11/2002	9.1	6.10	NA	20	-13.90	22	-15.90	24	34	-17.90	-27.90	34	40	C	0.010	3.0	37.0
GC-85-MW1W-A	NA	NA	7/8/1985	16.64	NA	13.68	10.0	3.68	25.0	-11.3	39.0	39.0	-25.32	-25.32	40.0	40.0	H	0.010	NA	NA
GC-85-MW2W-A	NA	NA	7/9/1985	8.10	NA	5.29	2.0	3.29	8.0	-2.7	12.5	23.5	-7.21	-18.21	23.0	30.0	H	0.010	NA	NA
GC-85-MW3W-A	-4889.520	10260.360	7/9/1985	8.87	NA	5.53	12.0	-6.47	15.0	-9.5	20.0	30.0	-14.47	-24.47	30.0	30.0	H	0.010	NA	NA
GC-85-MW4W-A	NA	NA	7/11/1985	11.40	NA	8.56	16.0	-7.44	19.0	-10.4	24.0	34.0	-15.44	-25.44	34.0	35.0	H	0.010	NA	NA
GC-85-MW5W-A	NA	NA	7/10/1985	10.30	NA	6.90	7.0	-0.10	13.0	-6.1	18.0	28.0	-11.10	-21.10	28.0	30.0	H	0.010	NA	NA
GC-85-MW6W-A	NA	NA	7/10/1985	9.38	NA	6.19	17.0	-10.81	20.0	-13.8	24.0	34.0	-17.81	-27.81	34.0	34.0	H	0.010	NA	NA
GC-85-MW7W-A	NA	NA	7/12/1985	7.38	NA	4.32	6.5	-2.18	10.0	-5.7	15.0	25.0	-10.68	-20.68	25.0	25.0	H	0.010	NA	NA
GC-85-MW8W-A	-4888.560	9545.100	9/25/1985	11.47	8.24	7.80	14.5	-6.70	16.0	-8.2	20.0	30.0	-12.20	-22.20	30.0	31.5	C	0.010	NA	NA
GC-85-MW9W-A	-4903.540	11016.040	9/25/1985	9.13	4.97	5.29	12.5	-7.21	15.5	-10.2	20.0	30.0	-14.71	-24.71	30.0	31.5	C	0.010	NA	NA
GC-85-MW10W-A	-5451.060	10285.280	9/24/1985	7.94	7.79	7.67	14.0	-6.33	16.0	-8.3	19.5	28.5	-11.83	-20.83	29.0	31.5	C	0.010	NA	NA

NA - Not Applicable or Not Available

Key to Conductor Casing and Screen Types:
A - 4-inch ID, Sch 40 PVC, continuous-slot
B - 4-inch ID, Sch 40 PVC, machine-slotted
C - 2-inch ID, Sch 40 PVC, machine-slotted
D - 4-inch ID, Type 304 Stainless Steel, continuous-slot
E - 1¼-inch ID, Sch 40 PVC, machine-slotted
F - 3/4-inch, ID, Sch 40 PVC, machine-slotted
G - 6-inch ID, Sch 40 PVC, machine-slotted
H - 2-inch ID, Sch 80 PVC, machine slotted
I - 11/2-inch ID, Sch 40, machine slotted

Wells Plugged and Abandoned or Replaced Since Issuance of 2015 Permit / Compliance Plan

STATE OF TEXAS PLUGGING REPORT for Tracking #165776

Owner:	**Union Carbide**	Owner Well #:	**OP-81-104W-B**
Address:	**3301 5TH AVE S** **TEXAS CITY,, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 59.89" N**
Well Location:	**3301 5TH AVE S** **TEXAS CITY,, TX 77590**	Longitude:	**094° 56' 12.19" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**Unknown**	Date Drilled:	**No Data**
Driller:	**Unknown**	License Number:	**Unknown**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8	**0**	**128**

Plugging Information

Date Plugged: **1/26/2017**

Plugger: **Steve Butrej**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

DIa (in.)	*Top (ft.)*	*Bottom (ft.)*
4	**2**	**128**

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**128**	**Grout 14 Bags/Sacks**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Fugro Consultants, Inc.**

6100 Hillcroft
Houston, TX 77081

Driller Name: **Steve Butrej**

License Number: **58675**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179848

Owner: **DOW**

Address: **3301 5th Ave S**
Texas City, TX 77590

Well Location: **2800 Loop 197 S**
Texas City, TX 77590

Well County: **Galveston**

Owner Well #: **MT-00-622W-A**

Grid #: **64-41-2**

Latitude: **29° 21' 40" N**

Longitude: **094° 55' 11" W**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**50.5**

Plugging Information

Date Plugged: **6/28/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**50.5**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179851

Owner:	**DOW**	Owner Well #:	**MT-01-651W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**20**

Plugging Information

Date Plugged: **6/28/2018** Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**20**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179852

Owner:	**DOW**	Owner Well #:	**MT-01-652W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77588**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**44**

Plugging Information

Date Plugged: **6/25/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**44**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179854

Owner:	**Dow**	Owner Well #:	**MT-01-653W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**31**

Plugging Information

Date Plugged: **6/27/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**31**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179855

Owner:	**DOW**	Owner Well #:	**MT-01-658W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**46**

Plugging Information

Date Plugged: **6/27/2018** Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**46**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179856

Owner:	**DOW**	Owner Well #:	**MT-01-659W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**36**

Plugging Information

Date Plugged: **6/28/2018** Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**36**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179857

Owner: **DOW**

Address: **3301 5th Ave S**
Texas City, TX 77590

Well Location: **2800 Loop 197 S**
Texas City, TX 77590

Well County: **Galveston**

Owner Well #: **MT-01-660W-A**

Grid #: **64-41-2**

Latitude: **29° 21' 40" N**

Longitude: **094° 55' 11" W**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**38.5**

Plugging Information

Date Plugged: **6/27/2018**

Plugger:

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**38.5**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179858

Owner:	**DOW**	Owner Well #:	**MT-02-687W-A**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**2**	**0**	**43.5**

Plugging Information

Date Plugged: **6/25/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**43.5**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179859

Owner:	**DOW**	Owner Well #:	**MT-02-688W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**35**

Plugging Information

Date Plugged: **6/25/2018** Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**35**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179861

Owner:	**DOW**	Owner Well #:	**MT-02-694W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**24**

Plugging Information

Date Plugged: **6/29/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**24**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179862

Owner:	**DOW**	Owner Well #:	**MT-02-695W-A**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S Texas City, TX 77590**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**20**

Plugging Information

Date Plugged: **6/29/2018**   Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**20**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**   License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179863

Owner: **DOW**

Owner Well #: **MT-02-696W-A**

Address: **3301 5th Ave S**
Texas City, TX 77590

Grid #: **64-41-2**

Latitude: **29° 21' 40" N**

Well Location: **2800 Loop 197 S**
Texas City, TX 77590

Longitude: **094° 55' 11" W**

Well County: **Galveston**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**24**

Plugging Information

Date Plugged: **6/29/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**24**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179823

Owner:	**DOW**	Owner Well #:	**MT-03-697W-A**
Address:	**3301 5th Ave. S** **Texas City, TX 77590**	Grid #:	**64-41-3**
Well Location:	**1301 Loop 197 N. Ave A** **Texas City, TX 77592**	Latitude:	**29° 21' 53" N**
		Longitude:	**094° 54' 36" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**Fugro Geosciences, Inc.**	Date Drilled:	**10/16/2003**
Driller:	**Keith W Dodds**	License Number:	**2698**

Well Report Tracking #27842

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
8	**0**	**63**

Plugging Information

Date Plugged: **6/29/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**60**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179824

Owner:	**DOW**	Owner Well #:	**MT-03-698W-A**
Address:	**3301 5th Ave. S** **Texas City, TX 77592**	Grid #:	**64-41-3**
		Latitude:	**29° 21' 53" N**
Well Location:	**1301 Loop 197 N. Ave A** **Texas City, TX 77592**	Longitude:	**094° 54' 54" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**Fugro Geosciences, Inc.**	Date Drilled:	**10/16/2003**
Driller:	**Keith W Dodds**	License Number:	**2698**

Well Report Tracking #27843

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**8**	**0**	**58**

Plugging Information

Date Plugged: **6/29/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**52**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179864

Owner:	**DOW**	Owner Well #:	**MT-07-811W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**3301 5th Ave S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**37**

Plugging Information

Date Plugged: **6/29/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**37**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179825

Owner: **DOW**

Address: **3301 5th Ave S**
Texas City, TX 77590

Well Location: **2800 Loop 197 S**
Texas City, TX 77590

Well County: **Galveston**

Owner Well #: **MT-84-112P-A**

Grid #: **64-41-2**

Latitude: **29° 21' 40" N**

Longitude: **094° 55' 11" W**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
0.75	**0**	**45**

Plugging Information

Date Plugged: **6/28/2018**

Plugger: **Joshua Crow**

Plug Method: **Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**45**	**Bentonite**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179826

Owner: **DOW**

Address: **3301 5th Ave S**
Texas City, TX 77590

Well Location: **2800 Loop 197 S**
Texas City, TX 77586

Well County: **Galveston**

Owner Well #: **MT-91-474W-A**

Grid #: **64-41-2**

Latitude: **29° 21' 40" N**

Longitude: **094° 55' 11" W**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**41**

Plugging Information

Date Plugged: **6/27/2018**

Plugger: **Joshua Crow**

Plug Method: **Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**41**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179827

Owner:	**DOW**	Owner Well #:	**MT-91-475W-A**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S Texas City, TX 77590**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**4**	**0**	**41**

Plugging Information

Date Plugged: **6/27/2018**

Plugger: **Joshua Crow**

Plug Method: **Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**41**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179829

Owner:	**DOW**	Owner Well #:	**MT-91-476W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**64**

Plugging Information

Date Plugged: **6/27/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**64**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

Report Amended on 8/15/2018 by Request #17121

STATE OF TEXAS PLUGGING REPORT for Tracking #179831

Owner:	**DOW**	Owner Well #:	**MT-91-477W-A**
Address:	**3301 5th Ave S Texas City , TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**53**

Plugging Information

Date Plugged: **6/27/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**53**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

**10710 S. Sam Houston Pkwy W
Houston, TX 77031**

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179833

Owner:	**DOW**	Owner Well #:	**MT-91-478W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**46.5**

Plugging Information

Date Plugged: **6/28/2018** Plugger:

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**46.5**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179834

Owner:	**DOW**	Owner Well #:	**MT-91-479W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**38**

Plugging Information

Date Plugged: **6/28/2018** Plugger:

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**38**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179835

Owner: **DOW**

Address: **3301 5th Ave S**
Texas City, TX 77590

Well Location: **2800 Loop 197 S**
Texas City, TX 77590

Well County: **Galveston**

Owner Well #: **MT-91-480W-A**

Grid #: **64-41-2**

Latitude: **29° 21' 40" N**

Longitude: **094° 55' 11" W**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**54**

Plugging Information

Date Plugged: **6/28/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**54**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179836

Owner:	**DOW**	Owner Well #:	**MT-91-482W-A**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S Texas City, TX 77590**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**45**

Plugging Information

Date Plugged: **6/28/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**45**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179837

Owner:	**DOW**	Owner Well #:	**MT-91-483W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**48**

Plugging Information

Date Plugged: **6/28/2018** Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**48**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179838

Owner:	**DOW**	Owner Well #:	**MT-97-533P-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
0.75	**0**	**34**

Plugging Information

Date Plugged: **6/27/2018**

Plugger: **Joshua Crow**

Plug Method: **Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**34**	**Bentonite**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179840

Owner:	**DOW**	Owner Well #:	**MT-97-550W-Ab**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**36**

Plugging Information

Date Plugged: **6/27/2018**

Plugger:

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**36**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179841

Owner: **DOW**

Owner Well #: **MT-97-567W-A**

Address: **3301 5th Ave S**
Texas City, TX 77590

Grid #: **64-41-2**

Latitude: **29° 21' 40" N**

Well Location: **2800 Loop 197 S**
Texas City, TX 77590

Longitude: **094° 55' 11" W**

Well County: **Galveston**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**25**

Plugging Information

Date Plugged: **6/27/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**25**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179842

Owner:	**DOW**	Owner Well #:	**MT-97-568W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 21' 40" N**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**24**

Plugging Information

Date Plugged: **6/29/2018** Plugger:

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**24**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179844

Owner:	**DOW**	Owner Well #:	**MT-97-569W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S** **Texas Clty, TX 77589**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**24**

Plugging Information

Date Plugged: **6/29/2018**

Plugger:

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**24**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179846

Owner:	**DOW**	Owner Well #:	**MT-97-570W-A**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**2800 Loop 197 S** **Texas City, TX 77590**	Latitude:	**29° 21' 40" N**
		Longitude:	**094° 55' 11" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

	Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
Borehole:	**2**	**0**	**36**

Plugging Information

Date Plugged: **6/25/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**36**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179839

Owner: **DOW**

Address: **3301 5th Ave S**
Texas City, TX 77590

Well Location: **2800 Loop 197 S**
Texas City, TX 77590

Well County: **Galveston**

Owner Well #: **MT-98-550W-Aa**

Grid #: **64-41-2**

Latitude: **29° 21' 40" N**

Longitude: **094° 55' 11" W**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**18**

Plugging Information

Date Plugged: **6/27/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**18**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179865

Owner:	**DOW**	Owner Well #:	**OP-81-102W-B**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 22' 25" N**
Well Location:	**3301 5th Ave S Texas City, TX 77590**	Longitude:	**094° 56' 46" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**138**

Plugging Information

Date Plugged: **7/26/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**138**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179866

Owner:	**DOW**	Owner Well #:	**OP-88-376W-B**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**3301 5th Ave S Texas City, TX 77590**	Latitude:	**29° 22' 25" N**
		Longitude:	**094° 56' 46" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
6	**0**	**144**

Plugging Information

Date Plugged: **7/26/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**144**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

**10710 S. Sam Houston Pkwy W
Houston, TX 77031**

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179870

Owner:	**DOW**	Owner Well #:	**OP-88-379W-B**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**3301 5th Ave S Texas City, TX 77590**	Latitude:	**29° 22' 25" N**
		Longitude:	**094° 56' 46" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**65**

Plugging Information

Date Plugged: **7/26/2018** Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**65**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179868

Owner:	**DOW**	Owner Well #:	**OP-88-379W-B**
Address:	**3301 5th Ave S Texas City, TX 77590**	Grid #:	**64-41-2**
Well Location:	**3301 5th Ave S Texas City, TX 77590**	Latitude:	**29° 22' 25" N**
		Longitude:	**094° 56' 46" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**136**

Plugging Information

Date Plugged: **7/26/2018** Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**136**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow** License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179871

Owner: **DOW**

Address: **3301 5th Ave S**
Texas City, TX 77590

Well Location: **3301 5th Ave S**
Texas City, TX 77590

Well County: **Galveston**

Owner Well #: **OP-89-406W-B**

Grid #: **64-41-2**

Latitude: **29° 22' 25" N**

Longitude: **094° 56' 46" W**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**124**

Plugging Information

Date Plugged: **7/26/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
4	**124**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179873

Owner:	**DOW**	Owner Well #:	**OP-89-407W-Ab**
Address:	**3301 5th Ave S** **Texas City, TX 77590**	Grid #:	**64-41-2**
		Latitude:	**29° 22' 25" N**
Well Location:	**3301 5th Ave S** **Texas City, TX 77590**	Longitude:	**094° 56' 46" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
2	**0**	**112**

Plugging Information

Date Plugged: **7/26/2018**

Plugger: **Joshua**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**112**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #179874

Owner: **DOW**

Owner Well #: **OP-89-407W-B**

Address: **3301 5th Ave S**
Texas City, TX 77590

Grid #: **64-41-2**

Latitude: **29° 22' 25" N**

Well Location: **3301 5th Ave S**
Texas City, TX 77590

Longitude: **094° 56' 46" W**

Well County: **Galveston**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **No Data**

Date Drilled: **No Data**

Driller: **No Data**

License Number: **No Data**

Borehole:

Diameter (in.)	*Top Depth (ft.)*	*Bottom Depth (ft.)*
4	**0**	**133**

Plugging Information

Date Plugged: **7/26/2018**

Plugger: **Joshua Crow**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	**133**	**Grout**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers**

10710 S. Sam Houston Pkwy W
Houston, TX 77031

Driller Name: **Joshua Crow**

License Number: **58337**

Comments: **No Data**

STATE OF TEXAS PLUGGING REPORT for Tracking #206028

Owner:	**Dow Chemical**	Owner Well #:	**GC-86-131W-A**
Address:	**3301 5th Avenue South** **Texas City, TX 77592**	Grid #:	**64-41-3**
		Latitude:	**29° 21' 21.46" N**
Well Location:	**3500 loop 197 South** **Texas City, TX 77590**	Longitude:	**094° 54' 28.47" W**
Well County:	**Galveston**	Elevation:	**No Data**

Well Type: **Monitor**

Drilling Information

Company:	**No Data**	Date Drilled:	**No Data**
Driller:	**No Data**	License Number:	**No Data**

Borehole: **No Data**

Plugging Information

Date Plugged: **12/11/2020**

Plugger: **Fernando Antunez**

Plug Method: **Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet**

Casing Left in Well:

Dia (in.)	*Top (ft.)*	*Bottom (ft.)*
2	5	32

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
0	2	**Natural Soil Natural Soil**
2	32	**Bentonite 2 Bags/Sacks**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Tolunay-Wong Engineers,Inc**

10710 S. Sam Houston Pkwy W.
Houston, TX 77031

Driller Name:	**Keith Barge**	License Number:	**4786**
Apprentice Name:	**Fernando Antunez**	Apprentice Number:	**59826**

Comments: **No Data**

Jacobs

PROJECT NUMBER
TCO016DW

WELL NUMBER
OP-87-369W-A-R

SHEET 1 OF 1

WELL COMPLETION DIAGRAM

PROJECT: Texas City OPDA Well Installation and P&A

LOCATION: Texas City, TX

DRILLING CONTRACTOR: Tolunay-Wong Engineers, Inc. (Driller: Stephen Hillis)

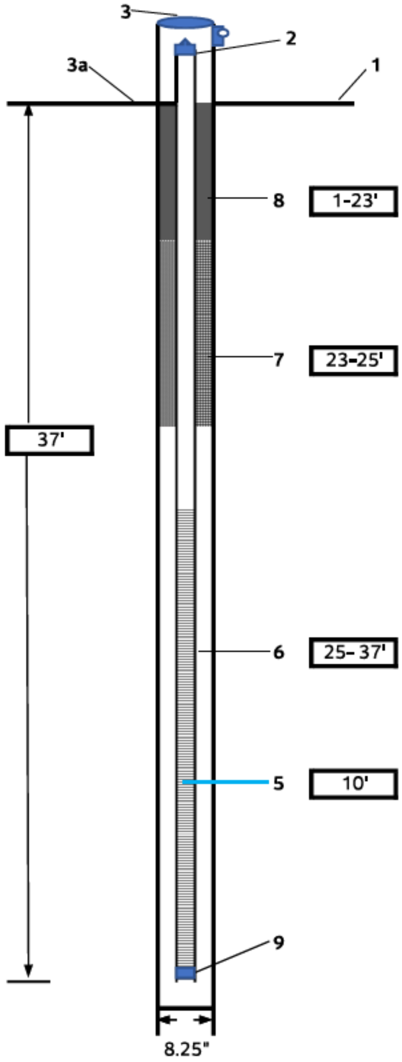
LOGGER: T. Babu

DRILLING METHOD AND EQUIPMENT: Hollow Stem Auger / CME 75 Rig

WATER LEVEL : 11.1 ft btoc

START: 11/21/2023

END: 11/22/2023



1- Ground elevation at well (ft amsl)	10.93 (NAVD88-natural ground)
2- Top of casing elevation (ft amsl)	14.19 (NAVD88)
3- Wellhead protection cover type	3ft Stick Up
3a- Concrete pad dimensions	4ft x 4ft x 4-inch
4- Casing	
Dia./type of well casing	2-inch dia. Stainless Steel
5- Screen	
Type/slot size of screen	2-inch dia. Stainless Steel 0.010-inch slot
6- Filter Pack	
a) Type	Consolidated aggregrate 16/30 sand
b) Quantity used	550 lbs (11x 50 lbs bags)
7- Seal	
a) Type	Bentonite Pellets
b) Quantity used	50 lbs (1x 50lbs bags)
8- Grout	
a) Grout mix used	Portland Cement
b) Volume used	65 gallons
c) Method of placement	Tremmie Pipe
9- Threaded End Cap	N/A
Comments :	Post Development Total Depth = 40.28 btoc
Well development :	
a) Method	purge via peristaltic pump
b) Purge Volume	20 gallons

Legend:

amsl - above mean sea level
btoc - below top of casing
dia. - diameter
ft - feet
lbs - pounds
NAVD= North American Vertical Datum

Jacobs

PROJECT NUMBER TC0016DW
BORING NUMBER OP-87-369W-A-R
Sheet 1 of 2

SOIL BORING LOG

PROJECT : Texas City OPDA Well Installation and P&A
LOCATION : Texas City, Texas
ELEVATION : Ground Surface Elevation = 10.93 feet (relative to NAVD88)
Top of Casing Elevation = 14.19 feet (relative to NAVD88)
DRILLING CONTRACTOR : Tolunay-Wong Engineers, Inc. (Driller: Stephen Hillis)
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger/ CME 75
WATER LEVELS : 11.1 feet below top of casing
STAR 11/20/2023 @ 1005
END : 11/20/2023 @ 1510
LOGGER : T. Babu

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	PID READINGS PPM	CORE DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
5	0 to 5	3/5	HSA-1	0.0 0.1	**0.0' to 2.0' - Fill (FL).** very dark brown (10YR; 2/2), moist to dry,dense, trace gravel, gravel is ~0.01' in length, rounded **2.0' to 5.0' - No Recovery.**	minimal chemical odor
10	5 to 10	3/5	HSA-2	0.1 0.1 0.1	**5.0' to 7.0' - Fill (FL).** black (10YR; 2/1), wet, loose, gravelly, gravel is ~0.05' in length, sub-rounded to sub-angular, pieces of PVC **7.0' to 10.0' - No Recovery.**	
15	10 to 15	3/5	HSA-3	0.0 0.0	**10.0' to 12.0' - Fill (FL).** light gray (10YR; 7/1), wet, very soft, low plasticity **12.0' to 15.0' - No Recovery.**	minimal chemical odor
20	15 to 20	5/5	HSA-4	0.0 0.0 0.0	**15.0' to 21.0' - Clay with Sand (CL).** light gray (10YR; 7/1), moist, medium stiff, medium plasticity, fine grained sand, poorly graded, brownish yellow (10YR; 6/8) silt lenses	
25	20 to 25	5/5	HSA-5	0.0 0.0	**21.0' to 23.0' -Sandy Silt (ML).** brown (10YR; 5/3), wet, very soft, low plasticity, fine grained sand, poorly graded, low plasticity, little clay, trace gravel, gravel is ~ 0.01' in length, sub-rounded	minimal chemical odor
30	25 to 30	5/5	HSA-6	0.0 0.0 0.0	**23.0' to 25.0' - Clay with Sand (CL).** light brownish grey (10YR; 6/2), moist, soft, medium plasticity, mottled yellowish red (5YR; 5/6) very fine grained sand, poorly graded, trace gravel, gravel is ~0.02' in length, sub-rounded	
35	30 to 35	4/5	HSA-7	0.0 0.0	**25.0' to 27.2' - Silty Sand with Clay (SP-SM).** reddish brown (5YR; 5/4), wet, dense, low plasticity, medium to fine grained sand, poorly graded, trace gravel, ~0.02' in length, sub-rounded	
40	35 to 40	5/5	HSA-8	0.0 0.0 0.0	**27.2' to 28.5' - Sandy Silt (ML).** reddish brown (5YR; 5/4), wet, soft, non-plastic, fine to very fine grained sand, poorly graded, light brownish gray (10YR; 6/2) silt lenses, little clay **28.5' to 30.0' - Sandy Silt (ML).** reddish brown (5YR; 5/4), moist, soft, low plasticity, fine to very fine grained sand, poorly graded, trace light brownish gray (10YR; 6/2) silt lenses, little clay	
45	40 to 45	3/5	HSA-9	0.0 0.0	**30.0' to 31.0' - No Recovery.** **31.0' to 35.0' - Sandy Silt (ML).** reddish brown (5YR; 5/4), moist to wet, very soft, low plasticity, fine to very fine grained sand, poorly graded, trace light brownish gray (10YR; 6/2) silt lenses, little clay	
50	45 to 50	4/5	HSA-10	0.0 0.0 0.0	**35.0' to 40.0' - Sandy Silt (ML).** brown, (7.5YR; 5/4), moist, soft, non-plastic, fine to very fine grained sand, poorly graded, little clay	
	50 to 55	4/5	HSA-11	0.0 0.0	**40.0' to 42.0' - No Recovery.** **42.0' to 45.0' - Silty Sand (SP-SM).** dark grayish brown (10YR; 4/2), moist to wet, dense, non-plastic, trace coarse grained sand, fine to very fine grained, poorly graded, trace organics (i.e. roots at 45.0')	

BRET R. RAHE
GEOLOGY
2798

1/18/2024
TBPG Firm 50613

Jacobs	PROJECT NUMBER TC0016DW	BORING NUMBER OP-87-369W-A-R Sheet 2 of 2

SOIL BORING LOG

PROJECT : Texas City OPDA Well Installation and P&A
LOCATION : Texas City, Texas
ELEVATION : Ground Surface Elevation = 10.93 feet (relative to NAVD88)
Top of Casing Elevation = 14.19 feet (relative to NAVD88)
DRILLING CONTRACTOR : Tolunay-Wong Engineers, Inc. (Driller: Stephen Hillis)
DRILLING METHOD AND EQUIPMENT USED : Hollow Stem Auger/ CME 75
WATER LEVELS : 11.1 feet below top of casing
STAR 11/20/2023 @ 1005
END : 11/20/2023 @ 1510
LOGGER : T. Babu

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (FT)	#/TYPE	PID READINGS PPM	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION
55				0.0	**45.0' to 46.0' - No Recovery.**	
	55 to 60				**46.0' to 47.5' - Silty Sand (SP-SM).** brown (7.5YR; 5/3), wet, dense, non-plastic, trace coarse grained sand, fine to very fine grained, poorly graded, little clay at 46.8' **47.5' to 50.0' - Clay with Sand (CL).** brown (7.5YR; 5/3), moist, medium stiff to stiff, medium plasticity, fine to very fine grained, poorly graded, reddish brown (5YR; 4/4) mottle	
60	60 to 65				**50.0' to 51.0' - No Recovery.** **51.0' to 53.0' - Clay with Sand (CL).** brown (7.5YR; 5/3), moist, medium stiff to stiff, medium plasticity, fine to very fine grained, poorly graded, reddish brown (5YR; 4/4) mottle	
65	65 to 70				**53.0' to 55.0' - Clay with Sand (CL).** dark gray (5YR; 4/1), moist, medium stiff to stiff, medium plasticity, fine to very fine grained, poorly graded, reddish brown (5YR; 4/4) mottle	
70	70 to 75				**Boring TD at 55 ft bgs**	
75						

STATE OF TEXAS WELL REPORT for Tracking #657336

Owner:	**Dow Chemical Company**	Owner Well #:	**OP-87-369W-A-R**
Address:	**3301 5th Ave S.** **Texas City, TX 77590**	Grid #:	**64-41-3**
Well Location:	**29.35923 N** **94.9118 W** **Right next to abandoned well being replaced** **Texas City, TX**	Latitude:	**29° 21' 33.23" N**
		Longitude:	**094° 54' 42.48" W**
		Elevation:	**No Data**
Well County:	**Galveston**		

Type of Work: **Replacement** Proposed Use: **Monitor**

Drilling Start Date: **11/20/2023** Drilling End Date: **11/20/2023**

Borehole:

Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
8.25	0	40

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

Filter Pack Intervals:

Top Depth (ft.)	Bottom Depth (ft.)	Filter Material	Size
25	37	Sand	16/30

Annular Seal Data:

Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
0	23	Grout 6 Bags/Sacks
23	25	Bentonite 1 Bags/Sacks
25	37	Sand 8 Bags/Sacks

Seal Method: **Tremie**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	**No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **TOLUNAY-WONG ENGINEERS**

1002 34TH ST N
Texas City, TX 77590

Driller Name: **Stephen Hillis** License Number: **60331**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Top (ft.)	Bottom (ft.)	Description
0	**2**	**Fill**
2	**5**	**No recovery**
5	**7**	**Fill**
7	**10**	**No recovery**
10	**12**	**Fill. Light gray, wet, very soft**
12	**15**	**No recovery**
15	**21**	**Clay with sand , light gray, moist**
21	**23**	**Sandy Silt, Brown, wet, very soft**
23	**25**	**Clay with sand. Light brownish gray**
25	**27.2**	**Silty sand with clay. Reddish brown, wet**
27.2	**28.5**	**Sandy silt. Reddish Brown**
28.5	**30**	**Sandy silt. Reddish brown**
30	**31**	**No recovery**
31	**35**	**Sandy silt. Reddish brown**
35	**40**	**Sandy silt. Brown, moist, soft**

Casing:
BLANK PIPE & WELL SCREEN DATA

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	**Riser**	**New Stainless Steel**		**0**	**27**
2	**Screen**	**New Stainless Steel**	**0.010**	**27**	**37**

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

STATE OF TEXAS PLUGGING REPORT for Tracking #234417

Owner: **Dow Chemical Company**

Address: **3301 5th Ave S.**
Texas City, TX 77590

Well Location: **29.35923 degrees N**
94.91180 degrees W
Texas City, TX 77590

Well County: **Galveston**

Owner Well #: **OP-87-369W-A**

Grid #: **64-41-3**

Latitude: **29° 21' 33.15" N**

Longitude: **094° 54' 42.68" W**

Elevation: **No Data**

Well Type: **Monitor**

Drilling Information

Company: **NA**

Driller: **NA**

Date Drilled: **No Data**

License Number: **NA**

Borehole: **No Data**

Plugging Information

Date Plugged: **11/20/2023**

Plugger: **Stephen Hillis**

Plug Method: **Tremmie pipe cement from bottom to top**

Casing Left in Well:

No Data

Plug(s) Placed in Well:

Top (ft.)	*Bottom (ft.)*	*Description (number of sacks & material)*
2	**55**	**Grout 2 Bags/Sacks**

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **TOLUNAY-WONG ENGINEERS**

1002 34TH ST N
Texas City, TX 77590

Driller Name: **Stephen Hillis**

License Number: **60331**

Comments: **Well was 55 feet but when measured it was at 44.5, tremmie pipe grout.**

Part B

Appendix XI – Compliance Plan

CP Attachment C

Sampling and Analysis Plan

The Dow Chemical Company

Sampling and Analysis Plan

Attachment C

Union Carbide Corporation

Off-Plant Disposal Area (OPDA)

HW Permit / CP No. 50264

Rev. 0

December 2024

Sampling and Analysis Plan

Attachment C
Union Carbide Corporation

Off-Plant Disposal Area (OPDA)
HW Permit / CP No. 50264

Rev. 0

December 2024

Prepared By:
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Phone: 713 953 4800
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Prepared For:
The Dow Chemical Company

Our Ref:
30228926

Richard J Trevino

Richard J. Trevino, P.G. (TX), RPG (MS)
Project Manager

Justin Dzubay

Justin Dzubay
Project Engineer

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By

Contents

Tables

Attachments

Acronyms and Abbreviations

°C	degree Celsius
COC	chain-of-custody
CP	compliance plan
DO	dissolved oxygen
ID	identification
LCS	laboratory control sample
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NAPL	nonaqueous phase liquid
NELAC	National Environmental Laboratory Accreditation Program
NTU	nephelometric turbidity unit
OPDA	Off-Plant Disposal Area
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SDL	sample detection limit
SVOC	semivolatile organic compound
TCEQ	Texas Commission on Environmental Quality
TRRP	Texas Risk Reduction Program
UCC	Union Carbide Corporation
USEPA	U.S. Environmental Protection Agency
VOA	volatile organic analysis
VOC	volatile organic compound

1 Introduction

Union Carbide Corporation (UCC), a Wholly Owned Subsidiary of The Dow Chemical Company (Dow), currently complies with sampling and analysis procedures for monitoring wells as outlined in Permit / Compliance Plan (CP) No. 50264 issued in October 2014, for the Off-Plant Disposal Area (OPDA) facility located at 2800 Loop 197 South, Texas City, Texas, as updated by subsequent Permit/ CP modifications.

This Sampling and Analysis Plan (SAP) is specifically for the CP portion of Permit No. 50264. This SAP will be utilized to support groundwater sampling and analysis procedures for the groundwater monitoring required under the CP.

Once this SAP is incorporated into the Permit/CP renewal, Dow will follow the procedures in this plan. Therefore, the text in this attachment reflects procedures that will be implemented once the Permit/CP modification is approved. This SAP outlines procedures for groundwater sampling and analysis to satisfy the corrective action, compliance monitoring and detection monitoring requirements. An up-to-date copy of this SAP will be maintained at the OPDA facility. This SAP discusses all aspects of groundwater sampling, from pre-field activities (Section 2), initial-field activities (Section 3), well purging (Section 4), well sampling activities (Section 5), and post-sampling activities (Section 6).

2 Pre-Field Activities

Various types of pre-field activities for each sampling event will be performed at the OPDA facility. These include preparing field documentation materials (Section 2.1), identifying wells to be sampled (Section 2.2), determining the frequency of sampling at each well (Section 2.3), and reviewing health and safety protocols for each facility (Section 2.4).

Before beginning a groundwater sampling event, the following data will be gathered and/or reviewed:

- Field Log Sheet—Use a field log sheet for each well sampled. An example of a field log sheet is included in Attachment 1.
- Chain-of-Custody (COC)—Maintain appropriate COC. A sample COC is included as Attachment 2.
- Determine which wells from appropriate tables are scheduled to be sampled for the sampling event (CP Table V)
- Field Equipment—Gather necessary field equipment such as water-level probe, sample bottles, and well-location maps.
- Health and safety issues—Review health and safety manuals/conduct tailgate meetings.

2.1 Field Documentation

Groundwater field forms will be maintained onsite. A field log sheet (Attachment 1) will be used for each well sampled and for each sampling event. The field forms generally will contain some or all of the following information:

- Names of personnel performing the sampling
- Sampling purpose (e.g., corrective action monitoring or semiannual sampling event)
- Weather conditions at the time of sampling
- Field observations
- Well identification (ID) number
- Integrity of the well
- Monitoring well measurements including:
    - Total well depth, when feasible
    - Well diameter
    - Depth to static groundwater level prior to purging from a standard measuring point
    - Water-level measurement technique
    - Height of the water column
    - Well volume
- Presence or absence of accumulated silt and technique for this measurement
- Presence or absence of nonaqueous phase liquid (NAPL [Section 3.4]) and if present, thickness of NAPL, and detection method during corrective action monitoring
- Well purging information including:

  - Well purging technique and equipment used
  - Purge volume
  - Purge (pumping) rate
  - Well purge date and time
- Sampling methods, including well sampling sequence, sampling equipment, and withdrawal procedures
- Sample observations (e.g., color, turbidity, odor, etc.)
- Results of any field measurements taken
- Sample handling procedures, including:
  - Date and time sample was collected
  - Sample ID number (unique alphanumeric identifier); Example, Well ID_DDMMYYYY, where DD is day of the month, MM is the month, YYYY is the four-digit year.
  - Types and numbers of containers used
  - Preservatives used (if any)
- Types of quality assurance (QA)/quality control (QC) samples collected
- A brief description of decontamination activities performed

Instrument calibration is also to be noted on instrument-specific calibration logs. An example of an instrument-specific calibration log is included in Attachment 1.

To change an incorrect entry on a field form, a single line will be drawn through the entry, and the change will be written above or adjacent to the incorrect entry along with the date the change was made. The change will be initialed by the person making the change.

2.2 Wells to Be Sampled

The specific wells to be sampled are identified in the Permit/CP issued by the Texas Commission on Environmental Quality (TCEQ). Wells include those listed in CP Table V along with corrective action observation wells and corrective action system wells shown on CP Attachment A. Each well sampled at the facility has dedicated or disposable sample tubing and/or dedicated sampling equipment to eliminate the potential for cross contamination.

2.3 Frequency of Monitoring and Sampling

The monitoring frequency for each set of wells is specified in CP Table VIII. Samples will be analyzed for parameters as specified in CP Tables III/IIIA.

When this SAP is incorporated into this Permit/CP for the OPDA facility, samples will be collected from each Permit/CP well in accordance with the following frequencies, as outlined in the Permit/CP.

Weather permitting, samples at the facility will be collected during the same 30-day period. Attempts will be made to schedule sampling events on a routine basis. However, to utilize personnel efficiently, accommodate laboratory capacity, or accommodate weather delays, the sampling (and subsequent reporting) may occur plus or minus 1 month from the routine schedule specified in the Permit/CP.

2.4 Health and Safety

Dow has established health and safety protocols at the OPDA facility. Groundwater sampling personnel comply with the general health and safety requirements for the facility. Minimum personal protective equipment (PPE), including hard hats, safety glasses, and protective gloves, are to be worn during groundwater sampling and decontamination activities as specified by facility-specific PPE guidelines.

3 Initial Field Activities

The OPDA facility has established several initial field activities, which are performed prior to well purging or sampling. These activities include well inspection (Section 3.1), assessing weather conditions (Section 3.2), measuring groundwater levels (Section 3.3), determining presence or absence of NAPL (Section 3.4), and measuring total well depth to determine silt accumulation (Section 3.5).

3.1 Well Inspection

Prior to taking groundwater-level measurements or sampling a well, the physical condition and integrity of a well are noted by the sampling team. The casing and cap are inspected for cracks, signs of deterioration, and signs of tampering. The sampler notes whether the cap and monitoring well are secure and whether the well label is legible. The well pad is inspected for cracks, signs of deterioration, erosion, settling, or animal and insect burrowing. As needed, dedicated equipment (e.g., pumps, tubing, etc.) is inspected for cleanliness, structural integrity, and deterioration. A "pre-sampling inspection checklist" is completed for each well. An example of this checklist is included in Attachment 1. Deficiencies are corrected in a timely manner.

3.2 Weather Conditions

Weather conditions at the time of sampling will be noted on the field form. Items such as ambient temperature, approximate wind speed and direction, and precipitation will be noted (as applicable).

3.3 Measuring Groundwater Levels

The depth to groundwater will be measured (relative to top of casing) at each well to be sampled and at other supplemental monitoring wells, so groundwater elevations (relative to mean sea level) and corresponding groundwater flow directions can be calculated as part of the reporting effort. Water levels will be measured using an electronic water-level meter, an interface probe, or other suitable means. Measurements will be made from a consistent, surveyed measuring point on the top of casing. Depth to groundwater measurements will be made to the nearest 0.01 foot. Water-level measurements will be taken within the same 24-hour period.

3.4 Determination of NAPLs

Wells that are sampled as part of this CP will be checked for the presence or absence of NAPL. Wells that are not equipped with dedicated equipment will be checked during each sampling event. Wells that have dedicated equipment will be checked for the presence of NAPL during maintenance and repairs for the equipment. A well will not be sampled if NAPL is detected in the well.

3.5 Measuring Total Depth and Silt Accumulation in Wells

The total depth of each well which is not equipped with a dedicated pump shall be measured during each sampling event. The total depth of each well which is equipped with a dedicated pump will be measured when: 1) pumps are removed for maintenance; or 2) the groundwater production rate of the dedicated pump decreases by 25% from the initial production rate when the pump was installed. The total depth shall be compared to the total depth recorded on the well construction log. Should a comparison of the measured and the recorded total depth reveal that greater than 20% of the well screen has been silted in, then Dow will perform such actions necessary (redevelopment, replacement, etc.) to enable the well to function properly.

3.6 Recovery Systems

Recovery wells are under continuous water withdrawal by continuous pumping. Water levels will be periodically checked during routine inspection activities. Sampling will be completed through the pump intake such that a sufficient volume is purged that is representative of groundwater conditions at the well.

4 Well Purging

After the initial field activities are completed but before sampling, each well will be purged to remove water that is unrepresentative of formation. Wells will be purged using either low-flow or casing-volume purging techniques.

4.1 Low-Flow Purge Techniques

For the groundwater sampling events, the wells at the Dow OPDA facility have dedicated or disposable tubing, dedicated pumps, or other equipment in each well.

When using low-flow purge techniques, the pumping rate is restricted shall be between 100 milliliters (mL) per minute to 500 mL per minute with a drawdown of 0.1 meters or less. The sampler will monitor dissolved oxygen (DO), turbidity, redox potential, pH, and specific conductivity to determine when purging is complete and sample collection is to occur. Measurements will be collected using a flow-through cell (or similar) every 3 to 5 minutes (or as often as practical) until the parameters have stabilized over a minimum of three readings. If turbidity readings are below 10 nephelometric turbidity units (NTUs), then the stabilization range can be amended to plus or minus (±) 20 percent (not to exceed 10 NTUs) over a minimum of three readings. Parameters stabilize according to the following stabilization criteria:

- ± 0.2 degrees Celsius (°C) for temperature
- ± 0.1 pH
- ± 3 percent conductivity
- ± 10 millivolts oxidation-reduction potential
- ±10 percent DO
- ± 10 percent turbidity or less than 10 NTUs

When measurements of these water quality parameters have stabilized, purging is complete, and sampling can begin.

Generally, only one field sample will be collected from each monitoring well. However, if replicate samples or multiple independent samples are to be collected from a well, the well will only be purged one time before the replicate or multiple independent samples are collected.

4.2 Casing-Volume Purging Techniques

If casing-volume purging becomes necessary, the well will be pumped until a minimum of three casing volumes have been removed. If the well does not yield three casing volumes in a reasonable time, the well will be purged to dryness. The sampler will select an appropriate pumping rate based on expected formation response characteristics for the well to be sampled. Monitoring wells at the facility will be allowed to recover to within 10 percent of the initial pre-purging water level before sampling occurs. If a well is bailed dry or does not recover to within 10 percent of initial water level within 2 hours, it will be sampled as soon as a sufficient volume of groundwater has entered the well to enable the collection of the necessary groundwater samples.

During purging, wells will be pumped using non-dedicated pumps, portable pumps in wells without dedicated equipment, or bailers. Various types of pumps will be used, including but not limited to centrifugal, peristaltic, or submersible pumps. Portable pumps generally will be placed about 5 feet below the static water level during purging and sampling. Tubing connected to pumps will be dedicated to a specific well; any non-dedicated tubing will be disposed of after each use. Tubing or stainless-steel bailers will be either disposable or dedicated to a specific well or site at the facility. Disposable rope will be used for the bailer line, and any portion of the rope that comes into contact with groundwater will be disposed of appropriately after each use.

5 Groundwater Sampling

Once purging is complete, groundwater samples will be collected using appropriate procedures (Section 5.1), filtered for metals (when necessary) (Section 5.2), and preserved according to prescribed techniques (Section 5.3). Appropriate QC will be used during each sampling event (Section 5.4).

5.1 Sample Collection

Wells will be sampled within 24 hours of purging. Samples will be collected and transferred into appropriate pre-field-cleaned containers either directly from the dedicated sample tubing or from bailers (disposable or dedicated to specific wells). If pumps are used for sampling, the pumping rate to fill sample bottles will be lower than the purging rates.

5.1.1 Sample Withdrawal

For monitoring wells, sample withdrawal procedures will be as follows:

- Before sample collection, field determination of groundwater temperature, pH, and specific conductance will be determined and recorded on the field log sheet.
- Sample collections sequence depends on parameters required. At present, samples for volatile organic analysis (VOA) will be collected first, then extractable organics, then metals (when necessary).
- A pumping rate of 100 mL per minute or less (where feasible) will be used for collection of volatile organic compounds (VOCs).
- Samples will be collected directly from recovery wells as they are pumping, using the dedicated pumps and piping used for groundwater remediation. After sample collection, field determination of groundwater temperature, pH, and specific conductance will be determined and recorded.

5.1.2 Special Handling

Special handling during sample collection will be as follows:

- Samples will not be composited in a common container and then split.
- Samples will not be transferred from one bottle to another.
- Container lids will be closed immediately following sample collection.
- No headspace will exist in the containers filled for VOC analysis to minimize the possibility of volatilization.
- Sampling equipment materials of construction should be stainless steel, Teflon, nylon, or other such inert material.

5.2 Filtering Samples for Metals Analysis

In the event that water samples are collected for metals analysis and high turbidity is exhibited, the samples will be filtered in the field before preservation. Generally, a hand vacuum filter (with disposable filtering apparatus) or an inline filter will be used to filter the water sample.

Funnels will be decontaminated using standard procedures. Whether using a vacuum pump, inline filter, or other approved filter, all samples collected for metals analysis will be filtered through a 10-micron filter, made of either paper or fiberglass, depending on the nature of the water sample. If a sample contains a visible amount of suspended solids, it may be necessary to use a paper pre-filter before the 10-micron filter. Samples intended for other nonmetal analyses or for total recovered metals will not be filtered.

5.3 Sample Preservation

Sample preservation will be completed to minimize physical and chemical alternations of unstable constituents within a sample medium. Sample preservation methods will be limited to pH control, chemical addition, and refrigeration. Samples will be appropriately preserved for the analyses to be performed, according to procedures in U.S. Environmental Protection Agency (USEPA) SW-846 method for samples sent to an offsite contractor laboratory. The minimum sample volumes, container types, preservatives, and holding times used are those listed in the most recent update to SW-846, Chapter 3 (for metallic analytes) and Chapter 4 (for organic analytes). For parameters not specified in Chapters 3 or 4, the requirements in the analytical methods will be met for container types, preservations, and holding times. Preservatives will be added to containers by the analytical laboratory before the sampling event.

5.4 Quality Control

Dow uses the field and laboratory QC procedures during groundwater sampling events described below.

5.4.1 Field Quality Control Samples

Field QC samples may include equipment blanks, trip blanks, and field duplicates. QC samples are collected in similar containers and handled in the same manner as field samples. Blank samples (laboratory method, equipment, and trip blanks) are collected to qualitatively verify that analytes detected in field samples are characteristic of the media samples and are not artifacts of the sampling and/or analytical processes.

Field blanks assess potential contamination from field conditions from sampling. Field blanks are a sample of analyte free water poured into sample container in the field then preserved and shipped to the laboratory with field samples.

Equipment blanks reflect the combined effects of sample collection, handling, transportation, storage, and analysis. An equipment blank consists of deionized water rinsed from non-dedicated sampling equipment following sample collection and decontamination procedures. Equipment blanks are only collected during groundwater sampling when non-dedicated sampling equipment is used; no equipment blanks are collected when dedicated sampling equipment is used.

Field QC samples (field blanks and equipment blanks) will be collected at a minimum of one (1) sample per sampling event.

If samples will be analyzed for VOCs, trip blanks will also be collected. Trip blanks are sealed vials containing organic-free water that are prepared in the laboratory, shipped to the field with empty sample containers, and returned to the laboratory with the collected samples. Trip blank samples travel with the cooler during a sampling event. Trip blank results are used to qualitatively verify that VOCs detected in samples are not artifacts from sample transportation to the laboratory or from sample storage prior to analysis. One trip blank per cooler containing samples for VOC analysis will be analyzed for VOCs.

Field duplicate samples are independent samples collected as close as possible to the same point in space and time as the sample submitted for analysis. They are a separate sample collected from the same source and analyzed independently. These results are used in documenting sampling precision. Field duplicate samples are collected at a rate of 10 percent of all field samples per matrix collected during a sampling event at a facility. Although generally only one field sample is collected at a well, if replicate samples or multiple independent samples are collected at a well, field duplicates will not be collected from that well.

5.4.2 Laboratory Quality Control Samples

Laboratory QC samples can consist of matrix spike (MS) samples, laboratory method blanks, and laboratory control samples in general accordance with SW-846. MS and matrix spike duplicate (MSD) samples are run by the offsite contractor laboratory.

Surrogates (deuterated monitoring compounds) and MS samples are typically part of a QC protocol for the analysis of organic compounds. Surrogates are compounds chemically similar to the species of interest but not expected to be present in actual field samples. A mixture of surrogates is spiked into every sample for organic analysis prior to extraction and carried through the entire extraction and analytical process. Recovery of these surrogate compounds provides an estimate of the effectiveness of the extraction and analysis for that single sample. Surrogates are used as specified in the latest version of the analytical methods being used.

MS samples are field samples to which known amounts of analytes of interest have been added by the laboratory. The samples are spiked before digestion or extraction and both a spiked and an unspiked sample aliquot are analyzed. The difference in results between the spiked sample and unspiked (native) sample is calculated and compared to the amount of spike added. Since actual samples are used for the recovery determination, MS and MSD recoveries provide estimates of accuracy and precision that may include matrix interferences. Usually expressed as percent recovery, MS/MSD results provide measures of accuracy in an actual sample matrix.

Precision can be measured by calculating the relative percent difference (RPD) between the results from the MS/MSD sample analyses. Generally, 5 percent of a batch of field samples will be analyzed as MS/MSD as prescribed by the analytical method.

Laboratory method blanks address the preparation and analytical processes. A laboratory method blank is an aliquot of analyte-free media that is carried through the entire preparation and analytical procedure to demonstrate that the analytical system (glassware, reagents, and instrumentation) was free of contamination. A method blank is analyzed by the laboratory with each batch of samples prepared and analyzed.

Laboratory control samples (LCSs) are similar to MS samples, except that the matrix is a clean analyte-free media (e.g., deionized water) and the spiking material is from a second source (e.g., from a different vendor, if possible, from the calibration standard). An LCS is prepared and analyzed with every analytical batch.

5.4.3 Laboratory QA/QC Procedures and Reporting

The reports sent from the laboratory performing the analyses must include the QA data required by the method used. In addition to the analytical results for a sample, the analytical reports sent by the laboratory performing the analyses also will include the following information:

- Completed COC (with signatures and dates relinquished/accepted)
- Sample receipt checklist / login summary
- Field sample IDs
- Laboratory sample IDs
- Analytical results for each sample (with units, dilution factors, etc.)
- Preparative and determinative analytical methods used
- Sample collection date
- Extraction date
- Analysis date
- Method blank summary report
- Surrogate recoveries and laboratory control limits
- LCS recoveries and laboratory control limits
- MS/MSD recoveries and RPDs and laboratory control limits
- Laboratory review checklists, exception reports and signature release statement as required by Texas Risk Reduction Program (TRRP)-13

6 Post-Groundwater Sampling Activities

Once samples have been collected, the sampler will perform decontamination (Section 6.1) and sample labeling (Section 6.2) and initiate COC (Section 6.3) and sample control (Section 6.4) procedures. Then the samples will be prepared for transport or shipping (Section 6.4) and will be delivered to the laboratory for analysis (Section 6.5). Finally, sampling waste will be properly managed (Section 6.6).

6.1 Decontamination

Decontamination of (non-dedicated) equipment that may come into direct contact with a field sample is necessary to achieve analytical results representative of field conditions and to minimize the possibility of cross contamination. Any equipment that is used at more than one well location (e.g., water-level meters, water quality instrumentation, portable sampling pumps, bailers, dedicated sampling equipment stored outside the well, etc.) and any equipment that comes into contact with groundwater requires decontamination before and between each use following the procedures below:

- Decontamination of water quality instrumentation generally will be limited to rinsing the probes and the flow-through cells with deionized/distilled water between wells.
- Miscellaneous sampling equipment can be decontaminated by washing the equipment in a solution of nonphosphate detergent (e.g., Alconox or equivalent) to remove visible particulate matter, residual oil, and grease, etc., and rinsing the equipment with water.
- Water-level meters or other similar equipment will be decontaminated by immersing the probe in a solution of nonphosphate detergent (e.g., Alconox or equivalent) and water, rinsing with water, and drying with a clean paper towel.
- Filter systems generally will be decontaminated by removing the disposable filter and pumping the decontamination solutions (e.g., nonphosphate detergent and water solution, followed by a water rinse) through the filter system in suitable amounts. Solvents that could damage the filtering equipment will not be used.
- Portable sampling pumps and associated nondedicated discharge hoses will only be decontaminated on the outside. The pump and the portion of the hose that were in contact with groundwater will be immersed in a nonphosphate detergent (e.g., Alconox or equivalent) and water solution, and rinsed with water. Solvents or acids that could damage the pumping equipment will not be used.

6.2 Sample Labeling and Sample Seals

Sample labels will be used to verify proper tracking of sample containers. Sample bottles will be labeled either in the field or by the laboratory. Labels will remain legible when wet. Sample labels will contain the following information:

- Source of sample (well number)
- Date sample was collected
- Time sample was collected
- Preservation method used

- Analysis required
- Name or initials of person collecting the sample

The sample source, date, and bottle number serve as the sample ID until a laboratory log sheet/report number is assigned by the analytical laboratory. Samples whose preservation methods render them a safety hazard are appropriately labeled.

Samples will be shipped in coolers or similar containers designed to keep samples at a constant 4°C and prevent breakage. Containers used for sample shipment will be sealed with the seal signed and dated by the sampler.

6.3 Chain-of-Custody

The Chain-of-Custody procedures include such documents as sample ID labels, field logbooks, and COC forms used to track the handling of samples sent to the offsite laboratory. Information recorded on COC forms typically includes some or all of the following:

- Name of project
- Sample ID number and sample location (well number)
- Corresponding laboratory analyses to be performed
- Date and time of sample collection
- Sample matrix (water)
- Number of containers
- Preservatives used (if not already noted on the sample label)
- Sampler's signature
- Signature of anyone handling a sample prior to analysis at the laboratory (including date and time of possession)
- Required QA/QC analyses
- Cooler number
- Internal temperature of container upon opening in the laboratory
- If applicable, special instructions

An example COC form is in Attachment 2.

The original COC form will accompany the samples to the offsite laboratory. The sampler generally will retain one copy of the COC form to put into the project file. Other copies of the form may be sent to other members of the sampling team, as necessary. Once at the laboratory, the laboratory log sheet/report number(s) generally will be recorded on the COC form. Indelible ink will be used for recording information on the COC form or laboratory request sheet.

6.4 Sample Control and Preparation for Transport or Shipping

Once samples have been collected and labeled, they will be kept in coolers with sufficient ice to maintain the samples at a temperature of 2-6°C for shipment or delivery to the offsite laboratory. The following procedures will be used for sample handling and shipment of samples to the offsite laboratory:

- Fill out the COC form to accompany the cooler(s) to the offsite laboratory (e.g., cooler).
- Verify the information on the COC form against the sample labels and sample purge forms. Make sure each sample container is accounted for and that samples are being sent to the correct laboratory.
- Wipe the exterior of the sample container clean with a paper towel.
- Verify that each container has a properly completed label.
- Securely wrap sample containers with Bubble Wrap bags provided by the laboratory.
- Preserve samples to 4°C using ice placed inside a cooler.

In addition to the above procedures, the following procedures will be used if the samples are shipped by common carrier:

- Place the wrapped sample container inside a small plastic bag and close the bag.
- If the cooler has a drain plug, tape the drain plug shut.
- Place a sufficient amount of packing material on the bottom of the cooler (if needed).
- Pack the containers by placing ample amounts of the packing material (the same material placed on the bottom of the cooler or Bubble Wrap) around each plastic bag with sample container(s) to prevent possible breakage and to adsorb liquid material released should breakage occur. The samplers may choose to place a large plastic bag inside the cooler as a secondary liner, and then place each plastic bag with sample containers and packing materials inside the large plastic bag. Packing material must be placed between and under all containers for multiple container shipments to prevent the containers from touching each other or the bottom/sides of the shipping container.
- Samples will be preserved to 4°C using ice or blue ice placed inside the cooler. If a garbage bag was used as a secondary liner, the ice bags will be placed inside the garbage bag and the bag will be secured with a knot or twist-tie.
- If needed, add any needed adsorbent to fill remaining void spaces.
- Place the COC form and any other instructions inside a plastic bag, seal the bag, and place in the cooler.
- Close the container, secure with strapping tape, and custody seal. The container then will be transported to the appropriate common carrier for delivery to the laboratory.

6.5 Analytical Methods

The samples will be sent to a laboratory that uses appropriate USEPA methods and has a QA/QC program in place and is certified by TCEQ under the Texas version of the National Environmental Laboratory Accreditation Program (NELAC). The laboratory will analyze groundwater samples from the OPDA facility.

The list of analytical monitoring requirements for compliance or corrective action monitoring programs is specified in the Section XI of the Permit (CP). Laboratory analyses are performed according to the following publications or their associated updates:

- SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, USEPA, Office of Solid Waste and Emergency Response
- Methods for Chemical Analyses of Water and Waste, USEPA Publication No. 600/4-79-20
- Standard Methods for Water and Wastewater, APHA-AWWA-WPCF

The types of analyses that may be performed for compliance or corrective action monitoring programs include VOCs, semivolatile organic compounds (SVOCs), and metals.

Laboratory test methods must be able to meet groundwater detection limit reporting requirements specified in the CP. The minimum sample volumes, container types, preservatives, and holding times used will be those listed in the most recent update to SW-846 Chapter 3 (for metals analysis) and Chapter 4 (for organic analytes). For parameters not specified in Chapters 3 or 4, the requirements in the analytical method will be met for container types, preservatives, and holding times. Laboratory results below the detection limit will be reported as “not detected” (U) or less than the sample detection limit (SDL).

Table 1 outlines the analytical methods, containers, and preservation techniques for groundwater sampling activities for this SAP. Different analytical methods may be used as they are approved by the governing agency.

Table 1. Groundwater Analytical Methods, Containers, Preservative Techniques

OPDA Facility

Permit/Compliance Plan No. 50264

Parameter	Analytical Method	Container / Quantity	Holding Time	Preservative
VOCs	SW846 8260D	3 × 40-mL V-TLS	14 days	HCl, pH <2, 4°C
SVOCs	SW846 8270E	2 × 1,000-mL TLC-Amb	7 days (extraction)	4°C
Metals	6020B	1 x 500-mL polyethylene	6 months	HNO3, pH <2, 4°C

Notes:
Analytical methods and container information are based on the most current/approved EPA methods for the parameters listed in the Permit/Compliance Plan.
VOCs = volatile organic compounds
V-TLS = glass vial Teflon-lined septum
TLS-Amb = Teflon-lined septum Amber Jar
HCl = hydrochloric acid
HNO3 = nitric acid

6.6 Management of Liquids, Solids, and Trash Generated During Field Activities

During groundwater sampling events, liquids (purge water and decontamination liquid), solids (PPE, expendable/disposable equipment, etc.), and general trash (empty boxes, etc.) will be generated. Liquids and solids generated during sampling and decontamination activities will be collected, characterized appropriately as nonhazardous (Class I, 2 or 3) or hazardous (H), and properly managed. Disposal methods for wastes generated during field activities consist of the following:

- Wastewater and purged groundwater will be treated at the onsite wastewater treatment plant.
- Contaminated solids such as gloves and tubing will be treated as a solid waste and properly disposed.

Attachment 1

Example Field Forms

Instrument Calibration Record

The Dow Chemical Company
Texas City, Texas

Hydrologic Monitoring
Houston, Texas

Date	Time	pH Hanna HI 9025 4.01/7.00 S.U.	Specific Conductivity Hanna HI 9033 (μS/cm)	Dissolved Oxygen Hanna HI 9142 Saturated Air	Turbidity Lamotte 2008 NTU	ORP Hanna HI 9025 200 - 275 mV	Organic Vapors Thermo Inst. 580 PID 100 ppm Isobutylene	Initials

Monitoring Well Purging and Sampling Record

The Dow Chemical Company,
Texas City, Texas

Hydrologic Monitoring
Houston, Texas

Well:
Location:

Well Information

Date	Time	Depth to LNAPL (ft-toc)	Depth to Water (ft-toc)	LNAPL (ft)	DNAPL (ft)	Well TD (ft-toc)	Screened Interval (ft-toc)	Tubing Intake (ft-toc)	Well Diameter (in)			Comments/Initials
		NA		0	0							

Well Purging Record

Date	Time	Volume Purged (L)	Depth to Water (ft-toc)	pH (std units)	T (C)	SC (umhos/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Purge Method	Comments
		0.5								Peristaltic Pump	
		1.0									
		1.5									
		2.0									
		2.5									
		3.0									

Well Sampling Record

Date	Time	Sample I.D.	Depth to Water (ft-toc)	pH (std units)	T (C)	SC (umhos/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Parameter	Preservative	Comments

Monitoring Well Development Record

The Dow Chemical Company,
Texas City, Texas

Hydrologic Monitoring
Houston, Texas

Well:
Location:

Well Information

Date	Time	Depth to Water (ft-toc)	Pre-development Total Depth (ft-toc)	Post-development Total Depth (ft-toc)	Screened Interval (ft-toc)	Well Diameter (in)	Water Column (ft)	Casing Volume (gal)		Comments/Initials

Well Develpment Record

Date	Time	Volume Removed (gal)	Depth to Water (ft-toc)	pH (std. units)	T (C)	SC (umhos/cm)	Turbidity (NTU)	Purge Method	Comments
								Large Peristaltic	
								Electric Submersible	

Attachment 2

Sample Chain-of-Custody

Chain of Custody Record

Client Information

Sampler:

Lab PM:

Carrier Tracking No(s):

COC No:

Client Contact:

Phone:

E-Mail:

Page:
Page _ of _

Company:

Analysis Requested

Job #:

Address:

City:

State, Zip:

Phone:

Email:

Project Name:

Site:

Project Number:

Due Date Requested:

TAT Requested (Business days):

Scripted Billing Information

Site Contact

Company Code
Plant Code

Cost Allocation Type
Cost Allocation Number

GL Account
Material Group

Submit Script Template & Invoice Copies to:

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2SO3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - ph 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification	**Sample Date**	**Sample Time**	**Sample Type** (C=comp, G=grab)	**Matrix** (W=water, S=solid, O=waste/oil, A=Air)																**Total Number of containers**	**Special Instructions/Note:**
			Preservation Code:																		

Possible Hazard Identification

☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown* ☐ *Radiological*

Sample Disposal

☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For __________ Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:
Date:
Time:
Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact:
∆ Yes ∆ No

Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

Ver: 04/19/2023

Arcadis U.S., Inc.
1330 Post Oak Blvd., Suite 2250
Houston
Texas 77056
Phone: 713 953 4800
Fax: 713 977 4620
www.arcadis.com

Part B

Appendix XI – Compliance Plan

Appendix XI.A.4

Geology Report

Union Carbide Corporation

Attachment B.XI.A.4

Geology Report

Off-Plant Disposal Area (OPDA)
Union Carbide Corporation
A Wholly Owned Subsidiary of The Dow Chemical Company
Texas City, Texas

December 2024

Attachment B.XI.A.4

Geology Report
Off-Plant Disposal Area (OPDA)
Union Carbide Corporation
A Wholly Owned Subsidiary of The Dow Chemical Company
Texas City, Texas

December 2024

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Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By

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Attachment 1. Total Dissolved Solid Concentration Map

1 Site Geology

The stratigraphy immediately underlying the OPDA Facility is characterized by fluvio-deltaic deposits of the Pleistocene Beaumont Formation and recent man-made fill. Cross sections developed using the lithologic data from a variety of boring logs are presented in Figures 1 through 8. Six geologic layers/zones (Table 1) were characterized for the surficial stratigraphy at the site. The geologic layers/zones were identified and are described in the following paragraphs:

- Zone I is fill material primarily from dredged spoil. This material was used for dike construction around and between the basins. When used for this purpose, the near-surface portion of the fill was “armored” with concrete rip rap. This “armor” may be mixed with dredge spoil material to a depth of several feet. Zone I is underlain by Zone II material.
- Zone II consists of silty clay and clay. It is laterally continuous beneath the OPDA. This zone ranges in thickness from 2 to 19 feet. Zone II is the upper, semi-confining layer above the –30 ft MSL aquifer (Zone III).
- Zone III, the –30 ft MSL aquifer, consists of silty sand, sand, and silt. It is the uppermost aquifer beneath the OPDA. This zone ranges in thickness from 0 to 30 feet beneath the OPDA with an average thickness of 20 feet. It is underlain by Zone IV. The top of Zone III dips slightly to the south with elevations ranging from –10 to –15 ft MSL. The base of Zone III dips to the south and also the west over Basins 3 and 4. The aquifer then pinches out as it passes the boundary to the former Marine Terminal (MT) area.
- Zone IV consists of clay and silty clay. It is about 70-feet thick and is continuous beneath the OPDA. This zone is the lower confining layer (aquiclude) beneath the –30 ft MSL aquifer. It separates and hydraulically isolates the –30 ft MSL aquifer from Zone V (–100 ft MSL aquifer). The thickness of Zone IV makes it an effective boundary for restricting contaminant transport to Zone V.
- Zone V has been arbitrarily designated the –100 ft MSL aquifer. It consists of fine sand and is continuous beneath the OPDA. It ranges in thickness from 9 to 48 feet. Deep borings show it is underlain by Zone VI.
- Zone VI consists of clay. It is at least 400-feet deep. This zone is a confining layer (aquiclude), separating and hydraulically isolating the –100 ft MSL aquifer from deeper aquifers below 400 feet.

2 Site Hydrogeology

2.1 Distribution and Thickness of the Transmissive Zones

Zone III represents the uppermost aquifer, or “-30 ft MSL aquifer”. Available data indicate that the “-30 ft MSL aquifer” is laterally continuous beneath most of the OPDA and becomes discontinuous beneath the Basin 2 at the northeast corner (Figure 7). The Industrial Ship Channel (ISC) cuts into this “-30 ft MSL aquifer”. The “-30 ft MSL aquifer” lithologies include interbedded sand, clayey sand, silty sand, sandy silt and silt units (Figure 2 to 8). The average thickness of the zone is about 20 feet, with individual sand units ranging from about 2 to 12 feet thick.

Table 1. UCC OPDA Site Stratigraphy Summary
(Reference: 2003 Permit Renewal Application Section E2)

			Stratigraphy at 378W-B			Range In Thickness	
			Depth			From	To
Site Zones	**Predominant Lithology**	**Function**	**Top (In Feet)**	**Bottom (In Feet)**	**Thickness (In Feet)**	**(In Feet) Boring No.**	**(In Feet) Boring No.**
I	Dredge Fill	Dike	0	10	10	(7) 374R-A	(20) 369R-A
II	Silty Clay	Semi-confining	10	27	17	(2) 368W-A	(19) 371B-A
III	Silty Sand to Sandy Silt	Uppermost Water-bearing Unit (-30 ft MSL aquifer)	27	44	17	(0) 485W-A	(30) 627B-A
IV	Clay and Silty Clay	Aquitard	44	105	61	(56) 115W-A	(84) 485W-A
V	Sand	-100 ft MSL aquifer	105	143	38	(9) 407W-B	(48) 377W-B
VI	Clay	Aquitard	143	Unknown	Unknown	Unknown	Unknown

The “-30 ft MSL aquifer” generally thickens to the south beneath the OPDA, ranging in thickness from 20 to 30 feet (Figure 4) in the southern area. The aquifer contains more silty material to the north near the ISC than to the south near the hurricane canal. The top of this aquifer ranges in elevation from –10 to –15ft MSL and dips slightly to the south. The aquifer also thickens toward the west beneath OPDA Basins 3 and 4 before it pinches out beneath the former Marine Terminal (MT) Facility. Thin, laterally discontinuous sand lenses apparently encased in clay and silty clay are reported in a few borings in the MT area. Such discontinuous sand lenses likely represent crevasse splay deposits, which are a commonly observed depositional environment within fluvio-deltaic systems.

Zone V, the “-100 ft MSL aquifer”, is a laterally continuous sandy unit beneath both the former MT and the OPDA which serves as the second transmissive zone between the overlying Zone IV and the underlying Zone VI. The top of the “-100 ft MSL aquifer” ranges in elevation from approximately –90 to –100 feet MSL. The average thickness of sand in the “-100 ft MSL aquifer” across the site is approximately 25 feet.

2.2 Aquitard

Zone IV has been subdivided into four intervals and numbered aquitard interval I through IV from the top to the bottom of the aquitard, respectively (ERM, 1992). Aquitard interval I contains discontinuous interbeds of silty and sandy clay and ranges in thickness from 3 to 33 feet with an average of about 17 feet. The interval contains abundant macropores in the form of root traces, fractures and soil-forming structures. Aquitard interval II has the least permeability of the four aquitard intervals. The interval is characterized by a dark greenish-gray color, soft and extremely plastic texture, lack of soil mottling and absence of macropores. The unit ranges in thickness from 0.4 to 5.2 feet and is laterally continuous beneath OPDA Basins 1 through 5. Aquitard interval III has an average thickness of 20 feet and is characterized by root traces and abundant plant and wood fragments throughout the interval which increase with depth. The lowermost aquitard unit, aquitard interval IV, directly overlies the “-100 ft MSL aquifer”. The average thickness is 20 feet. Root traces are abundant at the top of the interval and thin layers of oyster shells and shell fragments are present in the lower half of the unit.

2.3 Aquifer Properties

The “-30 ft MSL aquifer” is a semi-confined aquifer and the “-100 ft MSL aquifer” is a confined aquifer. Pump tests from 1988 indicated a hydraulic conductivity of 2.2 x 10-4 cm/sec for the “-30 ft MSL aquifer”. A modeling effort (ERM, 1993) calibrated the horizontal hydraulic conductivity of the “-30 ft MSL aquifer” to be within the range of 2.8 x 10–6 to 2.0 x 10-3 cm/sec. Porosity was estimated to be in a range of 0.22 to 0.35 for the uppermost aquifer. A storativity (or storage coefficient) of 0.002 was also determined by an aquifer pumping test (ERM, 1992) for the “-30 ft MSL aquifer”.

The “-100 ft MSL aquifer” was modeled as having a horizontal hydraulic conductivity of 1.8 x 10-4 to 9.0 x 10-3 cm/sec. The modeled porosity value for the “-100 ft MSL aquifer” was 0.22 (ERM, 1993). Table 2 summarizes the modeled properties of the “-30 ft MSL aquifer” and the “-100 ft MSL aquifer”.

2.4 Groundwater Hydrology

A potentiometric surface contour map (Figure 9 for January 2023 and Figure 10 for July 2023 for the “-30 ft MSL aquifer”, for the 2023 calendar year (Jacobs, 2024), indicates that groundwater flow patterns in the “-30 ft MSL aquifer” at the OPDA are as follows:

- Groundwater generally flows radially beneath Basins 1 and 5
- A northwest-southeast trending flow divide is present in the northern portions of Basins 1, 3, 5, and the southern portion of Basin 4. In both the third and fourth quarters of 2012, groundwater flow generally trended northward in the direction of the Texas City Industrial Ship Channel north of this divide and to the south toward the Gulf Coast Waste Disposal Authority (GCWDA) south of this divide.
- To the south of Basin 1 and 3, there is a potentiometric low area that is influencing groundwater flow. It is believed that this low is due to surface water management within a basin operated by GCWDA.

Based on the results of routine water level measurements from 1999 to 2023, the groundwater flow pattern in the “-30 ft MSL aquifer” appeared to be stable. The groundwater mounding appears to have decreased during last 20 years (from 2002 to 2023), as indicated by an overall decrease of potentiometric surface across the basins. This likely resulted from the soil cover installation in OPDA Basins 3 and 5 in 2005 and the soil cover installations at OPDA Basin 1 (completed February 2014), OPDA Basin 4 (completed in October 2014), and OPDA Basin 2 (completed December 2017)..

Table 2. Hydraulic Properties of Modeled Stratigraphic Unit (from ERM, 1993)

Model Layer	Hydrostratigraphic Zone	Horizontal Hydraulic Conductivity (cm/s)	Vertical Hydraulic Conductivity (cm/s)	Porosity	Storativity
1	Overlying Fill	4 x10-7 to 8 x 10-5	4 x10-8 to 7 x 10 -5	0.20	1 x 10 -5
2	-30 ft MSL aquifer	2.8 x10-6 to 2 x 10-3	7.1 x10-7 to 2 x 10 -4	0.02 to 0.35	3 x10-4 to 9 x 10 -4
3	Aquitard Interval I	9 x10-7 to 1 x 10-4	9 x10-8 to 4 x 10-5	0.20	1 x 10 -5
4	Aquitard Interval II	2.5 x10-8 to 8 x 10-8	9.5 x10-9 to 6 x 10-8	0.20	1 x 10 -5
5	Aquitard Interval III	6 x10-7 to 2.5 x 10-4	8 x10-8 to 2.5 x 10-5	0.20	1 x 10 -5
6	Aquitard Interval IV	9 x10-7 to 7 x 10-5	9 x10-8 to 2 x 10-5	0.20	1 x 10 -5
7	-100 ft MSL aquifer	1.8 x10-4 to 9 x 10-3	1.8 x10-5 to 9 x 10-4	0.22	3 x 10 -4
8	Zone VI Aquitard	9 x10-7 to 6 x 10 -6	2.8 x10-7 to 4 x 10 -6	0.20	1 x 10 -5

Water levels in “-30 ft MSL aquifer” monitoring wells respond daily to tidal fluctuations. An evaluation of tidal influence was conducted in 2000 (ERM, 2000). This study suggests that the horizontal groundwater gradient in the “-30 ft MSL aquifer” along the ISC was affected as a function of the fluctuation in the low tide and high tide cycle. The data also suggested that the average horizontal hydraulic gradient for the groundwater along the ISC was nearly flat, ranging from -0.00020 to 0.00012 ft/ft (ERM, 2000).

The general groundwater flow direction in the –100 ft MSL aquifer is to the northwest and west from the East Lagoon where a groundwater mound exists. South of Basin 1, the flow is to the southwest and south. A potentiometric surface map for the –100 ft MSL aquifer is shown on Figure 11. Groundwater flow within the –100 ft MSL aquifer is predominantly to the west and northwest within the 5-Basin area of the OPDA.

3 Groundwater Classification

Under the TRRP, 30 TAC §350.52, groundwater resources are classified based on the concentration of total dissolved solids (TDS) and/or sustainable yield. The -30 ft MSL aquifer is classified as a Class 3 groundwater based on the TDS concentrations (greater than 10,000 mg/L) in the groundwater samples collected from the -30 ft MSL aquifer and reported in the Marine Terminal/OPDA RFI Updated Report (ERM, 2001). A copy of the TDS concentration map is provided in Attachment 1. The -100 ft MSL aquifer is classified as a Class 2 groundwater.

4 References

Jacobs, 2024. *2023 Annual Groundwater Monitoring Report*, Union Carbide Corporation, Texas City Operations, Off-Plant Disposal Area. January 18.

ERM-Southwest, September 1, 1992. *Investigation of the Aquitard Underlying the “-30 ft MSL Aquifer” OPDA Facility*

ERM-Southwest, December 6, 1993. *Assessment of DNAPL Mobility at the OPDA*.

ERM-Southwest, September 6, 2000. *Tidal Influence Evaluation Report; Off-Plant Disposal Area (OPDA).*

ERM-Southwest, February 23, 2001. *Marine Terminal /OPPA RFI Update Report*.

Figures

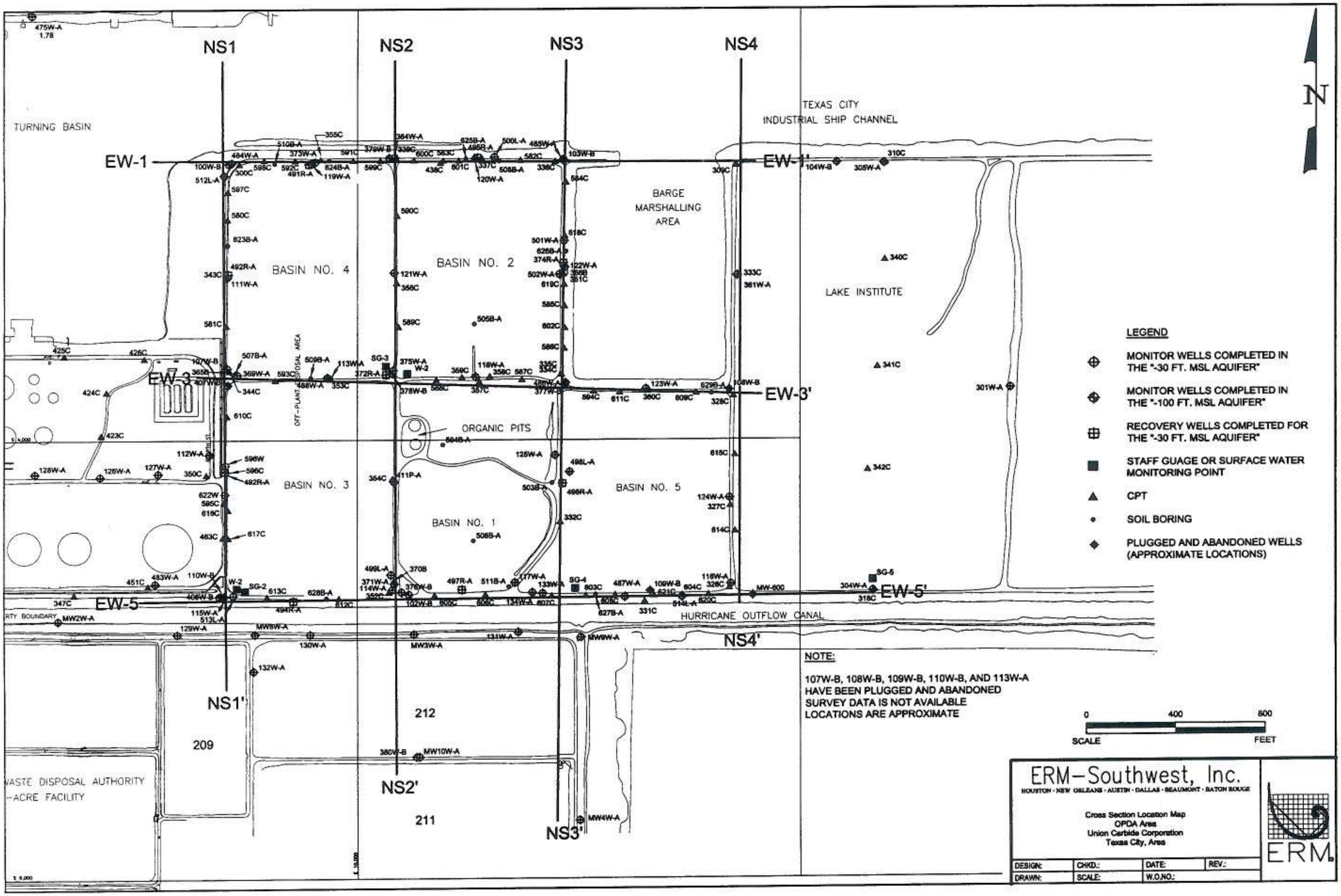
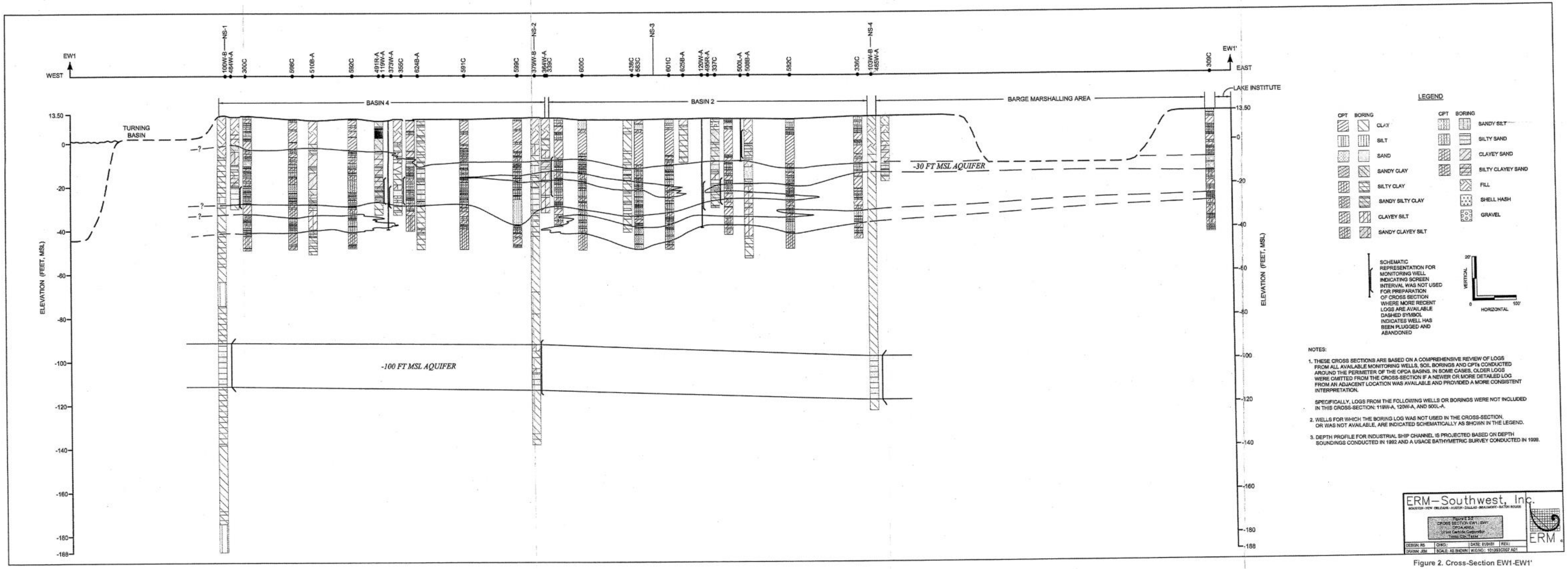


Figure 1 Cross Section Location Map



NOTES:

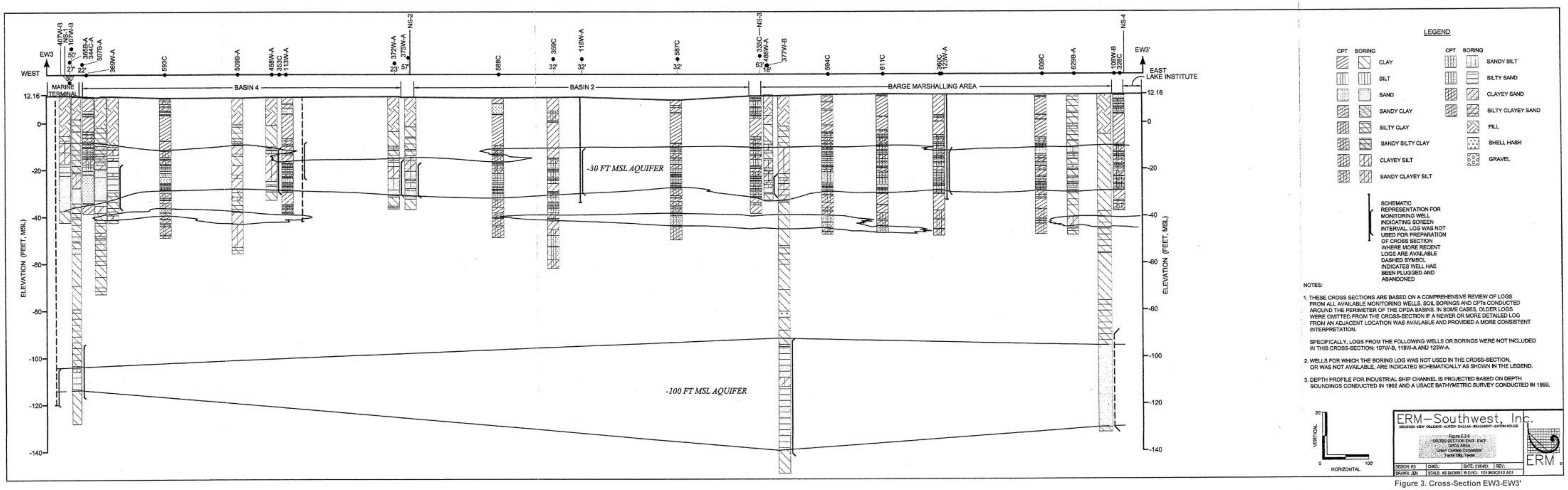
1. THESE CROSS SECTIONS ARE BASED ON A COMPREHENSIVE REVIEW OF LOGS FROM ALL AVAILABLE MONITORING WELLS, SOIL BORINGS AND CPTs CONDUCTED AROUND THE PERIMETER OF THE OPDA BASINS. IN SOME CASES, OLDER LOGS WERE OMITTED FROM THE CROSS-SECTION IF A NEWER OR MORE DETAILED LOG FROM AN ADJACENT LOCATION WAS AVAILABLE AND PROVIDED A MORE CONSISTENT INTERPRETATION.

   SPECIFICALLY, LOGS FROM THE FOLLOWING WELLS OR BORINGS WERE NOT INCLUDED IN THIS CROSS-SECTION: 119W-A, 120W-A, AND 500L-A.

2. WELLS FOR WHICH THE BORING LOG WAS NOT USED IN THE CROSS-SECTION, OR WAS NOT AVAILABLE, ARE INDICATED SCHEMATICALLY AS SHOWN IN THE LEGEND.

3. DEPTH PROFILE FOR INDUSTRIAL SHIP CHANNEL IS PROJECTED BASED ON DEPTH SOUNDINGS CONDUCTED IN 1992 AND A USACE BATHYMETRIC SURVEY CONDUCTED IN 1998.

Figure 2. Cross-Section EW1-EW1'



SCHEMATIC REPRESENTATION FOR MONITORING WELL INDICATING SCREEN INTERVAL. LOG WAS NOT USED FOR PREPARATION OF CROSS SECTION WHERE MORE RECENT LOGS ARE AVAILABLE DASHED SYMBOL INDICATES WELL HAS BEEN PLUGGED AND ABANDONED

NOTES:

1. THESE CROSS SECTIONS ARE BASED ON A COMPREHENSIVE REVIEW OF LOGS FROM ALL AVAILABLE MONITORING WELLS, SOIL BORINGS AND CPTs CONDUCTED AROUND THE PERIMETER OF THE OPDA BASINS. IN SOME CASES, OLDER LOGS WERE OMITTED FROM THE CROSS-SECTION IF A NEWER OR MORE DETAILED LOG FROM AN ADJACENT LOCATION WAS AVAILABLE AND PROVIDED A MORE CONSISTENT INTERPRETATION.

   SPECIFICALLY, LOGS FROM THE FOLLOWING WELLS OR BORINGS WERE NOT INCLUDED IN THIS CROSS-SECTION: 107W-B, 118W-A AND 123W-A.

2. WELLS FOR WHICH THE BORING LOG WAS NOT USED IN THE CROSS-SECTION, OR WAS NOT AVAILABLE, ARE INDICATED SCHEMATICALLY AS SHOWN IN THE LEGEND.

3. DEPTH PROFILE FOR INDUSTRIAL SHIP CHANNEL IS PROJECTED BASED ON DEPTH SOUNDINGS CONDUCTED IN 1992 AND A USACE BATHYMETRIC SURVEY CONDUCTED IN 1999.

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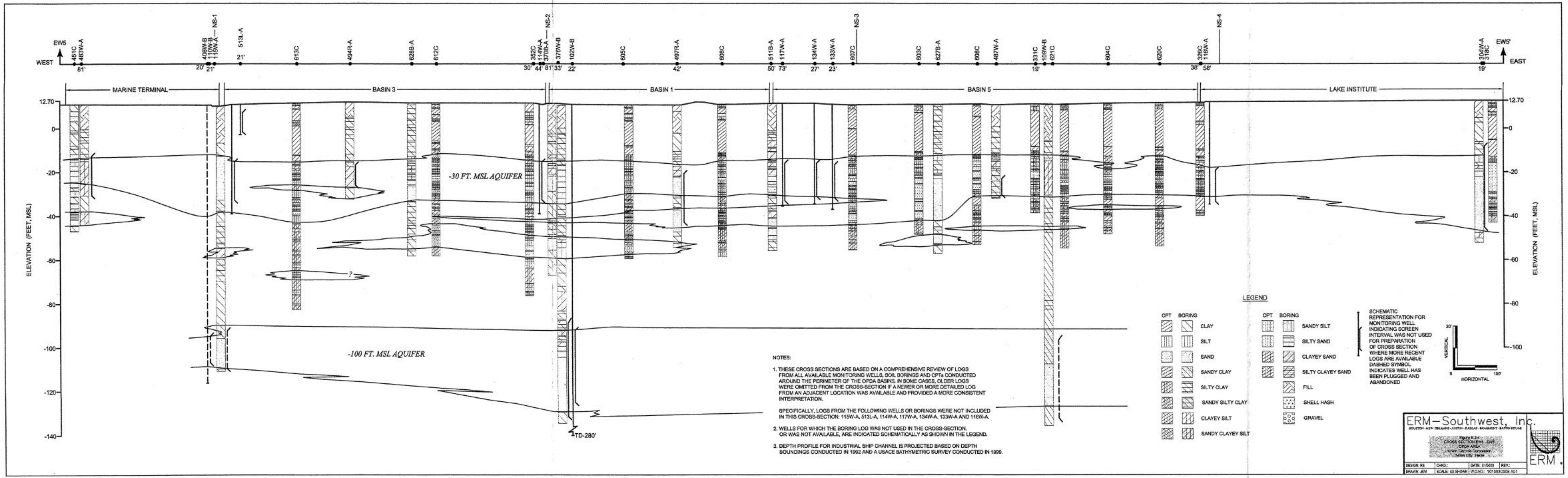
Figure E.2-9
CROSS SECTION EW3 - EW3'
OPDA AREA
Union Carbide Corporation
Texas City, Texas

DESIGN: RS	CHKD.:	DATE: 01/04/01	REV.:
DRAWN: JEM	SCALE: AS SHOWN	W.O.NO.: 1013930012 A01	

Figure 3. Cross-Section EW3-EW3'



NOTES:

1. THESE CROSS SECTIONS ARE BASED ON A COMPREHENSIVE REVIEW OF LOGS FROM ALL AVAILABLE MONITORING WELLS, SOIL BORINGS AND CPTs CONDUCTED AROUND THE PERIMETER OF THE OPDA BASINS. IN SOME CASES, OLDER LOGS WERE OMITTED FROM THE CROSS-SECTION IF A NEWER OR MORE DETAILED LOG FROM AN ADJACENT LOCATION WAS AVAILABLE AND PROVIDED A MORE CONSISTENT INTERPRETATION.

   SPECIFICALLY, LOGS FROM THE FOLLOWING WELLS OR BORINGS WERE NOT INCLUDED IN THIS CROSS-SECTION: 115W-A, 513L-A, 114W-A, 117W-A, 134W-A, 133W-A AND 116W-A.

2. WELLS FOR WHICH THE BORING LOG WAS NOT USED IN THE CROSS-SECTION, OR WAS NOT AVAILABLE, ARE INDICATED SCHEMATICALLY AS SHOWN IN THE LEGEND.

3. DEPTH PROFILE FOR INDUSTRIAL SHIP CHANNEL IS PROJECTED BASED ON DEPTH SOUNDINGS CONDUCTED IN 1992 AND A USACE BATHYMETRIC SURVEY CONDUCTED IN 1999.

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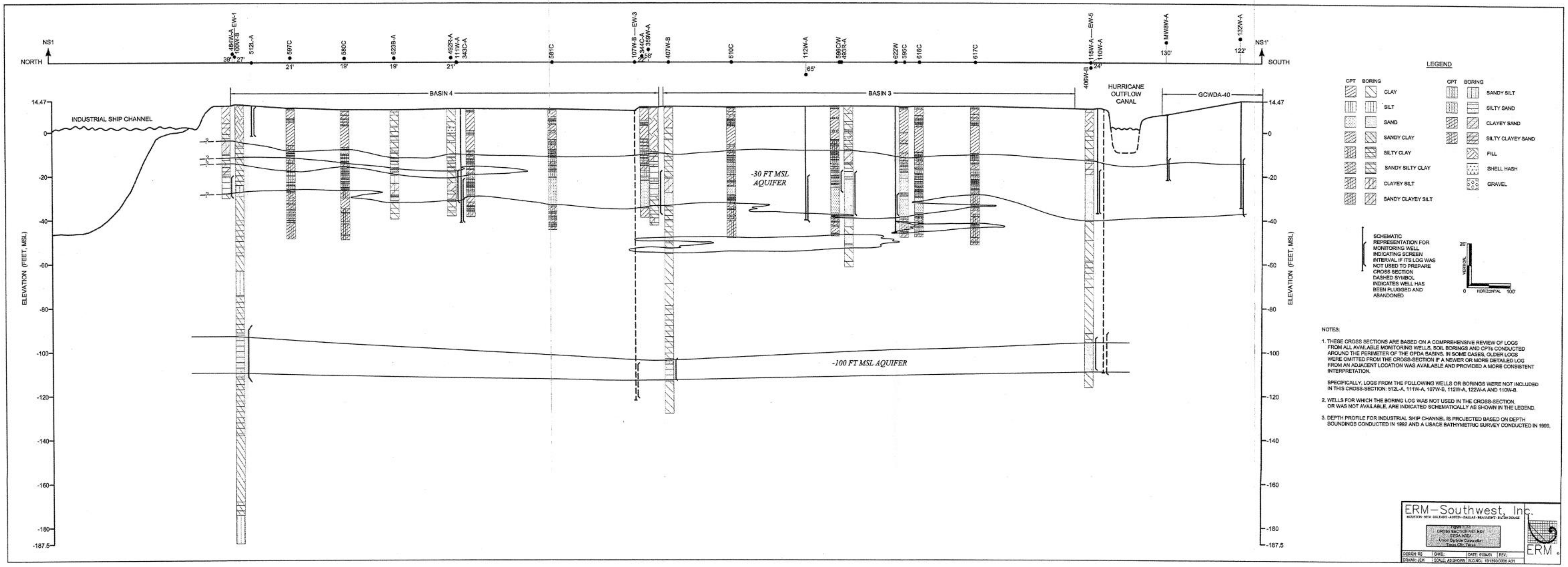
Figure E.2.4
CROSS SECTION EW5 - EW5'
OPDA AREA
Union Carbide Corporation
Texas City, Texas

DESIGN: RS	CHKD.:	DATE: 01/04/01	REV.:
DRAWN: JEM	SCALE: AS SHOWN	W.O.NO.: 101393C008 A01	

Figure 4. Cross-Section EW5-EW5'



NOTES:

1. THESE CROSS SECTIONS ARE BASED ON A COMPREHENSIVE REVIEW OF LOGS FROM ALL AVAILABLE MONITORING WELLS, SOIL BORINGS AND CPTs CONDUCTED AROUND THE PERIMETER OF THE OPDA BASINS. IN SOME CASES, OLDER LOGS WERE OMITTED FROM THE CROSS-SECTION IF A NEWER OR MORE DETAILED LOG FROM AN ADJACENT LOCATION WAS AVAILABLE AND PROVIDED A MORE CONSISTENT INTERPRETATION.

   SPECIFICALLY, LOGS FROM THE FOLLOWING WELLS OR BORINGS WERE NOT INCLUDED IN THIS CROSS-SECTION: 512L-A, 111W-A, 107W-B, 112W-A, 122W-A AND 110W-B.

2. WELLS FOR WHICH THE BORING LOG WAS NOT USED IN THE CROSS-SECTION, OR WAS NOT AVAILABLE, ARE INDICATED SCHEMATICALLY AS SHOWN IN THE LEGEND.

3. DEPTH PROFILE FOR INDUSTRIAL SHIP CHANNEL IS PROJECTED BASED ON DEPTH SOUNDINGS CONDUCTED IN 1992 AND A USACE BATHYMETRIC SURVEY CONDUCTED IN 1999.

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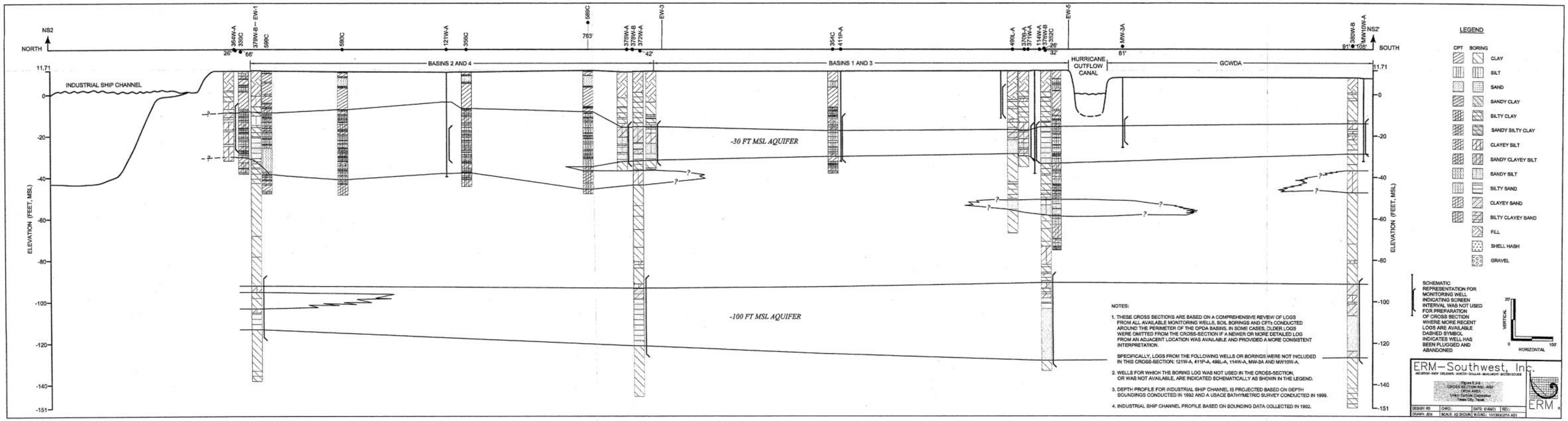
Figure [illegible]
CROSS SECTION NS1-NS1'
OPDA AREA
Union Carbide Corporation
Texas City, Texas

DESIGN: RS	CHKD.:	DATE: 01/04/01	REV.:
DRAWN: JEM	SCALE: AS SHOWN	W.O.NO.: 101393C006 A01	

Figure 5. Cross-Section NS1-NS1'



NOTES:

1. THESE CROSS SECTIONS ARE BASED ON A COMPREHENSIVE REVIEW OF LOGS FROM ALL AVAILABLE MONITORING WELLS, SOIL BORINGS AND CPTs CONDUCTED AROUND THE PERIMETER OF THE OPDA BASINS. IN SOME CASES, OLDER LOGS WERE OMITTED FROM THE CROSS-SECTION IF A NEWER OR MORE DETAILED LOG FROM AN ADJACENT LOCATION WAS AVAILABLE AND PROVIDED A MORE CONSISTENT INTERPRETATION.

   SPECIFICALLY, LOGS FROM THE FOLLOWING WELLS OR BORINGS WERE NOT INCLUDED IN THIS CROSS-SECTION: 121W-A, 411P-A, 499L-A, 114W-A, MW-3A AND MW10W-A.

2. WELLS FOR WHICH THE BORING LOG WAS NOT USED IN THE CROSS-SECTION, OR WAS NOT AVAILABLE, ARE INDICATED SCHEMATICALLY AS SHOWN IN THE LEGEND.

3. DEPTH PROFILE FOR INDUSTRIAL SHIP CHANNEL IS PROJECTED BASED ON DEPTH SOUNDINGS CONDUCTED IN 1992 AND A USACE BATHYMETRIC SURVEY CONDUCTED IN 1999.

4. INDUSTRIAL SHIP CHANNEL PROFILE BASED ON SOUNDING DATA COLLECTED IN 1992.

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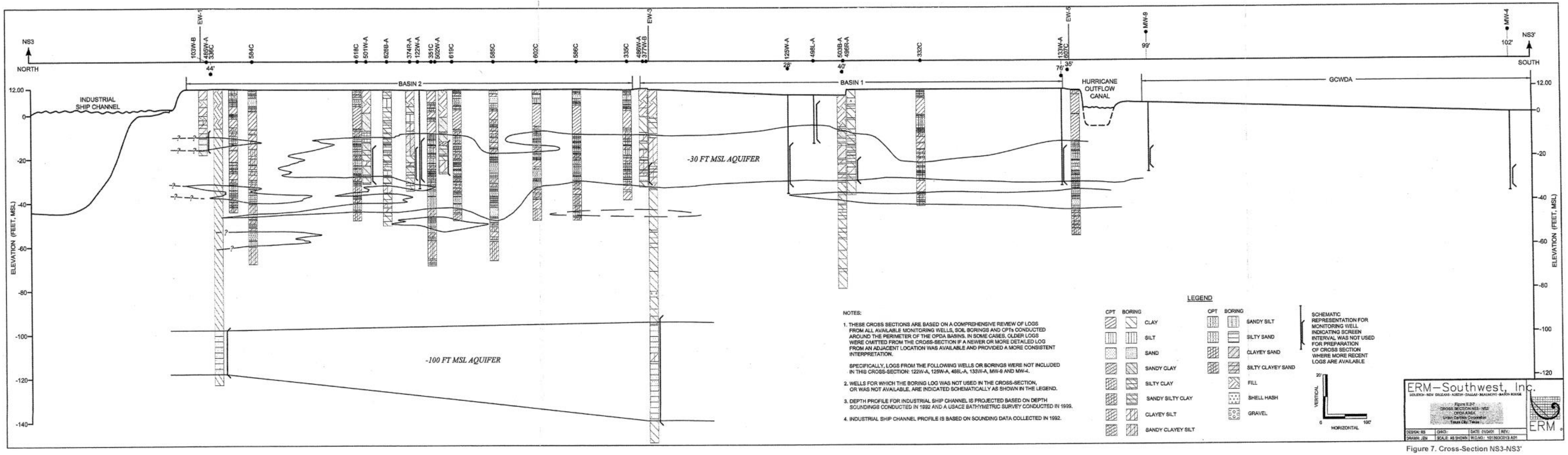
Figure E.2-6
CROSS SECTION NS2 - NS2'
OPDA AREA
Union Carbide Corporation
Texas City, Texas

DESIGN: RS	CHKD.:	DATE: 01/04/01	REV.:
DRAWN: JBX	SCALE: AS SHOWN	W.O.NO.: 1013930314 A01	

ERM

Figure 6. Cross-Section NS2-NS2'



NOTES:

1. THESE CROSS SECTIONS ARE BASED ON A COMPREHENSIVE REVIEW OF LOGS FROM ALL AVAILABLE MONITORING WELLS, SOIL BORINGS AND CPTs CONDUCTED AROUND THE PERIMETER OF THE OPDA BASINS. IN SOME CASES, OLDER LOGS WERE OMITTED FROM THE CROSS-SECTION IF A NEWER OR MORE DETAILED LOG FROM AN ADJACENT LOCATION WAS AVAILABLE AND PROVIDED A MORE CONSISTENT INTERPRETATION.

   SPECIFICALLY, LOGS FROM THE FOLLOWING WELLS OR BORINGS WERE NOT INCLUDED IN THIS CROSS-SECTION: 122W-A, 125W-A, 498L-A, 133W-A, MW-9 AND MW-4.

2. WELLS FOR WHICH THE BORING LOG WAS NOT USED IN THE CROSS-SECTION, OR WAS NOT AVAILABLE, ARE INDICATED SCHEMATICALLY AS SHOWN IN THE LEGEND.
3. DEPTH PROFILE FOR INDUSTRIAL SHIP CHANNEL IS PROJECTED BASED ON DEPTH SOUNDINGS CONDUCTED IN 1992 AND A USACE BATHYMETRIC SURVEY CONDUCTED IN 1999.
4. INDUSTRIAL SHIP CHANNEL PROFILE IS BASED ON SOUNDING DATA COLLECTED IN 1992.

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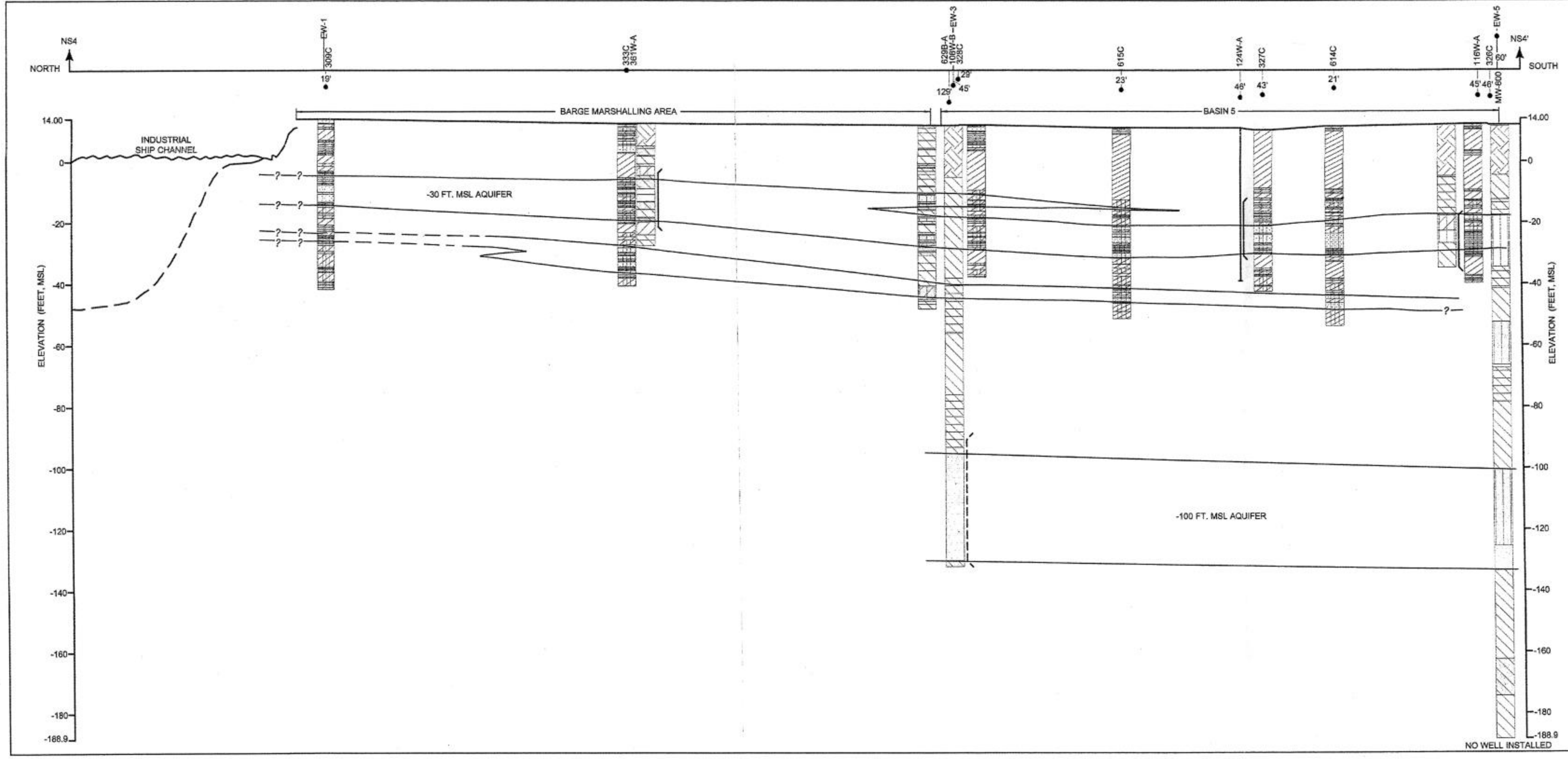
Figure E.2-7
CROSS SECTION NS3 - NS3'
OPDA AREA
Union Carbide Corporation
Texas City, Texas

DESIGN: RS	CHKD.:	DATE: 01/04/01	REV.:
DRAWN: JEM	SCALE: AS SHOWN	W.O.NO.: 101393C013 A01	

ERM

Figure 7. Cross-Section NS3-NS3'



NOTES:

1. THESE CROSS SECTIONS ARE BASED ON A COMPREHENSIVE REVIEW OF LOGS FROM ALL AVAILABLE MONITORING WELLS, SOIL BORINGS AND CPTs CONDUCTED AROUND THE PERIMETER OF THE OPDA BASINS. IN SOME CASES, OLDER LOGS WERE OMITTED FROM THE CROSS-SECTION IF A NEWER OR MORE DETAILED LOG FROM AN ADJACENT LOCATION WAS AVAILABLE AND PROVIDED A MORE CONSISTENT INTERPRETATION.

   SPECIFICALLY, THE LOG FROM WELL 124W-A WAS NOT INCLUDED.

2. WELLS FOR WHICH THE BORING LOG WAS NOT USED IN THE CROSS-SECTION, OR WAS NOT AVAILABLE, ARE INDICATED SCHEMATICALLY AS SHOWN IN THE LEGEND.

3. DEPTH PROFILE FOR INDUSTRIAL SHIP CHANNEL IS PROJECTED BASED ON DEPTH SOUNDINGS CONDUCTED IN 1992 AND A USACE BATHYMETRIC SURVEY CONDUCTED IN 1999.

4. INDUSTRIAL SHIP CHANNEL PROFILE ESTIMATED FROM SOUNDING DATA COLLECTED AT OTHER NORTH-SOUTH LOCATIONS.

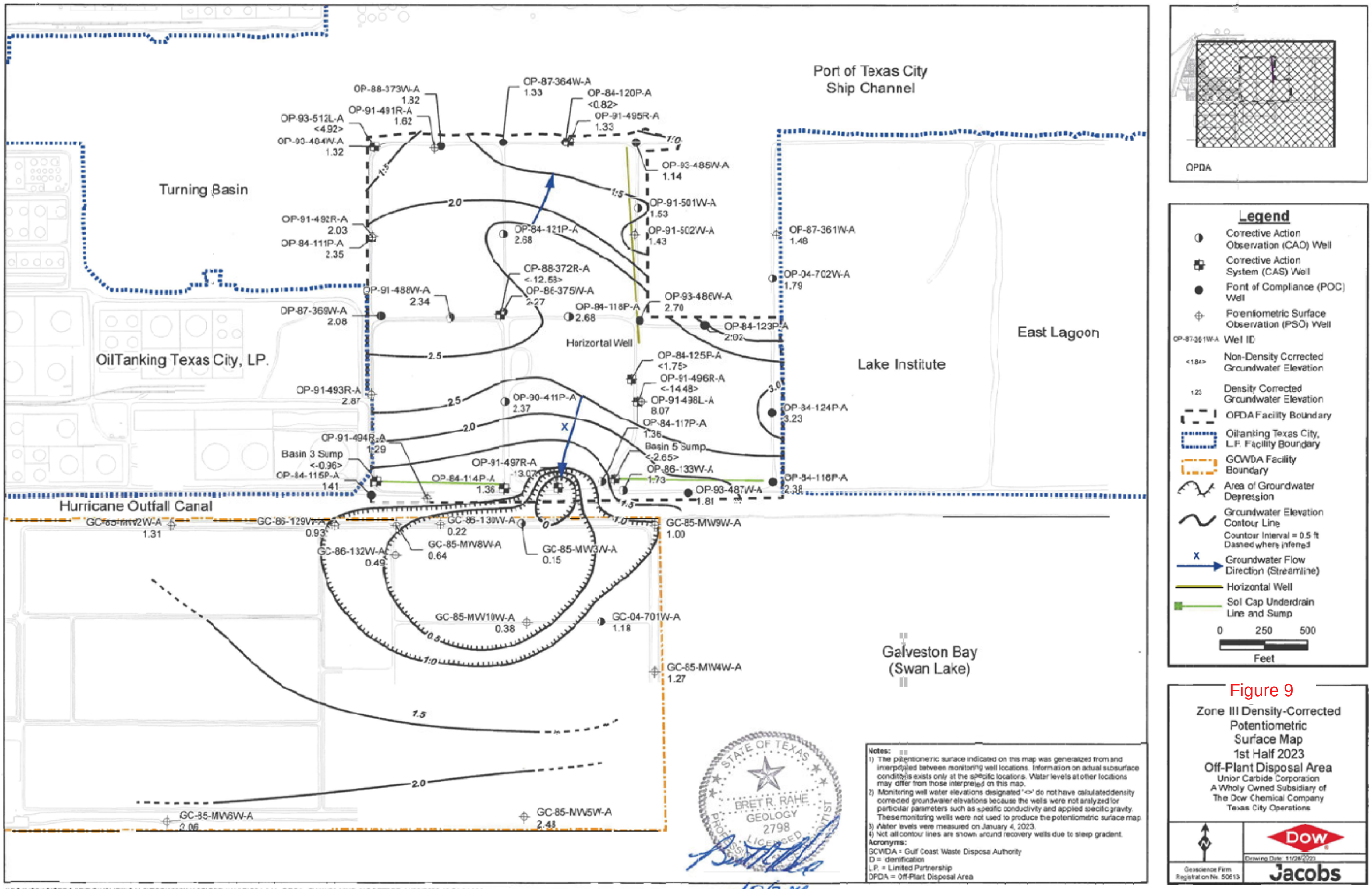
ERM–Southwest, Inc.
HOUSTON - NEW ORLEANS - AUSTIN - DALLAS - BEAUMONT - BATON ROUGE

Figure E-24
CROSS SECTION NS4 - NS4'
OPDA AREA
Union Carbide Corporation
Texas City, Texas

DESIGN: RS	CHKD.:	DATE: 05/04/01	REV.:
DRAWN: JEM	SCALE: AS SHOWN	W.O.NO.: 101393C011 A01	

ERM.

Figure 8. Cross-Section NS4-NS4'



Notes:

1) The potentiometric surface indicated on this map was generalized from and interpolated between monitoring well locations. Information on actual subsurface conditions exists only at the specific locations. Water levels at other locations may differ from those interpreted on this map.
2) Monitoring well water elevations designated '<>' do not have calulated density corrected groundwater elevations because the wells were not analyzed for particular parameters such as specific conductivity and applied specific gravity. These monitoring wells were not used to produce the potentiometric surface map.
3) Water levels were measured on January 4, 2023.
4) Not all contour lines are shown around recovery wells due to steep gradient.

Acronyms:

GCWDA = Gulf Coast Waste Disposa Authority
D = Idenification
L.P. = Limited Partnership
OPDA = Off-Plant Disposal Area

BRET R. RAHE
GEOLOGY
2798

1/18/2024

Figure 9

Zone III Density-Corrected Potentiometric Surface Map 1st Half 2023 Off-Plant Disposal Area

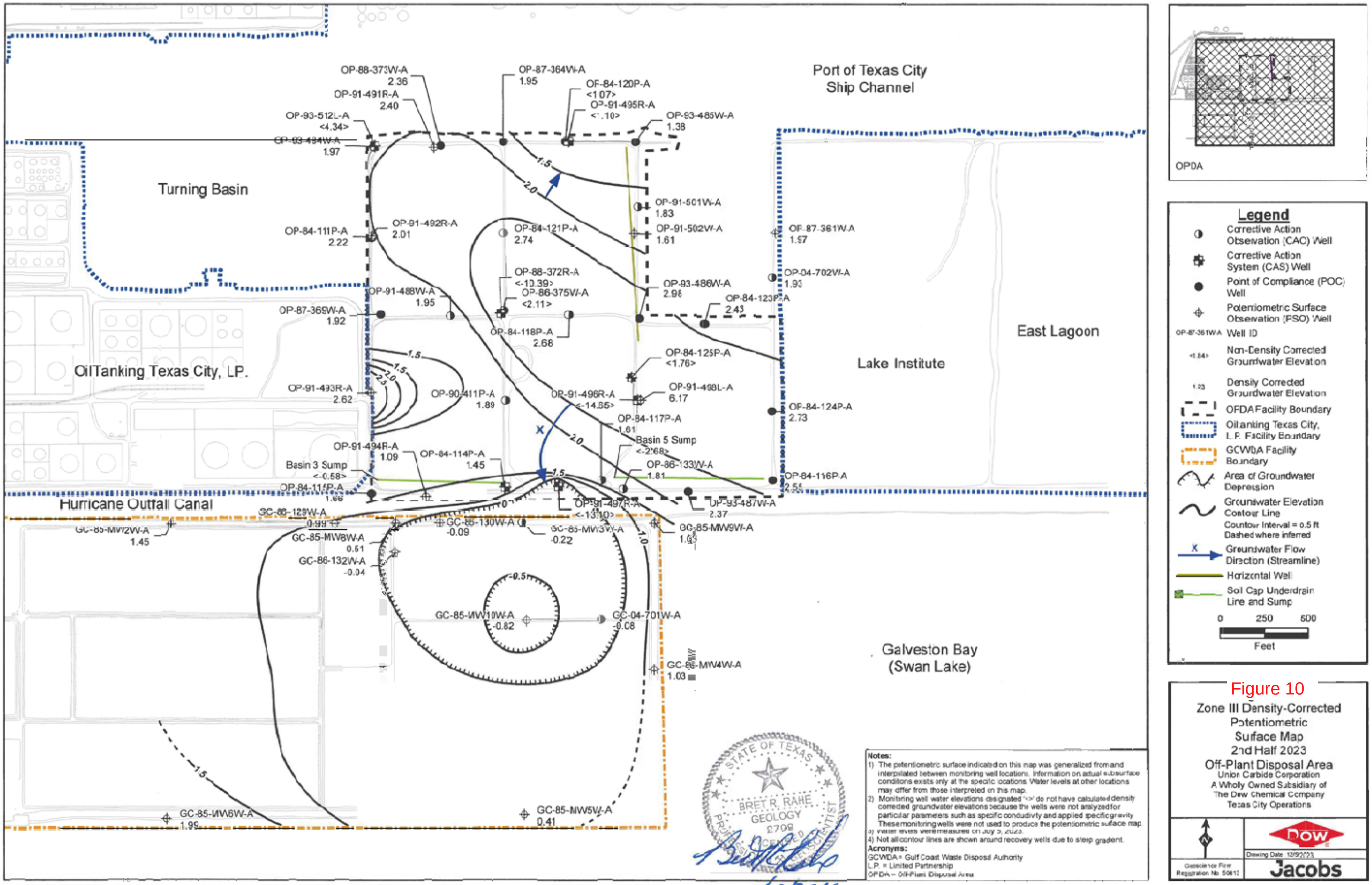
Union Carbide Corporation
A Wholly Owned Subsidiary of
The Dow Chemical Company
Texas City Operations

Drawing Date: 11/28/2023

Geoscience Firm
Registration No. 50613

Jacobs

\\DC1VS01\GISPROJ\D\DOWCHEMICALS\TCO\2023\MAPS\OPDA\1H\FIG01-04A_OPDA_GW1H23.MXD MCOTTERB 11/28/2023 10:51:21AM



Notes:

1) The potentiometric surface indicated on this map was generalized from and interpolated between monitoring well locations. Information on actual subsurface conditions exists only at the specific locations. Water levels at other locations may differ from those interpreted on this map.
2) Monitoring well water elevations designated '<>' do not have calculated density corrected groundwater elevations because the wells were not analyzed for particular parameters such as specific conductivity and applied specific gravity. These monitoring wells were not used to produce the potentiometric surface map.
3) Water levels were measured on July 5, 2023.
4) Not all contour lines are shown around recovery wells due to steep gradient.

Acronyms:

GCWDA = Gulf Coast Waste Disposal Authority
L.P. = Limited Partnership
OPDA – Off-Plant Disposal Area

BRET R. RAHE
GEOLOGY
2709

1/18/2024

Figure 10

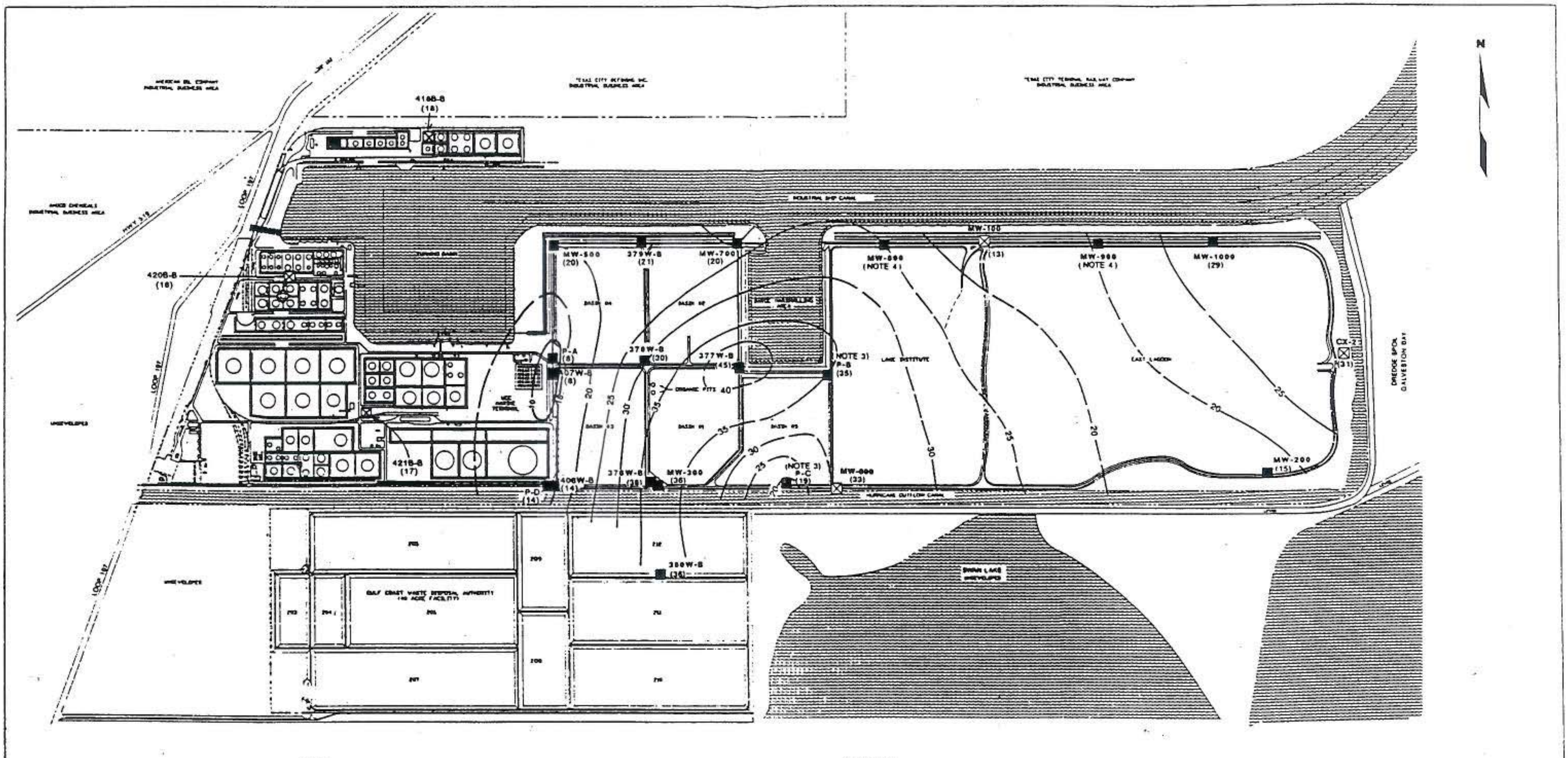
Zone III Density-Corrected
Potentiometric
Surface Map
2nd Half 2023
Off-Plant Disposal Area
Union Carbide Corporation
A Wholly Owned Subsidiary of
The Dow Chemical Company
Texas City Operations

Drawing Date: 12/5/2023

Geoscience Firm
Registration No. 50613

Jacobs

\\DC1VS01\GISPROJ\D\DOWCHEMICALS\TCO\2023\MAPS\OPDA2H\FIG01-04B_OPDA_GW2H23.MXD MCOTTERB 12/5/2023 3:56:11 PM



NOTES

1. ORIGINAL BASE MAP, PROVIDED BY UNION CARBIDE CORPORATION, WAS ADJUSTED BY ERM-SOUTHWEST TO REFLECT TOPOGRAPHIC SURVEY CONDUCTED IN AUGUST 1985
2. NAMES OF WELLS INSTALLED BY ERM SOUTHWEST ARE ABBREVIATED. FOR EXAMPLE, OP 58 378W-B IS SHOWN AS 378W-B
3. PIEZOMETERS P-B AND P-C WERE REMOVED AND PLUGGED IN DECEMBER 1988
4. DATA FROM WELLS MW-800 AND MW-900 WERE NOT USED BECAUSE OF THE POOR QUALITY OF THE GEOPHYSICAL AND STRATIGRAPHIC LOGS.

LEGEND

▤	SURFACE WATER
380W-B ■ (36)	MONITOR WELL IN THE "100 FT. MSL AQUIFER" (THICKNESS FT.)
MW-600 ☒ (33)	BORING PENETRATING THE "100 FT. MSL AQUIFER" THICKNESS (FT.)
— —25—	LINE OF EQUAL THICKNESS (FT) (DASHED WHERE UNCERTAIN)

400 0 400 800
SCALE feet

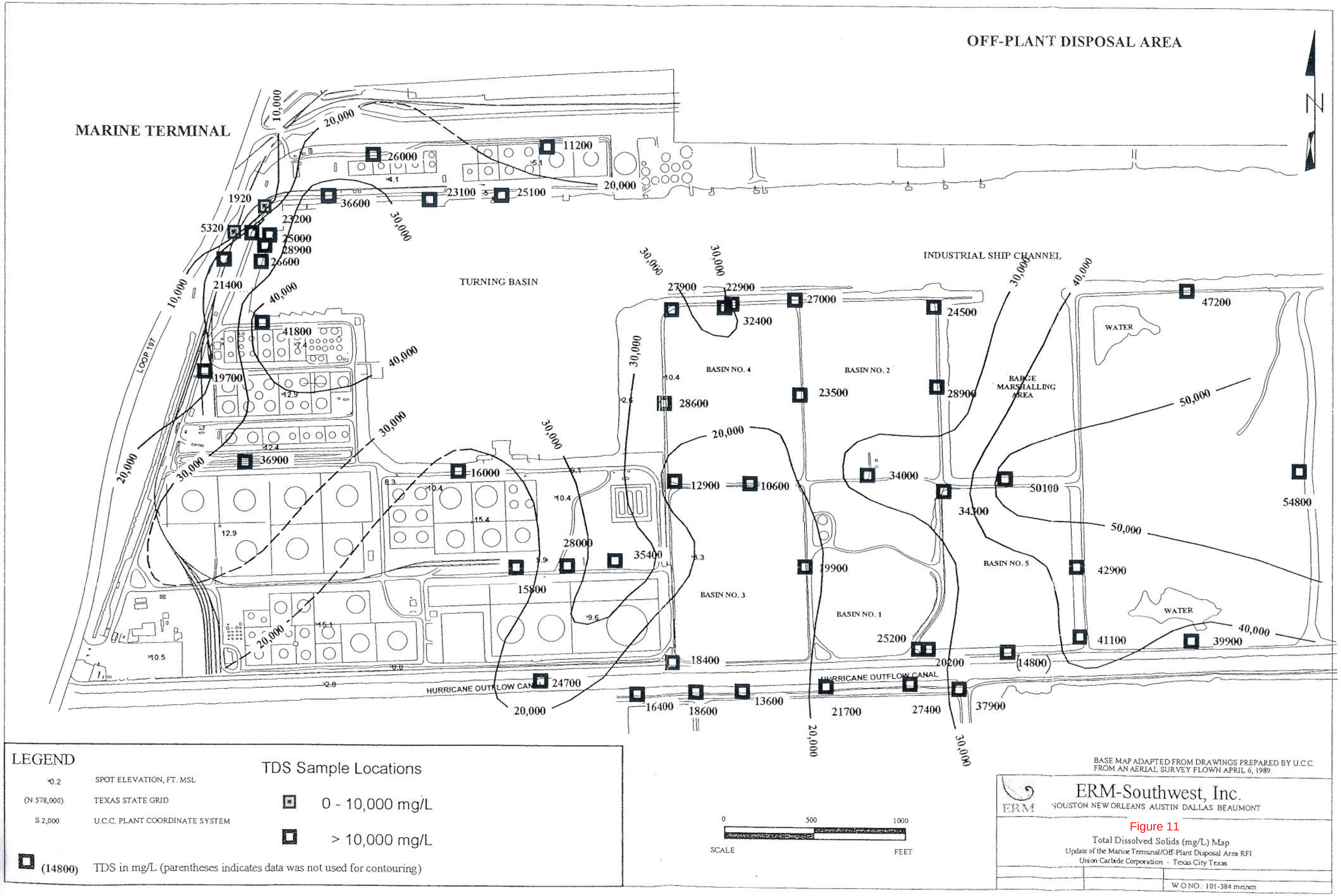
Figure 11. Potentiometric Surface Elevation: -100 ft MSL Aquifer

ERM-Southwest, inc.

Potentimetric Surface Map for –100 Ft. MSL Aquifer
Marine Terminal – OPDA Facility
Union Carbide Corporation
Texas City, Texas

Attachment 1

Total Dissolved Solid Concentration Map



BASE MAP ADAPTED FROM DRAWINGS PREPARED BY U.C.C.
FROM AN AERIAL SURVEY FLOWN APRIL 6, 1989.

ERM-Southwest, Inc.
HOUSTON NEW ORLEANS AUSTIN DALLAS BEAUMONT

Figure 11

Total Dissolved Solids (mg/L) Map

Update of the Marine Terminal/Off-Plant Disposal Area RFI

Union Carbide Corporation - Texas City Texas

W.O.NO.: 101-384 meinen

Arcadis U.S., Inc.
1330 Post Oak Blvd., Suite 2250
Houston
Texas 77056
Phone: 713 953 4800
www.arcadis.com

Part B

Appendix XI – Compliance Plan

Appendix XI.D

Corrective Action Monitoring Program

Union Carbide Corporation

Corrective Action Monitoring Program

Union Carbide Corporation

Off-Plant Disposal Area (OPDA) Facility

Rev. 0

December 2024

Corrective Action Monitoring Program

Union Carbide Corporation
Off-Plant Disposal Area (OPDA) Facility
Rev. 0
December 2024

Prepared By:
Arcadis U.S., Inc.
1330 Post Oak Blvd., Suite 2250
Houston
Texas 77056
Phone: 713 953 4800

Prepared For:
The Dow Chemical Company

Our Ref:
30228926

Richard J Trevino

Richard J. Trevino, P.G. (TX), RPG (MS)
Project Manager

Justin Dzubay

Justin Dzubay
Project Engineer

Version Control

Issue	Revision No.	Date Issued	Page No.	Description	Reviewed By

Contents

Tables

Figures

Appendices

Acronyms and Abbreviations

1,2-DCA	1,2-Dichloroethane
1,2-DCP	1,2-Dichloropropane
1,1,2-TCA	1,1,2-Trichloroethane
CAO	Corrective Action Observation
CAS	Corrective Action System
COC	Constituents of Concern
CP	Compliance Plan
DNAPL	dense nonaqueous phase liquid
Dow	The Dow Chemical Company
GCWDA	Gulf Coast Waste Disposal Authority
GWPS	groundwater protection standards
LNAPL	light nonaqueous phase liquid
OPDA	Off-Plant Disposal Area
POE	Point of Exposure
PSO	potentiometric surface observation
RCRA	Resource Conservation and Recovery Act (RCRA)
TAC	Texas Administrative Code
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
UCC	Union Carbide Corporation
VC	vinyl chloride

1 Introduction

This attachment presents an overview of the corrective action processes for the areas that are to be monitored under Corrective Action [30 Texas Administrative Code (TAC) 335.167] at the Union Carbide Corporation (UCC), a wholly owned subsidiary of The Dow Chemical Company (Dow) Off-Plant Disposal Area (OPDA) Facility. This attachment is intended to present information required for the Resource Conservation and Recovery Act (RCRA) Permit / Compliance Plan (CP) No. 50264 renewal application and present information required in Section XI.D.

2 Background

From 1952 through 1990, UCC used the OPDA facility as a system of wastewater treatment lagoons and as a primary waste management area. The five basins at the OPDA facility received solid waste and sludge from the UCC Texas City Main Plant Facility. The OPDA facility consists of four RCRA regulated units and four solid waste management units (SWMUs). A groundwater recovery system began operating in August 1994.

UCC performs groundwater corrective action and monitoring at the OPDA Facility in accordance with Texas Commission on Environmental Quality (TCEQ) approved RCRA Permit / CP No. 50264 which was approved and issued on June 25, 2015.

The shallow stratigraphy beneath the OPDA site consists of a complex interfingering of sediments deposited in a fluvio-deltaic system. The shallow subsurface at the OPDA is categorized into six stratigraphic zones (designated Zones I, II, III, IV, V, and VI). Zone I is fill material primarily from dredge spoil material used in the construction of the roads and dikes between the Basins. Zone II is a laterally continuous silty clay and clay unit which acts as the upper semi-confining layer to Zone III. Zone III represents the uppermost transmissive zone, or 30 feet mean sea level (msl) transmissive zone underlying OPDA Basins 1 through 5. Transmissive sands and silty sands of Zone III are generally laterally continuous beneath the OPDA site and are described as more laterally discontinuous beneath the Oiltanking Texas City, L.P. (Oiltanking) facility (formerly the Dow Marine Terminal) to the west. Zone IV is a clay aquitard between the 30 feet msl transmissive zone and the 100 feet msl transmissive zone. Zone V is the 100 feet msl transmissive zone and Zone VI is an aquitard underlying the 100 feet msl transmissive zone.

3 Areas Monitored Under Corrective Action

As specified in CP Table V and CP Attachment A Sheet 3 of 3, Table 1 lists the current wells and their functions as they apply to the groundwater monitoring program (Figure 1). The groundwater monitoring well network is located across OPDA Basins 1 through 5 and to the south on Gulf Coast Waste Disposal Authority (GCWDA) property. Additional potentiometric surface observation wells (PSO) are located outside of the OPDA facility that are used only for gauging on a semiannual basis. Groundwater samples from OPDA wells are analyzed for the indicator parameters identified in CP Table IIIA, which include benzene, 1,2-Dichloroethane (1,2-DCA), 1,2-Dichloropropane (1,2-DCP), 1,1,2-Trichloroethane (1,1,2-TCA), trichloroethene (TCE), vinyl chloride (VC), and bis(2-chloroethyl)ether (BCEE).

4 Groundwater Monitoring and Corrective Action Program Description

Currently, the groundwater elevations and monitoring at OPDA are examined through the corrective action program. In accordance with the CP, groundwater wells listed in CP Table V and CP Attachment A Sheet 3 of 3 at the OPDA are monitored for CP Table IIIA parameters semiannually in Zone III and annually at one zone V well. Constituents of concern (COC) concentrations are compared to their respective Groundwater Protection Standards (GWPS) across the site. Zone III wells are monitored semiannually and reported annually, the zone V well is reported annually. The GWPS for Zone III wells are based on Class 3 groundwater standards, while the deeper Zone V well is based on Class 2 groundwater standards.

Table 1 includes a list of wells included in the current groundwater monitoring program for OPDA. Results from all wells are compared to established GWPS for constituents listed in CP Table III/IIIA. **Figure 1** presents the current groundwater monitoring well network for OPDA. The CP monitoring network for the OPDA area also includes the following:

- 13 Zone III Point of Compliance (POC) Wells
- 1 Zone V POC Well
- 11 Zone III Corrective Action Observation (CAO) Wells
    - Former CAO well GC-86-131W-A was plugged in November 2023
- 10 Corrective Action System (CAS) Wells
    - OPDA Horizontal Well
    - Basin 3 and 5 Sumps are reported as CAS wells. These sumps are associated with the soil cover underdrain lines constructed as part of the soil cover installation in Basins 3 and 5 in 2005
    - Wells OP-93-512L-A, OP-84-114P-A, and OP-84-125P-A are currently being used to recover NAPL on a quarterly basis.

Wells OP-88-372R-A, OP-91-495R-A, OP-91-496R-A, and OP-91-497R-A are not noted in CP Attachment A Sheet 3 of 3 as CAS wells; however, they are currently being used to recover NAPL. A total of four Zone III PSO wells are currently on-site used for gauging only. Numerous PSO wells have been removed from the monitoring program since issuance of the Permit / CP in 2015.

Vertical CAS recovery wells, a horizontal well, and two sump wells are part of the existing corrective action program at OPDA. All recovery wells are active in the Zone III transmissive zone. The OPDA CAS consists of nitrogen-driven pumps at each recovery system, high-density polyethylene conveyance lines, and a centralized oil-water separation and air-stripper treatment system. Treated water is then conveyed off-site at the GCWDA facility in Texas City, TX.

5 Evaluation of Current Corrective Action

The following subsections provide an evaluation of the current corrective action for groundwater transmissive zones monitored at the OPDA Facility.

5.1 OPDA Zone III

The CAS and monitoring program for the Zone III transmissive zone consists of four recovery wells that actively recover DNAPL, and five monitoring wells from which NAPL is recovered monthly and quarterly. The CAS also includes a horizontal well that actively recovers groundwater from the Zone III transmissive zone. In addition, clay caps at Basins 1, 2, and 4 were completed in 2019. Each cap was installed in accordance with the approved Response Action Plan to reduce the infiltration of surface water into the Zone III water-bearing unit, which has historically caused mounding beneath the basins. UCC continues to monitor the potentiometric surface of Zone III to determine whether additional corrective action will be necessary to address the concentration of COCs in groundwater at the OPDA.

Historically, monitoring wells OP-84-114P-A, OP-84-120P-A, OP-84-125P-A, OP-86-375W-A, along with recovery wells OP-88-372R-A, OP-91-495R-A, OP-91-496R-A, OP-91-497R-A have contained dense nonaqueous phase liquid (DNAPL) while OP-93-512L-A contained light nonaqueous phase liquid (LNAPL). The wells listed above are considered non-compliant in accordance with CP Permit Provision XI.F,3,b,1,(e). During the latest reporting period (2023) wells OP-84-125P-A and OP-84-120P-A contained DNAPL and were not sampled.

Groundwater sampling trend graphs and historic groundwater sampling results for all Zone III wells can be found in **Appendix A**.

Zone III CAS Wells

Laboratory analysis from routine groundwater sampling events continue to show results from CAS wells Basin 3 Sump and Basin 5 Sump, below GWPS for all COCs. Concentrations of CP Table III constituents detected in groundwater samples collected from the Horizontal Well exceeded respective GWPS for multiple constituents, however, historically concentrations do show a decreasing trend. Benzene concentrations in CAS well OP-93-512L-A have fluctuated above and below the GWPS going back to 2018, while the 2023 and 2024 sampling events have exceeded the GWPS. Historically, LNAPL was detected in this well. Historically, OP-84-114P-A has exceeded GWPS for multiple COCs but concentrations continue to show a slight declining trend.

Zone III CAO Wells

Historically, groundwater samples collected from Zone III CAO wells (OP-91-488W-A, OP-04-702W-A, GC-04-701-A, and GC-85-MW3W-A) have consistently been below the GWPS for all CP Table IIIA COCs. CAO wells (OP-84-117P-A, OP-84-118P-A, OP-84-121P-A, OP-86-133W-A, OP-86-375W-A, OP-90-411P-A, OP-91-501W-A) have historically not met the applicable GWPS for multiple constituents. These CAO wells have generally shown a declining trend since the inception of groundwater sampling. However, benzene concentrations in CAO well OP-86-133W-A have stayed consistent or slightly increased over time, in July 2014 benzene concentration was at 6.35 mg/L and the latest sampling event in July 2024, benzene concentration was at 7.2 mg/L.

Zone III POC Wells

Historically, groundwater samples collected from Zone III POC wells (OP-84-111P-A, OP-84-115P-A, OP-84-116P-A, OP-84-123P-A, OP-84-124P-A, OP-88-373W-A, OP-93-485W-A, and OP-93-487W-A) have consistently been below the GWPS for all CP Table IIIA COCs. Laboratory results show that POC well OP-87-364W-A has historically been below the GWPS for all COCs except for benzene. A max benzene concentration of 3.08 mg/L was reported during the January 2016 sampling event. Since then, concentrations have ranged from 0.529 mg/L to 2.15 mg/L showing a relatively steady decreasing trend and below the GWPS for the past several years. Laboratory analysis has shown that benzene and 1,2-dichloropropane (1,2-DCP) concentrations continue to exceed their respective GWPS for POC well OP-87-369W-A-R. The original POC well 369W-A had a max 1,2-DCP concentration of 377 mg/L in the January 2021 sampling event and currently at a value of 300 mg/L (OP-87-369W-A-R) during the most recent July 2024 sampling event, indicating a relatively stable trend over the last several years. 1,2-DCA results for point of exposure well OP-87-369W-A-R have fluctuated near the GWPS from 2016 to present. Concentrations from the replacement well 369W-A-R will be monitored over time. 1,2-DCA, 1,2-DCP, and TCE in POC well OP-93-484W-A have consistently exceeded the GWPS for each respective COC while trends indicate that concentrations have been decreasing for several years. POC well OP-93-486W-A, continues to exceed GWPS for all CP Table IIIA constituents over the last several events. Concentrations observed historically at POC well 486W-A are relatively stable.

5.2 OPDA Zone V

The monitoring program for the Zone V transmissive zone consists of one POC well (OP-88-377W-B). 1,2-DCA and VC were above their respective GWPS during the 2023 reporting period, while all additional COCs have historically been compliant and below their respective GWPS. Concentrations observed historically at POC well OP-88-377W-B are relatively stable. A trend graph for this monitoring well is included in Appendix A.

6 Proposed Updates to the Corrective Action Program

6.1 Zone III

There are no proposed changes to the current Zone III groundwater corrective action and monitoring program. The frequency of NAPL recovery from select wells that act as CAS recovery wells will continue to be evaluated and changes to the NAPL removal frequency will be recommended to the TCEQ, as needed. Table 2 includes a summary of administrative updates made to the groundwater corrective action and monitoring program since issuance of the Permit / CP in 2015.

6.2 OPDA Zone V

There are no proposed changes to the current Zone V groundwater monitoring program. POC well OP-88-377W-B will continue to be monitored annually.

Tables

Table 1
Current Corrective Action and Monitoring Program
Union Carbide Corporation - Off-Plant Disposal Area
Permit / Compliance Plan No. 50264

Monitored Unit	Well	Current Well Function	Notes
Zone III	OP-84-111P-A	POC	
	OP-84-115P-A	POC	
	OP-84-116P-A	POC	
	OP-84-120P-A	POC	
	OP-84-123P-A	POC	
	OP-84-124P-A	POC	
	OP-87-364W-A	POC	
	OP-87-369W-A	POC	Monitoring well plugged in November 2023.
	OP-88-373W-A	POC	
	OP-93-484W-A	POC	
	OP-93-485W-A	POC	
	OP-93-486W-A	POC	
	OP-93-487W-A	POC	
	OP-84-117P-A	CAO	
	OP-84-118P-A	CAO	
	OP-84-121P-A	CAO	
	OP-86-133W-A	CAO	
	OP-86-375W-A	CAO	
	OP-90-411P-A	CAO	
	OP-91-488W-A	CAO	
	OP-91-501W-A	CAO	
	OP-04-702W-A	CAO	
	GC-04-701W-A	CAO	
	GC-86-131W-A	CAO	Monitoring well plugged in December 2020.
	GC-85-MW3W-A	CAO	
	OP-88-372R-A	-	Not formally designated as a CAS well.
	OP-91-491R-A	-	
	OP-91-492R-A	-	
	OP-91-493R-A	-	
	OP-91-494R-A	-	
	OP-91-495R-A	-	Not formally designated as a CAS well.
	OP-91-496R-A	-	Not formally designated as a CAS well.
	OP-91-497R-A	-	Not formally designated as a CAS well.
	OP-93-512L-A	CAS	
	OP-84-114P-A	CAS	
	OP-84-125P-A	CAS	
	Horizontal Well (HW)	CAS	
	Basin 3 Sump	CAS	
	Basin 5 Sump	CAS	
Zone V	OP-81-100W-B	PSO	
	OP-81-102W-B	PSO	Monitoring well plugged in July 2018
	OP-81-103W-B	PSO	
	OP-81-104W-B	PSO	Monitoring well plugged in January 2017.
	OP-88-377W-B	POC	
	OP-88-379W-B	PSO	Monitoring well plugged in July 2018
	OP-89-406W-B	PSO	Monitoring well plugged in July 2018
	OP-89-407W-B	PSO	Monitoring well plugged in July 2018
	GC-88-380W-B	PSO	

Notes:

CAO - Corrective Action Observation Well	POC - Point of Compliance Well
CAS - Corrective Action System Well	PSO - Potentiometric Surface Observation Well

Table 2

Proposed Corrective Action and Monitoring Program
Union Carbide Corporation - Off-Plant Disposal Area
Permit / Compliance Plan No. 50264

Monitored Unit	Well	Proposed Well Function	Notes
Zone III	OP-84-111P-A	POC	
	OP-84-115P-A	POC	
	OP-84-116P-A	POC	
	OP-84-120P-A	POC	
	OP-84-123P-A	POC	
	OP-84-124P-A	POC	
	OP-87-364W-A	POC	
	OP-87-369W-A-R	POC	Replacement well for OP-87-369W-A
	OP-88-373W-A	POC	
	OP-93-484W-A	POC	
	OP-93-485W-A	POC	
	OP-93-486W-A	POC	
	OP-93-487W-A	POC	
	OP-84-117P-A	CAO	
	OP-84-118P-A	CAO	
	OP-84-121P-A	CAO	
	OP-86-133W-A	CAO	
	OP-86-375W-A	CAO	
	OP-90-411P-A	CAO	
	OP-91-488W-A	CAO	
	OP-91-501W-A	CAO	
	OP-04-702W-A	CAO	
	GC-04-701W-A	CAO	
	GC-85-MW3W-A	CAO	
	OP-88-372R-A	CAS (1)	
	OP-91-491R-A	-	
	OP-91-492R-A	-	
	OP-91-493R-A	-	
	OP-91-494R-A	-	
	OP-91-495R-A	CAS (1)	
	OP-91-496R-A	CAS (1)	
	OP-91-497R-A	CAS (1)	
	OP-93-512L-A	CAS (2)	
	OP-84-114P-A	CAS (2)	
	OP-84-125P-A	CAS (2)	
	Horizontal Well (HW)	CAS	
	Basin 3 Sump	CAS	
	Basin 5 Sump	CAS	
Zone V	OP-81-100W-B	PSO	
	OP-81-103W-B	PSO	
	OP-88-377W-B	POC	
	GC-88-380W-B	PSO	

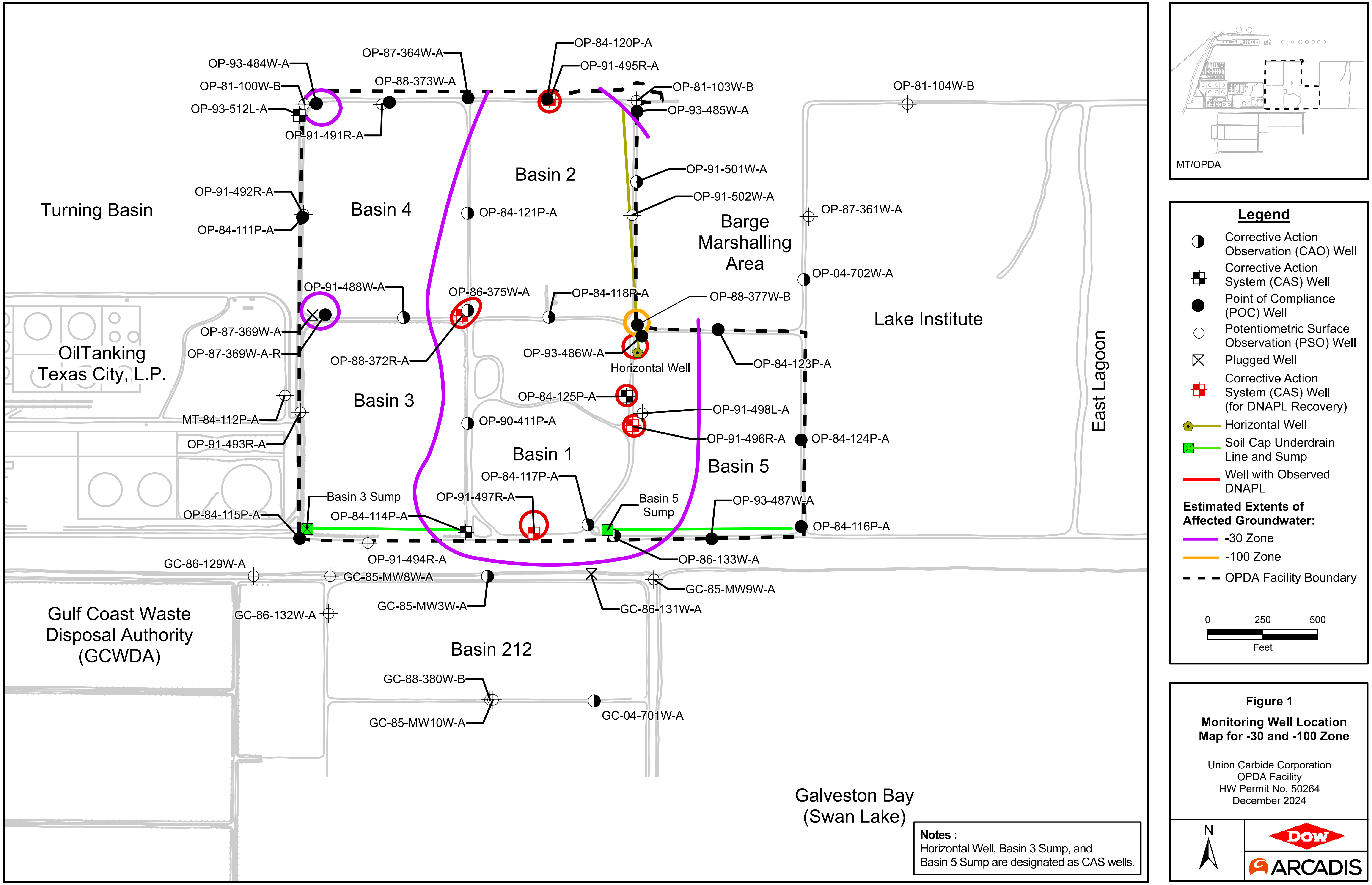
Notes:

CAO - Corrective Action Observation Well	POC - Point of Compliance Well
CAS - Corrective Action System Well	PSO - Potentiometric Surface Observation Well

(1) These wells are not listed in CP Attachment A Sheet 3 of 3 as CAS wells, however these wells function as CAS wells that are in operation for NAPL recovery.

(2) Monitoring wells are utilized for quarterly NAPL recovery.

Figures



Notes :
Horizontal Well, Basin 3 Sump, and Basin 5 Sump are designated as CAS wells.

Figure 1

Monitoring Well Location Map for -30 and -100 Zone

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

T:_ENV\DOW\TEXAS_CITY\GIS\TCO_OPDA_APAR\TCO_OPDA_APAR\MAPFILES\GEC\TCO_OPDA_APAR\TCO_OPDA_APAR.APRX LS3621 11/21/2024 10:46 AM

Appendix A

Trend Graphs for OPDA Monitoring Wells

Figure 1 OP84120PA

GWPS Exceedances Trend Analysis

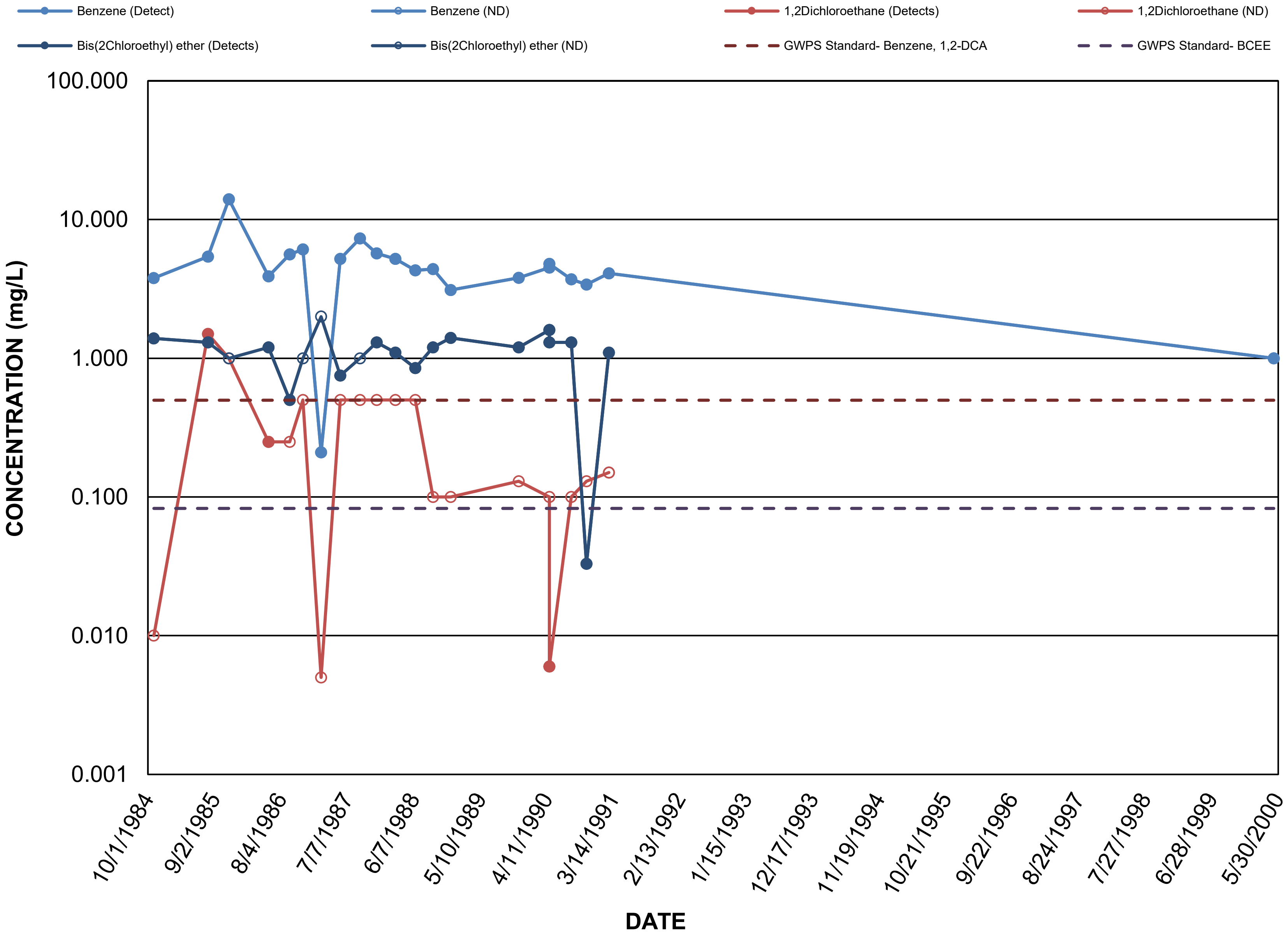


Figure 2 OP84114PA

GWPS Exceedances Trend Analysis

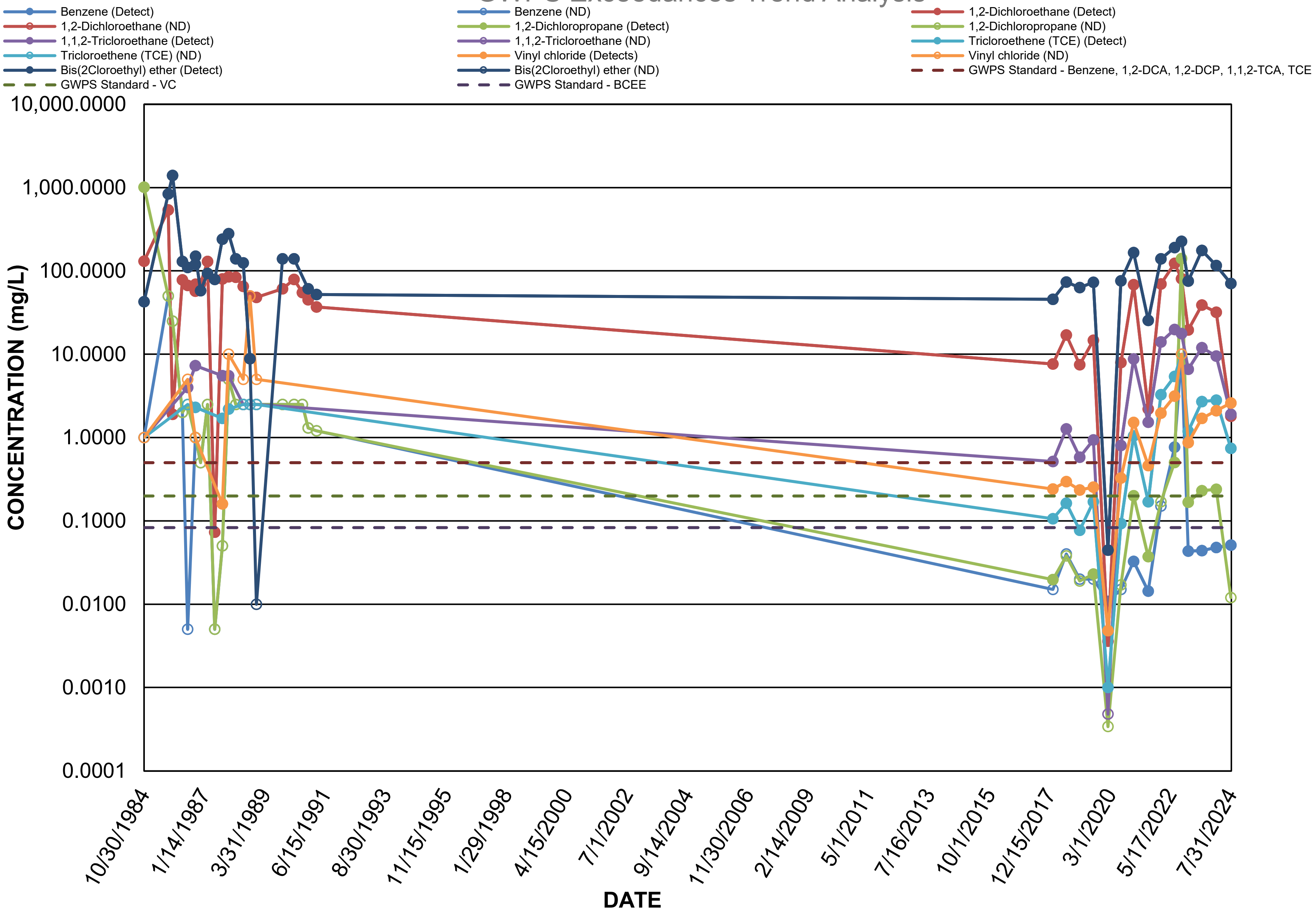


Figure 2 OP84114PA

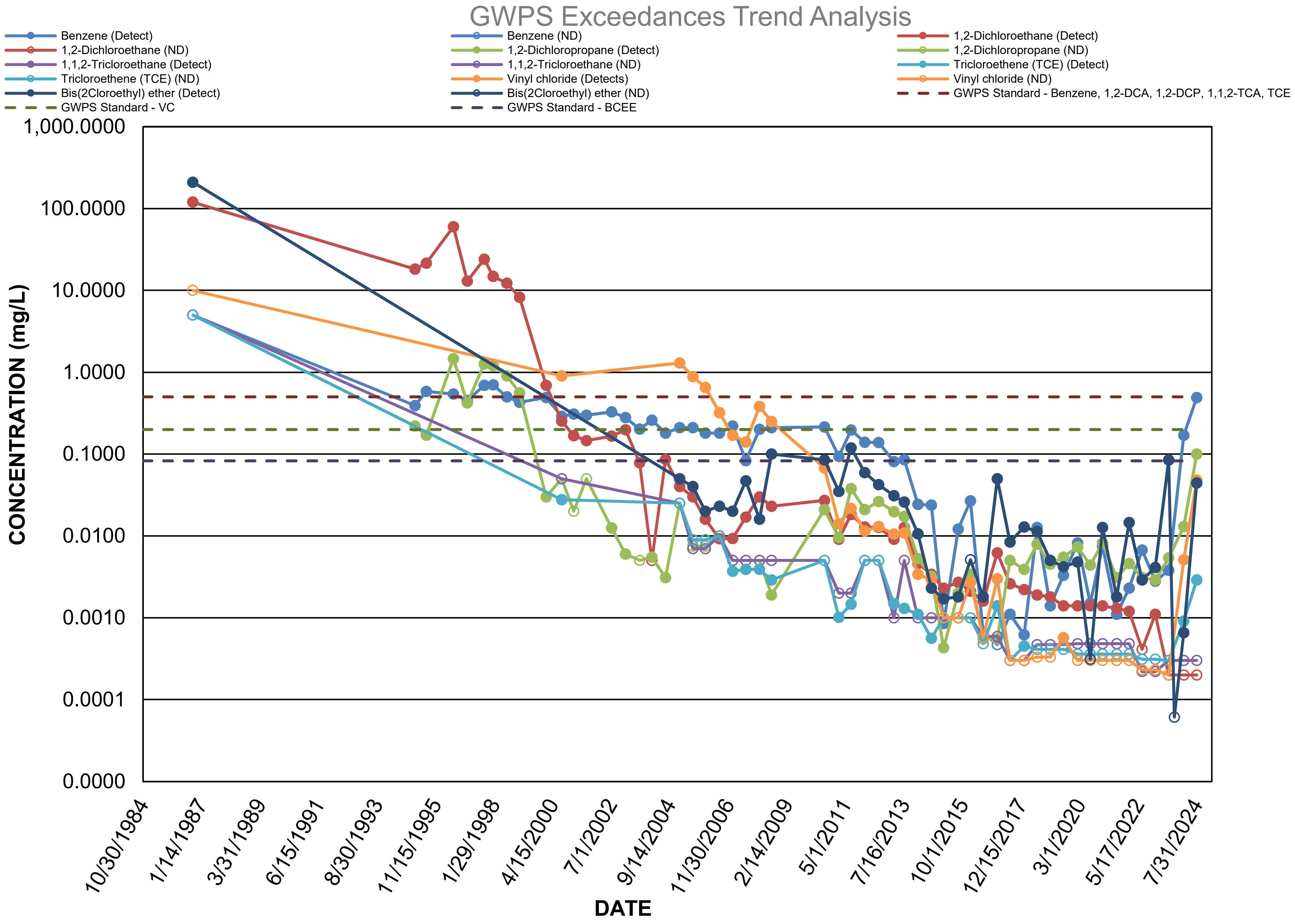


Figure 4 OP84115PA

GWPS Exceedances Trend Analysis

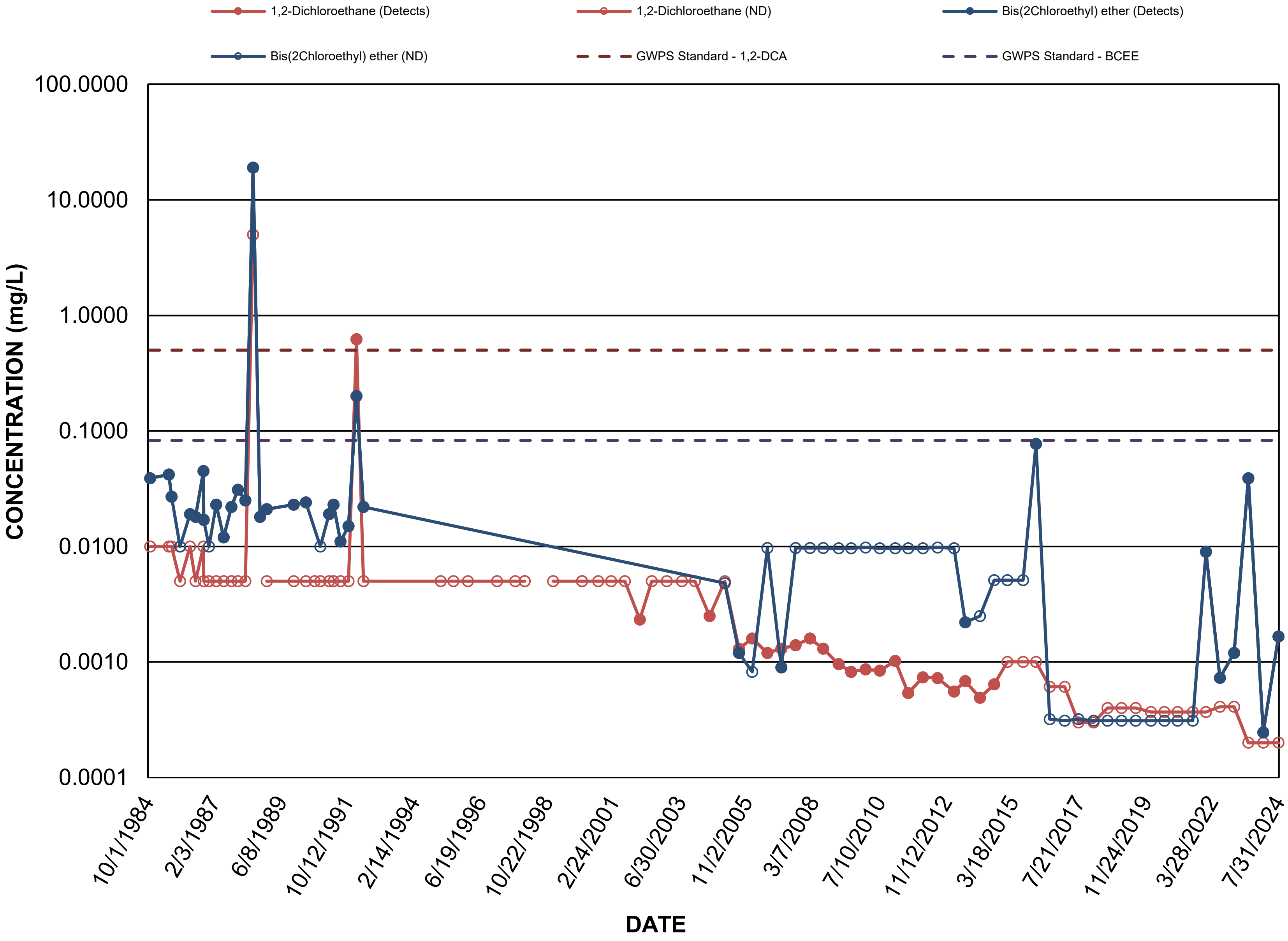


Figure 5 OP84117PA

GWPS Exceedances Trend Analysis

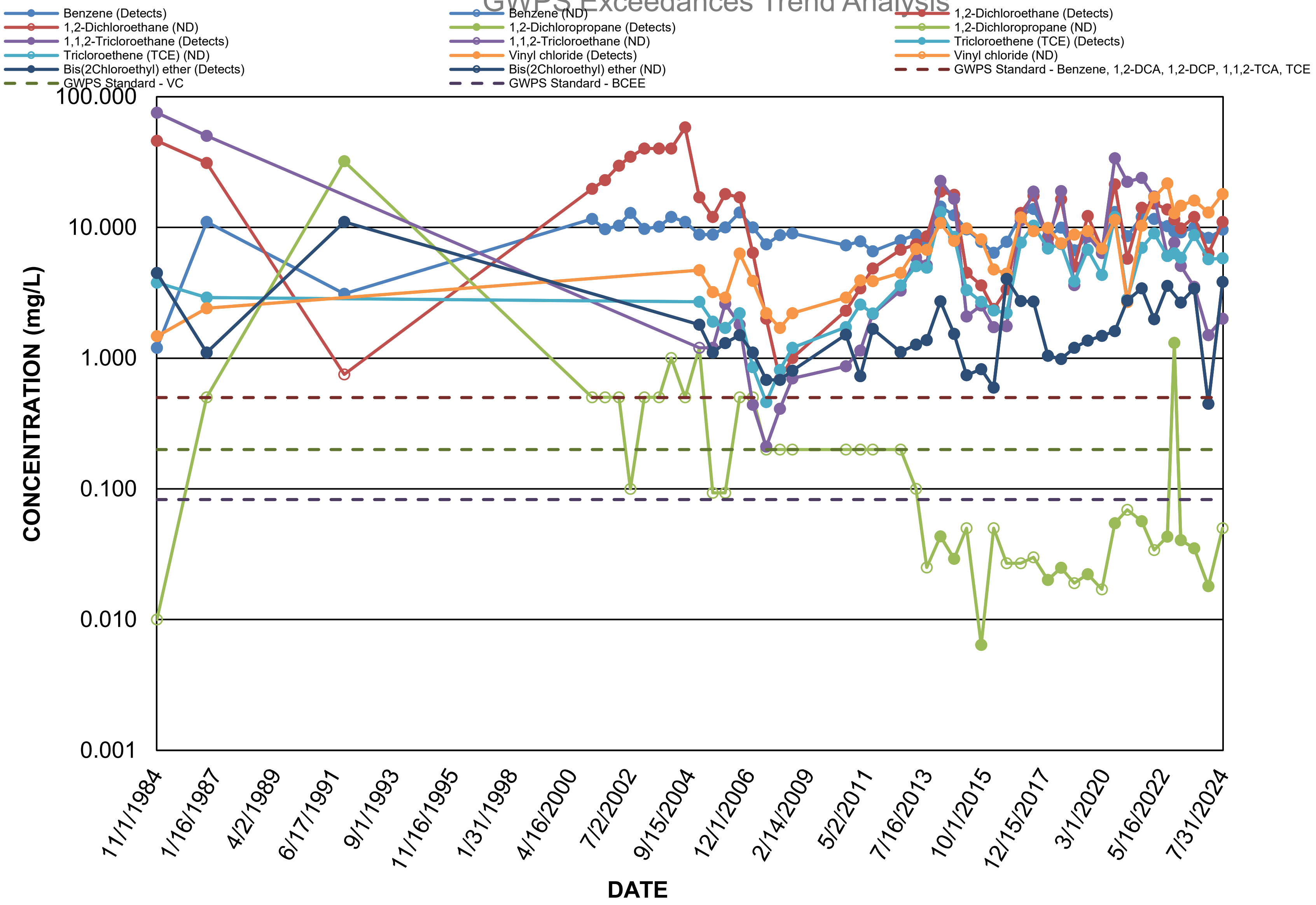
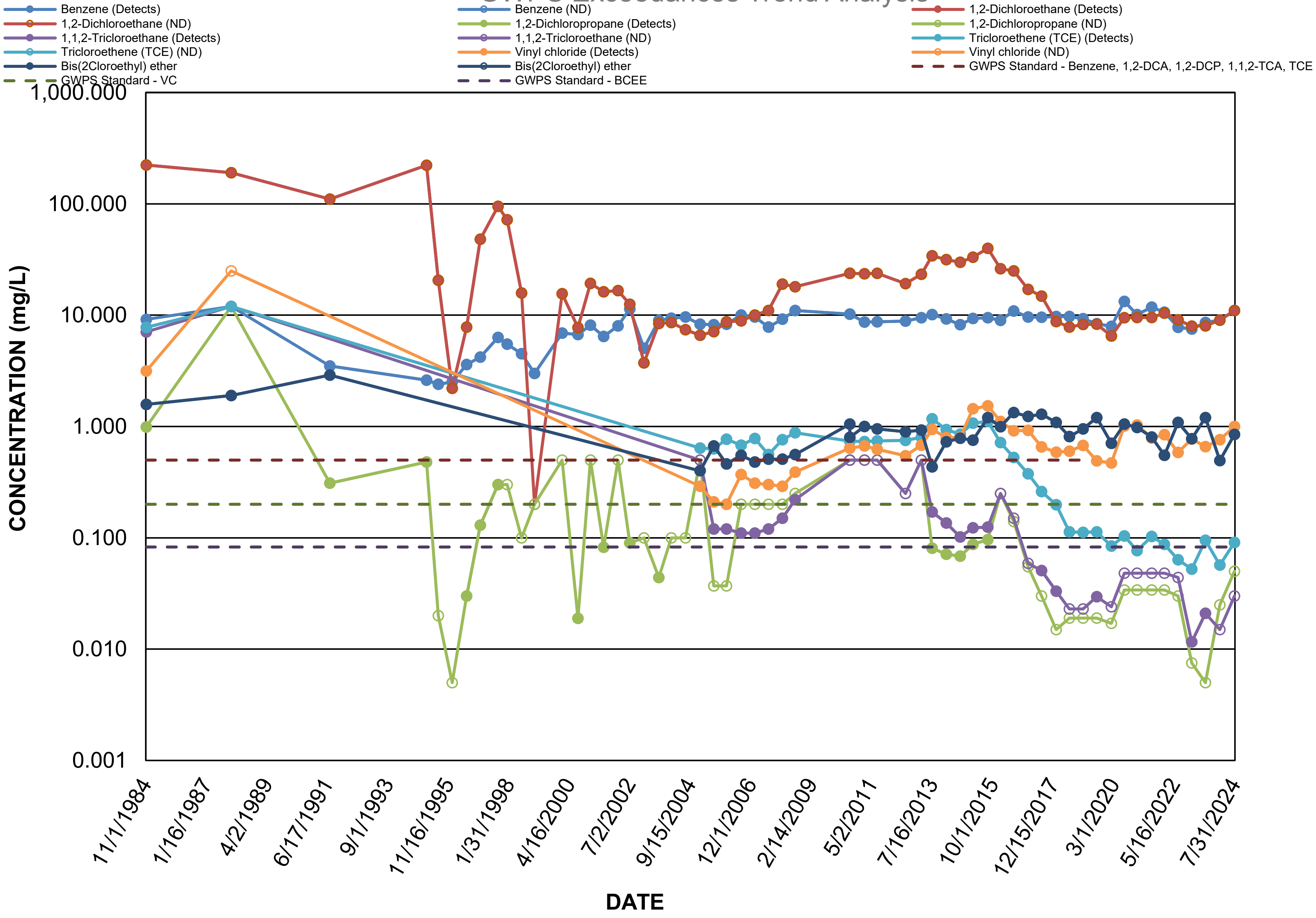


Figure 6 OP84118PA

GWPS Exceedances Trend Analysis



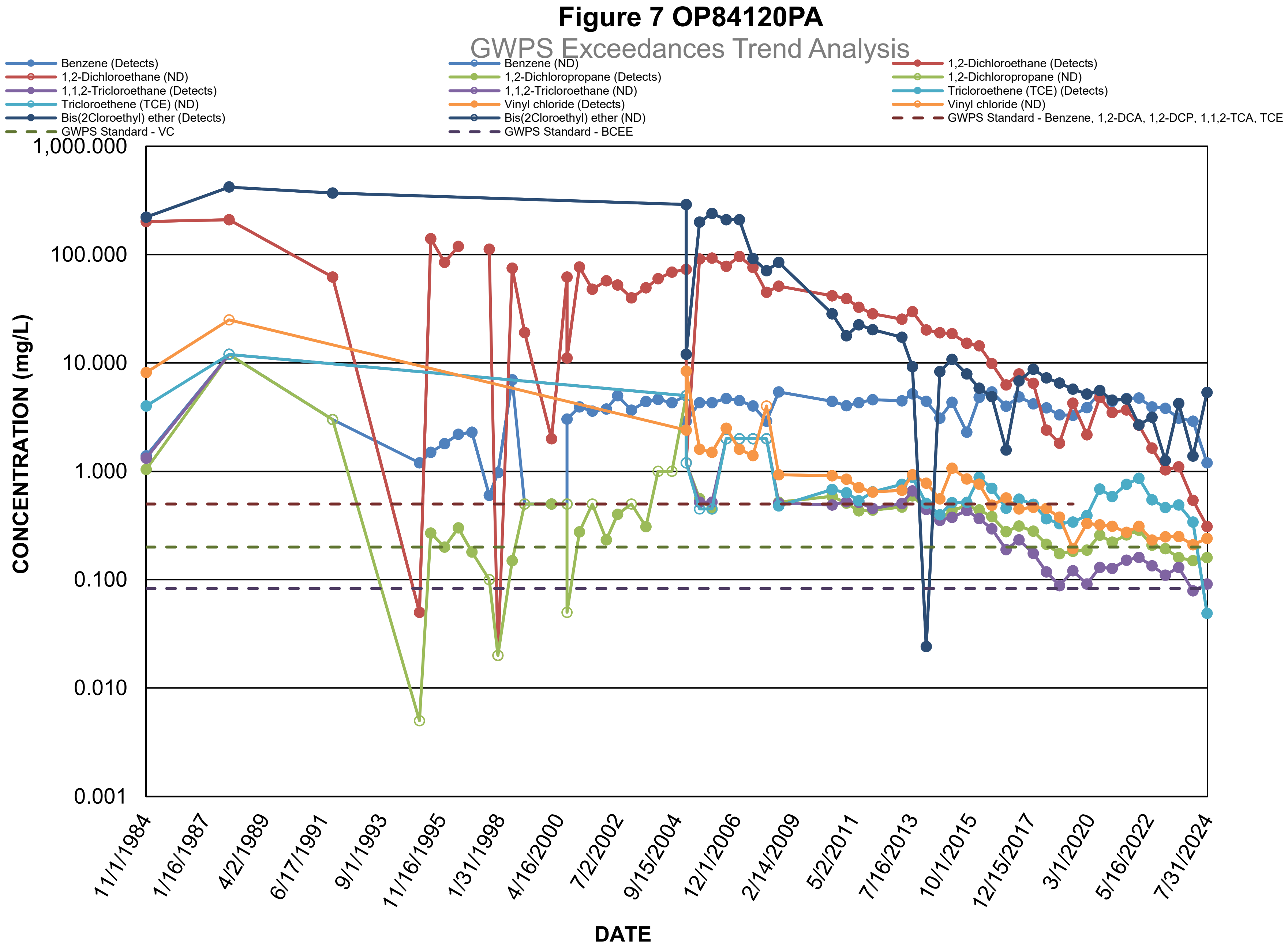


Figure 7 OP84120PA

GWPS Exceedances Trend Analysis

Figure 8 OP84123PA

GWPS Exceedances Trend Analysis

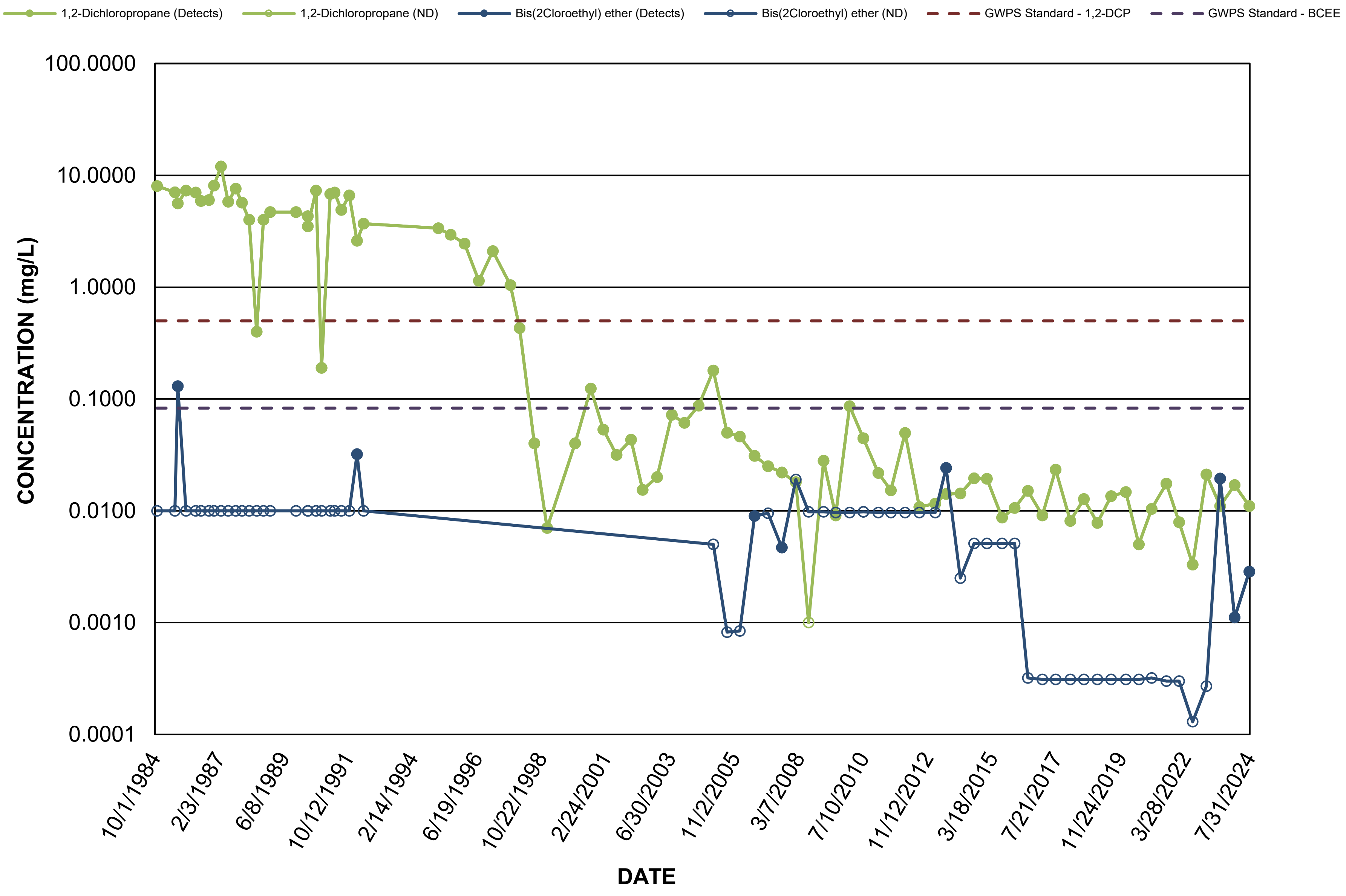


Figure 9 OP84125PA

GWPS Exceedances Trend Analysis

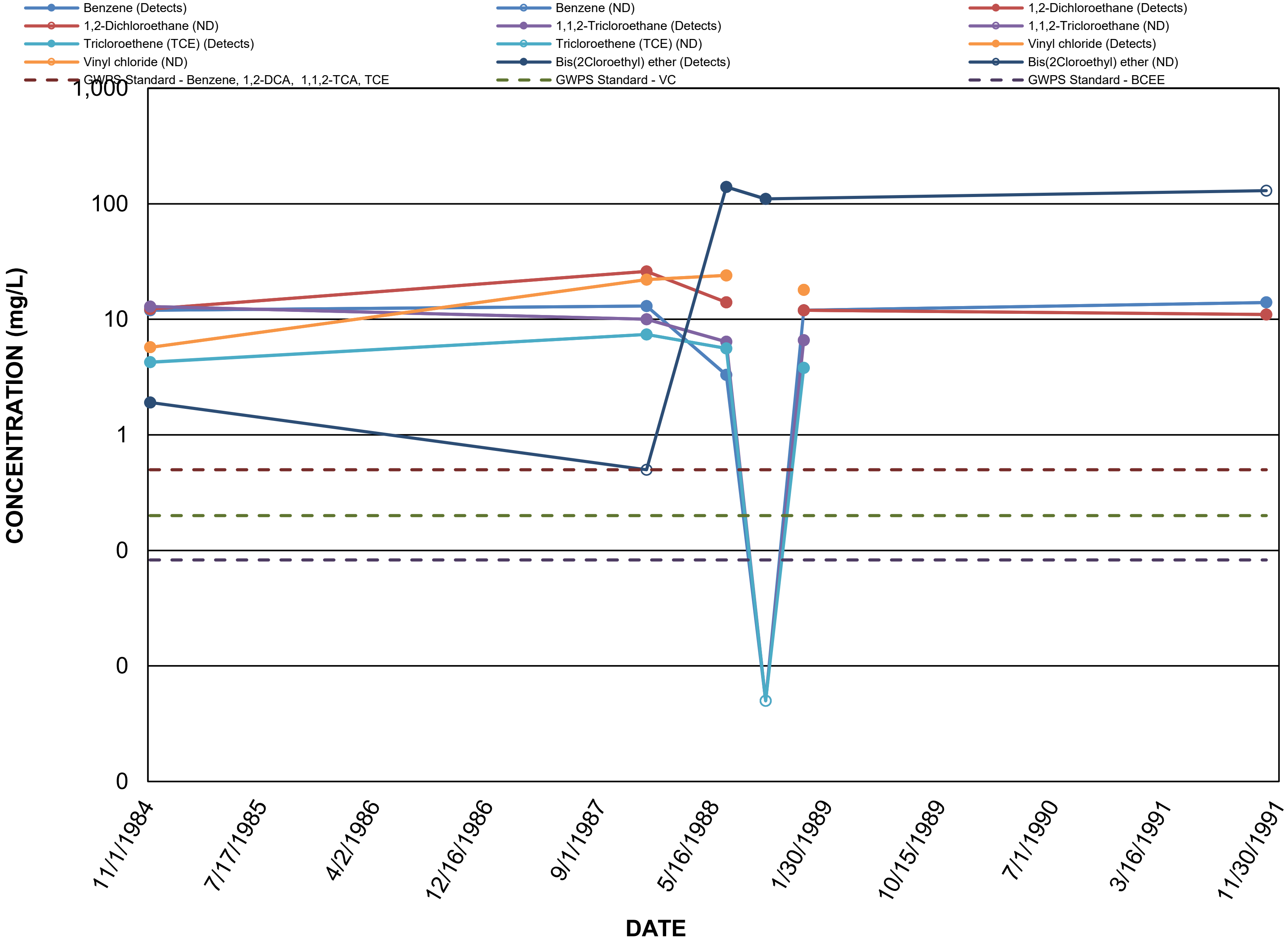


Figure 10 OP86133WA

GWPS Exceedances Trend Analysis

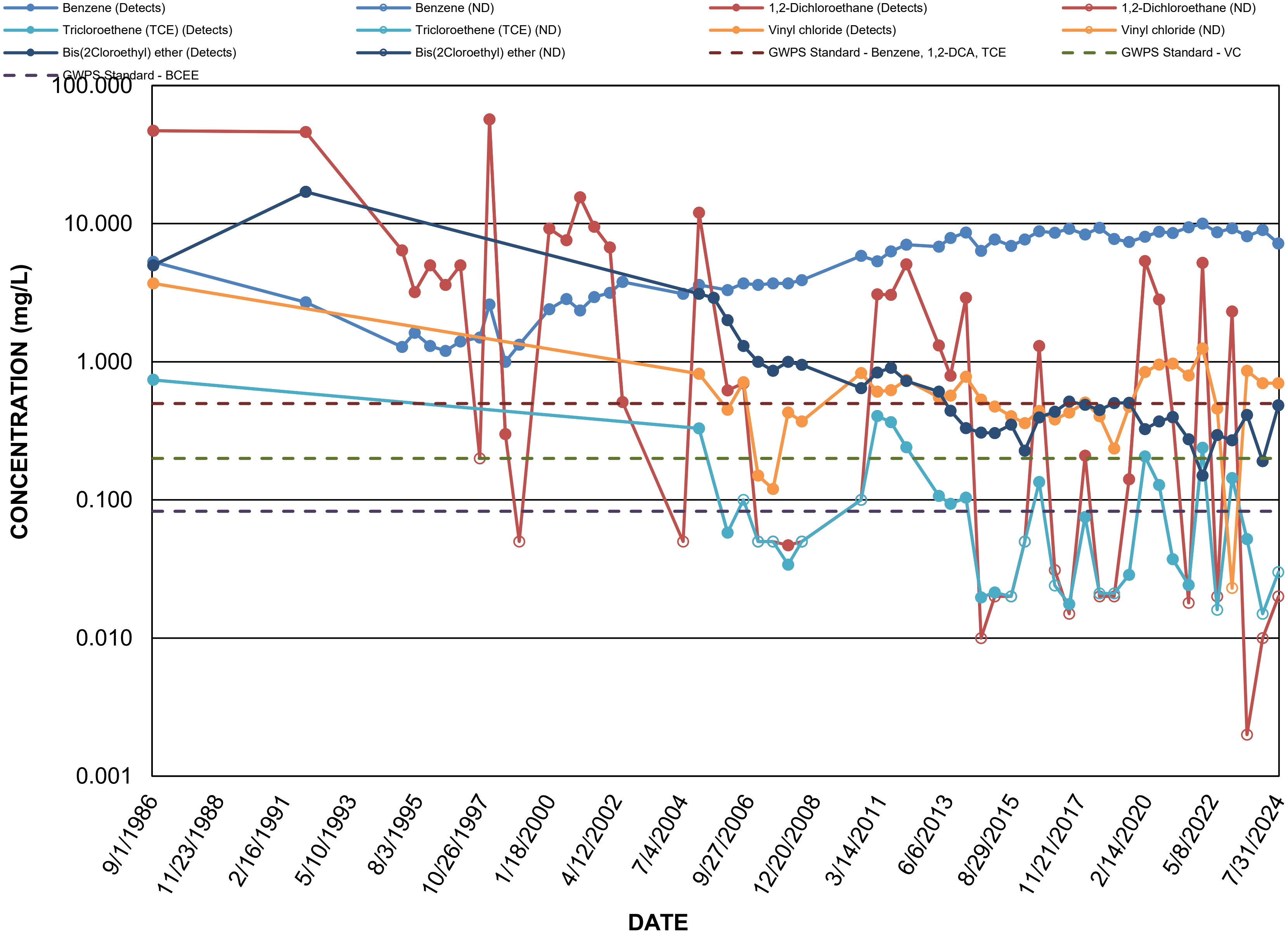


Figure 11 OP86375WA

GWPS Exceedances Trend Analysis

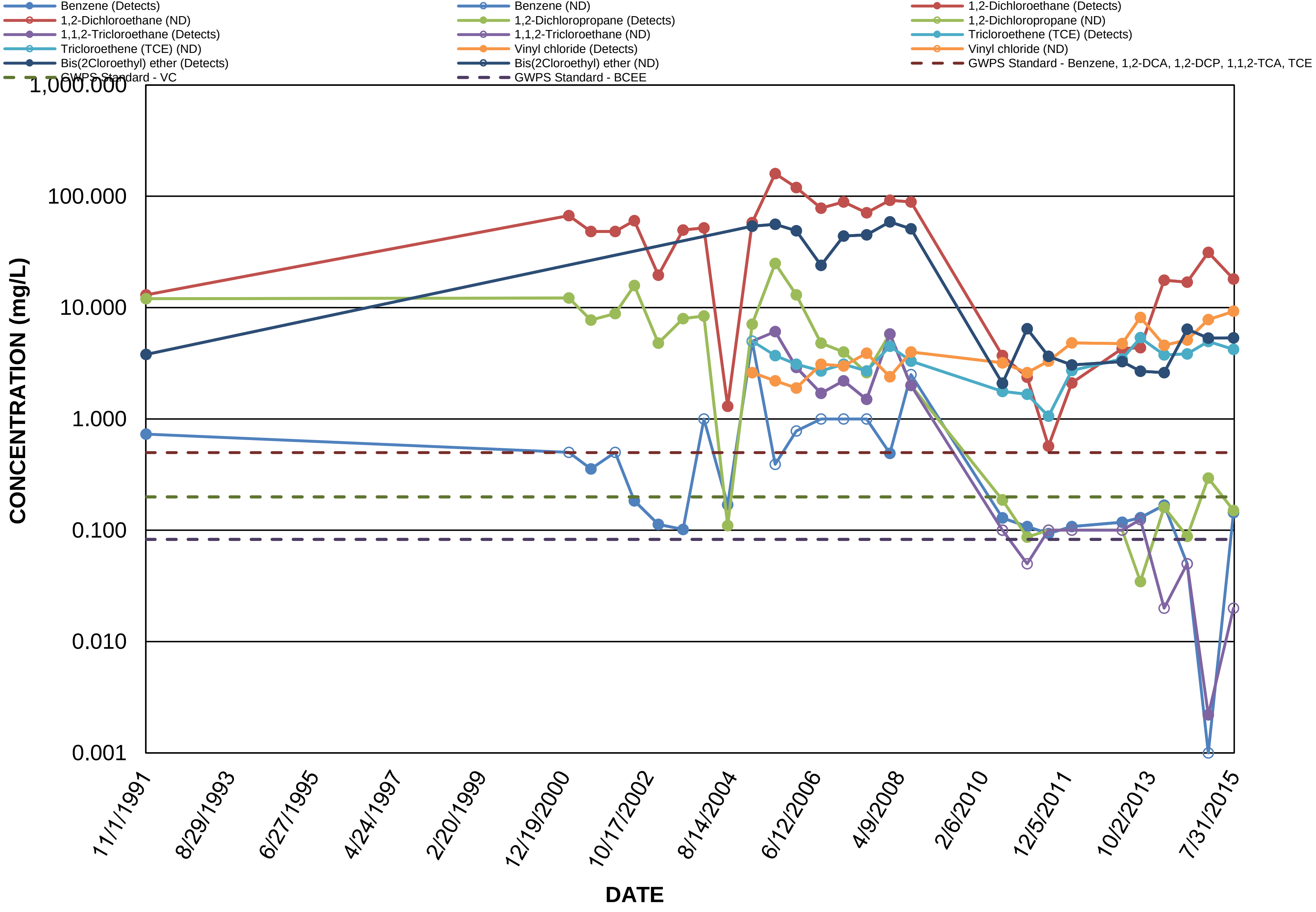


Figure 12 OP87364WA

GWPS Exceedances Trend Analysis

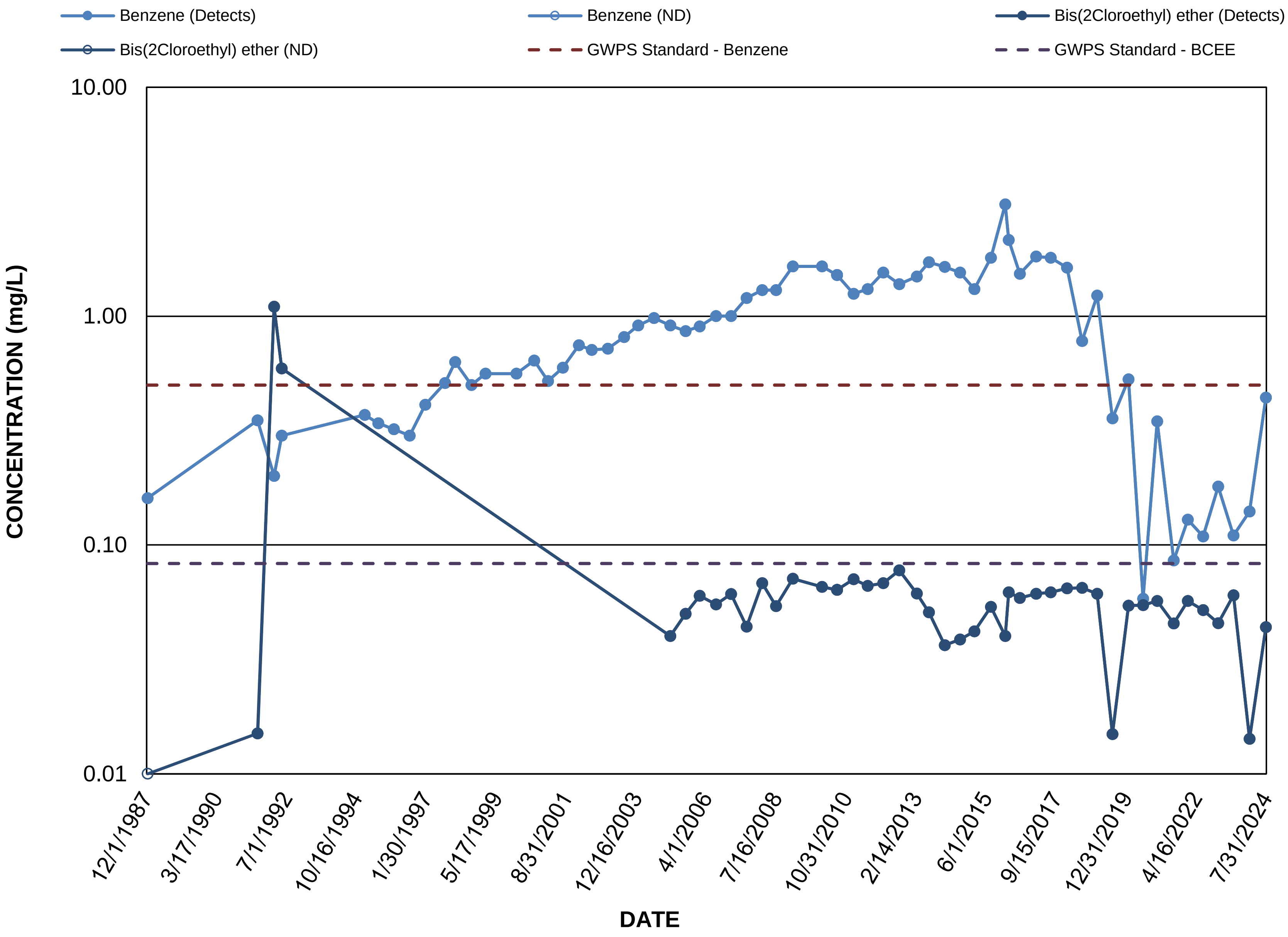


Figure 13 OP87369WA

GWPS Exceedances Trend Analysis

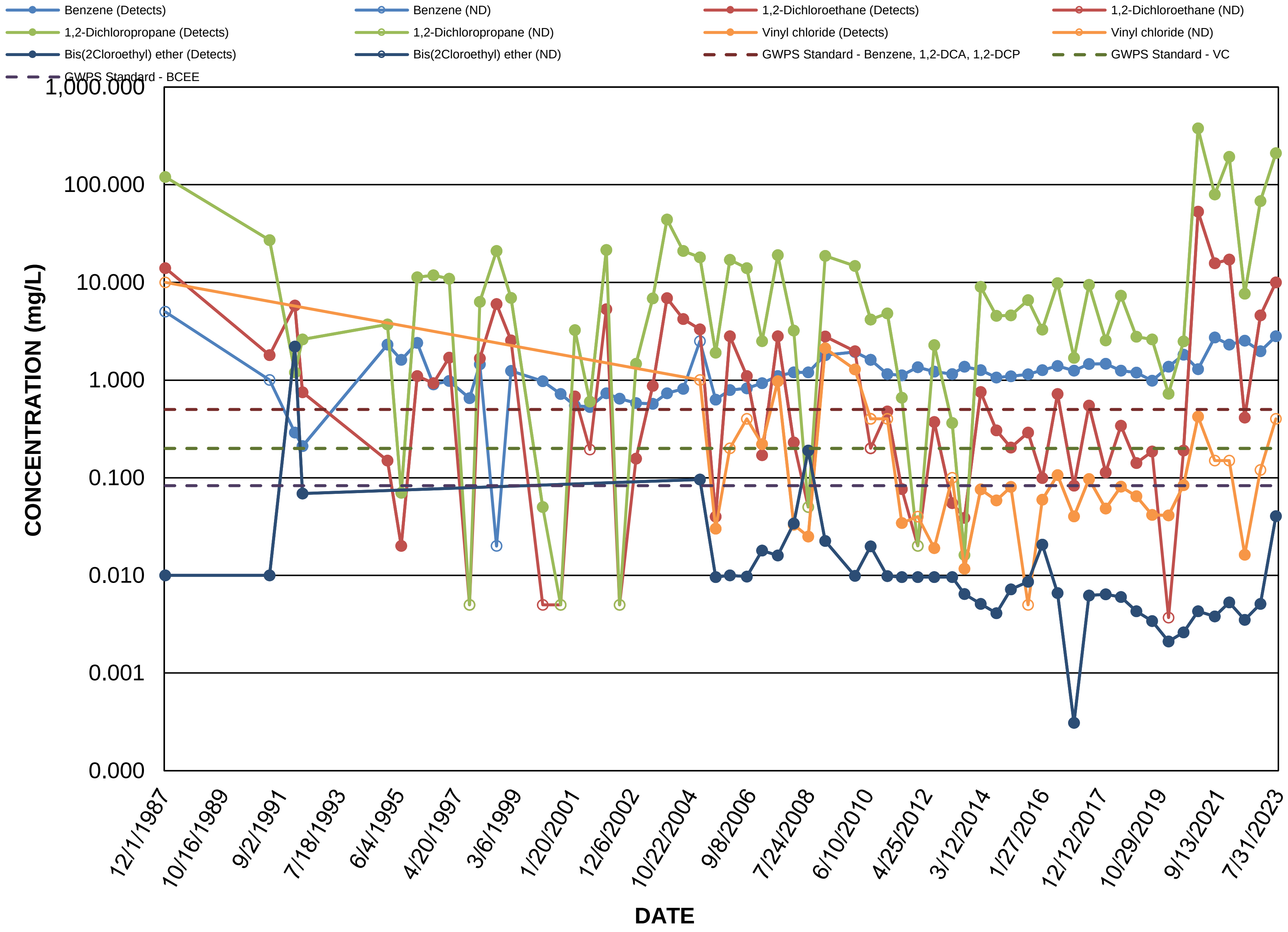


Figure 14 OP87369WAR

GWPS Exceedances Trend Analysis

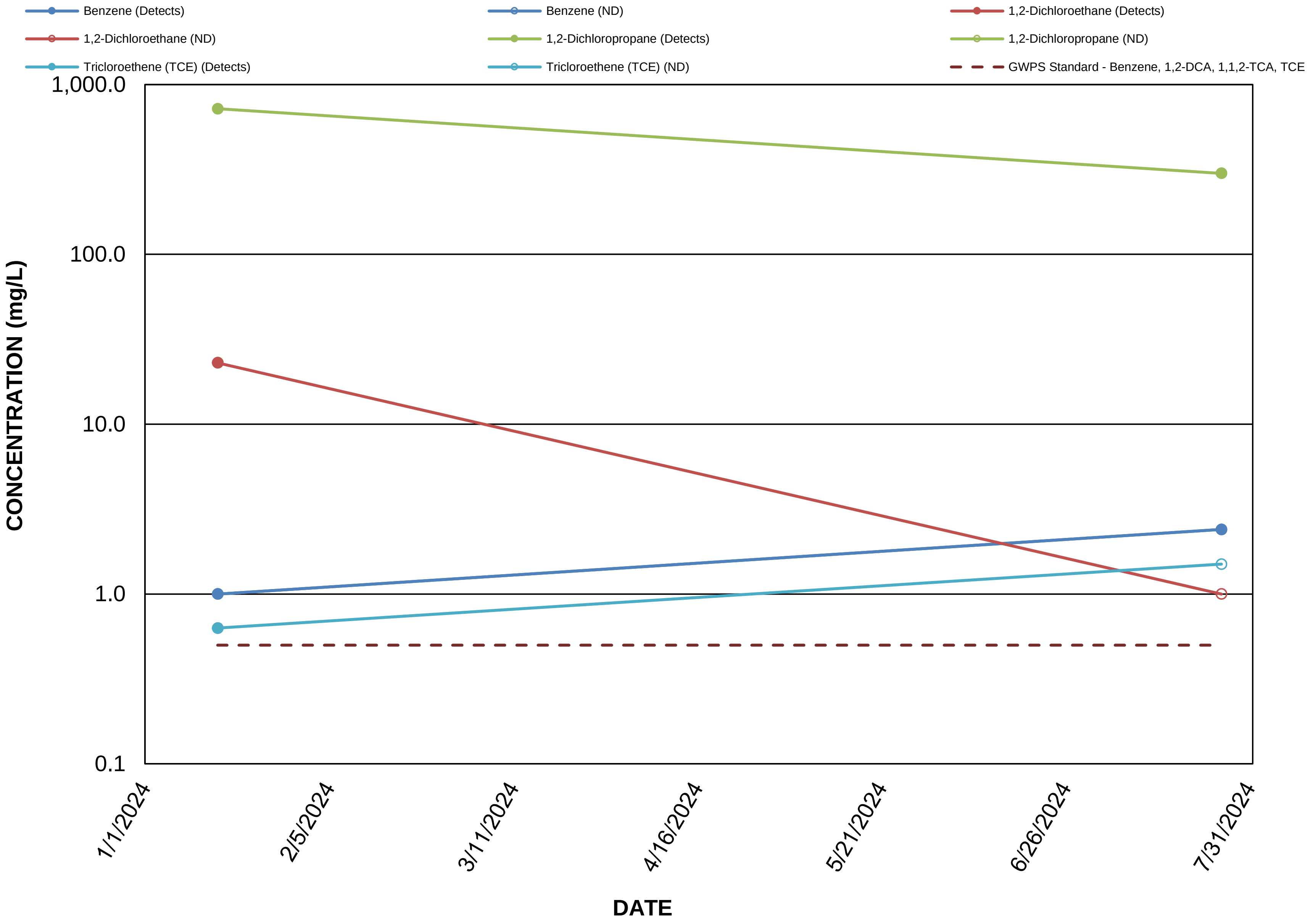


Figure 15 OP88372RA

GWPS Exceedances Trend Analysis

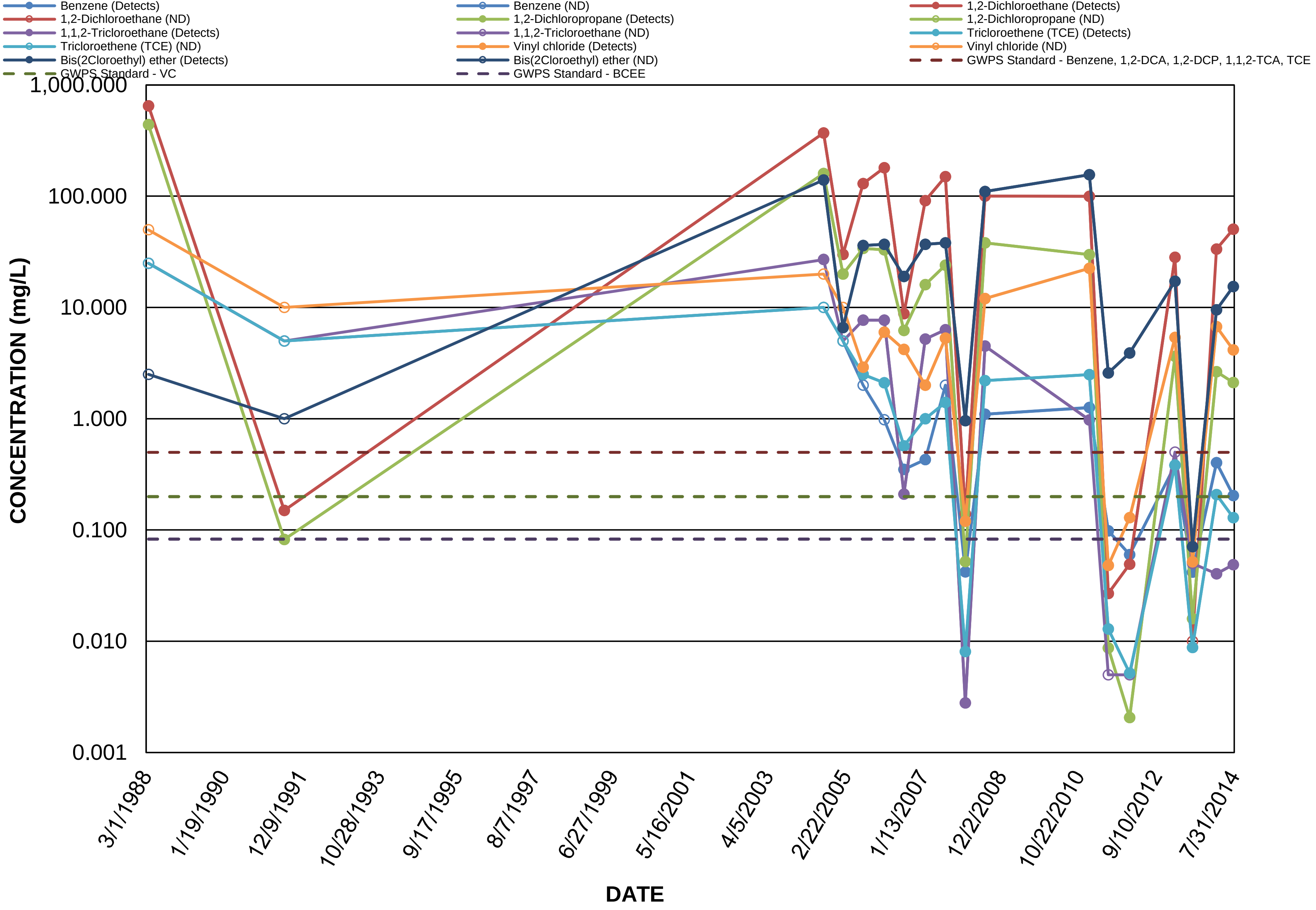


Figure 16 OP90411PA

GWPS Exceedances Trend Analysis

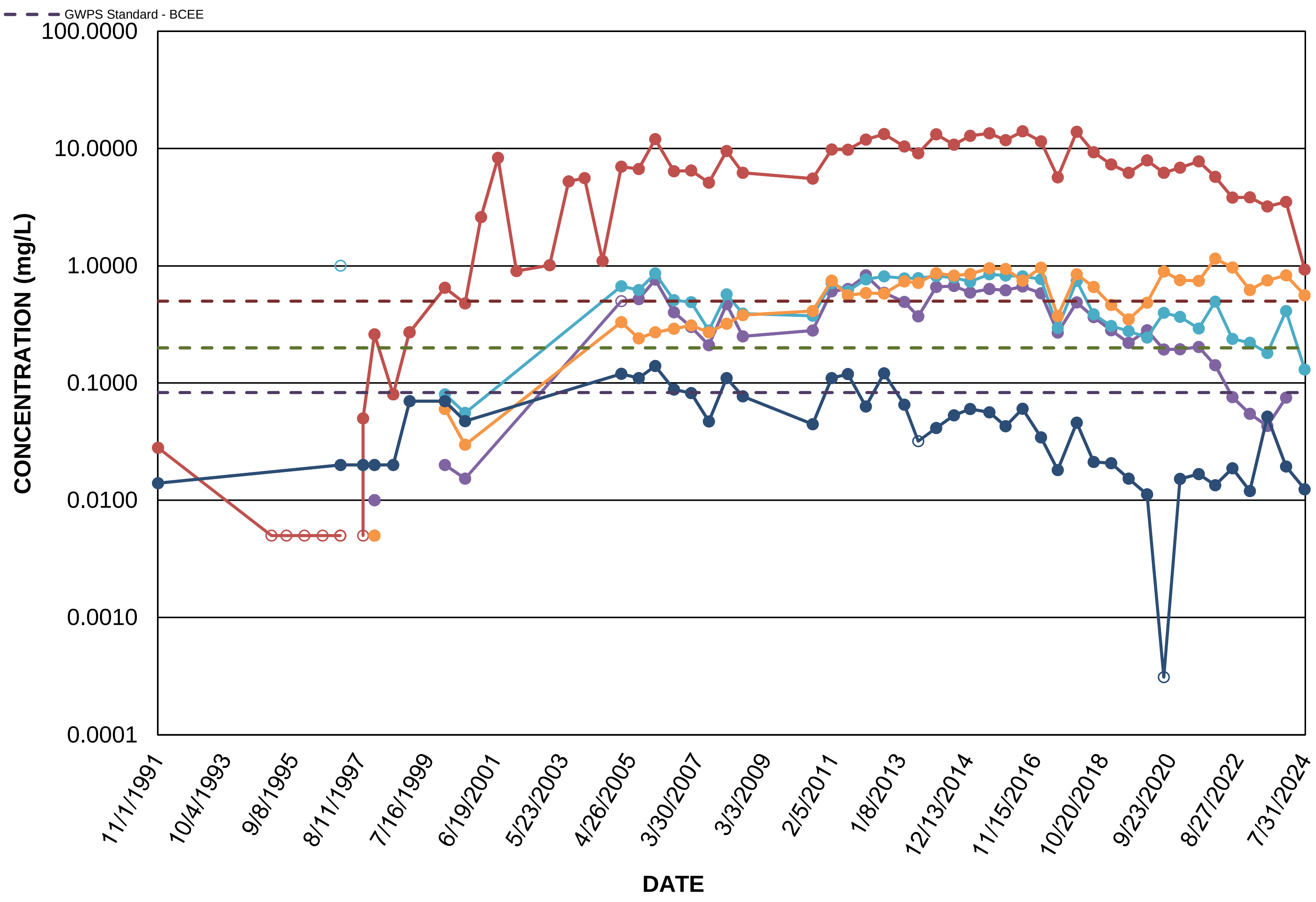


Figure 17 OP91488WA

GWPS Exceedances Trend Analysis

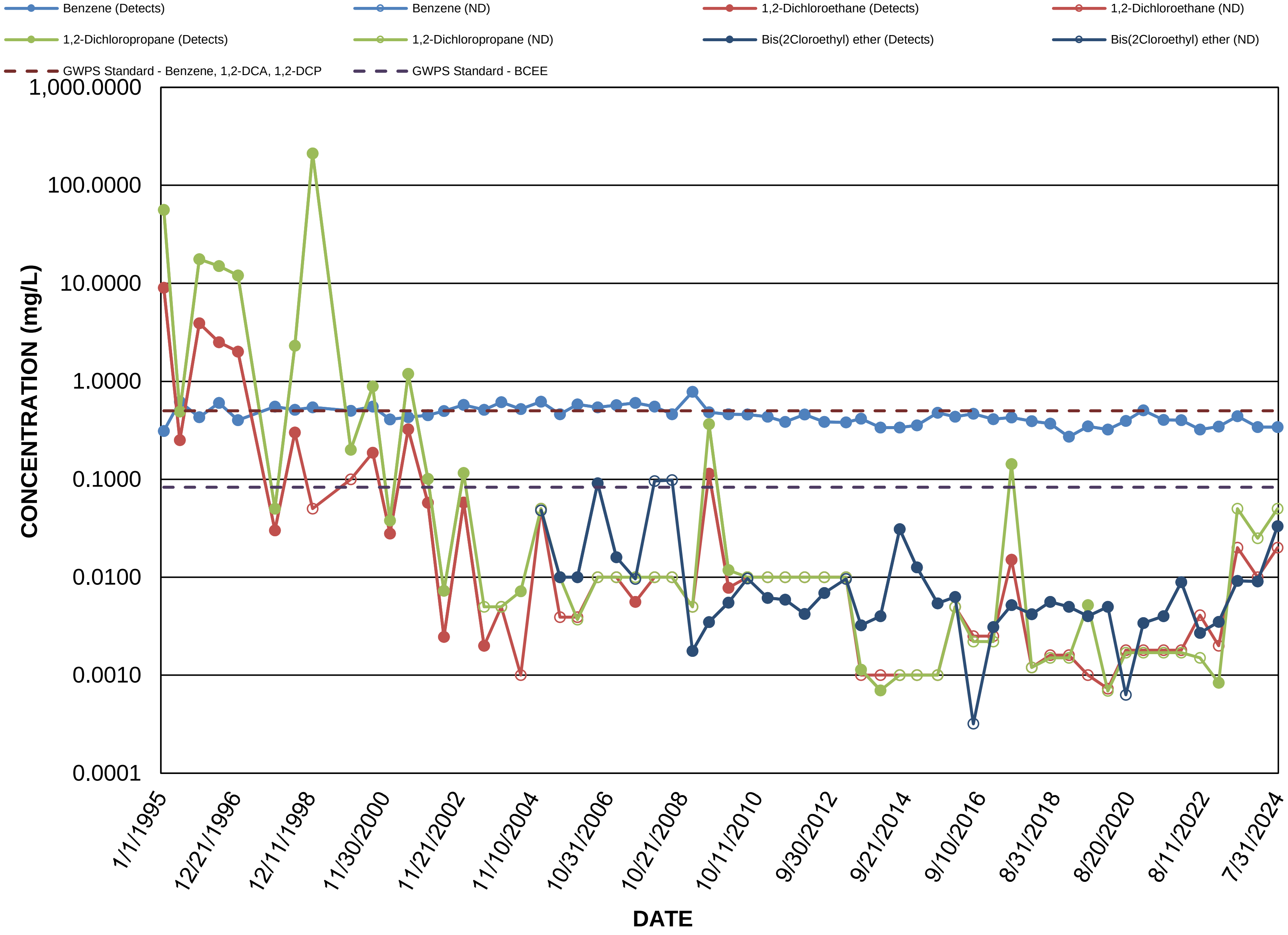


Figure 18 OP91491RA

GWPS Exceedances Trend Analysis

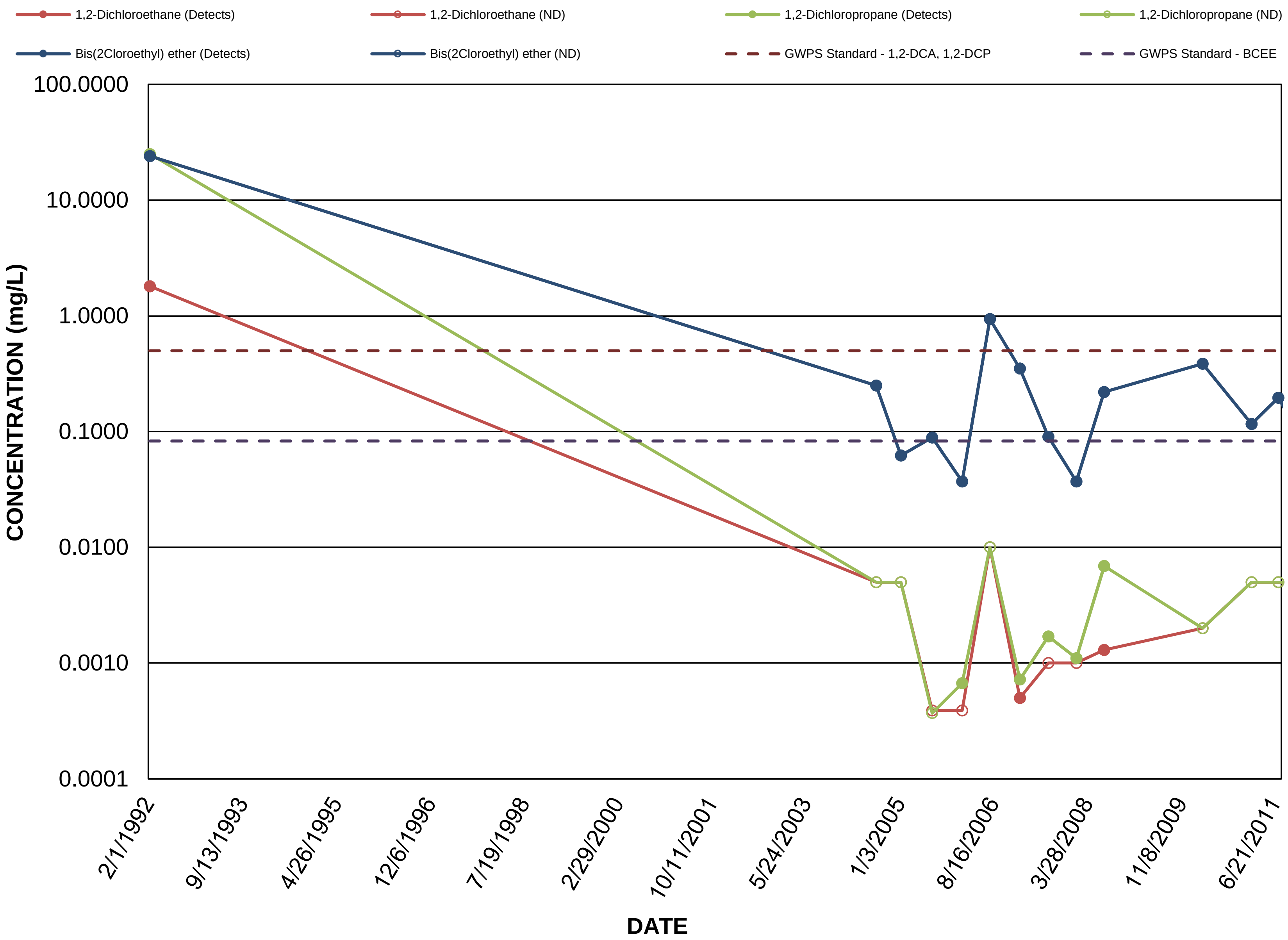


Figure 19 OP91495RA

GWPS Exceedances Trend Analysis

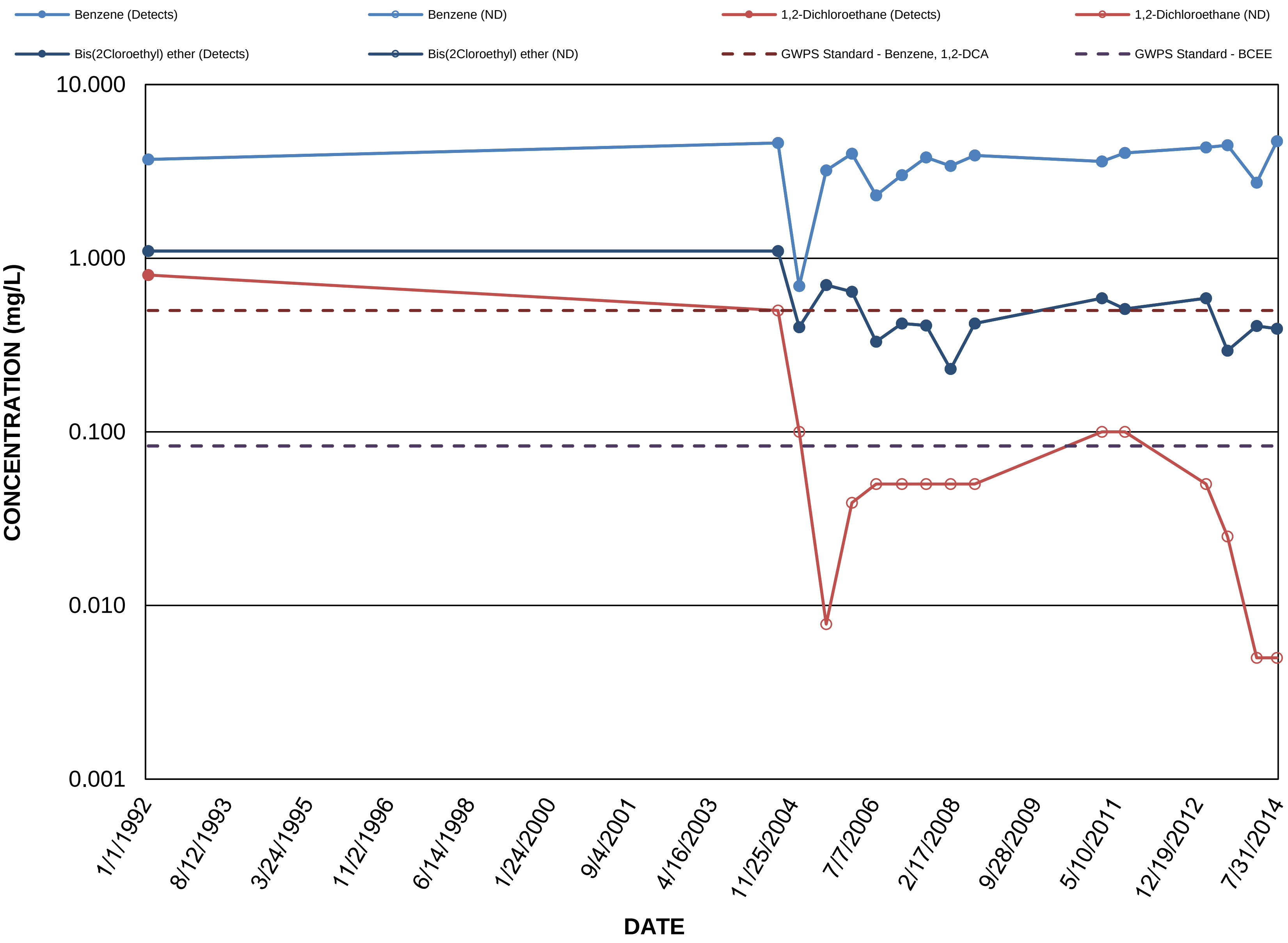


Figure 20 OP91496RA

GWPS Exceedances Trend Analysis

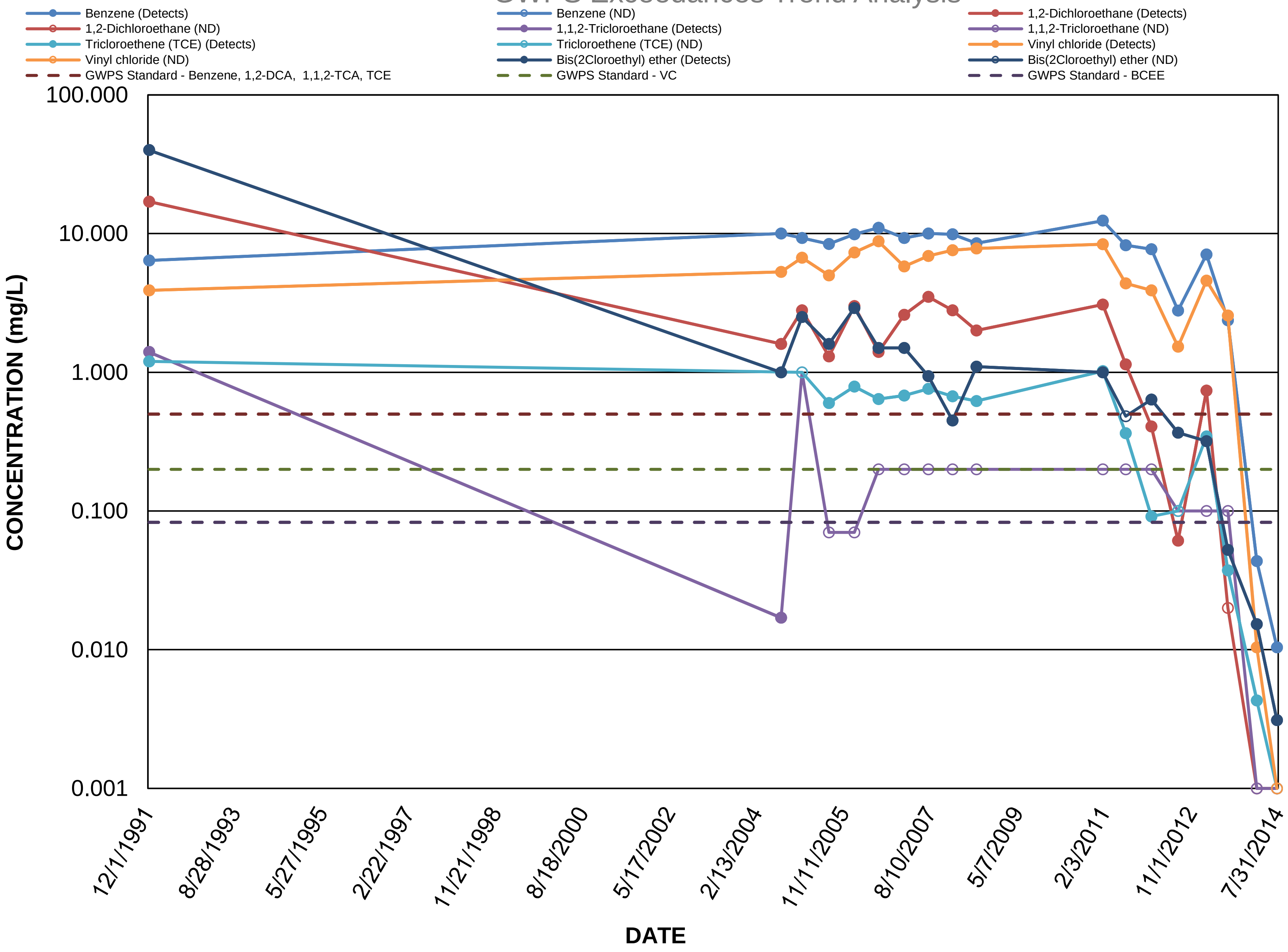


Figure 21 OP91497RA

GWPS Exceedances Trend Analysis

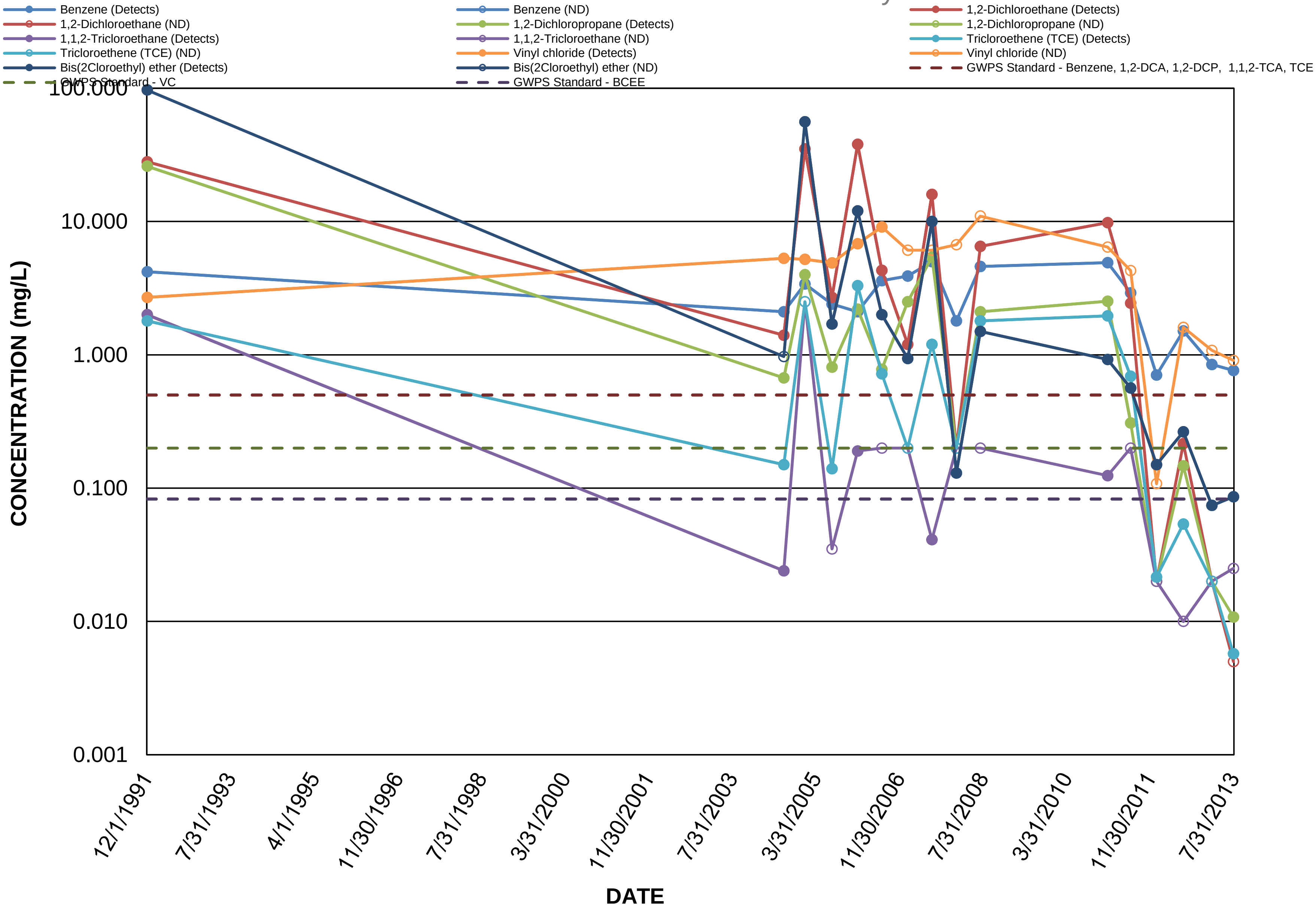


Figure 22 OP91501WA

GWPS Exceedances Trend Analysis

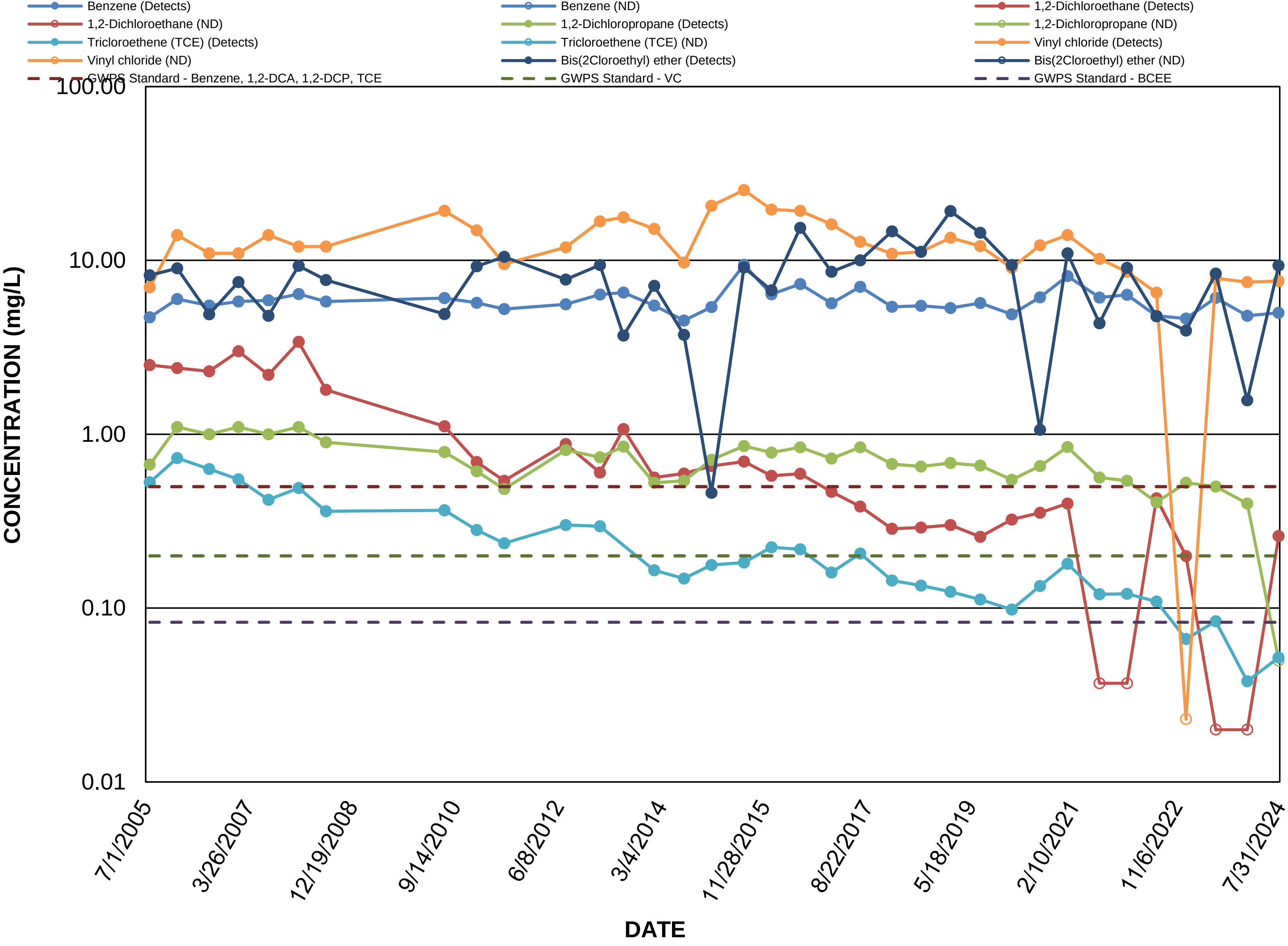


Figure 23 OP93484WA

GWPS Exceedances Trend Analysis

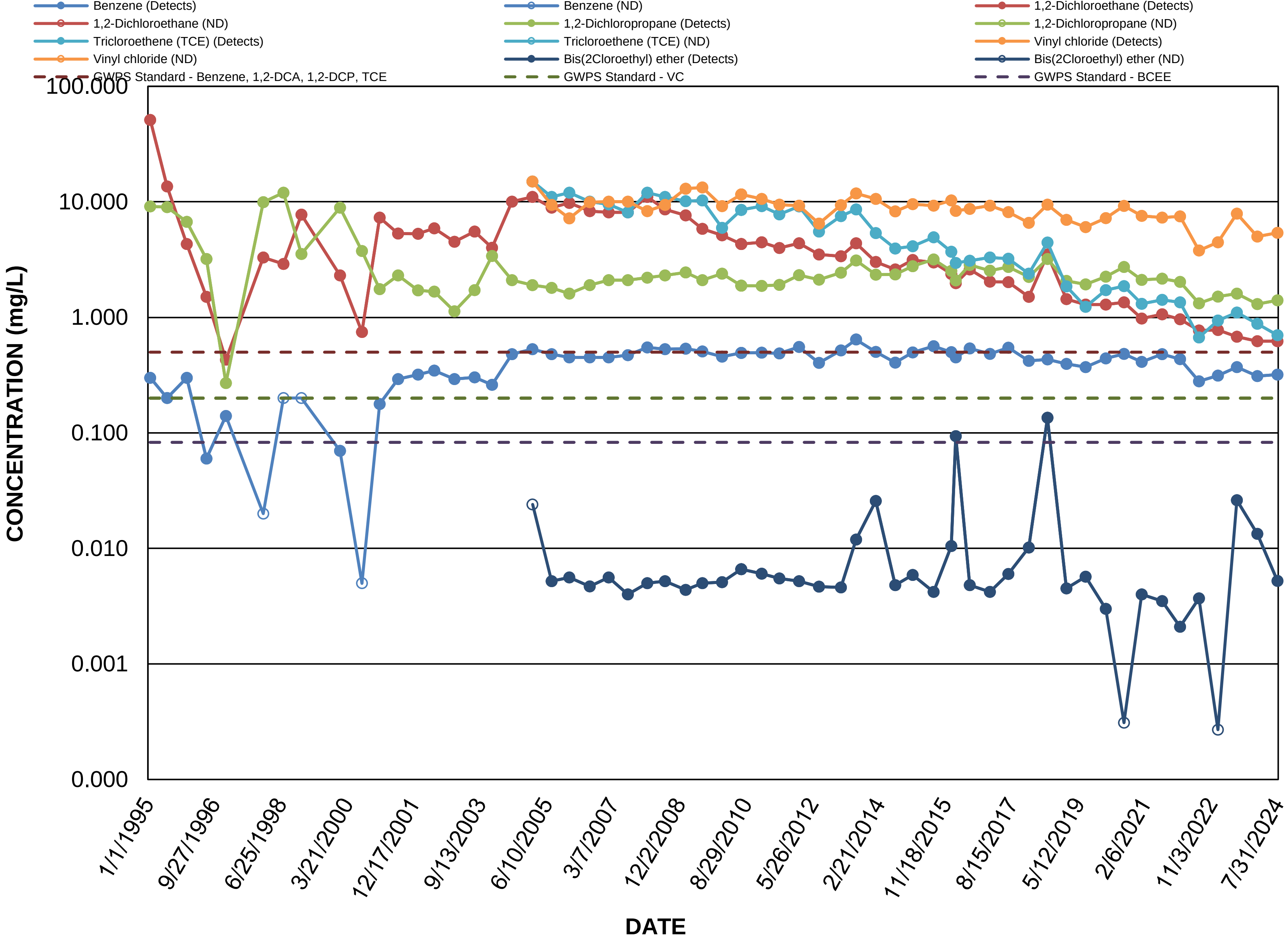


Figure 24 OP93485WA

GWPS Exceedances Trend Analysis

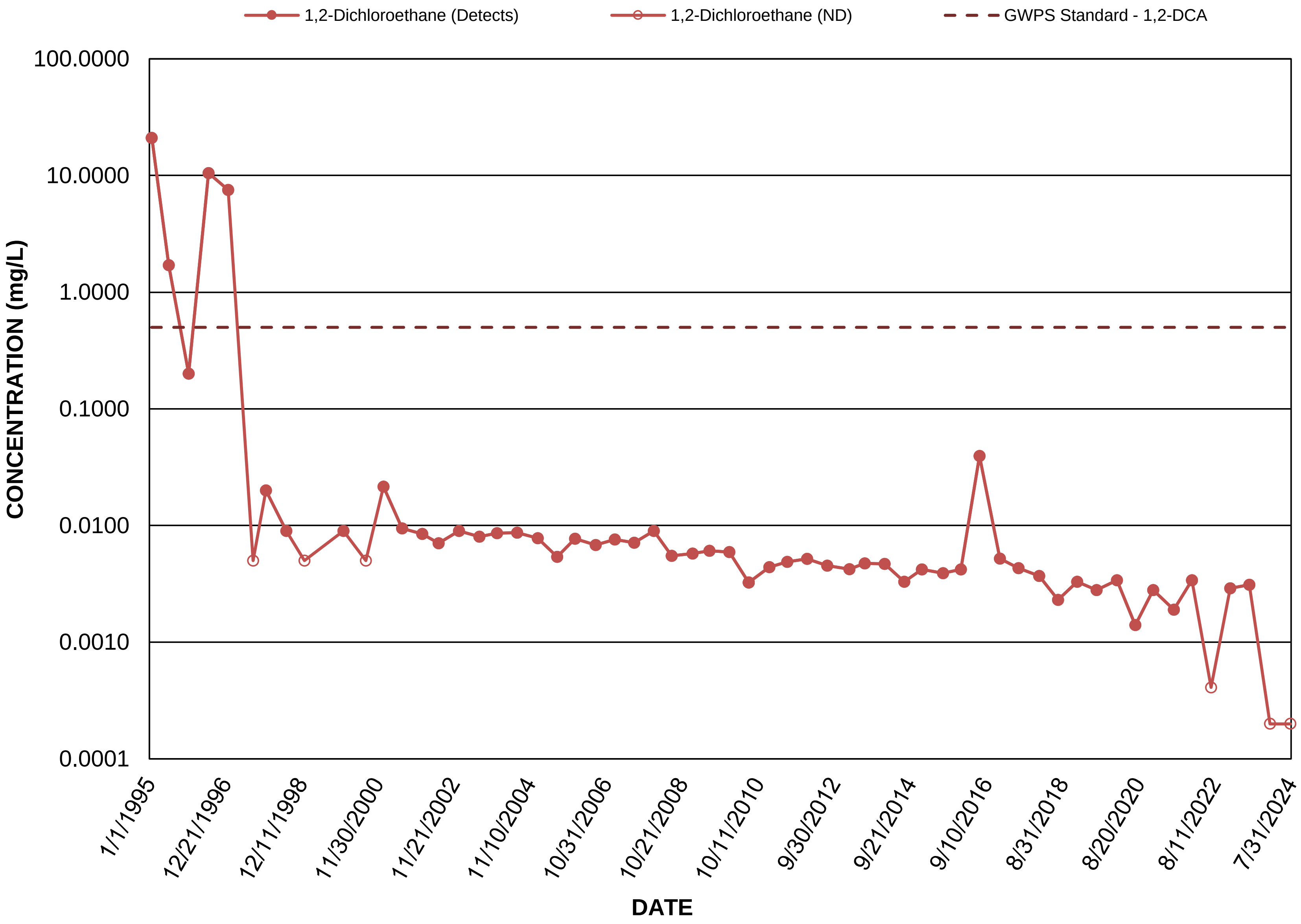


Figure 25 OP93486WA

GWPS Exceedances Trend Analysis

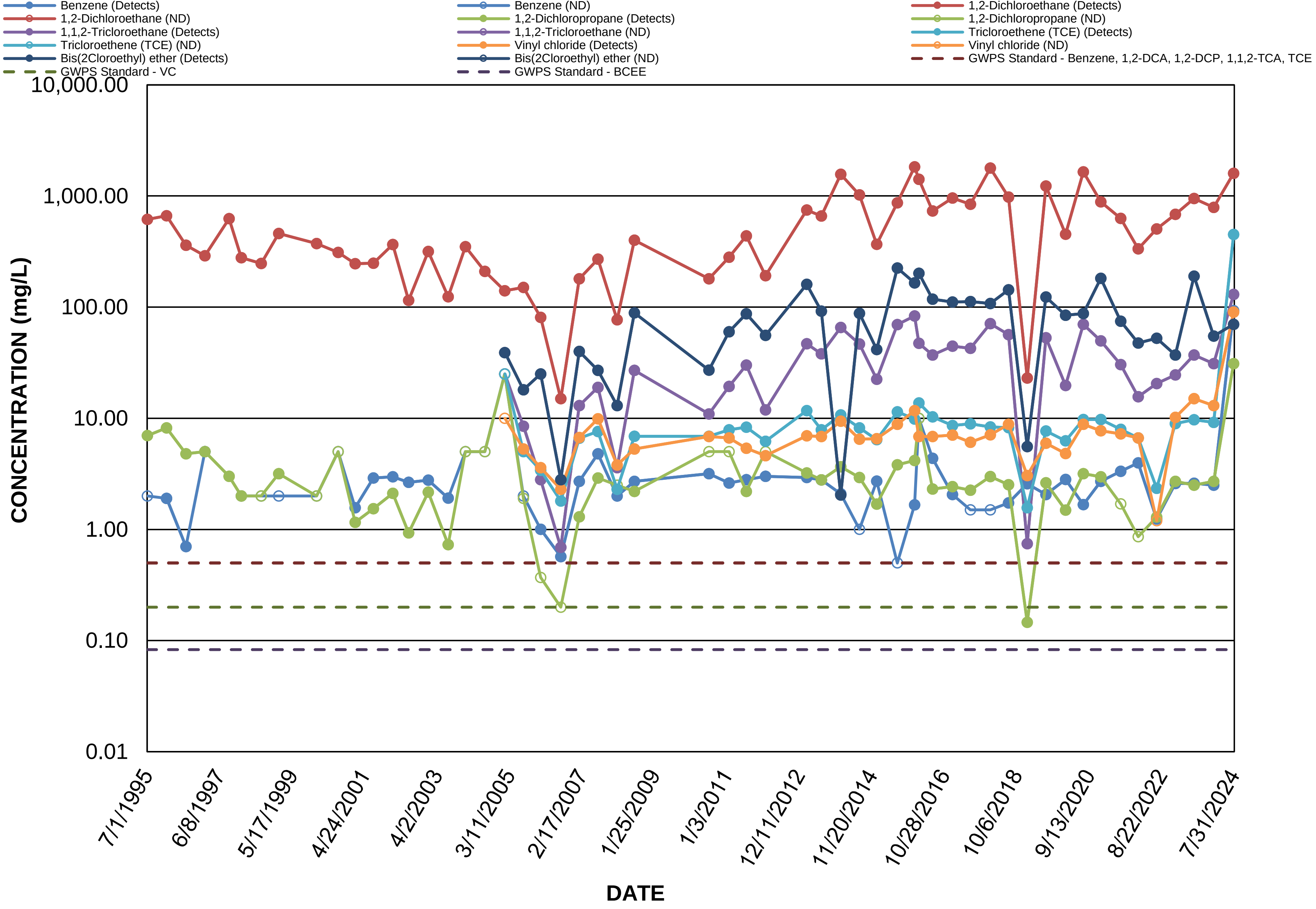


Figure 26 OP93512LA

GWPS Exceedances Trend Analysis

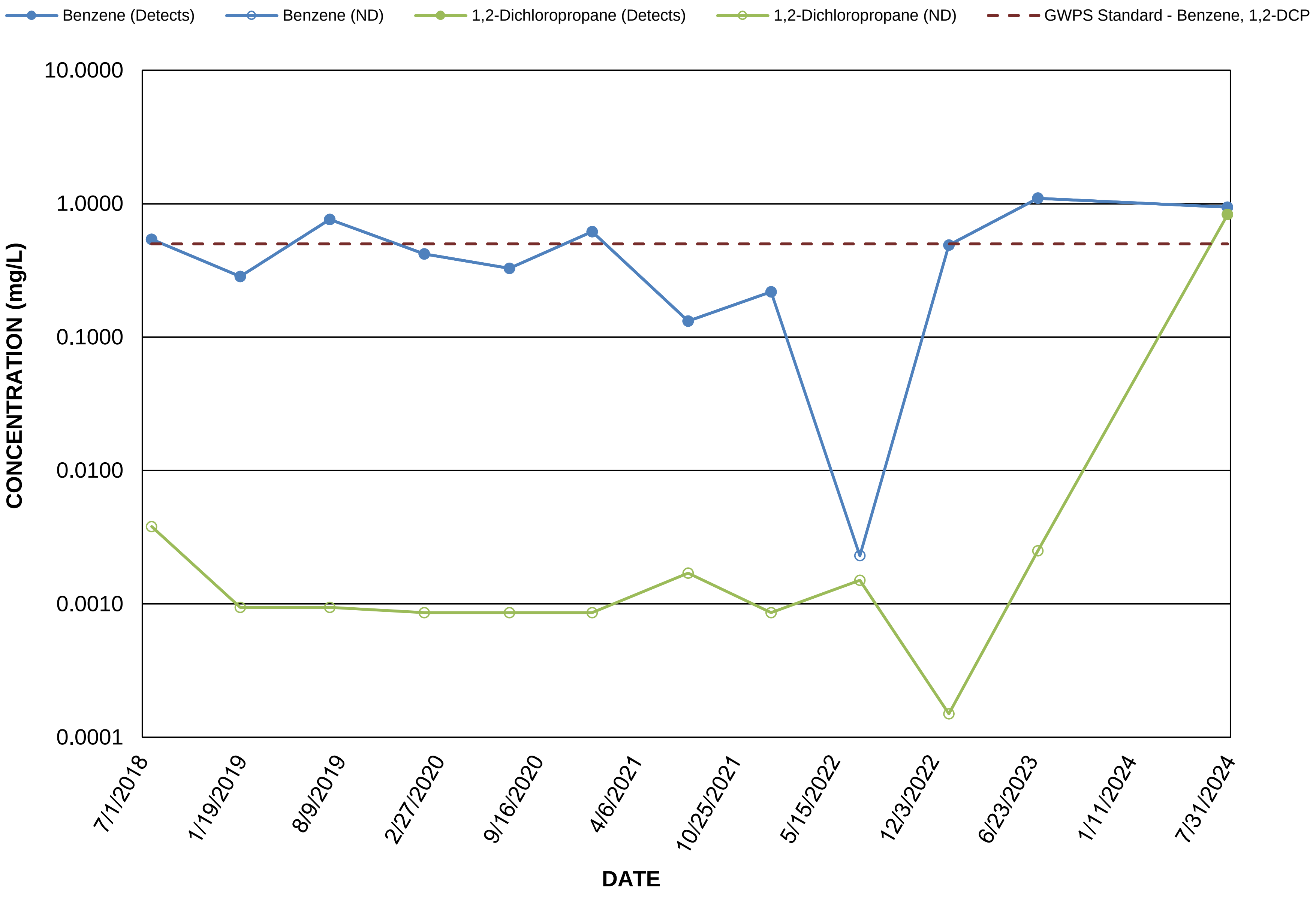
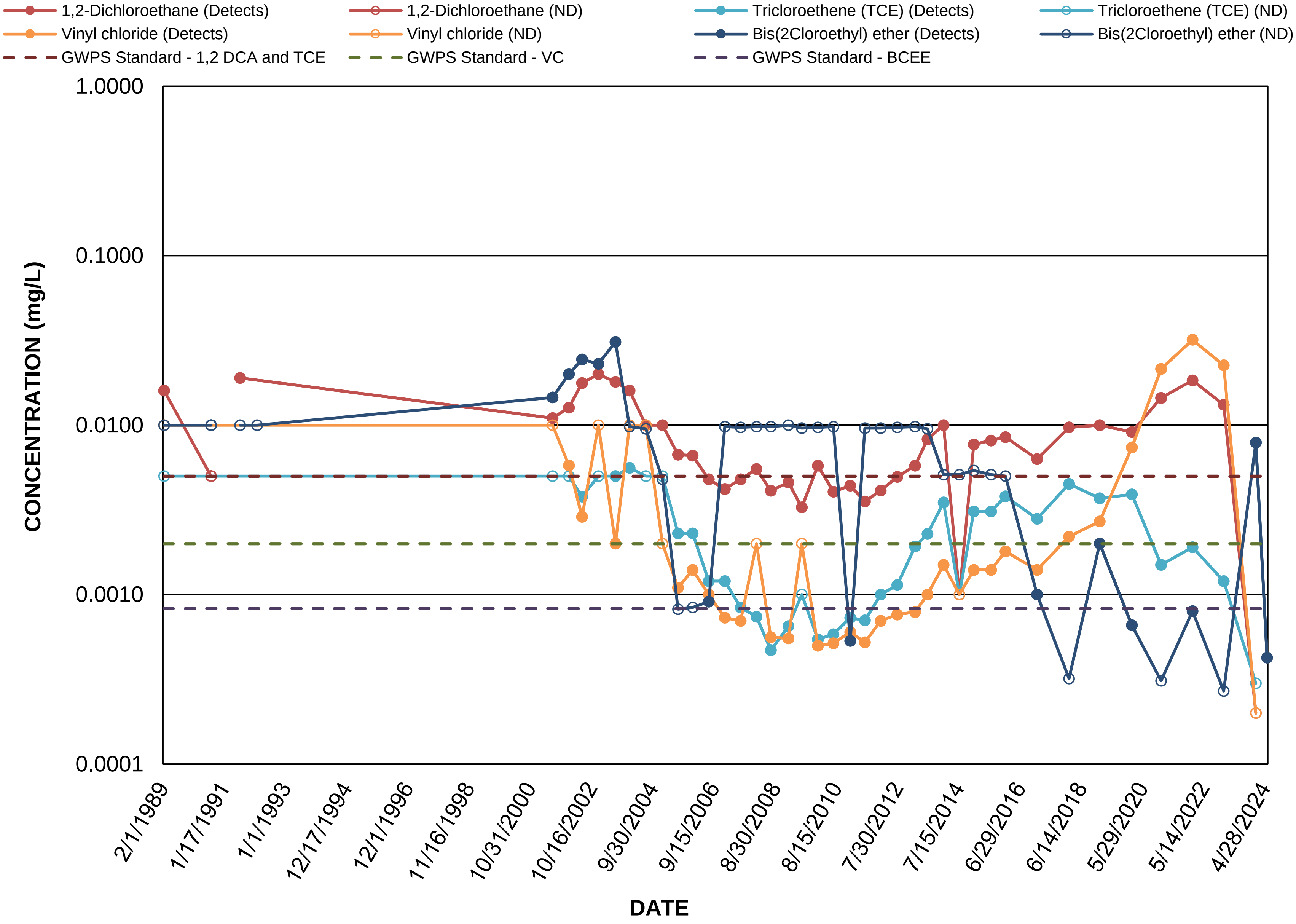


Figure 27 OP-88-377W-B

GWPS Exceedances Trend Analysis



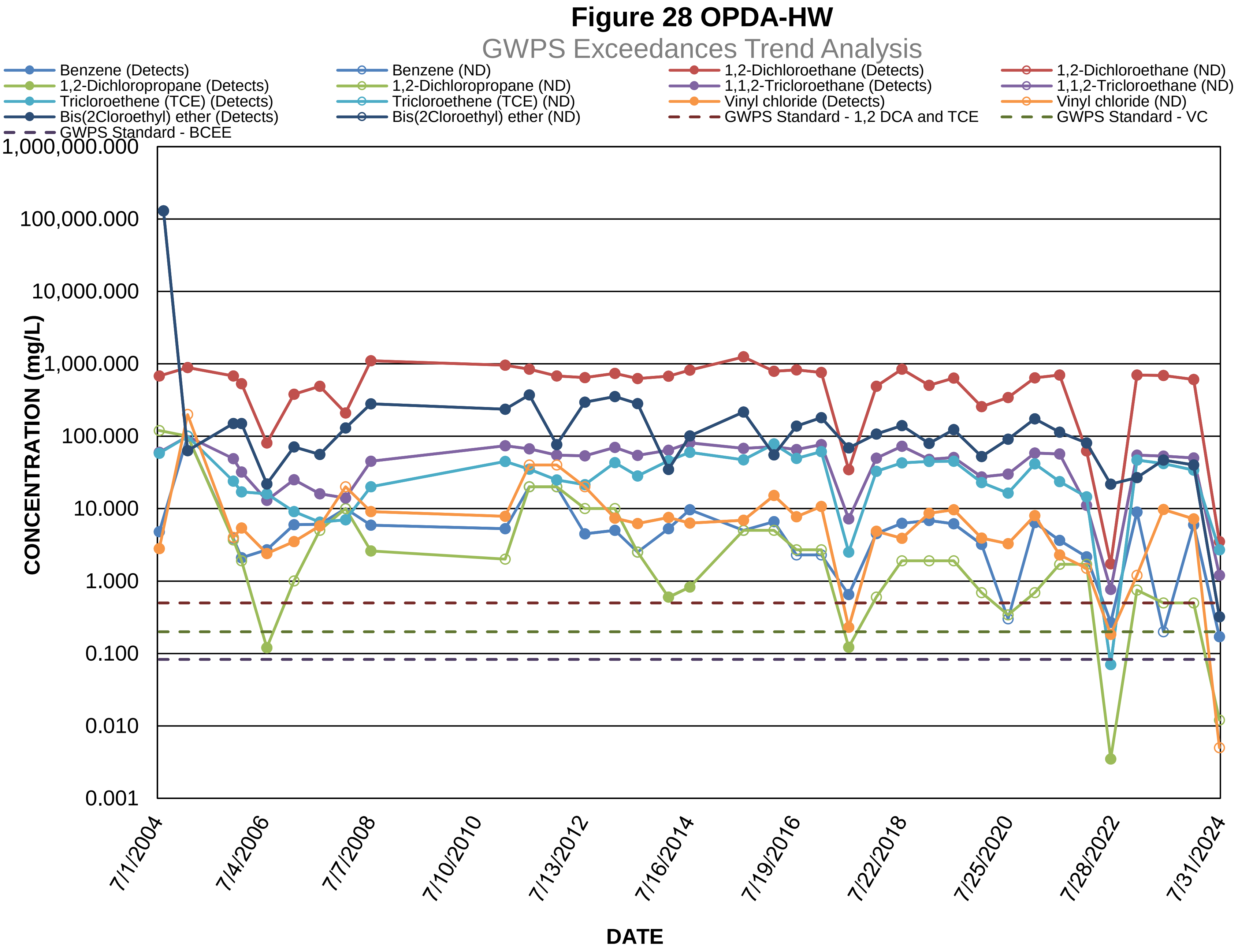


Figure 28 OPDA-HW
GWPS Exceedances Trend Analysis
Benzene (Detects)
Benzene (ND)
1,2-Dichloroethane (Detects)
1,2-Dichloroethane (ND)
1,2-Dichloropropane (Detects)
1,2-Dichloropropane (ND)
1,1,2-Tricloroethane (Detects)
1,1,2-Tricloroethane (ND)
Tricloroethene (TCE) (Detects)
Tricloroethene (TCE) (ND)
Vinyl chloride (Detects)
Vinyl chloride (ND)
Bis(2Cloroethyl) ether (Detects)
Bis(2Cloroethyl) ether (ND)
GWPS Standard - 1,2 DCA and TCE
GWPS Standard - VC
GWPS Standard - BCEE
CONCENTRATION (mg/L)
1,000,000.000
100,000.000
10,000.000
1,000.000
100.000
10.000
1.000
0.100
0.010
0.001
7/1/2004
7/4/2006
7/7/2008
7/10/2010
7/13/2012
7/16/2014
7/19/2016
7/22/2018
7/25/2020
7/28/2022
7/31/2024
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Part B

Appendix XI – Compliance Plan

Appendix XI.E

General Information and Financial Assurance

Table XI.E. – General Information

Waste Management Area/Unit Description	NOR No. (if applicable)	Compliance Period for Waste Management Area/Unit[1, 2]
NA	NA	

Footnotes:

1. 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

2. 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:

    a. the duration of your Compliance Plan;

    b. the estimated time frame for clean-up based on model projections and historical data as approved by the Executive Director; or

    c. the compliance period for the unit/area.

Table XI.E.1. Corrective Action Program Cost Estimate

Task	Cost
1. Pumping Capacity Per Year:	
A. Daily average system pumping rate	1,316 gal/day
B. Annual groundwater volume recovered	480,373 gal/yr
2. Off-Site Liquid Treatment / Disposal Cost:	
A. Volume of treated contaminated water to be disposed of off-site yearly	0 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 $/gal
(2) Total volume to be disposed per year	0 gal/yr
(3) Annual disposal cost (1 x 2)	0 $/yr
Annual Off-Site Liquid Treatment / Disposal Cost (2B3 + 2C +2D3 + 2E3)	**0 $**
3. On-site Wastewater 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 Wastewater Treatment System Capital Cost (3A)	0 $

B. Gallons of contaminated water to be treated on-site per year	480,373 gal/yr
C. Cost of on-site treatment per gallon	0.0112 $/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]	**5,380 $**
4. Inspections, Maintenance and Operation Cost for the Corrective Action Program:	
A. Operator's time on-site for inspections and maintenance per year	464 hr/yr
B. Charge of salary per hour	70 $/hr
C. Annual cost of labor (4A x 4B)	32,480 $/yr
D. Replacement cost of parts and equipment per year	3,600 $/yr
E. Electricity cost per year	2,000 $/yr
Annual Inspections / Maintenance / Operation Cost for the Corrective Action Program (4C + 4D + 4E)	**38,080 $**

Table XI.E.2.e - Groundwater Monitoring Cost Estimate

Task	Cost
1. Annual Sampling and Analysis Cost	
A. Background 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
B. Point of Compliance Wells	
(1) Number of wells	14
(2) Sample analysis cost per well	120 $/well
(3) Number of sampling events per year	2 /yr
(4) Sampling cost (1 x 2 x 3)	$ 3,360
C. Recovery Wells	
(1) Number of wells	3
(2) Sample analysis cost per well	120 $/well
(3) Number of sampling events per year	2 /yr
(4) Sampling cost (1 x 2 x 3)	$ 720
D. Corrective Action Observation Wells	
(1) Number of wells	11
(2) Sample analysis cost per well	120 $/well
(3) Number of sampling events per year	2 /yr
(4) Sampling cost (1 x 2 x 3)	$2,640
E. Point of Exposure 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
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	4
(2) Sample analysis cost per well	120 $/well
(3) Number of sampling events per year	2 /yr
(4) Sampling cost (1 x 2 x 3)	$ 960
2. Sampling Labor Cost:	
A. Hours of sampling per well	2 hrs/well
B. Number of sampling technicians per well	1 /yr
C. Charge per hour	70 $/hr
D. Total number of wells to be sampled annually	1
E. Total number of wells sampled semi-annually	27
F. Total number of wells sampled quarterly	0
G. Total number of wells sampled monthly	0
H. Total number of wells sampled per year (2D) + (2E x 2) + (2F x 4) + (2G x 12)	55
I. Sampling Labor Cost (2A x 2B x 2C x 2H)	$7,700
Annual Groundwater Monitoring Cost (Annual Sampling and Analysis Cost + Sampling Labor Cost)	$12,020
3. Well Installation (typical cost):	
A. Monitor well installation cost per well	15,000 $/well
B. Number of monitor wells to be installed	0
C. Cost of monitor well system (3A x 3B)	0
D. Recovery well installation cost per well	0 $/well
E. Number of Recovery Wells to be installed	0
F. Cost of Recovery well system (3D x 3E)	0
Total Well Installation Cost (3C + 3F)	0
4. Administrative Cost:	
A. Annual cost for record-keeping and report preparation	25,000

Annual Administrative Cost (4A)	25,000 $
5. Inspection and Maintenance Cost for the Monitoring Program:	
A. Operator's time (hours) on-site for inspections and maintenance per year	16 hr/yr
B. Charge or salary per hour	70 $/hr
C. Annual cost of labor (4A x 4B)	1,120 $/hr
D. Replacement of parts and equipment per year	2,000 $/hr
Annual Inspections / Maintenance Cost for the Groundwater Monitoring Program (5C + 5D)	$3,120

Table XI.E.3. - Financial Assurance Summary

Task	Cost
Annual Off-Site Liquid Treatment / Disposal Cost	$ 0
Annual On-Site Treatment / Disposal Cost	$ 5,380
Annual Inspection / Maintenance / Operation Cost for the Corrective Action Program	$ 38,080
Annual Groundwater Monitoring Cost	$ 12,020
Annual Administrative Cost	$ 25,000
Annual Inspection and Maintenance Cost for the Groundwater Monitoring Program	$ 3,120
Annual Subtotal	$ 83,600
Total Years Used for Calculating Financial Assurance for Corrective Action and/or Compliance Monitoring Program	30 Years
Remediation Cost (Annual Subtotal x Total Years Used)	$ 2,508,005
On-Site Wastewater Treatment System Capital Cost Total	$ 0
Total Well Cost	$ 0
10% Contingency	$250,801
Grand Total Cost (round to nearest $1000)	$ 2,758,806

Part B

Appendix XI – Compliance Plan

Appendix XI.E

Financial Assurance for OPDA Basins 1, 2, and 4

Unit Post-Closure Cost Estimate

Task	Cost
Post Closure Care Costs for SWMUs (Basins 1, 2, and 4)	
Mobilization/Demobilization	$3,000
Inspections (2 times per year)	$1,200
Mowing (4 times per year)	$14,000
Clearing, 0.5% of total area	$1,000
Repair of Compacted Clay	$12,500
Import and Place Topsoil	$8,000
Seeding	$1,500
Reporting & Administrative	$3,000
subtotal	**$44,200**
Contingency (10% minimum)	**$4,420**
Total Unit Post-Closure Care Cost x 30 yrs.	**$1,458,600 (in 2024 Dollars)**

Part B

Section XII – Hazardous Waste Permit Application Fee

Part B

Section XII – Hazardous Waste Permit Application Fee

Table XII.A. – Hazardous Waste Units

(For Application Fee Calculations)

Permit No. 50264

Permittee: Union Carbide Corporation

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]
Wastewater Treatment Basin	60,000,000 gallons	18	1	Within 10% of same size, handled same materials, and constructed of same material and same design
Organic Phase Separation Pit	85,000 gallons	<0.1	1	Within 10% of same size, handled same materials, and constructed of same material and same design
		Total[4] 18	Total[4] 2	

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.

Part B

Section XII – Hazardous Waste Permit Application Fee

Table XII.B – Hazardous Waste Permit Application Fee Worksheet

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

Name of Facility: Union Carbide Corporation, Off-Plant Disposal Area

Solid Waste Registration Number: 35921

1.Process Analysis - $1,000.. $ 1000

2.Facility Management Analysis - $500... $ 500

3.Unit Analysis - 2 units @ $500 per unit................................ $ 1000

4.Site Evaluation - 18 acres @ $100 per acre............................... $ 1800

(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** $ $4,465.00

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-PAY Trace No. 582EA000639143	12/13/2024	$4,365
E-PAY Trace No. 582EA000646386	1/24/2025	$150 (minimum fee)

January 31, 2025

FedEx # 7716 5853 4933

Guanhua Gai
[redacted]
[redacted] Section
Waste Permits Division, MC-126
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

Re: Administrative Notice of Deficiency Letter
Union Carbide Corporation
Texas City, Galveston County, Texas
Hazardous Waste Permit No. 50264
Industrial Solid Waste Registration No. 35921
Tracking No. 30613474; RN105087829/CN601688781
Permit Renewal with Minor Amendment

Dear Mr. Gai:

Union Carbide Corporation, a wholly owned subsidiary of The Dow Chemical Company (Dow) is providing this formal response to the Texas Commission on Environmental Quality (TCEQ) to address administrative comments provided in an e-mail, dated January 22, 2025, for the above referenced Hazardous Waste Permit.

Dow's formal response to the items listed on the January 22, 2025 TCEQ letter are presented in Table 1, attached. Included under each item is Dow's response and the actions taken to address each comment. Replacement pages include the revision date of January 2025 and are included in Attachment 1. The signature page for Part B is also included in Attachment 1.

Should you have any questions or need further information for this submittal, please contact Michelle Vetterlein at 303-747-5308 or e-mail at [redacted].

Sincerely,

Casey Rhodes
Senior Responsible Care Director

Enclosures:
Table 1 – Responses to Administrative NOD #1
Attachment 1 – Part B Signature Page and Replacement Pages

cc: Michelle Vetterlein / Dow (electronic)
Donnie Belote / Dow (electronic)
Richard Trevino / Arcadis (electronic)

Union Carbide Corporation
A Subsidiary of The Dow Chemical Company
Texas City Operations | P.O. Box 471 | Texas City, TX 77592-0471 USA

Table 1

Responses to Administrative NOD #1

Table 1. Responses to Administrative NOD #1
For RCRA Permit/Compliance Plan Renewal Application

Hazardous Waste Permit/Compliance Plan No. 50264
Industrial Solid Waste Registration No. 35921
Tracking No. 30613474; RN105087829/CN601688781

General Comment

TCEQ Comment ID No. C1

In accordance with Texas Water Code §5.1734, relating to Electronic Posting of Permit Applications (Senate Bill 1397, 88th Legislative Session, Regular Session, 2023), you must submit a complete electronic version of the permit application with all revisions included for posting on the TCEQ Website. **The required NORI documents will not be released until the complete electronic version of the application is received.**

Dow Response to Comment ID No. C1

Dow acknowledges a complete electronic version of the permit application will all revisions included for posting on the TCEQ Website need to be submitted.

Action Taken by Dow in Application

A complete electronic version of the permit application with all revisions included is posted on the TCEQ Website.

Part A, Page 1, General Information

TCEQ Comment ID No. A1

Please revise the facility and contact address zip code to 77590.

Dow Response to Comment ID No. A1

Dow acknowledges the incorrect facility and contact address zip code.

Action Taken by Dow in Application

The correct facility and contact address zip code has been revised to 77590 in Part A, Page 1 of the general information section.

Part B, Page 2, Section C

TCEQ Comment ID No. A2

Please revise Item 1 and 3 address zip code to 77590.

Dow Response to Comment ID No. A2

Dow acknowledges the incorrect zip code in Item 1 and 3.

Action Taken by Dow in Application

The zip code has been revised to 77590 in Item 1 and 3 of Part B, Page 2, Section C.

Part B, Appendix I, Adjacent Landowners

TCEQ Comment ID No. A3

Please provide a Landowner's map keyed to cross-reference the landowner's name to the proper locations on the map. Please submit a map key using the appropriate keying techniques.

Dow Response to Comment ID No. A3

Dow acknowledges a map keyed to cross-reference the landowner's name to the proper location is missing.

Action Taken by Dow in Application

Dow has revised the application to include a map to cross-reference the landowner's name.

Part B, Adjacent Landowner Mailing Labels

TCEQ Comment ID No. A4

The adjacent landowners mailing labels should only include adjacent landowners. The proper format to provide the required set of labels will be label sheets that have 30 labels to a page, 3 columns per page and 10 names per column (MS WORD Avery Standard 5160). Please ensure the landowner mailing labels are complete and contain no punctuation and are in all caps as required by the U.S. Postal Service. Please refer to the Part B Application instructions as a guide.

Dow Response to Comment ID No. A4

Dow acknowledges only adjacent landowners should be included with the mail labels and provided in the proper format as required by the U.S. Postal Service.

Action Taken by Dow in Application

Dow has provided only the adjacent landowner mail labels in the proper format as required by the U.S.

Postal Service.
Part B, Signature Page
TCEQ Comment ID No. A5
Please provide a new signature page with SUBSCRIBED AND SWORN to before me by the said **Casey Rhodes**.
Dow Response to Comment ID No. A5
Dow acknowledges a new signature page is required by Casey Rhodes.
Action Taken by Dow in Application
A new signature page by Casey Rhodes is provided.
Part B, Application Fee, Table XII.B
TCEQ Comment ID No. A6
The application is a renewal with Minor Amendment, please revise this table and submit the additional fees due of $100.00
Dow Response to Comment ID NO. A6
Dow is revising the table and acknowledges the additional fees of $100.00 are due with the submittal. A total of $150.00 (minimum E-Pay amount) was submitted to the TCEQ on January 24, 2025.
Action Taken by Dow in Application
Part B, Table XII.B has been revised as described and the associated additional fees have been submitted.

Attachment 1

Part B Signature Page and Replacement Pages

Signature Page

I, Casey Rhodes, Responsible Care Director
(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: 01/31/2025

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 Casey Rhodes
On this 31st day of January, 2025
My commission expires on the April 30 day of 2025, ______
Notary Public in and for Navarro County, Texas
*[**Note**: Application Must Bear Signature & Seal of Notary Public]*

Khloe Brennan

Khloe Brennon
My Commission Expires
04/30/2025
ID No. 129155313

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: __**Union Carbide Corporation, A Wholly Owned Subsidiary of The Dow Chemical Company**________

(Individual, Corporation, or Other Legal Entity Name)

TCEQ Solid Waste Registration No: _**35921**_______ EPA I.D. No.: _**TXD 980626782**_

Street Address (If Available): _**2800 Loop 197 South**______________

City: _**Texas City**_____________, State: _**TX**_________ Zip Code: _**77590**______

County: _**Galveston**___________________

Telephone Number: __**409-945-7411**______ Charter Number: _**1335606**________

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.

Union Carbide Corporation
A Wholly Owned Subsidiary of The Dow Chemical Company
2800 Loop 197 South
Texas City, Texas 77592

Casey Rhodes
Senior Responsible Care Director
281-553-2030
[redacted]

Michelle Vetterlein
Texas Waste Compliance and Permit Manager
304-747-5308
[redacted]

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.

C.T. Corporation System
1999 Bryan St., Ste 900
Dallas, Texas 75201-3136

C. Facility Contact

1. Persons or firms who will act as primary contact:

Name, Title:	Michelle Vetterlein - Texas Waste Compliance and Permit Manager
Address	2800 Loop 197 South
City, State:	Texas City, TX
Zip Code	77590
Telephone Number	304-747-5308
Alternate Telephone Number	
E-mail	[redacted]
Fax:	

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

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

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

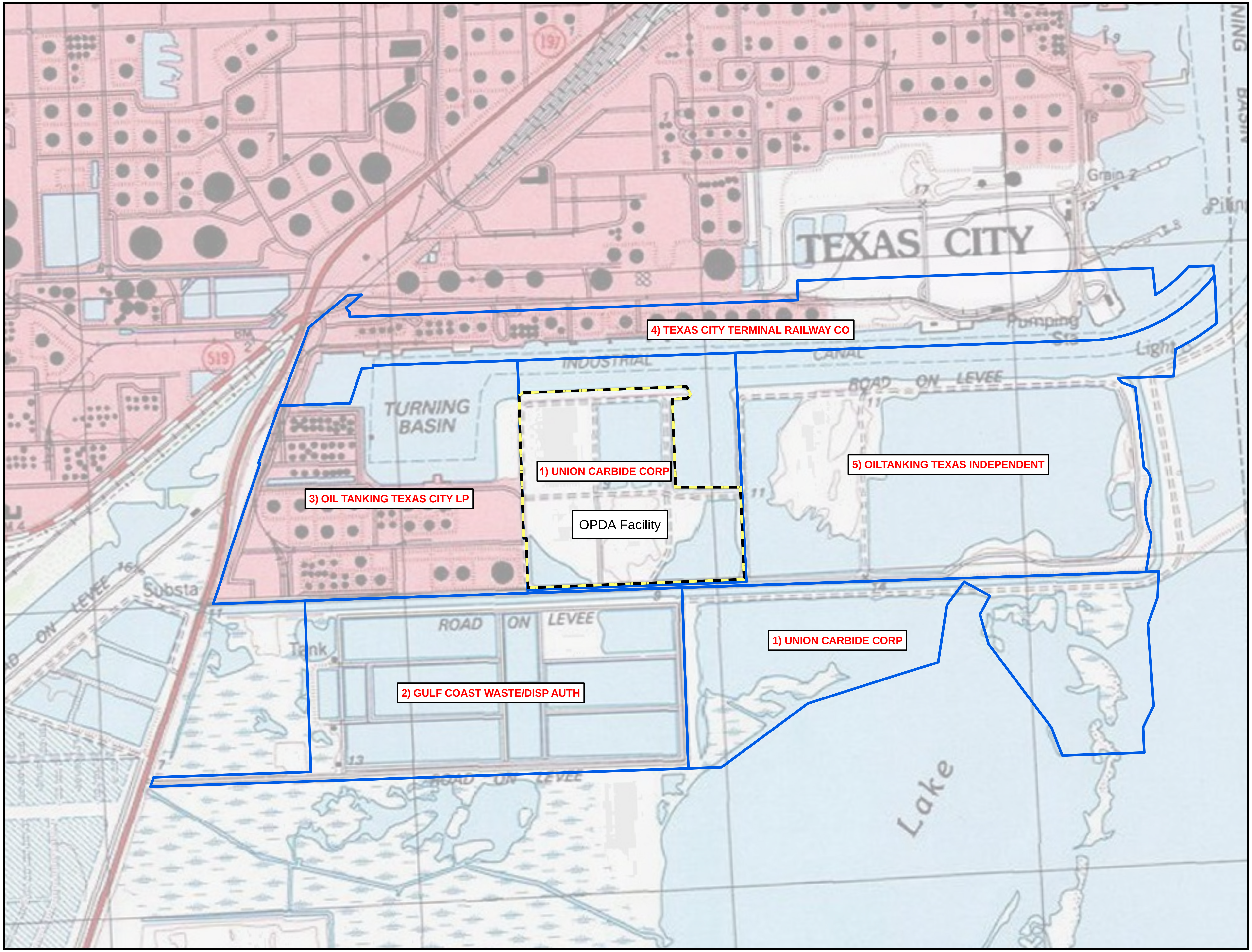
Name, Title:	CT Corporation System
Address	1999 Bryan St., STE 900
City, State:	Dallas, TX
Zip Code	75201-3136

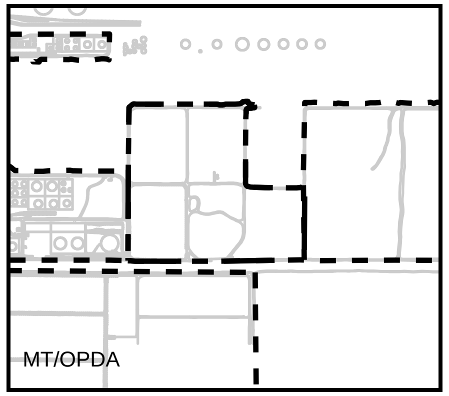
3. Individual responsible for causing notice to be published:

Name:	Michelle Vetterlein
Address	2800 Loop 197 South
City, State:	Texas City, TX
Zip Code	77590
Telephone Number	304-747-5308
Alternate Telephone Number	
E-mail	[redacted]
Fax:	

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

Name	Moore Memorial Public Library
Address	1701 9th Ave. North





LEGEND

⬚ Facility Boundary

▭ Surrounding Parcels

Reference: The displayed Digital Raster Graphic (DRG) includes portions of the United States Geological Survey 7.5 minute quadrangles of Virginia Point and Texas City (USGS, 1993).

0 300 600 1,200
Feet

Attachment B.I.G
Adjacent Owner Map

Union Carbide Corporation
OPDA Facility
HW Permit No. 50264
December 2024

N

T:_ENV\DOW\TEXAS_CITY\GIS\TCO_OPDA_APAR\TCO_OPDA_APAR\MAPFILES\GEC\TCO_OPDA_APAR\TCO_OPDA_APAR.APRX LS3621 10/22/2024 12:11 PM

UNION CARBIDE CORP
DOW CHEMICAL COMPANY
TAX DEPT APB BLDG FLOOR 4-A
332 SH 332 E
LAKE JACKSON TX 77566

GULF COAST WSTE/DISP AUTH
BP PORPERTY TAX DEPT
PO BOX 3092
HOUSTON TX 77253-3092

OILTANKING TEXAS CITY LP
PROPERTY TAX DEPARTMENT
9805 KATY FRWY STE 400
HOUSTON TX 77024-1269

TEXAS CITY TERMINAL RAILWAY CO
2425 HIGHWAY 146 N
TEXAS CITY TEXAS 77590-8811

OIL TANKING TEXAS INDEPENDENT
DEEPWATER EXPANSION LLC
9805 KATY FRWY STE 400
HOUSTON TX 77024-1269

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

Name of Facility: Union Carbide Corporation, Off-Plant Disposal Area

Solid Waste Registration Number: 35921

1.Process Analysis - $1,000.. $ 1000

2.Facility Management Analysis - $500... $ 500

3.Unit Analysis - _____2 units @ $500 per unit................................ $ 1000

4.Site Evaluation - ____18 acres @ $100 per acre............................... $ 1800

(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** $ $4,465.00

Make Checks Payable To:

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Complete And Return With Payment To:

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Quality Financial Administration Division -
MC 214 P.O. BOX 13088
Austin, Texas 78711-3088

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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-PAY Trace No. 582EA000639143 E-PAY Trace No. 582EA000646386	12/13/2024 1/24/2025	$4,365 $150 (minimum fee)