

**STATE OF MISSISSIPPI  
HAZARDOUS WASTE MANAGEMENT  
PERMIT**

TO OPERATE A HAZARDOUS WASTE MANAGEMENT FACILITY  
IN ACCORDANCE WITH THE REGULATIONS GOVERNING  
HAZARDOUS WASTE MANAGEMENT

**THIS CERTIFIES THAT**

**Chevron U.S.A. Inc.**

is hereby authorized to maintain a closed land treatment unit

located at

250 Industrial Road  
Pascagoula, Mississippi  
Jackson County

This permit is issued under the authority of the Mississippi Solid Wastes Disposal Law, and particularly Section 17-17-27 thereof, and rules adopted and promulgated thereunder, all of which authorize the Department of Environmental Quality to enforce all applicable requirements, under the Mississippi Hazardous Waste Management Regulations, and associated conditions included therein.

**MISSISSIPPI ENVIRONMENTAL QUALITY PERMIT BOARD**



**AUTHORIZED SIGNATURE**

**MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY**

**Permit Issued:** June 30, 2021

**Expires:** May 31, 2031

**Permit No.:** HW-87-406-02

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*Attachments are taken directly from the application but have been reformatted to fit the permit.*



## **MODULE I – GENERAL PERMIT CONDITIONS**

### **I.A. EFFECT OF PERMIT**

Subject to Title 11 Miss. Admin. Code Pt. 3, Ch. 1 Mississippi Hazardous Waste Management Regulations (MHWMR) Rule 1.16 Part MHWMR 270.4, compliance with this permit constitutes compliance, for purposes of enforcement, with Mississippi Solid Waste Disposal Law of 1974, Section 17-17-1, et seq. and subtitle C of RCRA, except for those requirements not included in the permit but which become effective by statute or which are promulgated by MHWMR Part 268. Issuance of this permit does not convey any property rights of any sort nor any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of any state or local laws or regulations. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Sections 3008(a), 3008(h), 3013, or 7003 of RCRA; Sections 106(a), 104, or 107 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9601 et seq., commonly known as CERCLA), or any other law providing for protection of public health or the environment.

### **I.B. PERMIT ACTIONS**

#### **I.B.1. Permit Modification, Revocation and Reissuance, and Termination**

This permit may be modified, revoked and reissued, or terminated for cause, as specified in MHWMR Rule 1.16 Part 270.41, 270.42, 270.43, or 270.50(d). The filing of a request for a permit modification, revocation and reissuance, or termination, or the notification of planned changes or anticipated noncompliance on the part of the Permittee, does not stay the applicability or enforceability of any permit condition.

#### **I.B.2. Permit Renewal**

This permit may be renewed as specified in MHWMR Rule 1.16 Part 270.30(b) and Permit Condition I.E.2. Review of any application for a permit renewal shall consider improvements in the state of control and measurement technology, as well as changes in applicable regulations.

### **I.C. SEVERABILITY**

The provisions of this permit are severable, and if any portion of this permit, or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

## I.D. DEFINITIONS

For purposes of this permit, terms and conditions used herein shall have the same meaning as those in RCRA and MHWMR Rule 1.23 Part 124, Rule 1.1 Part 260, Rule 1.2 Part 261, Rule 1.7 Part 264, Rule 1.15 Part 268, and Rule 1.16 Part 270; unless this permit specifically provides otherwise. Where terms are not defined in the regulation, the permit, or EPA and/or MDEQ guidelines or publications, the meaning associated with such terms shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term.

### I.D.1. Executive Director

"Executive Director" means the Executive Director of the Mississippi Department of Environmental Quality or his designee or authorized representative.

## I.E. DUTIES AND REQUIREMENTS

### I.E.1. Duty to Comply

The Permittee shall comply with all conditions of this permit except to the extent and for the duration such noncompliance is authorized by an emergency permit. Any permit noncompliance, other than noncompliance authorized by an emergency permit, constitutes a violation of Mississippi Hazardous Waste Management Regulations and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

### I.E.2. Duty to Reapply

If the Permittee wishes to continue an activity allowed by this permit after the expiration date of this permit, the Permittee shall submit a complete application for a new permit at least 180 days prior to permit expiration.

### I.E.3. Permit Expiration

Pursuant to MHWMR Rule 1.16 Part 270.50, this permit shall be effective for a fixed term not to exceed ten (10) years. This permit and all conditions herein will remain in effect beyond the expiration date if the Permittee has submitted a timely, complete application (per MHWMR Rule 1.16 Part 270.10, Rule 1.16 Part 270.13 through Part 270.29) and, through no fault of the Permittee, the Executive Director has not issued a new permit, as set forth in MHWMR Rule 1.16 Part 270.51.

### I.E.4. Permit Review Period

This permit shall be reviewed by the Executive Director five (5) years after the date of issuance and modified as necessary as required under MHWMR Part 270.50(d).

I.E.5. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

I.E.6. Duty to Mitigate

In the event of noncompliance with this permit, the Permittee shall take all reasonable steps to minimize releases to the environment and shall carry out such measures, as are reasonable, to prevent significant adverse impacts on human health and the environment.

I.E.7. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance include effective performance, adequate funding, adequate operator staffing and training, adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit.

I.E.8. Duty to Provide Information

The Permittee shall furnish to the Executive Director, within a reasonable time, any relevant information that the Executive Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit; or to determine compliance with this permit. The Permittee shall also furnish to the Executive Director, upon request, copies of records required to by this permit.

I.E.9. Inspection and Entry

Pursuant to MHWMR Rule 1.16 Part 270.30(i), the Permittee shall allow the Executive Director, or an authorized representative, upon the presentation of credentials and other documents, as may be required by law, to:

- I.E.9.a. Enter at reasonable times upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
- I.E.9.b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- I.E.9.c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

- I.E.9.d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by Mississippi Solid Waste Disposal Laws, any substances or parameters at any location.

I.E.10. Monitoring and Records

The Executive Director may require such testing by the Permittee, and may make such modifications to this permit, deemed necessary to ensure implementation of new regulations or requirements, or to ensure protection of human health or the environment.

- I.E.10.a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste to be analyzed must be the appropriate method from Appendix I of MHWMR Rule 1.1 Part 261, the EPA Region IV Environmental Compliance Branch's *Field Branches Quality System and Technical Procedures* (FBQSTP) (most recent version), or an equivalent method approved by the Executive Director. Procedures for sampling contaminated media must be those identified in the EPA Region IV FBQSTP or an equivalent method approved by the Executive Director. Laboratory methods must be those specified in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846*, *Standard Methods of Wastewater Analysis*, or an equivalent method approved by the Executive Director.
- I.E.10.b. The Permittee shall retain at the facility or other appropriate location as approved by the Executive Director, records of all monitoring information, including all calibration and maintenance records, records of all data used to prepare documents required by this permit, and records of all data used to complete the application for this permit for a period of at least three (3) years from the date of the sample, measurement, report, certification, and/or application, or until corrective action is completed, whichever date is later. These periods may be extended by the request of the Executive Director at any time and are automatically extended during the course of any unresolved enforcement action regarding this facility. The Permittee shall also maintain records for all groundwater monitoring wells and associated groundwater surface elevations for the duration of the post-closure care period.
- I.E.10.c. Pursuant to MHWMR Rule 1.16 Part 270.30(j)(3), records of monitoring information shall specify:
  - i. The dates, exact place, and times of sampling or measurement;

- ii. The individuals who performed the sampling or measurements;
- iii. The dates analyses were performed;
- iv. The individuals who performed the analyses;
- v. The analytical techniques or methods used, including any method detection limits for said technique; and
- vi. The results of such analyses.

I.E.11. Reporting Planned Changes

The Permittee shall give notice to the Executive Director, as soon as possible, of any planned physical alterations or additions that affect any regulated unit.

I.E.12. Reporting Anticipated Noncompliance

The Permittee shall give advance notice to the Executive Director of any planned changes in the permitted facility or activity that may result in noncompliance with the requirements of this permit.

I.E.13. Transfer of Permits

This permit may be transferred to a new owner or operator only after notice to the Executive Director and only if it is modified or revoked and reissued pursuant to MHWMR Rule 1.16 Part 270.40(b) or Part 270.41(b)(2) to identify the new permittee and incorporate such other requirements as may be necessary under the appropriate act. Before transferring ownership or operation of the facility during its operating life, or of a disposal facility the post-closure period, the Permittee shall notify the new owner or operator in writing of the requirements of MHWMR Rule 1.7 Part 264 and rule 1.16 Part 270, of HSWA, and of this permit.

I.E.14. Twenty-Four Hour Reporting

- I.E.14.a. The Permittee shall report to the Executive Director any noncompliance or any imminent or existing hazard from a release of hazardous waste or hazardous constituents which may endanger health or the environment. Any such information shall be reported orally within twenty-four (24) hours from the time the Permittee becomes aware of the circumstances. The report shall include the following:
- i. Information concerning the release of any hazardous waste or hazardous constituents that may cause an endangerment to public drinking water supplies.
  - ii. Information of a release or discharge of hazardous waste or hazardous constituents, or a fire or an explosion at the

facility which could threaten the environment or human health outside the facility.

- I.E.14.b. The description of the occurrence and its cause shall include:
- i. Name, address, and telephone number of the owner or operator;
  - ii. Name, address, and telephone number of the facility;
  - iii. Date, time, and type of incident;
  - iv. Name and quantity of materials involved;
  - v. The extent of injuries, if any;
  - vi. An assessment of actual or potential hazards to the environment and human health outside the facility, where this is applicable; and
  - vii. Estimated quantity and disposition of recovered material that resulted from the incident.
- I.E.14.c. A written submission shall also be provided within five days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance including exact dates and times; whether the noncompliance has been corrected; and if not, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Executive Director may waive the five-day written notice requirement in favor of a written report within 15 days.

I.E.15. Obligation for Corrective Action

The Permittee is required to continue this permit for any period necessary to comply with the corrective action requirements of this permit.

I.E.16. Other Noncompliance

The Permittee shall report all other instances of noncompliance not otherwise required to be reported above at the time monitoring reports are submitted. The reports shall contain the information listed in Condition I.E.13. of this Permit.

I.E.17. Other Information

Whenever the Permittee becomes aware that it failed to submit any relevant facts in the permit application or in any report to the Executive Director, the Permittee shall promptly submit such facts or information.

I.F. SIGNATORY REQUIREMENT

All applications, reports, or information submitted to or requested by the Executive Director, his designee, or authorized representative, shall be signed and certified in accordance with MHWMR Rule 1.16 Part 270.11 and Part 270.30(k).

I.G. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE EXECUTIVE DIRECTOR

All reports, notifications, or other submissions that are required by this permit to be given or sent by certified mail to the Executive Director in care of the Chief, Waste Division at the following address:

Mississippi Department of Environmental Quality  
515 E. Amite St.  
Jackson, MS 39201

PO Box 2261  
Jackson, Mississippi 39225

I.H. CONFIDENTIAL INFORMATION

In accordance with MHWMR Rule 1.16 Part 270.12, the Permittee may claim confidential any information required to be submitted by this permit.

I.I. DOCUMENTS TO BE MAINTAINED

The Permittee shall maintain at the facility the following documents and all amendments, revisions, and modifications thereto:

- I.I.1. Inspection schedules, as required by MHWMR Rule 1.7 Part 264.15(b) and this permit;
- I.I.2. Operating record, as required by MHWMR Rule 1.7 Part 264.73 and this permit;
- I.I.3. Post-Closure Plan, as required by MHWMR Rule 1.7 Part 264.118(a) and this permit;
- I.I.4. Financial assurance documentation, as required by MHWMR Rule 1.7 Part 264, Subpart H and this permit; and
- I.I.5. All other documents required by Condition I.E.10. and this permit.

## **MODULE II - GENERAL FACILITY CONDITIONS**

### **II.A. FACILITY DESCRIPTION**

This permit is issued to Chevron U.S.A. Inc. [MSD 054 179 403] as described in the permit application and amendments submitted on May 26, 2016, August 11, 2016, October 20, 2016, and July 19, 2018, hereinafter referred to as “the application”. This permit authorizes the Permittee, to conduct post-closure care activities for the North Landfarm, and to perform compliance monitoring of the groundwater beneath the landfarm. These activities are identified and described in Attachments A through E of this permit.

### **II.B. DESIGN AND OPERATION OF FACILITY**

The Permittee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste constituents to air, soil, or surface water, which could threaten human health or the environment, as required by MHWMR Rule 1.7 Part 264.31.

### **II.C. REQUIRED NOTICES**

#### **II.C.1. Hazardous Waste Imports**

The Permittee shall not receive hazardous waste from a foreign source.

#### **II.C.2. Hazardous Waste From Off-Site Sources**

The Permittee shall not receive any hazardous waste from an off-site source.

#### **II.C.3. Transfer of Permit**

Before transferring ownership or operation of the facility during its operating life, the owner or operator must notify the new owner or operator in writing of the requirements of MHWMR Rule 1.7 Part 264 and Rule 1.16 Part 270.

### **II.D. GENERAL WASTE ANALYSIS**

Not applicable to a closed land treatment unit.

### **II.E. SECURITY**

The Permittee shall comply with the security provisions of MHWMR Rule 1.7 Part 264.14(b)(2) and Part 264.14(c) and as described in Attachment C of this permit.



II.F. GENERAL INSPECTION REQUIREMENTS

The Permittee shall follow the inspection schedules set out in Attachment C of this permit. The Permittee shall remedy any deterioration or malfunction discovered by an inspection, as required by MHWMR Rule 1.7 Part 264.15(c). Records of inspections shall be kept as required by MHWMR Rule 1.7 Part 264.15(d).

II.G. PERSONNEL TRAINING

Not applicable to a closed land treatment unit.

II.H. LOCATION STANDARDS

The facility is not located in an area described in MHWMR Rule 1.7 Part 264.18(a). The North Landfarm meets the requirement of MHWMR 264.18(b)(1) through the use of peripheral dikes and fill areas.

II.I. PREPAREDNESS AND PREVENTION

The North Landfarm is in post-closure care and, therefore, there are no hazards posed from the handling of waste at the North Landfarm.

II.J. CONTINGENCY PLAN

Not applicable to a closed land treatment unit.

II.K. RECORDKEEPING AND REPORTING

Pursuant to MHWMR Rule 1.7 Part 264.73(a), the Permittee must keep a written operating record of post-closure care activities and those activities specified in MHWMR Rule 1.7 Part 264.73(b)(6) and Part 264.280(c). These records will be maintained at the facility or in the custody of the facility contact person, and shall be made available upon request. At a minimum, the following information must be recorded and maintained in the operating record until final closure (as defined in MHWMR Rule 1.1 Part 260.10):

- Records of inspections
- Monitoring, testing and analytical data
- Groundwater monitoring data

II.L. POST-CLOSURE

The requirements of this section apply to the North Landfarm as identified in Module III of this permit.

#### II.L.1 Post-Closure Care Period

The Permittee shall conduct post-closure care throughout the effective period of this permit as specified in MHWMR Rule 1.7 Part 264.117(a)(1) unless otherwise modified under MHWMR Rule 1.7 Part 264.117(b).

#### II.L.2 Post-Closure Activities

The Permittee shall conduct all post-closure activities in accordance with Module III of this permit and with the post-closure plans in Attachment D, as required by MHWMR Rule 1.7 Part 264.117(d).

#### II.L.3 Use of Property

Post-closure use of the property shall not disturb the integrity of covers, liners, or other components of the containment system; or the function of monitoring wells, benchmarks, or other components of the monitoring system, unless approved by the Executive Director under MHWMR Rule 1.7 Part 264.117(c).

#### II.L.4 Retention and Modification

The Permittee shall designate a facility contact person for all regulatory purposes as required by MHWMR Rule 1.7 Part 264.118(b)(3). This facility contact person shall retain an updated copy of the post-closure plans as specified in MHRMR Rule 1.7 Part 264.118(c).

### II.M. FINANCIAL REQUIREMENTS

#### II.M.1. Cost Estimate for Post-Closure

The Permittee must have a detailed written estimate of the cost of closing the facility, as per MHWMR Rule 1.7 Part 264.144(a).

II.M.1.a. The Permittee must annually adjust the post-closure cost estimate for inflation as required by MHWMR Rule 1.7 Part 264.144(b).

II.M.1.b. The Permittee must revise the post-closure cost estimate whenever there is a change in the post-closure plan, as required by MHWMR Rule 1.7 Part 264.144(c).

II.M.1.c. The Permittee must keep at the facility the latest post-closure cost estimate as required by MHWMR Rule 1.7 Part 264.144(d).

#### II.M.2. Financial Assurance for Facility Post-Closure

The Permittee shall demonstrate continuous compliance with MHWMR Rule 1.7 Part 264.144 by providing documentation of financial assurance as required by MHWMR Rule 1.7 Part 264.151 in at least the amount of the cost estimates required by Condition II.M.1. of this permit. Changes in the

financial assurance mechanisms must be approved by the Executive Director pursuant to MHWMR Rule 1.7 Part 264.145.

II.M.3. Other Mechanism

The Permittee may satisfy the financial assurance requirements for post-closure as specified by MHWMR Rule 1.7 Part 264.146.

II.M.4. Incapacity of Owners or Operators, Guarantors, or Financial Institutions

The Permittee shall comply with MHWMR Rule 1.7 Part 264.148 whenever necessary.

II.N. SPECIAL CONDITIONS

Where a discrepancy exists between the wording of an item in the application and this permit, the permit requirements take precedence over the application.

II.O. ANNUAL REPORT

Not applicable to a closed land treatment unit.

## **MODULE III – POST-CLOSURE CARE**

### **III.A. APPLICABILITY**

The requirements in this module apply to the North Landfarm unit as described in Attachment D.

### **III.B. POST-CLOSURE CARE PERIOD**

Post-closure care of the unit shall continue throughout the effective period of this permit.

### **III.C. POST-CLOSURE ACTIVITIES**

In accordance with MHWMR Rule 1.7 Part 264.280(c), the Permittee shall conduct the following activities during the post-closure care period:

III.C.1. The soil cover shall be maintained so that it is free of erosion gullies, cracking, settlement, or burrows. Vegetative growth shall be maintained year-round to ensure this occurs. Other maintenance shall take place as specified in the post-closure plan in Attachment D of this permit.

III.C.2. Run-on and run-off controls (dikes, etc.) shall be maintained and graded as described in the post-closure plan.

III.C.3. No food chain crops shall be grown during the post-closure care period.

III.C.4. The integrity of all groundwater monitoring wells shall be maintained. The protective posts and concrete pads shall be free of cracks and other damage.

III.C.5. Post-closure groundwater monitoring shall be conducted as required by MHWMR Rule 1.7 Part 264.99 according to the procedures described in Module IV and Attachment E of this permit.

III.C.6. The Permittee shall inspect the units in accordance with the inspection schedule in Attachment C, per Condition II.F of this permit.

III.C.7. All surveyed benchmarks shall be maintained.

### **III.D. POST-CLOSURE PROPERTY USE**

Post-closure use of the closed landfarm must comply with the standards of MHRMR Rule 1.7 Part 264.117(c) and Condition II.L.3. of this permit.

### III.E. REMOVAL OF WASTE

If the Permittee or any subsequent owner or operator of the land upon which the hazardous waste disposal unit is located wishes to remove hazardous wastes and hazardous waste residues and/or contaminated soils, then he shall request a modification to this post-closure permit in accordance with the applicable requirements in MHWMR Rule 1.23 Part 124 and Rule 1.16 Part 270. The Permittee or any subsequent owner or operator of the land shall demonstrate that the removal of hazardous wastes will satisfy the criteria of MHWMR Rule 1.7 Part 264.117(c).

### III.F. COMPLETION OF POST-CLOSURE CARE PERIOD

No later than sixty (60) days after completion of the established post-closure care period for the hazardous waste disposal unit, the Permittee shall submit to the Executive Director, by registered mail, a certification that the post-closure care for the hazardous waste disposal unit was performed in accordance with the specifications in the approved Post-Closure Plan. The certification must be signed by the Permittee and an independent registered professional engineer. Documentation supporting the independent, registered professional engineer's certification must be furnished to the Executive Director upon request until the Executive Director releases the Permittee from the financial assurance requirements for post-closure care under MHWMR Rule 1.7 Part 264.145(i).

### III.G. RETENTION OF PLAN

The Permittee shall designate a facility contact person for all regulatory purposes and notify the Executive Director in writing as to where the facility contact person may be reached during regular business hours. The facility contact person shall retain an updated copy of the post-closure plan as specified in MHWMR Rule 1.7 Part 264.118(b).

### III.H. POST-CLOSURE PERMIT MODIFICATIONS

The Permittee must request a permit modification to authorize a change in the approved Post-Closure Plan. This request must be in accordance with applicable requirements of MHWMR Rule 1.23 Part 124 and Rule 1.16 Part 270 and must include a copy of the proposed amended Post-Closure Plan for approval by the Executive Director. The Permittee shall request a permit modification whenever changes in operating plans or facility design affect the approved Post-Closure Plan or other events occur that affect the approved Post-Closure Plan. The Permittee must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the Post-Closure.

## **MODULE IV – GROUNDWATER PROTECTION**

### **IV.A. APPLICABILITY**

The requirements of this module apply to the North Landfarm.

### **IV.B. GROUNDWATER MONITORING PROGRAM**

Compliance Monitoring Program:

The Permittee is required to conduct a compliance monitoring program for groundwater at the North Landfarm per MHWMR Rule 1.7 Part 264.91(a)(1). This monitoring program will remain in effect throughout the term of this permit unless the permit is modified under Condition IV.N.

### **IV.C. GROUNDWATER MONITORING SYSTEM**

IV.C.1.Compliance Monitoring Wells:

For the purposes of this permit, wells, NL-1 NL-2, NL-3, and NL-4 shall be designated as the compliance monitoring wells for the North Landfarm. Compliance monitoring wells shall be located as indicated in Figure E-6 of Attachment E.

IV.C.2.Background Monitoring Well:

For the purpose of this permit monitoring well ASR shall be designated as the background monitoring well for the North Landfarm.

IV.C.3.Additional Monitoring Wells:

Due to changes that may occur in groundwater flow direction, construction or deletion of wells from the monitoring program may be required.

IV.C.4.Replacement Procedure:

Should the Permittee determine during an inspection or sampling event that any well identified in Condition IV.C. has been damaged such that it no longer meets the requirements of MHWMR Rule 1.7 Part 264.97(a) and (c), the Permittee shall notify the Executive Director in writing within seven (7) days of making such a determination and replace or repair the damaged well within thirty (30) days. Replacement wells should be constructed to the same specifications as the well being replaced.

IV.C.5.Deletion Procedure:

All wells deleted from the system shall be plugged and abandoned in accordance with Mississippi Office of Land and Water Resources regulations. Well plugging and abandonment methods and certification

shall be submitted to the Executive Director within thirty (30) days from the date the wells are removed from the program.

#### IV.D. GROUNDWATER PROTECTION STANDARDS

The groundwater protection standards under MHWMR Rule 1.7 Part 264.92 shall be equal to the concentration limits in Condition IV.E. of this permit during the compliance monitoring period. These groundwater protection standards are based on Maximum Contaminant Levels (MCLs) as established in the National Interim Primary Drinking Water Regulations (NIPDWR) under the Safe Drinking Water Act. In cases where MCLs have not been promulgated, the standard shall be background concentrations, Method Detection Limits (MDLs), or Alternate Concentration Limits (ACLs) established under MHWMR Rule 1.7 Part 264.94(b).

#### IV.E. HAZARDOUS CONSTITUENTS/CONCENTRATION LIMITS

The following hazardous constituents have been detected in the groundwater beneath the North Landfarm. All constituents shall be included in any groundwater quality analyses conducted during the compliance monitoring program as specified under MHWMR Rule 1.7 Part 264.99. The Permittee shall implement a compliance monitoring program to ensure that the North Landfarm is in compliance with the groundwater protection standard:

North Landfarm		
Constituent	Concentration Limit (mg/L)	Basis
Barium (total)	2	ACL
Benzene	0.3	ACL
Beryllium	0.07	ACL
Chromium (total)	0.38	ACL
Lead (total)	0.042	ACL
Toluene	0.043	ACL

#### IV.F. POINT OF COMPLIANCE

The point of compliance is represented by a vertical surface located at the hydraulically downgradient limit of the waste management area the extends down into the uppermost aquifer underlying the unit.

#### IV.G. COMPLIANCE PERIOD

The compliance period during which the groundwater protection standard applies shall extend throughout the effective date of this permit unless modified as described in MHWMR Rule 1.7 Part 264.96(c).

#### IV.H. GROUNDWATER MONITORING REQUIREMENTS

The Permittee shall monitor the quality of the groundwater across the compliance point as specified below as required by MHWMR Rule 1.7 Part 264.99:

<b>Wells</b>	<b>Parameters</b>	<b>Sampling Frequency</b>
All designated compliance point wells	All MHWMR Rule 1.7 Part 264 Appendix IX Parameters*	One well to be sampled each year on a rotating basis
All designated compliance point and background wells	The groundwater protection parameters specified in Condition IV.E.	Four samples from each well to be collected annually

\*Based on past sampling history and the fact that pesticides and herbicides were not produced at the facility, they may be excluded from the Appendix IX parameter list for testing.

#### IV.I. SAMPLING AND ANALYSIS PROCEDURES

The Permittee shall use the following techniques and procedures when obtaining and analyzing samples from the groundwater monitoring wells indicated in Condition IV.H.:

- IV.I.1. Prior to collecting groundwater samples from any monitoring well, the Permittee shall measure the water level in each well, calculate the volume of water in the well, and purge the water per the procedures specified in the Groundwater Monitoring Plan, Attachment E.
- IV.I.2. The Permittee shall collect and preserve all groundwater samples in accordance with the procedures specified in the Groundwater Monitoring Plan.
- IV.I.3. Groundwater samples shall be tracked and controlled using the sample identification and chain-of-custody procedures specified in the Groundwater Monitoring Plan.
- IV.I.4. The Permittee shall analyze all ground water samples in accordance with the procedures specified in the Groundwater Monitoring Plan.



IV.I.5 Appropriate QA/QC measures (field, trip, and equipment blanks and duplicate samples) will be utilized per the Groundwater Monitoring Plan.

IV.I.6. Total well depth shall be measured in accordance with the procedures specified in the Groundwater Monitoring Plan.

#### IV.J. GROUNDWATER SURFACE ELEVATION

The permittee shall determine the elevation of the groundwater surface to the nearest 0.01 foot at each well each time the groundwater is sampled, in accordance with Condition IV.I.1.

#### IV.K. STATISTICAL PROCEDURES

When evaluating monitoring results pursuant to Condition IV.L., the Permittee shall use the statistical procedures described in the Groundwater Monitoring Plan, Attachment E

#### IV.L. MONITORING PROGRAM AND DATA EVALUATION

The Permittee shall establish and implement a groundwater compliance monitoring program to determine whether the regulated unit is in compliance with the groundwater protection standard in Condition IV.D. The Permittee shall determine groundwater quality as follows:

IV.L.1. The Permittee shall collect, preserve, track, and analyze samples in accordance with Condition IV.I.

IV.L.2. The Permittee shall determine the concentrations of the hazardous constituents specified in Condition IV.E. in the groundwater at each monitoring well at the compliance point throughout the compliance period. This determination shall be annual.

IV.L.3. The Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer at least annually.

IV.L.4. The Permittee shall statistically compare the measured concentration of each monitored hazardous constituent with its concentration limit in the groundwater protection standard of Condition IV.E. each time groundwater quality is determined. The permittee must compare the groundwater quality measured at each compliance point monitoring well in accordance with the procedures specified in Condition IV.K.

IV.L.5. The analytical method and the method detection limit (MDL) for each constituent must be integrated in all reports of analysis.

#### IV.M. RECORDKEEPING AND REPORTING

IV.M.1. The Permittee shall enter all monitoring, testing, and analytical data obtained in the operating record as required by MHWMR Rule 1.7 Part 264.73(b)(6). The data must include all computations, calculated means, variances, and results of the statistical analyses specified in Condition IV.K.

IV.M.2 By March 1 of each year, the Permittee shall submit to the Executive Director a report containing the analytical results and statistical analysis for all groundwater monitoring data. The permittee shall maintain copies of lab reports and data validation information and make that information available upon request.

IV.M.3. If the Permittee determines pursuant to Condition IV.L.4. that there is statistically significant evidence of increased contamination beyond the concentration limit for a constituent specified in Condition IV.E., the Permittee shall:

IV.M.3.a Notify the Executive Director of this finding in writing within seven (7) days. The notification must indicate what concentration limits have been exceeded.

IV.M.3.b. Submit to the Executive Director an application for a permit modification to establish a corrective action program meeting the requirements of MHWMR Rule 1.7 Part 264.100 within 180 days. This application must at a minimum include the following information:

- i. A detailed description of corrective actions that will achieve compliance with the groundwater protection standard specified in Condition IV.E.
- ii. A plan for a groundwater monitoring program that will demonstrate the effectiveness of the corrective action. Such a groundwater monitoring program may be based on the compliance monitoring program outlined in this module.

IV.M.3.c If, pursuant to Condition IV.L.4, it is determined that the groundwater concentration limits under Condition IV.E. are being exceeded at any monitoring well at the point of compliance, the Permittee may demonstrate that a source other than a regulated unit caused the contamination, or that the detection was caused by an error in sampling, analysis, or statistical evaluation; or a natural variation in the groundwater. In making such a demonstration, the Permittee must:

- i. Notify the Executive Director in writing within seven (7) days that he intends to make the demonstration;

- ii. Within ninety (90) days, submit a report to the Executive Director which demonstrates that the apparent noncompliance resulted from one or more of the aforementioned reasons;
- iii. Within ninety (90) days, submit to the Executive Director an application for a permit modification to make any appropriate changes to the compliance monitoring program at the facility, and;
- iv. Continue to monitor in accord with the compliance monitoring program established under this Module.

IV.M.4. If the Permittee finds MHWMR Rule 1.7 Part 264 Appendix IX constituents in the groundwater that are not already identified in Condition IV.E., the Permittee must:

- IV.M.4.a. Resample any affected well within thirty (30) days and repeat the MHWMR Rule 1.7 Part 264 Appendix IX analysis. If the second analysis confirms the presence of new constituents, the Permittee must report the concentration of these additional constituents to the Executive Director within seven (7) days after completion of the second analysis and add them to the monitoring list contained in Condition IV.E.; or
- IV.M.4.b Report the concentrations of any additional constituents found to the Executive Director within seven (7) days after completion of the initial analysis and add them to the monitoring list contained in Condition IV.E., and
- IV.M.4.c. Submit to the Executive Director an application for a permit modification to establish a corrective action program meeting the requirements of MHWMR Rule 1.7 Part 264.100 within 100 days, or
- IV.M.4.d. Within ninety (90) days submit to the Executive Director a petition to establish Alternate Concentration Limits (ACLs) for those additional constituents identified into the groundwater protection standard as outlined by the monitoring list contained in Condition IV.E. of this permit.

#### IV.N. MODIFICATION

If the Permittee determines that the compliance program no longer satisfies the requirements of this Module, he must, within ninety (90) days, submit an application for a permit modification to make any appropriate changes to the program.

## **MODULE V - WASTE MINIMIZATION**

### **V. APPLICABILITY**

Not applicable to a closed land treatment unit.

## **MODULE VI - LAND DISPOSAL RESTRICTIONS**

### **VI.A. GENERAL RESTRICTIONS**

MHWMR Rule 1.15 Part 268 identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances which an otherwise prohibited waste may continue to be placed on or in a land treatment, storage or disposal unit. The Permittee shall maintain compliance with the requirements of MHWMR Rule 1.15 Part 268. Where the Permittee has applied for an extension, waiver or variance under MHWMR Rule 1.15 Part 268, the Permittee shall comply with all restrictions on land disposal under this Module once the effective date for the waste has been reached pending final approval of such application.

### **VI.B. LAND DISPOSAL PROHIBITIONS AND TREATMENT STANDARDS**

- VI.B.1. A restricted waste identified in MHWMR Rule 1.15 Part 268 Subpart C may not be placed in a land disposal unit without further treatment unless the requirements of MHWMR Rule 1.15 Part 268 Subparts C and/or D are met.
- VI.B.2. The storage of hazardous wastes restricted from land disposal under MHWMR Rule 1.15 Part 268 is prohibited unless the requirements of MHWMR Rule 1.15 Part 268 Subpart E are met.

## **MODULE VII - ORGANIC AIR EMISSION REQUIREMENTS**

### **VII.A. GENERAL INTRODUCTION**

In the June 21, 1990, Federal Register, EPA published the final rule for Phase I Organic Air Emission Standards (40 CFR Parts 264 and 265, Subparts AA and BB) for hazardous waste treatment, storage, and disposal facilities. Phase II Organic Air Emission Standards (40 CFR Parts 264 and 265, Subpart CC) was published in the Federal Register on December 6, 1994. The State of Mississippi adopted Subparts AA and BB in September 1990 and Subpart CC in December 2000. Subpart AA contains emission standards for process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, and air or steam stripping operations that process hazardous waste with an annual average total organic concentration of at least ten (10) parts per million (ppm) by weight. Subpart BB contains emission standards that address leaks from specific equipment (i.e. pumps, valves, compressors, etc.) that contains or contacts hazardous waste that has an organic concentration of at least ten (10) percent by weight. Subpart CC contains emissions standards for tanks, surface impoundments, or containers for which all hazardous waste entering a unit has an average volatile organic concentration at the point of waste origination of less than 500 parts per million (ppm) by weight.

### **VII.B. ORGANIC AIR EMISSION STANDARDS**

Prior to constructing any equipment with process vents subject to the requirements of MHWMR Rule 1.7 Part 264, Subpart AA, or installing any additional equipment subject to the requirements of MHWMR Rule 1.7 Part 264, Subpart BB, or installing any tanks, surface impoundments, and containers subject to the requirements of MHWMR Rule 1.7 Part 264, Subpart CC, the Permittee shall supply the specific Part B information required pursuant to MHWMR Rule 1.16 Part 270.24, Part 270.25, and Part 270.27, as applicable.

## MODULE VIII – RCRA CORRECTIVE ACTION

The Permittee is subject to the requirements of the RCRA Corrective Action Program. The United States Environmental Protection Agency (USEPA) has authority to implement the RCRA Corrective Action Program under the Hazardous and Solid Waste Amendments (HSWA of 1984, PL 98-616). The Corrective Action requirements at the facility are being implemented under the most recent HSWA permit issued by USEPA.

The East Landfarm is a closed waste treatment area that was constructed in 1981 to treat oil bearing refinery waste. The East Landfarm stopped receiving wastes in 1988, marking the commencement of closure. Closure was accomplished in accordance with an approved closure plan by natural biodegradation of the organic waste residues, stabilization of the inorganic treatment residues and cover placement (topsoil placed above a clayey soil layer). In a letter dated January 28, 1992, the MDEQ acknowledged closure of the East Landfarm has been completed as per the approved closure plan, and Post-Closure requirements must be adhered to. The landfarm is currently maintained by cutting grass and general maintenance. Groundwater monitoring is ongoing.

The East Landfarm is located on the East Hill, a Solid Waste Management Area (SWMA) comprised of former landfills. The Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) listed below make up the East Hill SWMA.

<b>SWMU / AOC No.</b>	<b>SWMU / AOC Name</b>
SWMU 1	Landfill A
SWMU 2	Landfill B
SWMU 3	Landfill C
SWMU 4	Landfill D
SWMU 16	Tetraethyl lead (TEL) Weathering Area
SWMU 25	Waste Container Storage Area
SWMU 26	East Catalyst Pad
SWMU 29	East Landfarm
SWMU 60	Fire Training Area
AOC 72	Landfill Underneath the TEL Weathering Area
AOC 82	Landfill Underneath the East Landfarm/East Catalyst Pad

The East Landfarm was closed, and post-closure care of the unit continued throughout the effective period of the facility's Hazardous Waste Management Permit (Permit No. HW054179403; EPA I.D. No. MSD054179403).


Because the now clean-closed East Catalyst Pad and East Landfarm were built on top of AOC 82 and are adjacent to SWMUs 1 through 4, SWMU 60 and AOC 72, it is difficult to determine the individual source of variations in the groundwater constituents or concentrations due to the multiple potential sources. For that reason, the East Landfarm is being managed and regulated under EPA's HSWA Corrective Action Program. The concurrent renewal in 2021 of both the

Hazardous Waste Management Permit and the HSWA permit is considered the mechanism that memorialized the transfer of the East Landfarm care to continue under the Corrective Action Program.



# **ATTACHMENT A**

## **RCRA Hazardous Waste Part A Permit Application**

<b>SEND COMPLETED FORM TO:</b> The Appropriate State or Regional Office.	<b>United States Environmental Protection Agency</b> <b>RCRA SUBTITLE C SITE IDENTIFICATION FORM</b>		
<b>1. Reason for Submittal</b>  MARK ALL BOX(ES) THAT APPLY	<b>Reason for Submittal:</b> <input type="checkbox"/> To provide an Initial Notification (first time submitting site identification information / to obtain an EPA ID number for this location) <input checked="" type="checkbox"/> To provide a Subsequent Notification (to update site identification information for this location) <input type="checkbox"/> As a component of a First RCRA Hazardous Waste Part A Permit Application <input checked="" type="checkbox"/> As a component of a Revised RCRA Hazardous Waste Part A Permit Application (Amendment # _____) <input type="checkbox"/> As a component of the Hazardous Waste Report (If marked, see sub-bullet below) <input type="checkbox"/> Site was a TSD facility and/or generator of >1,000 kg of hazardous waste, >1 kg of acute hazardous waste, or >100 kg of acute hazardous waste spill cleanup in one or more months of the report year (or State equivalent LQG regulations)		
<b>2. Site EPA ID Number</b>	EPA ID Number <span style="border: 1px solid black; padding: 0 2px;">M</span> <span style="border: 1px solid black; padding: 0 2px;">S</span> <span style="border: 1px solid black; padding: 0 2px;">D</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">5</span> <span style="border: 1px solid black; padding: 0 2px;">4</span> <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;">7</span> <span style="border: 1px solid black; padding: 0 2px;">9</span> <span style="border: 1px solid black; padding: 0 2px;">4</span> <span style="border: 1px solid black; padding: 0 2px;">0</span> <span style="border: 1px solid black; padding: 0 2px;">3</span>		
<b>3. Site Name</b>	Name: Chevron Pascagoula Refinery		
<b>4. Site Location Information</b>	Street Address: 250 Industrial Road		
	City, Town, or Village: Pascagoula		County: Jackson
	State: MS	Country: USA	Zip Code: 39581
<b>5. Site Land Type</b>	<input checked="" type="checkbox"/> Private <input type="checkbox"/> County <input type="checkbox"/> District <input type="checkbox"/> Federal <input type="checkbox"/> Tribal <input type="checkbox"/> Municipal <input type="checkbox"/> State <input type="checkbox"/> Other		
<b>6. NAICS Code(s) for the Site (at least 6-digit codes)</b>	A. <span style="border: 1px solid black; padding: 0 2px;">3</span> <span style="border: 1px solid black; padding: 0 2px;">2</span> <span style="border: 1px solid black; padding: 0 2px;">4</span> <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;"> </span>		C. <span style="border: 1px solid black; padding: 0 2px;">3</span> <span style="border: 1px solid black; padding: 0 2px;">2</span> <span style="border: 1px solid black; padding: 0 2px;">5</span> <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;"> </span>
	B. <span style="border: 1px solid black; padding: 0 2px;">3</span> <span style="border: 1px solid black; padding: 0 2px;">2</span> <span style="border: 1px solid black; padding: 0 2px;">5</span> <span style="border: 1px solid black; padding: 0 2px;">3</span> <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;">1</span>		D. <span style="border: 1px solid black; padding: 0 2px;">3</span> <span style="border: 1px solid black; padding: 0 2px;">2</span> <span style="border: 1px solid black; padding: 0 2px;">5</span> <span style="border: 1px solid black; padding: 0 2px;">1</span> <span style="border: 1px solid black; padding: 0 2px;">8</span> <span style="border: 1px solid black; padding: 0 2px;">0</span>
<b>7. Site Mailing Address</b>	Street or P.O. Box: PO Box 1300		
	City, Town, or Village: Pascagoula		
	State: MS	Country: USA	Zip Code: 39568
<b>8. Site Contact Person</b>	First Name: DeJamian		MI: D    Last: Wells
	Title: Environmental Specialist		
	Street or P.O. Box: 250 Industrial Road		
	City, Town or Village: Pascagoula		
	State: MS	Country: USA	Zip Code: 39581
	Email: <a href="mailto:DejamianWells@chevron.com">DejamianWells@chevron.com</a>		
	Phone: (228) 934-7492	Ext.:	Fax:
<b>9. Legal Owner and Operator of the Site</b>	A. Name of Site's Legal Owner: Chevron Corporation		Date Became Owner: 10/30/1963
	Owner Type: <input checked="" type="checkbox"/> Private <input type="checkbox"/> County <input type="checkbox"/> District <input type="checkbox"/> Federal <input type="checkbox"/> Tribal <input type="checkbox"/> Municipal <input type="checkbox"/> State <input type="checkbox"/> Other		
	Street or P.O. Box: 6001 Bollinger Canyon Road		
	City, Town, or Village: San Ramon		Phone: (925) 842-1000
	State: CA	Country: USA	Zip Code: 94583
	B. Name of Site's Operator: Chevron USA, Inc.		Date Became Operator: 10/30/1963
	Operator Type: <input checked="" type="checkbox"/> Private <input type="checkbox"/> County <input type="checkbox"/> District <input type="checkbox"/> Federal <input type="checkbox"/> Tribal <input type="checkbox"/> Municipal <input type="checkbox"/> State <input type="checkbox"/> Other		

**10. Type of Regulated Waste Activity (at your site)**

Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

**A. Hazardous Waste Activities; Complete all parts 1-10.**Y ☒ N ☐**1. Generator of Hazardous Waste**

If "Yes," mark only one of the following – a, b, or c.

- ☒ a. LQG: Generates, in any calendar month, 1,000 kg/mo (2,200 lbs/mo.) or more of hazardous waste; or Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lbs/mo) of acute hazardous waste; or Generates, in any calendar month, or accumulates at any time, more than 100 kg/mo (220 lbs/mo) of acute hazardous spill cleanup material.

- ☐ b. SQG: 100 to 1,000 kg/mo (220 – 2,200 lbs/mo) of non-acute hazardous waste.

- ☐ c. CESQG: Less than 100 kg/mo (220 lbs/mo) of non-acute hazardous waste.

If "Yes" above, indicate other generator activities in 2-10.

Y ☐ N ☐

- 2. Short-Term Generator** (generate from a short-term or one-time event and not from on-going processes). If "Yes," provide an explanation in the Comments section.

Y ☐ N ☐

- 3. United States Importer of Hazardous Waste**

Y ☐ N ☐

- 4. Mixed Waste (hazardous and radioactive) Generator**

Y ☐ N ☒**5. Transporter of Hazardous Waste**

If "Yes," mark all that apply.

- ☐ a. Transporter  
☐ b. Transfer Facility (at your site)

Y ☒ N ☐

- 6. Treater, Storer, or Disposer of Hazardous Waste** Note: A hazardous waste Part B permit is required for these activities.

Y ☐ N ☒

- 7. Recycler of Hazardous Waste**

Y ☐ N ☒

- 8. Exempt Boiler and/or Industrial Furnace** If "Yes," mark all that apply.

- ☐ a. Small Quantity On-site Burner Exemption  
☐ b. Smelting, Melting, and Refining Furnace Exemption

Y ☐ N ☒

- 9. Underground Injection Control**

Y ☐ N ☒

- 10. Receives Hazardous Waste from Off-site**

**B. Universal Waste Activities; Complete all parts 1-2.**Y ☒ N ☐

- 1. Large Quantity Handler of Universal Waste** (you accumulate 5,000 kg or more) [refer to your State regulations to determine what is regulated]. Indicate types of universal waste managed at your site. If "Yes," mark all that apply.

- a. Batteries ☒  
b. Pesticides ☐  
c. Mercury containing equipment ☐  
d. Lamps ☒  
e. Other (specify) \_\_\_\_\_ ☐  
f. Other (specify) \_\_\_\_\_ ☐  
g. Other (specify) \_\_\_\_\_ ☐

Y ☐ N ☒

- 2. Destination Facility for Universal Waste**

Note: A hazardous waste permit may be required for this activity.

**C. Used Oil Activities; Complete all parts 1-4.**Y ☐ N ☒

- 1. Used Oil Transporter** If "Yes," mark all that apply.

- ☐ a. Transporter  
☐ b. Transfer Facility (at your site)

Y ☐ N ☒

- 2. Used Oil Processor and/or Re-refiner** If "Yes," mark all that apply.

- ☐ a. Processor  
☐ b. Re-refiner

Y ☐ N ☒

- 3. Off-Specification Used Oil Burner**

Y ☐ N ☒

- 4. Used Oil Fuel Marketer** If "Yes," mark all that apply.

- ☐ a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner  
☐ b. Marketer Who First Claims the Used Oil Meets the Specifications

**D. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR Part 262 Subpart K**

❖ You can ONLY Opt into Subpart K if:

- you are at least one of the following: a college or university; a teaching hospital that is owned by or has a formal affiliation agreement with a college or university; or a non-profit research institute that is owned by or has a formal affiliation agreement with a college or university; AND
- you have checked with your State to determine if 40 CFR Part 262 Subpart K is effective in your state

Y ☐ N ☐ 1. Opting into or currently operating under 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories  
See the item-by-item instructions for definitions of types of eligible academic entities. Mark all that apply:☐ a. College or University☐ b. Teaching Hospital that is owned by or has a formal written affiliation agreement with a college or university☐ c. Non-profit Institute that is owned by or has a formal written affiliation agreement with a college or universityY ☐ N ☐ 2. Withdrawing from 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories**11. Description of Hazardous Waste****A. Waste Codes for Federally Regulated Hazardous Wastes.** Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g., D001, D003, F007, U112). Use an additional page if more spaces are needed.

D001	D002	D003	D004	D005	D006	D007
D008	D009	D010	D011	D018	D019	D021
D022	D023	D024	D025	D026		D028
D035	D036	D037	D038	D039	D040	F001
F002	F003		F005	F037	F038	K048
K049	K050	K051	K052	K169	K170	K171
K172	P012	P014	P018	P022	P030	P048
P054	P098	P105	P110	P119	P120	U002
U007	U012	U019	U031	U044	U051	U052

**B. Waste Codes for State-Regulated (i.e., non-Federal) Hazardous Wastes.** Please list the waste codes of the State-Regulated hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.



**12. Notification of Hazardous Secondary Material (HSM) Activity**

Y ☐ N ☒ Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 261.2(a)(2)(ii), 40 CFR 261.4(a)(23), (24), or (26)?

If "Yes," you must fill out the Addendum to the Site Identification Form: Notification for Managing Hazardous Secondary Material.

**13. Comments**

**14. Certification.** I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. For the RCRA Hazardous Waste Part A Permit Application, all owner(s) and operator(s) must sign (see 40 CFR 270.10(b) and 270.11).

Signature of legal owner, operator, or an authorized representative	Name and Official Title (type or print)	Date Signed (mm/dd/yyyy)
	Refinery General Manager	5/24/2016

# **ATTACHMENT B**

## **Facility Description/List of Figures**

## SECTION B. FACILITY DESCRIPTION

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### **B-1 GENERAL DESCRIPTION**

Chevron U.S.A. Inc. is the owner of the Pascagoula Refinery. The Refinery is operated by Chevron Pascagoula Refinery, a division of Chevron U.S.A. Inc. The Pascagoula Refinery is located in Jackson County's John C. Stennis - Bayou Casotte Industrial Park, which is adjacent to the City of Pascagoula, Mississippi. The street address is:

**Chevron Pascagoula Refinery  
250 Industrial Road  
Pascagoula, Mississippi 39581**

The mailing address is:

**Chevron Pascagoula Refinery  
P.O. Box 1300  
Pascagoula, Mississippi 39568-1300**

Petroleum refining facilities occupy approximately 1000 acres of Chevron's 3100 acre plot. The remaining undeveloped acreage contains tidal marshlands and pine woodlands. Process capacity of the Pascagoula Refinery is 351,000 barrels per day with operations including the manufacture of gasolines, distillate fuel oils, petroleum coke, residual fuel oils, alkylates, aromatic chemicals, base oils, liquefied petroleum gas, and jet fuel. Sulfur and anhydrous ammonia are also produced at this facility. Hazardous wastes are generated during the continuous refinery processing operations and during scheduled shutdowns of individual process units for routine maintenance.

Figure B-1 illustrates the boundaries of the Pascagoula Refinery property and the locations of the hazardous waste management facilities. Figures B-2 and B-3 illustrate topographic contours of hazardous waste management facilities and surrounding areas.

Chevron operated a miscellaneous storage/treatment unit (subpart X) identified as the East Catalyst Pad which provided on-site treatment for spent catalysts from refinery processes prior to commercial off-site recycling or disposal. The East Catalyst Pad consists of an upper concrete pad (159 ft x 164 ft. x 8 inches thick) underlain by a similar concrete pad. A leak detection/collection system is located between the upper and lower concrete pads. The lower concrete pad is underlain by a continuous high-density polyethylene (HDPE) membrane liner. The unit was covered by a free-standing shelter to reduce the potential for rainfall accumulation in the unit. However, a tornado struck the facility on October 22, 2017, and severely damaged the shelter structure, resulting in no protection from rainfall. Consequently, Chevron has ceased using the unit for treatment of hazardous waste and plans to clean-close it.

In the event that clean closure of the East Catalyst Pad is not possible/practical, Chevron requests that all post closure activities be included in the HSWA permit to be issued by USEPA.

Chevron manages hazardous wastes in less-than-90 day storage units, which are managed in accordance with the requirements of 40 CFR parts 262 and 265, as applicable.

There are two land treatment units in post closure care at the refinery; the North Landfarm and the East Landfarm. Hazardous wastes applied to the landfarms during their active life were mainly oily wastes and sludges. These units are covered with a clay cap and soil cover that is graded, seeded, and routinely inspected and maintained. Chevron Pascagoula Refinery requests that the East Landfarm be moved to the corrective action program per 40 CFR 264.110 (c) (1) & (2) and covered in Section J of this application. Discussion of post closure care will concern both landfarms, although the activities at the North Landfarm only apply to the State issued permit, and activities at the East Landfarm are applicable to the EPA issued HSWA permit.

## **B-2 TOPOGRAPHIC MAP**

Figure B-1, provides the required topographic information and is taken from the 7.5 minute USGS topographic map for the area including the refinery and its surroundings.

### **B-2a General Requirements**

Figures B-2 through B-9 are facility maps providing information on the physical layout of the plant and surrounding area, including other regulatory information required to assure safe operation of the regulated units. The wind rose (Figure B-4) provides historical information on prevailing wind conditions.

### **B-2b Additional Information on the Topographic Map for Land Disposal Facilities**

Map requirements specific to the closed landfarm units and SWMUs are provided in Module E, including information on the site hydrogeology, location of the point of compliance, and location of monitoring wells. Module J contains maps with the location of all SWMUs.

## **B-3 FACILITY LOCATION INFORMATION**

### **B-3a Seismic Requirements**

Chevron Pascagoula Refinery is located in Mississippi, a political jurisdiction not identified in Appendix VI of MHWMR 264 and is therefore not subject to seismic design considerations.

### **B-3b Floodplain Standard**

Chevron Pascagoula Refinery is located within the 100-year flood plain as defined in the FEMA Flood Insurance Rate Map (FIRM) for the unincorporated areas of Jackson County, Mississippi, Community Panel Numbers 28059C059C0451G and 28059C059C0453G. The 100 year flood elevations for various locations in the refinery are shown in Figure B-5 and B-6.

### **B-3c Demonstration of Compliance**

The North Landfarm is located in Zone AE-16 (flood hazard zone for the 100-year return frequency flood), based on the FIRM. The regulated unit is located in a stillwater zone.



The unit has a peripheral dike system to provide protection from flood waters having an elevation of eleven and two-tenths (11.2) feet, NAVD. The Landfarm is totally enclosed by the dike, which provides protection from washout and inundation for smaller storm events. The North Landfarm is closed and capped with recompacted clay, topsoil and a permanent vegetative cover. There is no significant risk of washout of waste from the unit. The North Landfarm will be inspected after every major storm event for any potential erosion of the cover and cap system.

**B-3c(1)(a) Engineering Analysis, Demonstration of no Adverse Effects, and Plan and Schedule for Future Compliance**

Between 1976 and 1988, the landfarms received petroleum containing soils and sludges from the refinery to be treated by enhanced natural biologic degradation. Landfill applications ceased in 1988, but the refinery continued the biological treatment until the landfarms were capped in 1992. The landfarms were closed and capped with recompacted clay, topsoil, and a vegetative cover established in accordance with the EPA approved closure plan. No further action is required to protect from washout in the event of a major flood event.

The East Catalyst Pad is protected from washout by a surrounding berm/wall.

**B-4 TRAFFIC PATTERNS**

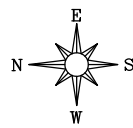
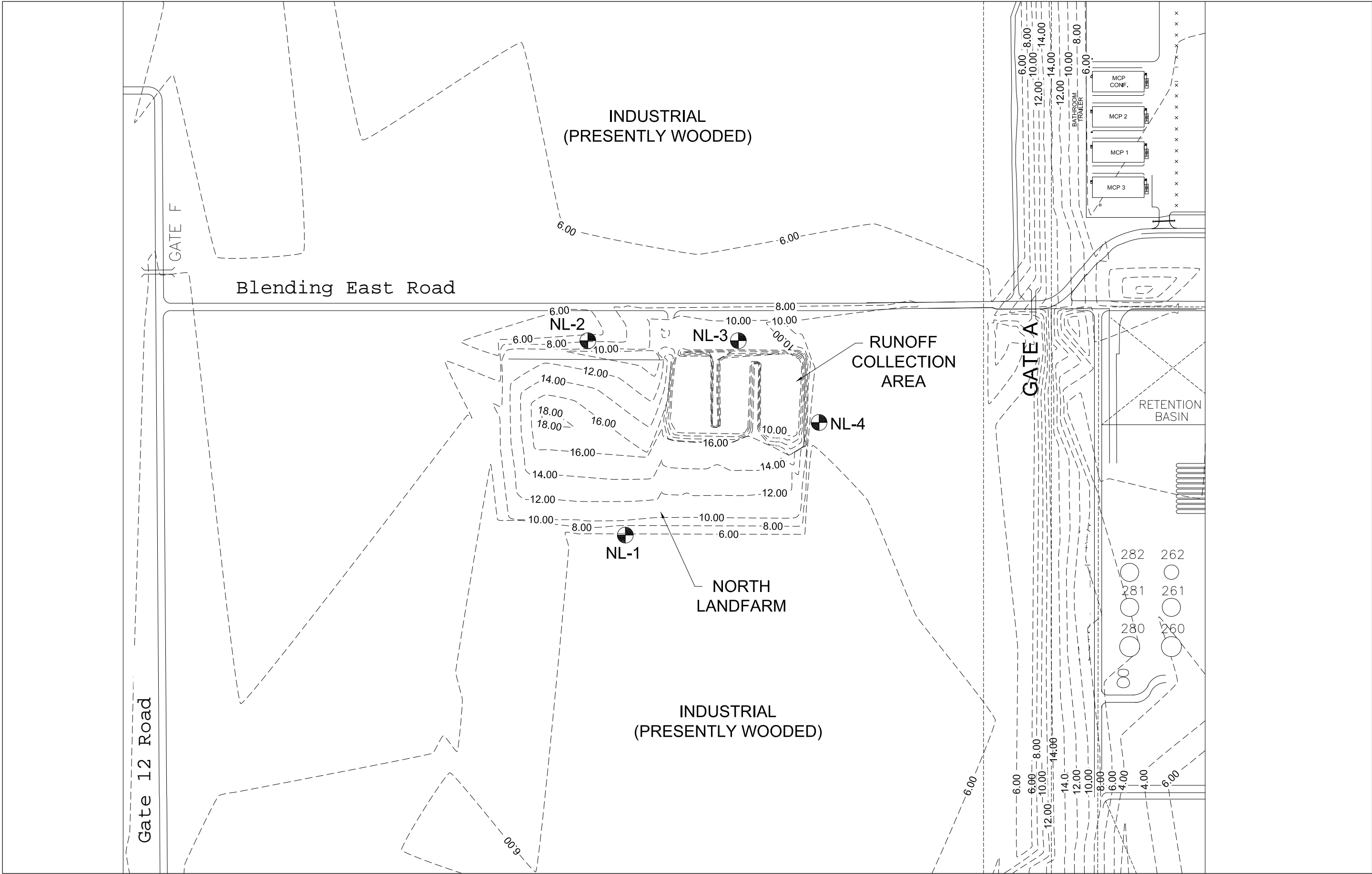
This section is not applicable, the facility no longer operates any active hazardous waste management units.

## Section B – Figures





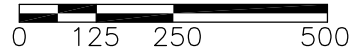




LEGEND

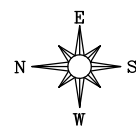
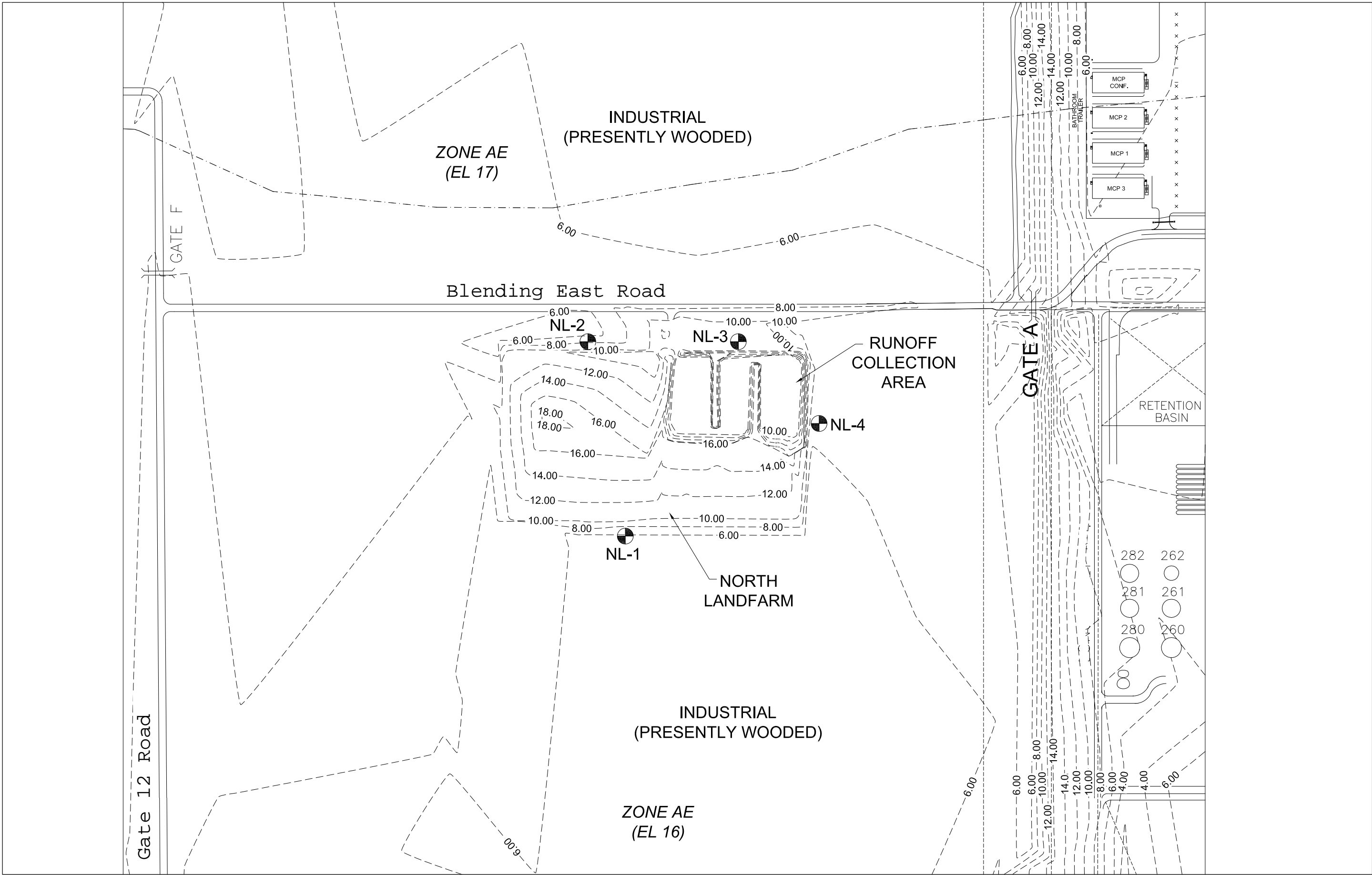


SCALE IN FEET





NORTH LANDFARM TOPOGRAPHIC MAP  
CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI  
PART B PERMIT RENEWAL APPLICATION

Figure B-2



REFERENCE MAPS:  
FLOOD INSURANCE RATE MAP, 28059C0451G, EFFECTIVE DATE MARCH 16, 2009.

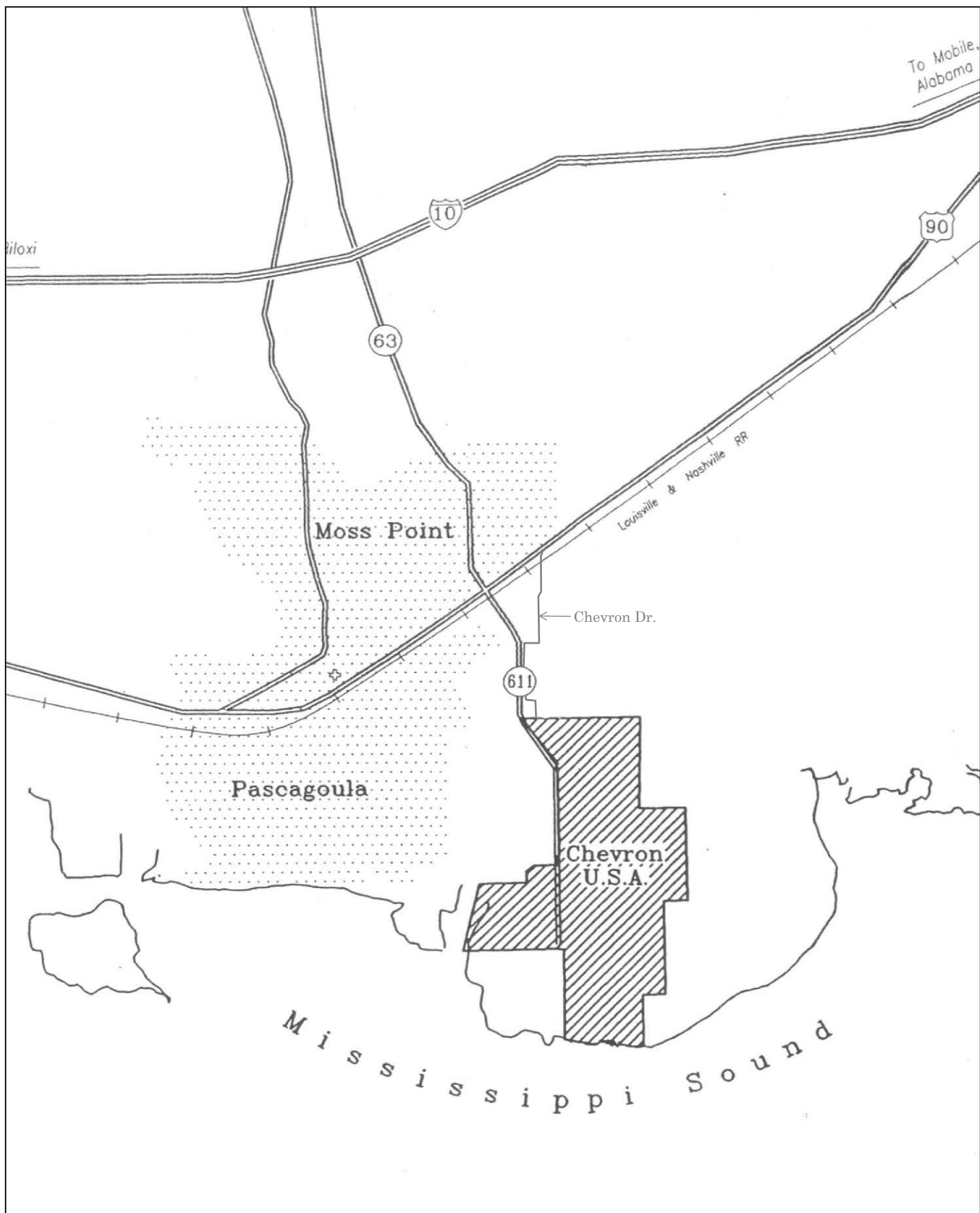
**LEGEND**

-  MONITORING WELL
-  DIVISION BETWEEN FEMA ZONES
- ZONE AE** FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD ZONE DESIGNATION



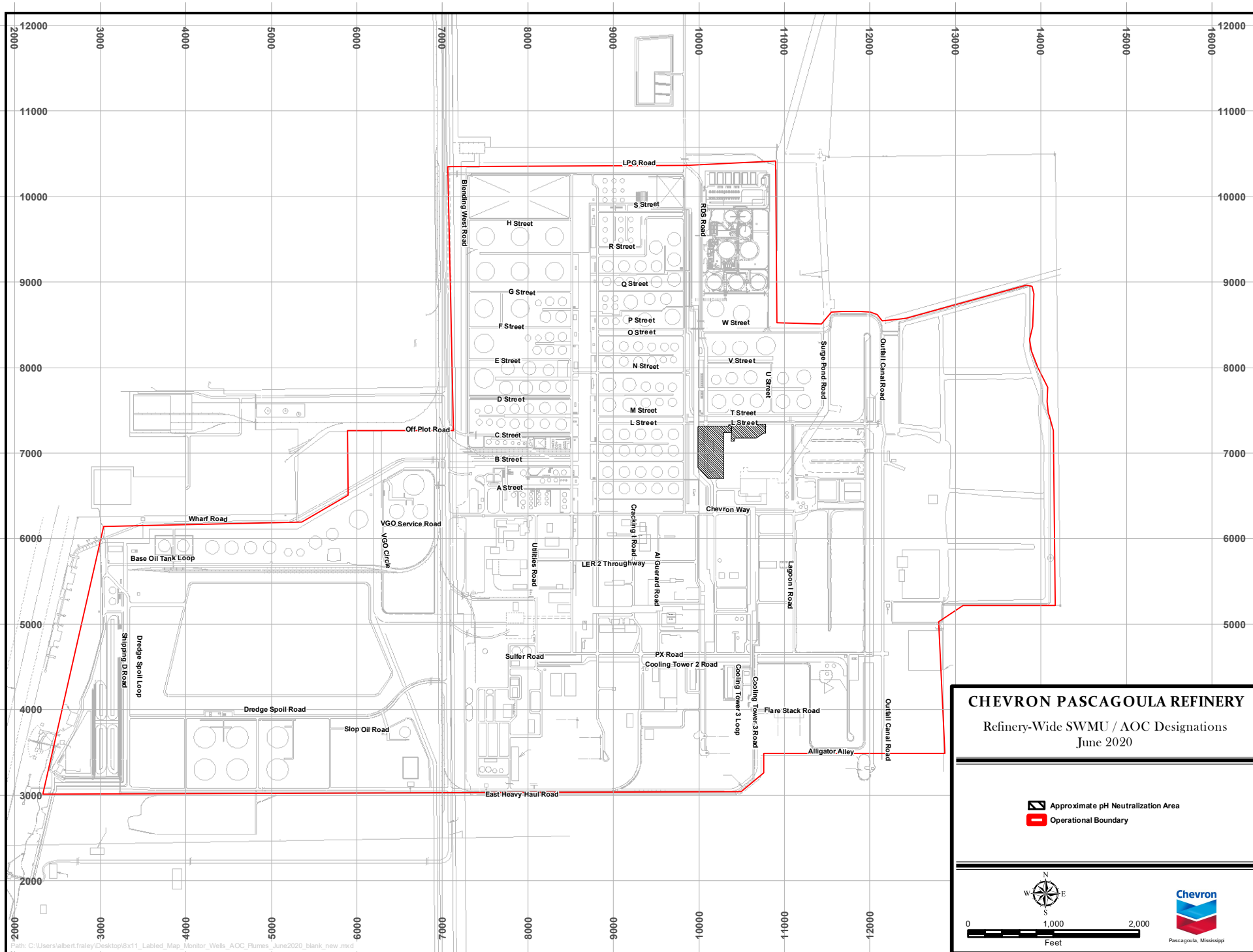
NORTH LANDFARM  
100-YEAR FLOODPLAIN MAP  
CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI  
PART B PERMIT RENEWAL APPLICATION

Figure B-5



**ACCESS ROADS TO REFINERY  
CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI  
PART B PERMIT RENEWAL APPLICATION**

Figure B-7



**CHEVRON PASCAGOULA REFINERY**

Refinery-Wide SWMU / AOC Designations

June 2020

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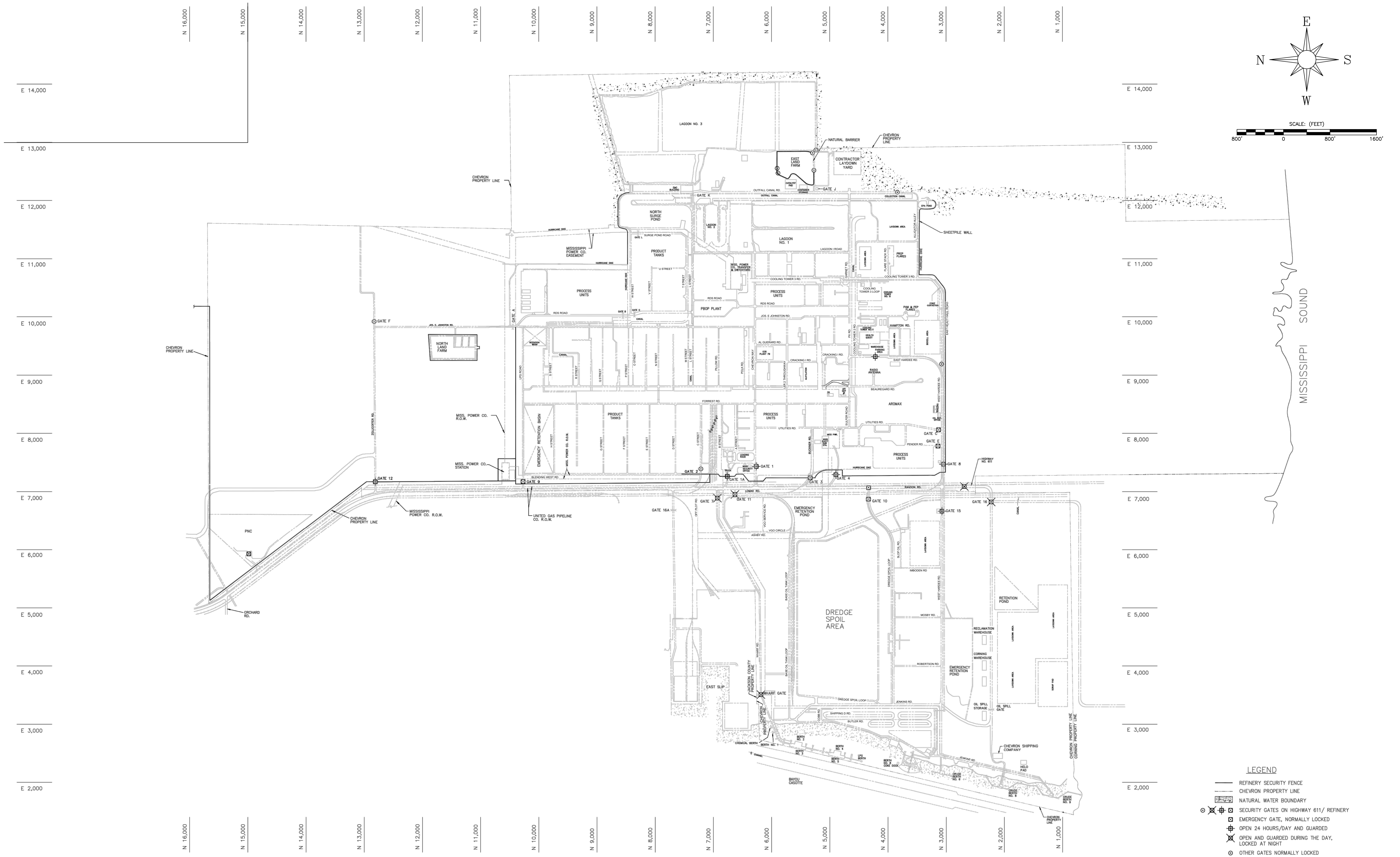
Approximate pH Neutralization Area  
 Operational Boundary

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Feet

Figure B-8



[illegible]



# **ATTACHMENT C**

## **Security and Inspection Schedule**

## **F-2 INSPECTION SCHEDULE**

Trained Chevron personnel conduct regular inspections of the facility and equipment. Attachment F -1 is a copy of the inspection schedule. The Pascagoula Refinery conducts regular inspections of the facilities as required by MHWMR 270.14(b)(5). The frequencies of these inspections have been generally weekly and after any storm event (1 inch or greater in 24 hours). Experience has shown that the closed landfarm does not require frequent inspections, since it is in a secure location and closed with a clay cap, topsoil and vegetated soil cover in place. Chevron is proposing that the landfarm will be inspected annually, and after a 24-hour, 25-year rainfall event (11 inches or greater). No further inspections of the catalyst pad will be conducted, since operation of the unit has ceased and wastes have been removed.

### **F-2a General Inspection Requirements**

Example landfarm inspection logs are included as Figure F-3. These inspections include review of general facility operation, as required by 264.15(a) and (b), as well as a review of items specific to landfarm (MHWMR 264.273(g)). Post-closure care requirements are also listed in MHWMR 264.280(c). Since the landfarms are in post closure, the inspections are targeted to checking the condition of the cover for sign of erosion, need for vegetation management on the cap, and inspecting run-on and run-off control structures and facilities.

The inspector indicates the status of items as acceptable or unacceptable on an inspection log. If the status of a particular item is unacceptable, complete information will be recorded on the inspection log. Repairs will be completed promptly and if necessary remedial action taken, as detailed in Section F-2a(3). The date and nature of repairs or remedial action will be documented in the inspection log. Training for inspection personnel includes a review of problem types, decision criteria for determining deterioration, locations of deterioration and appropriate follow-up actions if an inspected item is unacceptable.

#### **F-2a(1) Types of Problems**

Since the landfarms are in post-closure care, inspections are focused on the integrity of the cap and drainage structures. Mowing of the vegetative cover on the landfarms prevents growth of large plants that might disturb/penetrate the clay cap s on these units. Any significant erosion observed in the landfarm cover is repaired by filling with soil.

#### **F-2a(2) Frequency of Inspections**

Also provided in Attachment F-1 is the frequency of inspection for each item. This inspection frequency is based on the rate of possible deterioration of equipment and the probability of an environmental or human health incident if the deterioration, malfunction, or operator error goes undetected between inspections.

#### **F-2a(3) Schedule of Remedial Actions**

Work request to correct inspection deficiencies will be initiated within 24 hours of discovery. Weekly progress reports will be presented to the Environmental Operations Coordinator from the personnel responsible for completing the remedial actions. The Environmental Operations Coordinator will determine the frequency of the progress reports based on the potential to impact human health or the environment, expected time of completion and any other factors determined to be significant. Documentation will become part of the facility operating record. The date of correction/resolution of

any problem noted on an inspection log will be noted on that log sheet, along with a description of the corrective action taken.

#### **F-2a(4) Inspection Log**

For convenience and to assure compliance the Inspection Schedule and Inspection Log have been combined for each facility and are therefore referred to as the Inspection Schedule/Log. These are included as Attachment F-1.

#### **F-2b Specific Process Inspection Requirements**

Chevron will conduct the following inspections as required by federal and state regulations (see Attachment F-1). Each inspection will be documented in the facility's operating record.

##### **F-2b(7) Land Treatment Facility Inspection**

Chevron has a landfarm that has undergone closure and is now permitted for post closure care. The unit is inspected in accordance with the requirements found in Module I of this application.

##### **F-2b(7)(a) Runon and Runoff Control System**

Chevron has a landfarm that has undergone closure and is now permitted for post closure care. The runon and runoff controls are inspected in accordance with the requirements found in Module I of this application.

##### **F-2b(7)(b) Wind Dispersal Control System**

Chevron has a landfarm that has undergone closure and is now permitted for post closure care. The final cover has been installed on the units, therefore wind dispersal control is no longer applicable.

##### **F-2b(8) Miscellaneous Unit Inspections**

The East Catalyst pad is no longer in operation and wastes have been removed, therefore routine inspections are no longer needed.

#### **F-3 WAIVER OR DOCUMENTATION OF PREPAREDNESS AND PREVENTION REQUIREMENTS**

Chevron is not seeking a waiver of preparedness and prevention requirements.

##### **F-3a Equipment Requirements**

Chevron maintains a variety of emergency equipment including, but not necessarily limited to, internal communication devices, external communication devices, spill response equipment and firefighting equipment

Chevron employees have received training and participate in continuing education programs in the use and application of this equipment.

##### **F-3a(1) Internal Communication**

Internal communications systems utilized by Chevron include conventional telephones, cell phones,

hand-held, two-way radios and the plant-wide alarm system. Through the use of this equipment, all employees can be contacted or otherwise informed of actual or potential emergencies.

#### **F-3a(2) External Communication**

Chevron utilizes the telephone system for external communications. Additionally, cell phones and hand-held, two-way radios can be used as a backup to the phone system for communicating with local agencies.

#### **F-3a(3) Emergency Equipment**

Fire control equipment is located strategically throughout the Refinery. This equipment includes Types A, B, and C fire extinguishers, fixed fire monitors, and fixed foam applicators. The fire monitors receive water from an on-site fire water systems and the monitors can be quickly adapted for foam application.

Chevron maintains a supply of various types of spill control equipment. This equipment includes, but is not necessarily limited to, absorbent pigs, blankets and booms; application equipment such as brooms and shovels; and pumps. Arrangements are in place with local contractors in the event additional resources are required. Likewise, Chevron maintains a supply of equipment that would be used to decontaminate areas or structures impacted by a spill. This equipment includes personal protective equipment (PPE), high pressure water and steam. Safety showers and eyewashes are located at selected areas.

#### **F-3a(4) Water and Fire Control**

Water for fire control is provided through the Jackson County industrial water supply or the on-site fire water supply systems equipped with an auxiliary powered pump in the event of electrical power loss. The fire monitors are designed to be operated either in a water-only mode or with foam supply.

#### **F-3a(5) Testing and Maintenance of Equipment**

The communications system, alarm, fire control equipment, spill control equipment, and decontamination equipment are tested semi-annually in accordance with the schedule in Attachment F-1 and maintained as needed.

#### **F-3a(6) Access to Communication or Alarm System**

Personnel have access to a communication device with which they can access the alarm system, in the event of an incident which required activation of the alarm system, such as evidence of a fire.

#### **F-3b Aisle Space Requirement**

Not applicable.

#### **F-3c Documentation of Arrangements**

Not applicable for units in post closure.

#### **F-4 PREVENTION PROCEDURES, STRUCTURES AND EQUIPMENT**

##### **F-4a Unloading Procedures**

Wastes are not unloaded at the Refinery's land treatment facility since they are in post-closure.

##### **F-4b Runoff**

Where applicable, each of the Refinery's hazardous waste management facilities is equipped with run-off control structures to prevent potential contamination of the environment and to prevent flooding of the facilities. Run-off control systems are described in Module D of the Part B permit application. The closed landfarms include basins to collect and direct runoff to the refinery wastewater treatment system.

##### **F-4c Water Supplies**

There are no nearby sources of potable surface waters. All run-off from the Refinery's hazardous waste management facilities is routed to the NPDES - permitted wastewater system for treatment prior to discharge into the Mississippi Sound. Only de minimis losses are treated in this manner.

Run-off collection and control systems are described in Module D of this application.

##### **F-4d Equipment and Power Failure**

Power failure does not pose an immediate threat to the closed landfarm. Nevertheless, emergency generators are available if needed.

##### **F-4e Personnel Protection Procedures**

Personal protection equipment is readily available to all personnel involved in handling hazardous wastes at the Refinery. All such personnel are properly trained in its use. Examples of such equipment include rubber boots and gloves, coveralls, dust masks, self-contained breathing equipment, Hi-Glo and Acidmaster suits, and other materials and supplies.

##### **F-4f Procedures to Minimize Releases to the Atmosphere**

The closed landfarms do not present a threat for a release to the atmosphere

#### **F-5 PREVENTION OF REACTION OF IGNITABLE, REACTIVE AND INCOMPATIBLE WASTE**

##### **F-5a Caution to Prevent Ignition or Reaction of Ignitable or Reactive Waste**

The closed landfarms do not present a hazard for ignition or reaction of ignitable or reactive waste

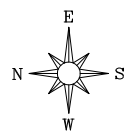
##### **F-5b General Precautions for Handling Ignitable or Reactive Waste and Mixing of Incompatible Waste**

The closed landfarms are not subject to any requirements related to incompatible wastes.

##### **F-5b(1) Documentation of Adequacy of Procedures**

Not applicable.

# Module F Figures



SCALE IN FEET  
0 750 1500 3000

SECURITY FENCE PLAN  
CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI  
PART B PERMIT RENEWAL APPLICATION

FIGURE F-1



TYPICAL WARNING SIGN  
CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI  
PART B PERMIT RENEWAL APPLICATION

Figure F-2



AREA/EQUIPMENT	TYPES OF PROBLEMS	FREQUENCY OF INSPECTION		CONDITION		COMMENTS CORRECTIVE ACTION TAKEN/DATE REPAIRED
		ANNUALLY	AFTER STORMS	ACCEPTABLE	UNACCEPTABLE	
<u>STORMWATER RUN-OFF CONTROL</u>	Evidence of erosion, subsidence, or loss of grass cover					
Surface (cap) condition						
Area Grade and Sloping	erosion, ponding, channeling					
Run-off Collection Ditches	sludge/debris accumulation					
Stormwater Collection Pond	sludge/debris accumulation					
<u>SECURITY AND SAFETY</u>						
Exterior Fence	corrosion, damage to chain link fence					
Gates and Locks	corrosion, damage, sticking locks					
Access Roads	potholes					
Warning Signs	damage or missing signs					
Lighting	burned out light, broken light shield					
Communications (two-way radio)	weak signal, no transmission, interference					

	NORTH LANDFARM INSPECTION SCHEDULE CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI PART B PERMIT RENEWAL APPLICATION
	Figure F-3

# **ATTACHMENT D**

## **Post-Closure Plan**

## **I-2 POST CLOSURE PLANS**

The refinery has two (2) land treatment units in post-closure care, the North Landfarm and East Landfarm. Treated waste residues, including those from several listed under MHWR 264, Subpart D, remained in place at the North and East Landfarms after closure. Both units were capped with a clay cap, topsoil and vegetation cover during closure. The East Landfarm is co-located with solid waste management units which are subject to RCRA corrective action. Post Closure care for the East Landfarm is moving to corrective action. The landfarm will be monitored and maintained per the corrective action program for the Pascagoula Refinery.

Post-closure care for the Landfarms will comprise inspection, monitoring, maintenance, and where applicable, operation of run-on and run-off controls, final covers and security systems. Groundwater monitoring will be conducted as described in Section E of the permit through the post-closure period.

Detailed descriptions of post-closure activities are provided in the following subsections of this part.

At least one (1) copy of the post-closure plans will be maintained at the Refinery through the post-closure period. The person responsible for maintaining and updating the plans as required will be the Manager, Safety, Environmental and Health, who may be reached at the following address:

Manager, Safety, Environmental and Health  
Chevron Pascagoula Refinery  
Post Office Box 1300  
Pascagoula, MS 39568-1300

By telephone, call (228) 938-4600. The Manager, Health, Environmental, Safety and Emergency will also be responsible for updating the plans, including pertinent copies requested by agencies, through the post-closure period.

### **I-2a Inspection Plan**

The landfarm units are inspected annually and after each 25 year; 24 hour storm event (approximately 11 inches) for erosion of the cap and vegetative control of the cover. The integrity of each groundwater monitoring well is also checked.

### **I-2b Monitoring Plan**

The current Groundwater Monitoring Program is designed to provide compliance monitoring at the Landfarms. The specific objectives of the compliance monitoring are to determine whether selected constituents are present in the groundwater, and, if detected, to evaluate the extent of these constituents, the rate of migration, and direction of flow in the shallow groundwater. The Monitoring Plan is described in detail in **Section E (Groundwater Monitoring)**.

### **I-2c Maintenance Plan**

Regular maintenance which will be required during post-closure care will consist of mowing on an “as-needed” basis to control weeds and brush and repair of the cap due to erosion of the cover. Soil

amendments such as lime or mineral fertilizers may be applied as required to maintain the grass cover.

#### **I-2d Land Treatment**

No food-chain crops will be grown during post-closure. The vegetative cover installed during closure was comprised of grasses adapted to the region. The only regular maintenance required during post-closure will be mowing on an “as-needed” basis to control weeds and brush and repair of the cap due to erosion of the cover. Soil amendments such as lime or mineral fertilizers may be applied as required to maintain the grass cover.

Run-on controls at the Landfarms are passive, comprising dikes and area grading to divert storm water away from it. These will remain in place through the post-closure period. Repairs will consist of placing clean fill into any rifts which may appear, followed by reseeding with a suitable grass mixture.

Run-off control is provided by area grading, perimeter dikes, and catch basins at the units. Collected storm water will gravity flow through drainage piping to the main wastewater management system after storms for monitoring and treatment prior to NPDES-permitted discharge. This system will remain in place and be operated as needed during post-closure.

Groundwater monitoring, however, will continue during post-closure as described in **Section E (Groundwater Monitoring)** of this application.

#### **I-2e Post-Closure Care for Miscellaneous Units**

The East Catalyst Pad, a permitted Miscellaneous Unit, has been closed and any post-closure care will be managed under the HSWA Corrective Action permit.

#### **I-2f Post-Closure Security**

In addition to the general security provisions of fencing, gates and guards; several other features contribute to the safety and security of the Refinery and on-site hazardous waste management facilities. Ample lighting is provided throughout the Refinery. Guards and Refinery operating personnel are equipped with hand-held, two-way radios for general communication and for immediate reporting of upset conditions. Radio frequencies licensed to the Refinery are used to minimize interference from outside transmitters. The Refinery's internal telephone system links the main gate guards with operations personnel. The same telephone system is used for communications outside the Refinery.

A computerized Smart Badge access system controls authorized personnel movement into and out of the Refinery. All visitors and contractors entering the Refinery must sign a daily log sheet and obtain appropriate passes.

In addition, identifying permits are issued to Refinery vehicles for access through the Refinery gates. All visitor and contractor vehicles are issued temporary gate permits by security. These permits must be clearly visible in the vehicle's windshield at all times.

All existing hazardous waste management facilities are located completely within the Pascagoula Refinery boundaries. The Refinery has a 24-hour surveillance system, which meets the requirements of

264.14(b)(1). The North Landfarm is totally enclosed with security fencing to keep any human or ecological receptors out of the area. Fences are inspected as part of the Inspection Plan.

### **I-2g Post-Closure Contact**

The Manager, Safety, Environmental and Health is responsible for maintaining and updating the post-closure plans. The Manager may be reached at the following address:

Manager, Safety, Environmental and Health  
Chevron Pascagoula Refinery  
Pascagoula Refinery  
Post Office Box 1300  
Pascagoula, MS 39568-1300

By telephone, call (601) 938-4600. The Manager, Safety, Environmental and Health will also be responsible for updating the plans, including pertinent copies requested by agencies, through the post-closure period.

## **I-3 NOTICES REQUIRED FOR DISPOSAL**

### **I-3a Certification of Closure**

Within sixty (60) days of completion of closure of each hazardous waste management unit and within sixty (60) days of final closure, closure certification was submitted to the Executive Director, Mississippi Department of Environmental Quality, Jackson, Mississippi. The certification stated that the hazardous waste management unit or facility has been closed in accordance with the specifications of the approved closure plan. The certification was signed by an authorized Chevron Pascagoula Refinery representative and by an independent Mississippi registered professional engineer.

### **I-3b Survey Plat**

Upon the certification of closure of each hazardous waste landfarm, Chevron submitted to the local zoning authority, and to the Regional Administrator, a survey plat indicating the location and dimensions of hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat was prepared and certified by a professional land surveyor. The plat filed with the local zoning authority contains a note, prominently displayed, which states the owner's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable subpart G regulations.

A survey plat is not required for the East Catalyst Pad.

### **I-3c Post-Closure Certification**

Within sixty (60) days of completion of the post-closure care period for each hazardous waste management unit, certification will be submitted to the Executive Director, MDEQ. The certification will state that the post-closure care for the hazardous waste management unit was performed in accordance with the specifications of the approved post-closure plan. The certification will be signed by an

authorized Chevron Pascagoula Refinery representative and by an independent Mississippi registered professional engineer.

#### **I-3d Post-Closure Notices**

Chevron Pascagoula Refinery has, in accordance with Mississippi State Law, recorded a notation on the deed or some other instrument which is normally examined during title search to any closed portion of disposal facility property that will in perpetuity notify any potential purchaser of such property that:

1. The land has been used to manage hazardous wastes;
2. Its use is restricted under MHWMR Subpart G; and
3. The survey plat and record of the types, locations, and quantities of hazardous wastes disposed within each closed portion of the facility required in MHWMR 264.116 and 264.119 (a) have been filed with the Jackson County Planning Commission and with the MDEQ.

This notice was placed in the deed as soon as possible after completion of the Notice to Local Land Authority described in **Section I-3b (Survey Plat)** above.

#### **I-4 CLOSURE COST ESTIMATE**

All hazardous waste management units have been closed and a closure cost estimate is not applicable.

#### **I-5 FINANCIAL ASSURANCE FOR CLOSURE**

All hazardous waste management units have been closed and financial assurance for closure is not applicable.

#### **I-6 POST-CLOSURE COST ESTIMATE**

The post-closure care cost estimates for the Landfarms are provided in Attachment I-1.

#### **I-7 FINANCIAL ASSURANCE MECHANISM FOR POST-CLOSURE CARE**

Chevron Pascagoula Refinery utilizes the Financial Test and Corporate Guarantee for financial assurance for post-closure care of the Landfarms. The financial assurance documentation for post-closure care of the Landfarms is provided in Attachment I-2.

#### **I-8 LIABILITY REQUIREMENTS**

Chevron Pascagoula Refinery utilizes the Financial Test and Corporate Guarantee for Liability Coverage, both sudden and non-sudden. The financial assurance documentation for the liability requirements associated with the hazardous waste management units is provided in Attachment I-2.

#### I-9 USE OF STATE REQUIRED MECHANISMS

Mississippi does not have separate state required financial mechanisms.

## **Attachment I-1**

### **Post Closure Cost Estimate**



**North Landfarm Post Closure Care  
Chevron Pascagoula Refinery**

<b>1. Preparation and Planning</b>					
<b>DIRECT LABOR</b>					<b>NOTES</b>
Principal	4	hours	\$143.17	\$572.68	Management of project controls and progress report.
Senior PM	8	hours	\$124.56	\$996.48	
Proj. Geologist (Task Manager)	16	hours	\$79.16	\$1,266.56	
Jr. Geologist	30	hours	\$65.33	\$1,959.90	
Field Technician	6	hours	\$70.64	\$423.84	
<b>Total Direct Labor</b>	<b>64</b>			<b>\$5,219.46</b>	
<b>TASK 1 TOTAL</b>				<b>\$5,219.46</b>	
<b>2. Annual Groundwater ACL/App IX Groundwater Sampling Event</b>					
<b>DIRECT LABOR</b>					<b>NOTES</b>
Proj. Geologist (Task Manager)	42	hours	\$79.16	\$3,324.72	Estimated 2.5 days for sampling plus 1 day contingency. 5 monitor wells for ACL sampling at North Landfarm. 2 monitor wells for Appendix IX parameters.
Field Technician	42	hours	\$70.64	\$2,966.88	
<b>Total Direct Labor</b>	<b>84</b>			<b>\$6,291.60</b>	
<b>EQUIPMENT AND MATERIALS</b>					
Tubing	500	feet	\$0.25	\$125.00	
Sample materials (water chemistry, etc.)	4	days	\$100.00	\$350.00	
Water Quality Meter	4	days	\$50.00	\$175.00	
Sampling Pump	4	days	\$50.00	\$175.00	
Water Level Meter	4	days	\$35.00	\$122.50	
Personnel Protective Equipment	4	days	\$20.00	\$70.00	
<b>Total Equipment and Materials</b>				<b>\$1,017.50</b>	
<b>TRAVEL</b>					
Days Subsistence/Pascagoula, MS	6	days	\$120.00	\$720.00	
Car Rental (includes fuel)	3	days	\$100.00	\$300.00	
<b>TOTAL TRAVEL</b>				<b>\$1,020.00</b>	
<b>LABORATORY ANALYSES</b>					
	32	samples		<b>\$9,802.00</b>	5 monitor wells sampled, 4 replicate sample per well plus QA/QC. Analysis for BTEX and metals.
	5	samples		<b>\$3,680.00</b>	2 monitor wells plus QA/QC for App. 9 VOCs, SVOCs, metals, PCBs, cyanide, dioxins and furans.
<b>TASK 2 TOTAL</b>				<b>\$21,811.10</b>	
<b>3. ACL and Appendix IX Reporting</b>					
<b>DIRECT LABOR</b>					<b>NOTES</b>
Principal	3	hours	\$143.17	\$429.51	Compile data sets, prepare tables, figures, appendices and narrative for RCRA report.
Senior PM	12	hours	\$124.56	\$1,494.72	
Proj. Geologist	60	hours	\$79.16	\$4,749.60	
Jr. Geologist	60	hours	\$65.33	\$3,919.80	
Senior Drafter	12	hours	\$81.22	\$974.64	
Project Support	16	hours	\$45.27	\$724.32	
<b>TOTAL DIRECT LABOR</b>	<b>163</b>			<b>\$12,292.59</b>	
<b>TASK 3 TOTAL</b>				<b>\$12,292.59</b>	
<b>4. Data Validation</b>					
<b>DIRECT LABOR</b>					<b>NOTES</b>
Senior Project Manager	3	hours	\$143.17	\$429.51	100% data validation for ACL and APP IX data sets.
Specialist Chemist	60	hours	\$99.53	\$5,971.80	
<b>TOTAL DIRECT LABOR</b>	<b>63</b>			<b>\$6,401.31</b>	
<b>TASK 4 TOTAL</b>				<b>\$6,401.31</b>	

**North Landfarm Post Closure Care  
Chevron Pascagoula Refinery**

**5. Landfarm Dike and Cover Maintenance**

<b>DIRECT LABOR</b>	<b>QUANTITY</b>	<b>UNITS</b>	<b>UNIT RATE</b>	<b>TOTAL</b>	<b>NOTES</b>
North Landfarm Mowing	20	events	\$2,030.00	\$40,600.00	8 acre area.
North Landfarm Dike and Cover Mainten	11	days	\$3,200.00	<u>\$35,200.00</u>	
<b>TASK 5 TOTAL</b>				<b>\$75,800.00</b>	

**North Landfarm Post Closure Care - Annual**

1. Preparation and Planning	\$5,219.46
2. Annual Groundwater ACL/App IX Groundwater Sampling Event	\$21,811.10
3. ACL and Appendix IX Reporting	\$12,292.59
4. Data Validation	\$6,401.31
5. Landfarm Dike and Cover Maintenance	<u>\$75,800.00</u>

**North Landfarm Annual Post Closure Care Cost** **\$121,524.46**

**Add 5 % Overhead** **\$6,076.22**

**Add 10 % Contingency** **\$12,152.45**

**TOTAL NORTH LANDFARM POST CLOSURE CARE ANNUAL COST** **\$139,753.13**



**Kathy Trujillo**  
Senior Financial Analyst – Finance, Planning & Performance

March 27, 2019

Gary C. Rickard, Executive Director  
Mississippi Department of Environmental Quality  
515 East Amite Street  
Jackson, MS 39201

**Re: Financial Assurance for Chevron U.S.A. Inc. – Pascagoula Refinery, MSD 054179403**

Dear Mr. Rickard:

Enclosed please find the following Chevron Corporation documents submitted on behalf of our subsidiary, Chevron U.S.A. Inc.:

- Chief Financial Officer's Letter dated March 22, 2019 with Attachments A and B
- Corporate Guarantee for Closure and Post-Closure Care
- Corporate Guarantee for Liability Coverage
- 2018 Chevron Form 10-K containing our Report of Independent Registered Public Accounting Firm
- Accountant's Special Report
- Bonding Rating information

Where applicable, the inflation factor of 1.024% was applied as of February 2019.

This document provides financial assurance for the following facilities:

MSD054179403  
Chevron U.S.A. Inc.  
Pascagoula Refinery  
P.O. Box 1300  
Pascagoula, MS 39567

Please feel free to contact me by phone or email if you have any questions.

Sincerely,

Kathy Trujillo

Enclosures

Executive Director  
Mississippi Department of Environmental Quality  
Re: Pascagoula Refinery MSD 054179403  
March 27, 2019  
Page 2

cc: Stephanie Ghisletta – Chevron Environmental Management Company  
Blake Hall – Chevron Environmental Management Company

By overnight delivery, with 10-K  
Mr. Steven Bailey  
Office of Pollution Control – Hazardous Waste Division  
Department of Environmental Quality  
515 East Amite Street  
Jackson, MS 39201



**Patricia E. Yarrington**  
Vice President and Chief Financial Officer

March 22, 2019

Gary C. Rikard, Executive Director  
Mississippi Department of Environmental Quality  
515 East Amite Street  
Jackson, MS 39201

**Re: Chevron U.S.A. Inc. - Pascagoula Refinery, MSD 054179403**

Dear Mr. Rikard:

I am the Chief Financial Officer of Chevron Corporation, 6001 Bollinger Canyon Road, San Ramon, California. This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure and/or post-closure care as specified in subpart H of 40 CFR parts 264 and 265.

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 subpart H of 40 CFR parts 264 and 265: Chevron Corporation does not own or operate any such facilities.

The firm identified above guarantees, through the guarantee specified in subpart H of 40 CFR parts 264 and 265, liability coverage for both sudden and nonsudden accidental occurrences at the following facilities owned or operated by the following: See Attachment B. The firm identified above is the direct or higher-tier parent corporation of the owner or operator. Chevron U.S.A. Inc. is a subsidiary of Chevron Corporation.

1. The firm identified above owns or operates the following facilities for which financial assurance for closure or post-closure care or liability coverage is demonstrated through the financial test specified in subpart H of 40 CFR parts 264 and 265. Chevron Corporation does not own or operate any such facilities. The current closure and/or post-closure cost estimates covered by the test are shown for each facility: None.
2. The firm identified above guarantees, through the guarantee specified in subpart H of 40 CFR parts 264 and 265, the closure and post-closure care or liability coverage of the following facilities owned or operated by the guaranteed party. See Attachments A and B. The current cost estimates for closure or post-closure care so guaranteed are shown for each facility: See Attachment A.
3. In States where EPA is not administering the financial requirements of subpart H of 40 CFR parts 264 and 265, this firm is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use of a test equivalent or substantially equivalent to the financial test specified in subpart H of 40 CFR parts 264 and 265. Chevron Corporation does not own or operate any such facilities. The current closure or post-closure cost estimates covered by such a test are shown for each facility: None.
4. The firm identified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated either to EPA or a State through the financial test or any other financial assurance mechanism specified in subpart H of 40 CFR parts 264 and 265 or equivalent or substantially equivalent State mechanisms. Chevron Corporation does not own or operate any such facilities. The current closure and/or post-closure 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 UIC facilities for which financial assurance for plugging and abandonment is required under part 144 and is assured through a financial test: None. The current closure cost estimates as required by 40 CFR 144.62 are shown for each facility: None.

This firm is required to file a Form 10-K 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, 2018.

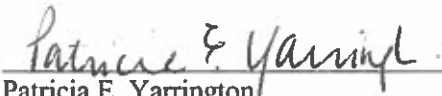
ALTERNATIVE II

1. Sum of current closure and post-closure cost estimates	\$ 611,126,281
2. Amount of annual aggregate liability coverage to be demonstrated	\$ 102,000,000
3. Sum of lines 1 and 2	\$ 713,126,281
4. Current bond rating of most recent issuance and name of rating service:	Aa2 Moody's Investor Services AA Standard and Poor's
5. Date of issuance of bond	\$4 billion issued on March 3, 2017
6. Date of maturity of bond	\$1 billion due February 28, 2019 (retired) \$1 billion due March 3, 2020 \$1 billion due March 3, 2022 \$1 billion due March 3, 2024
7. Tangible net worth*	\$ 150,907,000,000
8. Total assets in the U.S.*	\$ 71,560,000,000
9. Is line 7 at least \$10 million?	Yes
10. Is line 7 at least 6 times line 3?	Yes
11. Are at least 90% of the assets located in the U.S.? If not, complete line 12.*	No
12. Is line 8 at least 6 times line 3?	Yes

Gary C. Rikard, Executive Director  
Mississippi Department of Environmental Quality  
Re: Letter from Chief Financial Officer – Pascagoula Refinery  
March 22, 2019  
Page 3

I hereby certify that the wording of this letter is identical to the wording specified in 40 CFR 264.151(g) as such regulations were constituted on the date shown immediately below.

CHEVRON CORPORATION

  
\_\_\_\_\_  
Patricia E. Yarrington  
Vice President and Chief Financial Officer

March 22, 2019

## CORPORATE GUARANTEE FOR CLOSURE OR POST-CLOSURE CARE

Guarantee made this 22<sup>nd</sup> day of March, 2019, by CHEVRON CORPORATION, a business corporation organized under the laws of the State of Delaware, herein referred to as guarantor. This guarantee is made on behalf of Chevron U.S.A. Inc. ("CUSA") of 6001 Bollinger Canyon Road, San Ramon, California, which is our subsidiary, to the Mississippi Department of Environmental Quality ("DEQ").

### Recitals

1. Guarantor meets or exceeds the financial test criteria and agrees to comply with the reporting requirements for guarantors as specified in 40 CFR 264.143(f), 264.145(f), 265.143(e), and 265.145(e).

2. CUSA owns or operates the following hazardous waste management facility covered by this guarantee:

MSD 054179403  
Chevron U.S.A. Inc.  
Pascagoula Refinery  
P.O. Box 1300  
Pascagoula, MS 39567

For corrective action, closure and post closure care  
Estimated costs set forth on Attachment A

3. "Closure plans" and "post-closure plans" as used below refer to the plans maintained as required by subpart G of 40 CFR parts 264 and 265 for the closure and post-closure care of the facility as identified above.

4. For value received from CUSA, guarantor guarantees to DEQ that in the event that CUSA fails to perform closure and post-closure care of the above facility in accordance with the closure or post-closure plans and other permit or interim status requirements whenever required to do so, the guarantor shall do so or establish a trust fund as specified in subpart H of 40 CFR part 264 or 265, as applicable, in the name of CUSA, in the amount of the current closure or post-closure cost estimates as specified in subpart H of 40 CFR parts 264 and 265.

5. Guarantor agrees that if, at the end of any fiscal year before termination of this guarantee, the guarantor fails to meet the financial test criteria, guarantor shall send within 90 days, by certified mail, notice to the DEQ Executive Director and to CUSA that he intends to provide alternate financial assurance as specified in subpart H of 40 CFR part 264 or 265, as applicable, in the name of CUSA. Within 120 days after the end of such fiscal year, the guarantor shall establish such financial assurance unless CUSA has done so.

6. The guarantor agrees to notify the DEQ Executive Director, by certified mail, of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming guarantor as debtor, within 10 days after commencement of the proceeding.

7. Guarantor agrees that within 30 days after being notified by the DEQ Executive Director of a determination that guarantor no longer meets the financial test criteria or that he is disallowed from continuing as a guarantor of closure or post-closure care, he shall establish alternate financial assurance as specified in subpart H of 40 CFR part 264 or 265, as applicable, in the name of CUSA unless CUSA has done so.

8. Guarantor agrees to remain bound under this guarantee notwithstanding any or all of the following: amendment or modification of the closure or post-closure plan, amendment or modification of the permit, the extension or reduction of the time of performance of closure or post-closure, or any other modification or alteration of an obligation of the owner or operator pursuant to 40 CFR part 264 or 265.



9. Guarantor agrees to remain bound under this guarantee for as long as CUSA must comply with the applicable financial assurance requirements of subpart H of 40 CFR parts 264 and 265 for the above-listed facility, except as provided in paragraph 10 of this agreement.

10. Guarantor may terminate this guarantee by sending notice by certified mail to the DEQ Executive Director and to CUSA, provided that this guarantee may not be terminated unless and until CUSA obtains, and the DEQ Executive Director approves, alternate closure and/or post-closure care coverage complying with 40 CFR 264.143, 264.145, 265.143 and/or 265.145.

11. Guarantor agrees that if CUSA fails to provide alternate financial assurance as specified in subpart H of 40 CFR part 264 or 265, as applicable, and obtain written approval of such assurance from the DEQ Executive Director within 90 days after a notice of cancellation by the guarantor is received by the DEQ Executive Director from the guarantor, guarantor shall provide such alternate financial assurance in the name of CUSA.

12. Guarantor expressly waives notice of acceptance of this guarantee by the DEQ or by CUSA. Guarantor also expressly waives notice of amendments or modifications of the closure and/or post-closure plan and of amendments or modifications of the facility permit(s).

I hereby certify that the wording of this guarantee is identical to the wording specified in 40 CFR 264.151(h) as such regulations were constituted on the date first above written.


Effective Date: March 22, 2019

CHEVRON CORPORATION



Patricia E. Yarrington  
Vice President and Chief Financial Officer

Signature of witness or notary:



Assistant Secretary

## GUARANTEE FOR LIABILITY COVERAGE

Guarantee made this 22<sup>nd</sup> day of March, 2019, by CHEVRON CORPORATION, a business corporation organized under the laws of the State of Delaware herein referred to as guarantor. This guarantee is made on behalf of Chevron U.S.A. Inc. ("CUSA") of 6001 Bollinger Canyon Road, San Ramon, California, which is our subsidiary, to any and all third parties who have sustained or may sustain bodily injury or property damage caused by sudden and/or nonsudden accidental occurrences arising from operation of the facility covered by this guarantee.

### Recitals

1. Guarantor meets or exceeds the financial test criteria and agrees to comply with the reporting requirements for guarantors as specified in 40 CFR 264.147(g) and 265.147(g).
2. CUSA owns or operates the following hazardous waste management facility covered by this guarantee:

MSD 054179403  
Chevron U.S.A. Inc.  
Pascagoula Refinery  
P.O. Box 1300  
Pascagoula, MS 39567

This corporate guarantee satisfies RCRA third-party liability requirements for both sudden and nonsudden accidental occurrences in above named owner or operator facility for coverage in the amount \$10,000,000 annual aggregate.

3. For value received from CUSA, guarantor guarantees to any and all third parties who have sustained or may sustain bodily injury or property damage caused by sudden and/or nonsudden accidental occurrences arising from operations of the facility covered by this guarantee that in the event that CUSA fails to satisfy a judgment or award based on a determination of liability for bodily injury or property damage to third parties caused by sudden and/or nonsudden accidental occurrences, arising from the operation of the above-named facility, or fails to pay an amount agreed to in settlement of a claim arising from or alleged to arise from such injury or damage, the guarantor will satisfy such judgment(s), award(s), or settlement agreement(s) up to the limits of coverage identified above.

4. Such obligation does not apply to any of the following:

(a) Bodily injury or property damage for which CUSA is obligated to pay damages by reason of the assumption of liability in a contract or agreement. This exclusion does not apply to liability for damages that CUSA would be obligated to pay in the absence of the contract or agreement.

(b) Any obligation of CUSA under a workers' compensation, disability benefits, or unemployment compensation law or any similar laws.

(c) Bodily injury to:

(1) An employee of CUSA arising from, and in the course of, employment by CUSA; or

(2) The spouse, child, parent, brother, or sister of that employee as a consequence of, or arising from, and in the course of employment by CUSA. This exclusion applies:

(A) Whether CUSA may be liable as an employer or in any other capacity; and

(B) To any obligation to share damages with or repay another person who must pay damages because of the injury to persons identified in paragraphs (1) and (2).

(d) Bodily injury or property damage arising out of the ownership, maintenance, use, or entrustment to others of any aircraft, motor vehicle, or watercraft.

(e) Property damage to:

(1) Any property owned, rented, or occupied by CUSA;

(2) Premises that are sold, given away or abandoned by CUSA if the property damage arises out of any part of those premises;

(3) Property loaned to CUSA;

(4) Personal property in the care, custody, or control of CUSA;

(5) That particular part of real property on which CUSA or any contractor or subcontractors working directly or indirectly on behalf of the CUSA are performing operations, if the property damage arises out of these operations.

5. Guarantor agrees that if, at the end of any fiscal year before termination of this guarantee, the guarantor fails to meet the financial test criteria, guarantor shall send within 90 days, by certified mail, notice to the DEQ Executive Director and to CUSA that he intends to provide alternate liability coverage as specified in 40 CFR 264.147 and 265.147, as applicable, in the name of CUSA. Within 120 days after the end of such fiscal year, the guarantor shall establish such liability coverage unless CUSA has done so.

6. The guarantor agrees to notify the DEQ Executive Director by certified mail of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming guarantor as debtor, within 10 days after commencement of the proceeding.

7. Guarantor agrees that within 30 days after being notified by the DEQ Executive Director of a determination that guarantor no longer meets the financial test criteria or that he is disallowed from continuing as a guarantor, he shall establish alternate liability coverage as specified in 40 CFR 264.147 or 265.147 in the name of CUSA, unless CUSA has done so.

8. Guarantor reserves the right to modify this agreement to take into account amendment or modification of the liability requirements set by 40 CFR 264.147 and 265.147, provided that such modification shall become effective only if the DEQ Executive Director does not disapprove the modification within 30 days of receipt of notification of the modification.

9. Guarantor agrees to remain bound under this guarantee for so long as CUSA must comply with the applicable requirements of 40 CFR 264.147 and 265.147 for the above-listed facility, except as provided in paragraph 10 of this agreement.

10. Guarantor may terminate this guarantee by sending notice by certified mail to the DEQ Executive Director and to CUSA, provided that this guarantee may not be terminated unless and until CUSA obtains, and the DEQ Executive Director approves, alternate liability coverage complying with 40 CFR 264.147 and/or 265.147.
11. Guarantor hereby expressly waives notice of acceptance of this guarantee by any party.
12. Guarantor agrees that this guarantee is in addition to and does not affect any other responsibility or liability of the guarantor with respect to the covered facilities.
13. The guarantor shall satisfy a third-party liability claim only on receipt of one of the following documents:
  - (a) Certification from the Principal and the third-party claimant(s) that the liability claim should be paid. The certification shall be worded as follows, except that instructions in brackets are to be replaced with the relevant information and the brackets deleted:

**CERTIFICATION OF VALID CLAIM**

The undersigned, as parties [insert Principal] and [insert name and address of third-party claimant(s)], hereby certify that the claim of bodily injury and/or property damage caused by a [sudden or nonsudden] accidental occurrence arising from operating [Principal's] hazardous waste treatment, storage, or disposal facility should be paid in the amount of \$ .

[Signatures]

Principal

(Notary) Date

[Signatures]

Claimant(s)

(Notary) Date

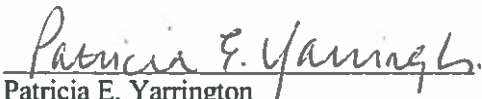
- (b) A valid final court order establishing a judgment against the Principal for bodily injury or property damage caused by sudden or nonsudden accidental occurrences arising from the operation of the Principal's facility or group of facilities.
14. In the event of combination of this guarantee with another mechanism to meet liability requirements, this guarantee will be considered primary coverage.

Gary C. Rikard, Executive Director  
Mississippi Department of Environmental Quality  
Re: Corporate Guarantee for Liability Coverage – Pascagoula Refinery  
March 22, 2019  
Page 4

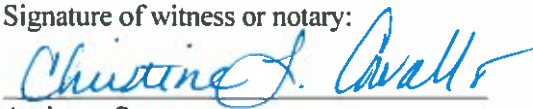
I hereby certify that the wording of the guarantee is identical to the wording specified in 40 CFR 264.151(h)(2) as such regulations were constituted on the date shown immediately below.

Effective date: March 22, 2019

CHEVRON CORPORATION

  
Patricia E. Yarrington  
Vice President and Chief Financial Officer

Signature of witness or notary:

  
Assistant Secretary

**CHEVRON CORPORATION  
ENVIRONMENTAL FINANCIAL RESPONSIBILITY  
ATTACHMENT "A"  
FYE 2018  
SORTED BY STATE**

**CALIFORNIA**

***RCRA FACILITIES***

**Chevron U.S.A. Inc.**

CAD008336901			
Chevron U.S.A. Inc.	Closure	\$	3,261,709
El Segundo Refinery	Post-Closure	\$	12,123,985
P.O. Box 97			
El Segundo, CA 90245			
CAT080010283			
Chevron U.S.A. Inc.	Post-Closure	\$	1,121,587
Westside Disposal Facility			
(EPC Westside)			
26244 Highway 33			
Fellows, CA 93324			
CAD009114919			
Chevron U.S.A. Inc.	Closure	\$	1,574,433
Richmond Refinery	Post-Closure	\$	17,533,518
P.O. Box 1272			
Richmond, CA 94802			
CAD043237486			
Chevron U.S.A. Inc.	Closure	\$	92,881,336
940 Hensley Street	Post-Closure	\$	20,627,493
Richmond, CA 94804			

***CERCLA FACILITIES ADMINISTERED BY U.S. EPA***

**Chevron U.S.A. Inc.**

California Dept. of Toxic Substances			
Control v. Chevron U.S.A Inc. et al	Work	\$	10,000,000
Civil Docket No. 98-CV-05412-REC-DLB			
Purity Oil Sales, Inc. Superfund Site			
Malaga, CA 93725			
Waste Disposal, Inc. Superfund Site			
(CERCLIS ID #CAD980884357	Work	\$	7,900,000
Los Nietos Road at Greenleaf Avenue			
Santa Fe Springs, CA 90670			

**CHEVRON CORPORATION**  
**ENVIRONMENTAL FINANCIAL RESPONSIBILITY**  
**ATTACHMENT "A"**  
**FYE 2018**  
**SORTED BY STATE**

**CALIFORNIA (cont'd)**

**Texaco Inc.**

CAD980636781 Texaco Inc. Pacific Coast Pipeline Site 67 East Telegraph Road Fillmore, CA 93016	Work	\$	10,000,000
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Thomas Ranch 2798 Palisades Drive Corona, CA 92880	Work	\$	688,347
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**Union Oil Company of California**

Thomas Ranch 2798 Palisades Drive Corona, CA 92880	Work	\$	688,347
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***STATE ADMINISTERED FINANCIAL ASSURANCE***

**Chevron Environmental Management Company**

APN 8170-027-006 Former Arbo Box Property 12468 Putnam Street Whittier, CA 90602	Work	\$	135,000
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**Union Oil Company of California**

CA920426434 Guadalupe Oil Field Guadalupe, CA	Work	\$	50,000,000
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**Chevron U.S.A. Inc.**

Reichelt Site (D. Whittington Site) (Docket No. I/SE 00/01-003 Chevron U.S.A. Inc. 521 and 551 West Gertrude Avenue Richmond, CA 94801	Post-Closure	\$	218,923
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**CHEVRON CORPORATION**  
**ENVIRONMENTAL FINANCIAL RESPONSIBILITY**  
**ATTACHMENT "A"**  
**FYE 2018**  
**SORTED BY STATE**

**CALIFORNIA (cont'd)**

RWQCB Order No. R2-2011-0036  
Richmond Refinery  
841 Chevron Way  
Richmond, CA 94801

Corrective Action      \$      17,884,342

**Chevron U.S.A. Inc., successor in interest to Chevron Chemical Company**

Docket #HSA97/98—005  
Calspray Site  
135 Walker Street  
Watsonville, CA 95076

Work      \$      294,400

**Chevron Environmental Management Company**

CAD043237486  
Former Chevron Chemical Company Pond Site  
940 Hensley Street  
Richmond, CA 94804

Corrective Action      \$      17,870,970

**Chevron Land Development Company**

Chevron Hilltop West Richmond Project  
Former San Pablo Tank Farm  
(Order No. R2-2003-0032)  
Richmond, CA 94801

Post-Closure      \$      1,967,500



CHEVRON CORPORATION  
ENVIRONMENTAL FINANCIAL RESPONSIBILITY  
**ATTACHMENT "A"**  
FYE 2018  
SORTED BY STATE

## GEORGIA

### *STATE ADMINISTERED FINANCIAL ASSURANCE*

#### **Union Oil Company of California**

HSI# 10830

Chemical Specialists and Development, Inc.  
2275 Tucker Industrial Rd.  
Tucker, GA 30084

Corrective Action      \$      8,320,574

## ILLINOIS

### *RCRA FACILITIES*

#### **Chevron Environmental Management Company**

ILD041518861

Chevron Environmental Management Co.  
Lockport Plant  
301 W. 2nd Street  
Lockport, IL 60441

Post-Closure      \$      3,832,719  
Corrective Action      \$      287,435

## IOWA

### *CERCLA FACILITIES ADMINISTERED BY U.S. EPA*

#### **ACC Chemical Company**

VII-JK (CERCLA Remediation Action)  
Chemplex Site  
4010 21<sup>st</sup> Street  
Camanche, IA 52730

Work      \$      1,200,000  
(Unit 1 & Unit 2)

#### **Getty Chemical Company**

VII-JK (CERCLA Remediation Action)  
Chemplex Site  
4010 21<sup>st</sup> Street  
Camanche, IA 52730

Work      \$      1,200,000  
(Unit 1 & Unit 2)

**CHEVRON CORPORATION**  
**ENVIRONMENTAL FINANCIAL RESPONSIBILITY**  
**ATTACHMENT "A"**  
**FYE 2018**  
**SORTED BY STATE**

**LOUISIANA**

***RCRA FACILITIES***

**Chevron Oronite Company LLC**

LAD034199802			
Chevron Oronite Company, LLC	Post-Closure	\$	2,436,221
10285 Highway 23			
P.O. Box 70			
Belle Chasse, LA 70037			

***STATE ADMINISTERED FINANCIAL ASSURANCE***

**Chevron Oronite Company LLC**

Site ID No. GD-075-1511/ Permit # P-0112			
Chevron Oronite Company, LLC	Closure	\$	3,454,138
Oak Point Plant	Corrective Action	\$	54,439,153
Highway 23 – P.O. Box 70			
Belle Chasse, LA 70037			

**MISSISSIPPI**

***RCRA FACILITIES***

**Chevron U.S.A. Inc.**

MSD054179403			
Chevron U.S.A. Inc.	Closure	\$	2,831,092
Pascagoula Refinery	Post-Closure	\$	9,630,570
P.O. Box 1300	Corrective Action	\$	12,527,306
Pascagoula, MS 39567	(USEPA R4)		

CHEVRON CORPORATION  
ENVIRONMENTAL FINANCIAL RESPONSIBILITY  
**ATTACHMENT "A"**  
FYE 2018  
SORTED BY STATE

**NEW JERSEY**

***RCRA FACILITIES***

**Chevron U.S.A. Inc.**

NJD081982902 Chevron U.S.A. Inc. Perth Amboy Refinery 1200 State Street Perth Amboy, NJ 08861	Corrective Action	\$	24,100,000
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**NEW MEXICO**

***CERCLA FACILITIES ADMINISTERED BY U.S. EPA***

**Chevron U.S.A. Inc.**

Docket No. 2011-12 Mariano Lake Mine Site 15N, 14W/Sections 11 and 12 McKinley County, NM 87313	Work	\$	500,000
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**Chevron Mining Inc.**

NMD002899094 Questa Mine - Removal Action AOC (Docket06-09-12) Chevron Mining Inc. Chevron Questa Mine NM Highway 38 Red River Canyon Questa, NM 87556	Work	\$	5,000,000
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NMD002899094 Questa Mine - Early Design AOC (Docket 06-13-12) Chevron Mining Inc. Chevron Questa Mine NM Highway 38 Red River Canyon Questa, NM 87556	Work	\$	24,069,784
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**CHEVRON CORPORATION**  
**ENVIRONMENTAL FINANCIAL RESPONSIBILITY**  
**ATTACHMENT "A"**  
**FYE 2018**  
**SORTED BY STATE**

Questa Mine – Partial Consent Decree (Civil Action Case No. 16-904 WPL/SCY Chevron Mining Inc. Chevron Questa Mine NM Highway 38 Red River Canyon Questa, NM 87556	Work	\$	143,632,481
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## **OHIO**

### ***RCRA FACILITIES***

#### **Chevron U.S.A. Inc.**

OHD004254132 Chevron U.S.A. Inc. Cincinnati Refinery P.O. Box 96 North Bend, OH 45052	Corrective Action (Administrative Order on Consent with U.S. EPA region 5)	\$	9,739,000
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### ***STATE ADMINISTERED FINANCIAL ASSURANCE***

#### **Chevron U.S.A. Inc.**

OHD004254132 Chevron U.S.A. Inc. Cincinnati Refinery P.O. Box 96 North Bend, OH 45052	Post-Closure (Ohio EPA)	\$	177,000
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#### **Union Oil Company of California**

CERCLA Docket No. 91-F-90011 Union Oil Company of California Heath Facility (Consent Order) 840 Heath Road Heath, OH 43056	Work	\$	4,902,375
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**CHEVRON CORPORATION**  
**ENVIRONMENTAL FINANCIAL RESPONSIBILITY**  
**ATTACHMENT "A"**  
**FYE 2018**  
**SORTED BY STATE**

**PENNSYLVANIA**

***CERCLA FACILITIES ADMINISTERED BY U.S. EPA***

**Chevron Environmental Management Company**

Docket No. CERC-03-2015-0168DC			
Metro Container Corporation Site	Work	\$	129,450
In and around the Borough of Trainer			
Delaware County, PA			

**TEXAS**

***RCRA FACILITIES***

**Chevron Environmental Management Company**

TXD007378995			
Chevron Environmental Management Company	Post-Closure	\$	432,903
Amarillo Plant	Corrective Action	\$	4,769,707
4240 S.E. 3 <sup>rd</sup> Avenue			
Amarillo, TX 79104			

***STATE ADMINISTERED FINANCIAL ASSURANCE***

**Chevron Environmental Management Company**

SWR No. 30004, Docket No. 97-0404-IHW-E			
TXD 008090409	Post-Response	\$	1,159,740
Chevron Environmental Management Company	Action Care (Work)		
Port Arthur Facility			
2001 B Gulfway Drive			
Port Arthur, TX 77670			

**CHEVRON CORPORATION  
ENVIRONMENTAL FINANCIAL RESPONSIBILITY  
ATTACHMENT "A"  
FYE 2018  
SORTED BY STATE**

**UTAH**

***RCRA FACILITIES***

**Chevron U.S.A. Inc.**

UTD092029768

Chevron U.S.A. Inc.

Salt Lake Refinery

2351 North 1100 West

Salt Lake City, UT 84116

Post-Closure \$ 1,252,000

Corrective Action \$ 378,000

***CERCLA FACILITIES ADMINISTERED BY U.S. EPA***

**Chevron U.S.A. Inc.**

Docket# CERCLA-08-2003-0014

Chevron U.S.A. Inc.

Northwest Oil Drain

Salt Lake County, UT 84116

Work \$ 705,000

**WASHINGTON**

***STATE ADMINISTERED FINANCIAL ASSURANCE***

**Chevron U.S.A. Inc., successor in interest to Chevron Chemical Company**

MTCA No. 132017660

Bee-Jay Scales (Consent Decree)

310 Warehouse Avenue and 116 North 1<sup>st</sup> Street

Sunnyside, WA

Corrective Action \$ 2,552,524

**CHEVRON CORPORATION**  
**ENVIRONMENTAL FINANCIAL RESPONSIBILITY**  
**ATTACHMENT "A"**  
**FYE 2018**  
**SORTED BY STATE**

**WYOMING**

***RCRA FACILITIES***

**Chevron Environmental Management Company**

WYD088677943

Chevron Environmental Management Co.	Post-Closure	\$	3,840,000
Casper Plant	Corrective Action	\$	11,956,019
P.O. Box 307	Closure	\$	2,099,200
Evansville, WY 82636			

**PUERTO RICO**

***CERCLA FACILITIES ADMINISTERED BY U.S. EPA***

**Chevron U.S.A. Inc., successor in interest to Chevron Chemical Company**

PRD980763783

Fibers Public Supply Wells Superfund Site	Work	\$	2,800,000
Civil Action Number 92-2486			
RTE 3			
Jobos, Guayama, Puerto Rico 00654			

**CHEVRON CORPORATION  
ENVIRONMENTAL FINANCIAL RESPONSIBILITY  
ATTACHMENT "B"**

**FYE 2018**

**LIABILITY COVERAGE FOR  
BOTH SUDDEN AND NONSUDDEN ACCIDENTAL OCCURRENCES  
FOR RCRA/CERCLA PROJECT SITES**

<b>State</b>	<b>Letter</b>	<b>Site</b>	<b>Amount of Annual Aggregate Coverage to be demonstrated in Financial Test</b>
CA	CA DTSC	El Segundo Refinery	\$ 8,000,000
		Richmond Refinery	\$ 8,000,000
		Richmond Hensley Street	\$ 8,000,000
		Westside Disposal Facility	\$ 8,000,000
IA	US EPA	Chemplex - ACC Chemical Company	\$ 12,000,000
		Chemplex - Getty Chemical Company	\$ 12,000,000
IL	IL EPA	Lockport Plant	\$ 8,000,000
MS	USEPA	Pascagoula Refinery	\$ 8,000,000
MS	MS DEQ	Pascagoula Refinery	\$ 10,000,000
NJ	NJ DEP	Perth Amboy Refinery	\$ 2,000,000
UT	UT DS&HW	Salt Lake City Refinery	\$ 8,000,000
WY	WY DEQ	Casper Plant	\$ 10,000,000
		<b>TOTAL:</b>	<b>\$ 102,000,000</b>





## **Report of Independent Accountants**

To the Board of Directors of Chevron Corporation:

We have performed the procedures enumerated below, which were agreed to by Chevron Corporation (the "Company") solely to assist you in evaluating certain financial information in connection with the letter dated March 22, 2019 from the Vice President and Chief Financial Officer of the Company to the Mississippi Department of Environmental Quality - Pascagoula Refinery (the "Letter"). The Company is responsible for the Letter. The sufficiency of these procedures is solely the responsibility of the parties specified in this report and we have no responsibility for verification of any underlying data. Consequently, we make no representation regarding the sufficiency of the procedures enumerated below either for the purpose for which this report has been requested or for any other purpose.

The procedures performed and results thereof are as follows.

1. We recalculated the formulas included in the Letter, Alternative II at items 1, 3, 10, and 12 to determine mathematical accuracy and found no differences.
2. We compared the Net Worth of the Company at December 31, 2018, as stated in the financial assurances supporting schedule, to the amount set forth as Total Equity in the consolidated financial statements included in the Company's 2018 Annual Report on Form 10-K. We found no difference.
3. We compared the Intangible Assets of the Company at December 31, 2018, as stated in the financial assurances supporting schedule, to a supporting schedule prepared by the Company from its accounting records. We also recalculated the mathematical accuracy of the supporting schedule. We found no differences.
4. We compared the Tangible Net Worth of the Company, determined by subtracting Intangible Investments from Net Worth, to the corresponding amount as stated in the Letter, Alternative II at item 7. We found no difference.
5. We compared the Total Assets in the U.S. of the Company at December 31, 2018, as stated in the Letter, Alternative II at item 8 to the amount set forth as Total Assets - United States in Note 13 to the consolidated financial statements included in the Company's 2018 Annual Report on Form 10-K. We found no difference.
6. We recalculated the percentage of the Total Assets in the U.S., as stated in 5 above, of the amount set forth as Total Assets in the consolidated balance sheet included in the Company's 2018 Annual Report on Form 10-K and agreed that this percentage is less than 90% as stated in the Letter, Alternative II at item 11.



This agreed-upon procedures engagement was conducted in accordance with attestation standards established by the American Institute of Certified Public Accountants. We were not engaged to and did not conduct an audit or an examination, the objective of which would be the expression of an opinion, or a review, the objective of which would be the expression of a conclusion, on the specified elements, accounts or items referred to in 1 to 6 above. 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.

This report is intended solely for the information and use of the Company and the Mississippi Department of Environmental Quality - Pascagoula Refinery and is not intended to be and should not be used by anyone other than these specified parties.

*PricewaterhouseCoopers LLP*

San Francisco, California  
March 22, 2019

## Chevron Corporation

Add to Portfolio

Ticker: CVX    Moody's Org ID: 716000    Market Segment: Corporates    Industry: ENERGY: OIL - INTEGRATED  
Peer Group: Energy, Oil & Gas - Integrated    Domicile: UNITED STATES

### LONG TERM RATING

Rating: **Aa2**, Not on Watch  
Type: **LT Issuer Rating**  
Date: 15 Jan 2019

### SHORT TERM RATING

Rating: **P-1**, Not on Watch  
Type: **Commercial Paper - Dom Curr**  
Date: 15 Jan 2019

### OUTLOOK

**Positive**  
Date: 15 Jan 2019

### OTHER DEBTS ON WATCH?

No

Chevron Corp.

Issuer Credit Rating					
Rating Type	Rating	Rating Date	Regulatory Identifiers	CreditWatch/ Outlook	CreditWatch/ Outlook Date
Local Currency LT	AA <a href="#">Regulatory Disclosures</a>	17-Dec-2018	EE	Stable	17-Dec-2018
Local Currency ST	A-1+ <a href="#">Regulatory Disclosures</a>	30-Nov-1981	EE		
Foreign Currency LT	AA <a href="#">Regulatory Disclosures</a>	17-Dec-2018	EE	Stable	17-Dec-2018
Foreign Currency ST	A-1+ <a href="#">Regulatory Disclosures</a>	30-Nov-1981	EE		
<a href="#">View Ratings Definitions</a>		<a href="#">Debt Types</a>			

UNITED STATES SECURITIES AND EXCHANGE COMMISSION  
Washington, D.C. 20549

**Form 10-K**

☒ ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE  
SECURITIES EXCHANGE ACT OF 1934  
For the fiscal year ended December 31, 2018

OR

☐ TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE  
SECURITIES EXCHANGE ACT OF 1934  
For the transition period from \_\_\_\_\_ to \_\_\_\_\_  
Commission File Number 001-00368

**Chevron Corporation**

(Exact name of registrant as specified in its charter)

Delaware

94-0890210

6001 Bollinger Canyon Road,  
San Ramon, California 94583-2324

(State or other jurisdiction of  
incorporation or organization)

(I.R.S. Employer  
Identification No.)

(Address of principal executive offices)  
(Zip Code)

Registrant's telephone number, including area code (925) 842-1000  
Securities registered pursuant to Section 12(b) of the Act:

Title of Each Class

Name of Each Exchange  
on Which Registered

Common stock, par value \$.75 per share

New York Stock Exchange, Inc.

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

Yes ☒ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act.

Yes ☐ No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.

Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files).

Yes ☒ No ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§ 229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☒

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer ☒

Accelerated filer ☐

Non-accelerated filer ☐

Smaller reporting company ☐

Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates computed by reference to the price at which the common equity was last sold, or the average bid and asked price of such common equity, as of the last business day of the registrant's most recently completed second fiscal quarter — \$242.2 billion (As of June 29, 2018)

Number of Shares of Common Stock outstanding as of February 11, 2019 — 1,900,062,760

DOCUMENTS INCORPORATED BY REFERENCE

(To The Extent Indicated Herein)

Notice of the 2019 Annual Meeting and 2019 Proxy Statement, to be filed pursuant to Rule 14a-6(b) under the Securities Exchange Act of 1934, in connection with the company's 2019 Annual Meeting of Stockholders (in Part III)

# **ATTACHMENT E**

## **Groundwater Monitoring**

## SECTION E. GROUNDWATER MONITORING

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Chevron is requesting that the long term care and groundwater monitoring requirements for the East Landfarm be transferred to the Refinery's RCRA Corrective Action program, which is currently overseen by U.S. EPA Region 4 with participation from the Mississippi Department of Environmental Quality (MDEQ). This will allow for any identified releases from any of the Solid Waste Management Units (SWMUs) or Areas of Concern (AOCs) at the East Hill Solid Waste Management Area to be addressed holistically, considering the potential sources from the multiple, and in some cases, overlapping units.

The East Landfarm was built at the Pascagoula Refinery on top of an area called the East Hill. Historically, the East Hill was an area where assorted refinery wastes were disposed including construction and demolition material, spent catalysts, and other refinery wastes. This landfilled area was built up in elevation over the early history of the refinery and has since been redeveloped to serve as part of the refinery's hurricane protection system as well as an elevated location that houses contractor office trailers and parking, a fire station, fire training grounds, equipment and materials laydown areas, the East Catalyst Pad and the former East Landfarm. For RCRA Corrective Action purposes, the East Hill is designated as a Solid Waste Management Area and includes the following SWMUs and AOCs: Landfill A (SWMU 1), Landfill B (SWMU 2), Landfill C (SWMU 3), Landfill D (SWMU 4), East Catalyst Pad (SWMU 26), East Landfarm (SWMU 29), Fire Training Area (SWMU 60), Landfill Underneath the TEL Weathering Area (AOC 72), and Landfill Underneath the East Landfarm/East Catalyst Pad (AOC 82).

In October 1998, U.S. EPA amended the RCRA Hazardous Waste regulations to address situations where regulated units are situated among solid waste management units (or areas of concern), a release has occurred, and the regulated unit and the solid waste management units (or areas of concern) may have contributed to the release (63 FR 56710, specifically 56724-56726). MDEQ has adopted these amended regulations by reference. Because the East Catalyst Pad and East Landfarm were built on top of AOC 82 and are adjacent to SWMUs 1 through 4, SWMU 60 and AOC 72, it is difficult to determine the individual source of variations in groundwater constituents or concentrations given the multiple potential sources.

Therefore, Chevron is requesting that the long term care and groundwater monitoring requirements for the East Catalyst Pad, if required, and East Landfarm be transferred to the Refinery's Corrective Action Program. By allowing the groundwater requirements to be conducted under the Refinery Corrective Action Program, MDEQ and U.S. EPA Region 4 will be able to verify that corrective action for the East Hill Solid Waste Management Area is designed to address the area and issues as a whole.

With the transfer of groundwater monitoring requirements for the East Catalyst Pad and East Landfarm to the Refinery's Corrective Action program, the following sections solely discuss groundwater monitoring requirements for the North Landfarm.

Chevron does not operate solid waste management units which meet the exemption from groundwater protection requirement under 40 CFR 264.90(b).

Chevron does not operate interim status units.

### **E-3 GENERAL HYDROGEOLOGIC INFORMATION**

This section contains a brief outline of the hydrology and geology of the Refinery area. Included is a discussion of the major aquifers in the area and of the groundwater flow patterns and rates across the Refinery and at the North Landfarm.

#### **E-3a Topography**

The land surface in the Pascagoula area varies from flat to gently rolling terraces and gradually slopes to the Mississippi Sound. This descent is marked by poorly preserved escarpments which are a result of river and marine terracing. The elevations in the vicinity of the Refinery range from near sea level to 10 feet above mean sea level, as shown in Figure E-1.

The Chevron Pascagoula Refinery property is bounded by the Mississippi Sound and Gulf of Mexico to the south, a densely wooded area to the north, Bayou Casotte to the west, and coastal marshlands, Point aux Chenes Bay and Bangs Lake to the east. The natural drainage in the area of the Refinery is into Bayou Casotte and Bangs Lake, and to a lesser extent, into Bayou Rosa and Priest Bayou to the south. The Refinery area is nearly level, consequently, drainage from the area is relatively poor. The Refinery operating areas are completely surrounded by a hurricane protection dike. The dike is constructed as an earthen berm around most of the Refinery and has an average elevation of 18.5 feet (North American Vertical Datum, 1988).

All stormwater water flow from developed areas inside the Refinery is discharged through NPDES permitted outfalls.

#### **E-3b Regional Hydrogeology**

The regional aquifer underlying the Refinery is the Coastal Lowlands Aquifer System. This aquifer underlies portions of southern Mississippi, Alabama, and Louisiana as well as portions of Florida and Texas. The aquifer system extends offshore to the edge of the continental shelf of the Gulf of Mexico, but becomes saline in offshore areas. The Coastal Lowlands Aquifer System becomes thicker nearer the Gulf of Mexico, is heterogeneous, and generally contains beds of sand, silt, and clay (Geraghty & Miller, 1981, Preliminary Assessment of the Hydrogeologic Conditions Underlying the Chevron Pascagoula Refinery, Pascagoula, Mississippi).

The aquifers underlying the Refinery are of Miocene age or younger and are generally less than 1,000 feet below land surface. The principal fresh water-bearing units under the Refinery, in order of increasing depth from top to bottom, are the Citronelle Formation, the Graham Ferry Formation, and the 600-foot and 800-foot sand zones of the Pascagoula Formation. These aquifers are composed of sands and gravels and are separated from one another by deposits of clay and silty clay.

#### **E-3c Aquifer Formations**

The regional hydrogeologic setting at the Refinery consists of deltaic and alluvial deposits composed primarily of sand, silt, and clay sediments. Typically, lateral changes in these deposits vary greatly, even over relatively short distances. The Citronelle Formation, along with the younger terrace and alluvial deposits, form the uppermost aquifer beneath the site. Generally, the unconsolidated sediments of the Citronelle Formation consist of quartz sand, chert, and gravel, although large lenses of relatively low-



permeability clay may be present locally. In general, the Citronelle Formation grades into coarser sediments with depth.

The sand of the Graham Ferry Formation is the most widely used aquifer in the Pascagoula area. The upper 20 to 100 feet of this formation consists of green clay; however, the lower 100 feet of this formation consists of gray sand or sandy clay, with clay lenses.

The Pascagoula Formation contains two significant aquifers, commonly referred to as the 600-Foot Sand aquifer and the 800-Foot Sand aquifer. These major aquifers consist of gray, fine-to coarse-grained quartz sand, and chert. The gray appearance of the sand formations is due to the high percentage of ferromagnesium minerals. The 800-Foot Sand is lithologically similar to the 600-Foot Sand, although regionally not as extensive. The deeper and older fresh water-bearing sands and intervening clay units of the Graham Ferry and Pascagoula Formation form a general regional stratigraphic sequence which dips approximately 30 feet per mile to the south. Site geologic cross-sections are presented in Figure E-2 through Figure E-4.

### **E-3d Groundwater Use and Movement**

The deeper aquifers underlying the Pascagoula area provide a major source of fresh water for both municipal and industrial use. The City of Pascagoula water supply comes from wells drilled into the Graham Ferry and Pascagoula formations in depths between 300 and 800 feet ([cityofpascagoula.com/ccr](http://cityofpascagoula.com/ccr)). The base of the fresh waters varies from about sea level to more than 1,000 feet below sea level. The increase in the withdrawal of groundwater from the underlying aquifers has resulted in a series of depressions in the potentiometric surfaces of the aquifers. The direction and velocity of the movement of water has changed and the gradients of the underlying aquifers have been altered in the Pascagoula area. In these areas of drawdown west and northwest of the Refinery, the downward head difference between the surficial aquifer and the underlying confined aquifer is about 40 feet. The general direction of movement of groundwater is toward the Pascagoula area. Beneath the Refinery there is generally no appreciable head difference between the surficial and uppermost confined aquifers, however a net upward gradient occurs at some locations within the Refinery.

The majority of production water wells have been constructed in the shallow alluvial sediments of the Citronelle Formation and in the lower sands of the Graham Ferry Formation. The average depths of these wells range from about 135 to 375 feet below land surface; however, several wells have been drilled into the Pascagoula Formation to depths greater than 800 feet below land surface.

The major centers of groundwater withdrawal in the vicinity are concentrated to the west and northwest of the Refinery area. These wells, which were developed in the Pascagoula and Graham Ferry Formations, yield as much as 600 gpm (gallons per minute) of groundwater, and supply an estimated cumulative total of about 5 mgd (millions of gallons per day) to the area. The majority of the groundwater is pumped from the public supply wells of the City of Pascagoula and from industrial wells of nearby industries.

The Refinery's potable water supply originates from two water wells screened in the Graham Ferry Aquifer. The water wells produce approximately 320 gpm, and production is rotated between wells each week. The potable water is used for eyewash and safety shower stations, restroom usage and drinking

water following additional filtering.

### **E-3e Potentiometric Surface**

The increase in pumping from the underlying aquifers in the Pascagoula area has caused a regional decline of water levels in the underlying aquifers. The general direction of groundwater movement in the lower confined aquifer is to the west-northwest toward the major centers of withdrawal.

As a result of the decreasing hydraulic gradient with depth, water has the potential to move from the shallower aquifers into the deeper aquifers. However, in areas that are not affected by the withdrawal, the potentiometric surface of the deeper aquifers often rises above land surface. In these areas, the hydraulic potential will be reversed. Findings from the RCRA Facility Investigation indicate the area under the Refinery exhibits this upward hydraulic potential.

### **E-3f Site-Specific Hydrogeology**

The site stratigraphy is characterized by three hydro-stratigraphic units to a depth of approximately 60 to 70 feet below the North Landfarm. These units include: 1) the surficial sands and fill material, 2) a thick "fat" clay, and 3) a lower sand unit which comprises the upper sand section of the Citronelle Aquifer.

The surficial soils, commonly referred to as the Upper Sand Unit, consist of sand, clayey sand, and silty sand and occur to depths between 12 and 20 feet below grade. These sands constitute the uppermost aquifer. This unit is unconfined and separated from the upper sand of the Citronelle Aquifer by a confining aquitard. Based on pumping tests conducted on the uppermost aquifer and the upper sand of the Citronelle Aquifer at nested monitoring wells, the two permeable units show no evidence of being hydraulically connected.

The second unit is a clay layer, called the Upper Clay Unit, and it underlies the uppermost aquifer and acts as an aquitard to vertical groundwater flow in the monitoring areas. This Upper Clay Unit is an average of 16-ft thick in the North Landfarm area. This clay is very plastic; boring logs show it contains wood and plant fragments in some locations and silty pockets in other locations. This clay aquitard is continuous under the Refinery in the monitoring areas. The upper surface of this aquitard undulates across the Refinery site.

The lower sand unit consists primarily of alternating lenses and layers of silty and clayey sand, sandy clay, and silty clay. The lower sand unit appears to be consistent across the Refinery. A cross-section showing these hydro-stratigraphic units is presented in Figure E-5.

### **E-3g Groundwater Flow Direction and Rate**

Potentiometric surface maps have been constructed for the uppermost aquifer at the North Landfarm using data collected in the fall and spring 2017 sampling events. The groundwater elevation data were obtained from background well ASR, and the wells that are being used to monitor the shallow unconfined aquifer beneath the North Landfarm. These monitoring wells are generally screened between elevations of 5 and -5 feet RD (Refinery Datum) within the uppermost aquifer overlying the first clay aquitard.

Groundwater flow directions were determined for the North Landfarm Hazardous Waste Management Area from depth to water measurements collected during recent sampling events. The water levels were collected from all points designated in the Mississippi Hazardous Waste Permit. Table E-1 presents the water level data for the 2017 sampling events.

**North Landfarm** –The local groundwater flow in the vicinity of the North Landfarm is, historically, toward the east/southeast. However, temporary groundwater flow reversals at the North Landfarm have occurred occasionally since 2011 largely due to land clearing activities and a subsequent reduction in groundwater recharge. A reversal in groundwater flow direction was observed during the Spring 2017 sampling event with groundwater flow reversing from southeast to northwest. Monitor wells at the North Landfarm were strategically placed around the perimeter of the unit to identify any potential releases or changes in groundwater chemistry.

The average approximate gradient in the vicinity of the North Landfarm is  $3.3 \times 10^{-4}$  ft/ft. Flow direction and gradient were calculated based on groundwater elevations during the fall and spring 2017 sampling events from wells NL-1, NL-2, NL-3 and NL-4. Figure E-6 and Figure E-7 illustrate the groundwater flow direction during 2017.

Features influencing localized groundwater flow conditions in the North Landfarm study area include:

1. The West Ditch – A north to south running ditch located approximately 75-feet west of the North Landfarm: Measured elevations of the bottom of the ditch range from 5.88-ft to 5.96-ft above the Refinery Datum (RD). It is likely that the West Ditch has acted as a groundwater recharge feature. Sufficient data is unavailable to determine if this ditch acts as a groundwater discharge feature during dry periods.
2. North Landfarm Access Road and Ditches – A north-south running access road parallels the eastern side of the North Landfarm: A water-bearing ditch runs parallel to the eastern side of this road. This ditch is located approximately 150-feet to 175-feet east of the North Landfarm. Another shallower, generally dry ditch runs parallel between the access road and the North Landfarm. The access road represents a slightly elevated linear feature, with an elevation of approximately 9-feet above local grade. Following periods of significant rainfall, it is likely that these features represent a zone of groundwater recharge. However, groundwater recharge in this area is more likely influenced by the effective southward drainage of the ditch that lies between the North Landfarm and the access road.
3. North Landfarm – The majority of the North Landfarm is above the grade of the surrounding area: The North Landfarm was historically subject to some groundwater mounding. This potential for mounding, as was noted in previous ACL Sampling Events, was mitigated by the sump maintained in the runoff collection area adjacent to the North Landfarm. In 2014, Chevron replaced the sump pump with a headwall and piping to allow for gravity drainage from the runoff collection area to the West Ditch.

The calculated flow velocity, based on averages of the regional southeastern gradient observed at the North Landfarm monitoring wells in the fall and spring of 2017, was approximately 0.41 and 0.086 ft/yr,

respectively. These flow rates were based on the revised hydraulic conductivity values for wells NL-3 and NL-4. The average gradient at the North Landfarm was calculated to be approximately  $1.15 \times 10^{-3}$  ft/ft for the fall event and  $2.38 \times 10^{-4}$  for the spring event. Flow rates were calculated using Darcy's Equation with the following variables:

Darcy's Equation: $Velocity (V) = \frac{hydraulic\ conductivity (K) \times hydraulic\ gradient (i)}{porosity (Ne)}$		
K	hydraulic conductivity	$4.0 \times 10^{-6}$ ft/sec
i	North Landfarm (average gradient)	$3.3 \times 10^{-4}$ ft/ft
Ne	average porosity	35 percent (0.35)

The hydraulic conductivity was obtained from results of low flow pumping tests conducted on the shallow water-bearing Upper Sand Unit at wells tested for the North Landfarm during the week of April 21, 1997. The hydraulic conductivity is the arithmetic mean for the three (3) wells tested at the North Landfarm, NL-1, NL-3, and NL-4. This conductivity compares to a geometric mean of  $7.6 \times 10^{-5}$  ft/sec calculated from field permeability tests conducted in 1987, and reported in Alternative Concentration Limit Demonstration – Chevron U.S.A., Inc., Pascagoula Refinery (ERM-Southwest, 1987). The hydraulic gradient was calculated based on the fall and spring 2017 measured water levels. The average porosity of 35 percent is an assumed value that represents the midpoint of the overall porosity range for silt and sand, as reported in Groundwater and Wells (Driscoll, 1986).

### E-3h Basis for Identification of Uppermost Aquifer

Under EPA and MHWMR regulations (RCRA Subpart B, 260.10 (Definitions)), an "aquifer" is defined as a geologic formation or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

For groundwater monitoring purposes, MHWMR 264.95 requires monitoring wells to be screened in the "uppermost aquifer". Studies have shown the uppermost aquifer (Upper Sand) at the Refinery is a surficial unconfined aquifer. Wells screened in the Upper Sand unit typically produce one gallon of water per minute or less. Developing the Upper Sand unit for domestic use is not economically practical for such low yields. However, for the purpose and intent of RCRA, the Upper Sand unit has been designated the "uppermost aquifer" since it would be the first water-bearing zone impacted by any potential migration of hazardous waste from the North Landfarm.

The uppermost aquifer is isolated from the main body of the underlying Citronella formation by an apparently continuous clay layer averaging about 20 feet thick. Observations confirming the hydraulic isolation of the surficial aquifer (in which our monitoring wells are screened) from the lower sands include:

1. Fluid level data presented in Table E-2 shows that the water elevations in the shallow wells are consistently different from the water elevations in the deeper paired wells completed below the clay aquitard. Locations of these paired wells are shown in Figure E-8.

2. A pumping test conducted at two sets of these paired wells provided no indication of interconnection between the two formations. Results of the pumping test are provided in Attachment A to Section E.
3. Geotechnical and dissipation tests, using cone penetrometer equipment, showed the vertical hydraulic conductivity of the Upper Clay averages around  $1.5 \times 10^{-7}$  cm/sec.

The regulatory intent of MHWMR 264, Subpart F is to ensure that groundwater contamination migrating from a regulated unit is detected early enough to permit effective corrective action to be taken. In light of the hydraulic isolation of the surficial aquifer from underlying formations, low downward gradients, and locally upward gradients (Table E-2 and Attachment A to Section E), the unconfined surficial aquifer meets all explicit and implicit criteria for designation as the uppermost aquifer.

#### **E-4 TOPOGRAPHIC MAP REQUIREMENTS**

##### **E-4a Topographic Map**

Figures B-1.2 and B-1.3 (presented in Section B of this application) present the information required by this section. Additional hydrogeologic information required by the section is discussed in Section E.3.a.

#### **E-5 CONTAMINANT PLUME DESCRIPTION**

##### **E-5a Contaminant Plume Description**

In 1984, Chevron implemented changes in the groundwater monitoring program at units operating then under interim status standards. New wells were installed at the downgradient boundary or "compliance point" of the North Landfarm. The MHWMR 265, Subpart F contamination indicators (pH, TOC, TOX, uMHOS/cm) were then abandoned in favor of a suite of analytes selected to identify the difference between natural geochemical conditions and migration of contaminants into the groundwater.

The presence of very low concentrations of several contaminants was confirmed in compliance point monitoring wells at the North Landfarm in 1986. The refinery responded by implementing an assessment program to determine the extent, rate of migration, and concentrations of contaminants in the plume. The findings of that study were documented in the report entitled "Groundwater Quality Assessment Report" (ERM - Southwest, 1987a) and in subsequent reports of quarterly monitoring data. These reports have been previously submitted with the 1988 Part B permit application.

In summary, the groundwater assessment completed in 1987 revealed that:

1. Constituents traceable to hazardous and non-hazardous wastes typically managed at the North Landfarm had migrated into the shallow groundwater beyond the compliance points of the unit.
2. The contaminant plume was limited in extent, reaching no more than about 200 feet downgradient from the unit.

3. Contaminant concentrations were very low and generally at statistically significant levels only near the unit boundaries. Beyond the unit boundaries only concentrations at or near analytical detection limits had been observed.

An alternate concentration limit (ACL) petition was prepared in 1987, and subsequently approved by the EPA and MDEQ in 1988, for specific groundwater monitoring parameters at the North Landfarm. This petition included an exhaustive review of the contaminants present in these plumes, including toxicities, dispersion modelling, attenuation mechanisms, exposure pathways, etc. This ACL application, entitled "Alternate Concentration Limit Petition" (ERM-Southwest, 1987b) was submitted with the 1988 Part B Permit application and is not included with this permit renewal.

The conclusion drawn at that time was that the contaminants observed to date do not pose any tangible present or future threat to human health or the environment. Very few of the monitored constituents have been detected in the groundwater since approval of the ACLs, and those that have been detected are at concentrations well below the approved ACL.

Since their first detection in 1985, the contaminant concentrations have steadily declined at the compliance point wells. In most cases, they are no longer detectable. In the past nine years of Appendix IX sampling, only minor metal detections have been reported.

As part of the closure of the North Landfarm, it was graded to promote surface water run-off and was capped with two feet of clay to prevent infiltration. This cap was overlain by six inches of top soil that supports a vegetated cover. Additional information on closure and post-closure care activities appears in Section I of this application.

Since there is no evidence for an existing contaminant plume at the North Landfarm, no plume map has been constructed to delineate the horizontal and vertical extent of contamination. Likewise, no Appendix IX constituents are identified on a map.

## **E-6 GENERAL MONITORING PROGRAM REQUIREMENTS**

The current Groundwater Monitoring Program is designed to provide compliance monitoring at the North Landfarm and East Landfarm. Chevron is requesting a permit change to move all long term care and groundwater monitoring of the East Landfarm to the Corrective Action program as part of the Hazardous and Solid Waste Amendments portion of the permit, Section L. Groundwater monitoring will be addressed for these two units in conjunction with the existing solid waste management units co-located with these facilities. All subsequent discussion of groundwater monitoring program requirements will be related to the North Landfarm only. The specific objectives of the compliance monitoring are to determine whether selected constituents are present in the groundwater above the groundwater protection standard, and to evaluate the groundwater flow rate and direction in the upper most aquifer.

Prior to initiating this Groundwater Monitoring Program, twelve (12) quarters of assessment monitoring were conducted. Groundwater assessment was initially implemented as a result of statistically significant increases in the concentrations of specific constituents at the Refinery's downgradient

monitoring wells, NL-3, EL-2, COD-WP-2, and COD-WP-5, located at the North Landfarm and the COD Pond, respectively. The approach to this groundwater assessment was outlined in the work plan entitled Ground Water Assessment Plan, dated June 23, 1986, and approved by MDEQ. The results were presented in the report entitled Ground Water Quality Assessment Report, dated April 7, 1987.

In conjunction with this assessment, an ACL demonstration was performed for selected constituents at the North Landfarm. MDEQ and the U.S. EPA approved the ACLs. These constituents included benzene, toluene, ethylbenzene, and xylenes (BTEX), phenolics, lead and chromium for the North Landfarm. An ACL for barium at the North Landfarm was established in May of 1995. In July of 1996, the statistical method for analyzing constituent concentrations versus background was modified.

In April of 1997, the Refinery conducted new sets of aquifer tests to verify hydraulic conductivities for various locations around the Refinery, including the North Landfarm. A pump test was conducted for monitor wells NL-1, NL-3 and NL-4 at the North Landfarm. The North Landfarm's hydraulic conductivity for this pump test was calculated to be  $4.0 \times 10^{-6}$  feet per second (ft/sec). The results were somewhat similar to the results from aquifer testing during the groundwater assessment conducted in 1987. The Refinery currently uses these most recent conductivity results in calculating the flow velocity for the North Landfarm.

During the November 2003 groundwater monitoring event, Chevron detected beryllium above the allowable statistical limit at the North Landfarm. In accordance with the permit requirements, Chevron added this constituent to its alternate concentrations limits (ACL) monitoring list. Chevron proposed to use the U.S. EPA Region IX Preliminary Remediation Goal (PRGs) for tap water as the ACL for beryllium which is protective of human health for a lifetime of exposure to drinking water. The ACL is considered protective because the monitoring well where this constituent was identified (NL-3) is not in a drinking water aquifer, is well within the Refinery property, and the rate of groundwater flow at the Refinery is very slow (approximately 1-2 feet per year). The U.S. EPA Region IX PRG value of 0.073 mg/L for beryllium was established as the ACL in the current permit.

#### **E-6a Description of Wells**

Four wells (NL-1, NL-2, NL-3, and NL-4) are used to monitor the groundwater quality at the North Landfarm. Well ASR is used for background groundwater quality analysis. The locations of these wells are shown on Figure E-6 and Figure E-7. The wells are screened in the fine, silty sands which compose the surficial aquifer. The average thickness of the surficial aquifer is 15 to 20 feet thick at the North Landfarm. Wells were constructed by conventional drilling methods and have 2-inch or 4-inch threaded PVC casings and screens. Lockable security casings were then set in concrete pads poured around the borehole casings. Monitor wells were installed per existing EPA protocol and requirements.

Soil boring logs for existing groundwater monitoring wells are provided in Attachment B to Section E. Monitoring well construction details are summarized in Table E-3. This table also includes construction details for those wells used strictly for water level measurements.

#### **E-6b Description of Sampling and Analysis Procedures**

Sampling and analytical procedures for the North Landfarm are described in the Sampling and Analysis Plan – ACL and Appendix IX Compliance Monitoring. The Sampling and Analysis Plan Table of Contents

are provided in Attachment C to Section E.

#### **E-6c Procedures for Establishing Background Quality**

Background water quality was established for the North Landfarm in the ACL petition submitted with the 1988 Part B Permit application.

North Landfarm background water quality has historically been established from data obtained at well ASR Figure E-6. Monitor well ASR is regionally upgradient and sufficiently removed from the unit to produce groundwater unaffected by hazardous waste management activities. Well ASR is completed in native soils.

Assurance that the North Landfarm monitoring wells have been installed downgradient is provided by groundwater flow maps in Figure E-6 through Figure E-9. Flow directions, now well established, are based upon groundwater elevation data obtained each time wells have been sampled.

These elevation data will continue to be collected and evaluated during post-closure groundwater sampling at the North Landfarm.

#### **E-6d Statistical Procedures**

The Chevron Pascagoula Refinery implemented an alternate groundwater monitoring program in May 1985 at its hazardous waste management units which were then operating under interim status standards. This program was designed to meet the groundwater monitoring standards for permitted facilities and is characterized by the substitution of specific analytes for the generic contamination indicators (TOC, etc.) usually employed at interim status facilities. Acting on approval of MDEQ and EPA - Region IV, Chevron implemented their current program. The current program is consistent with the monitoring program Chevron proposed in their permit application for existing hazardous waste management (HWM) units in 1984, and with the Mississippi Hazardous Waste Management Regulations (MHWMR) at 264, Subpart F. Early implementation of the program allowed Chevron to conduct meaningful groundwater monitoring as permitting activities continued.

In July 1985, Chevron was directed by the MDEQ and EPA - Region IV to accelerate their monitoring schedule. In their report to those agencies dated February 20, 1986, Chevron presented data obtained under the accelerated program. As noted in that report and as discussed with the agencies in a meeting held February 21, 1986 at EPA - Region IV headquarters, those data did not meet accepted criteria for evaluation by conventional statistical methods, including Cochran's Approximation of the Behrens-Fisher Student's-t (CABF-t) (see MHWMR 264.97(h) and Appendix IV to Chapter 264.

#### Data Validation

Sample results should be reported as similar to blank concentrations when the concentration of the analyte in the sample exceeds 10 times the concentration in the associated blank for the common contaminants (methylene chloride, acetone, toluene, 2-butanone [MEK], and common phthalate esters), or 5 times the concentration for other analytes. Chevron will use this method to remove any false positives prior to statistical evaluations.



The statistical analyses that Chevron will apply to their ACL and Appendix IX groundwater monitoring programs are as follows:

#### Statistical Analysis for ACL Monitoring

First, the mean of the reported values will be determined for each set of replicate data. In calculating the mean, results reported at less than the detection limit will be given a value of one-half of the method detection limit. (EPA cites this treatment of values less than the detection limit as an acceptable method in Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance - March, 2009). The mean will be rounded to the same significance as the corresponding ACL. The mean and the ACL will then be compared to determine if the mean has exceeded the ACL.

#### Statistical Analysis for Appendix IX Monitoring

A mean cannot be calculated for the Appendix IX analyses since only one replicate is collected from each well. All detections will first be compared to the established ACLs. For organic constituents with no existing ACL, the result will then be compared to a value equal to an order-of-magnitude greater than the detection limit to determine if the constituent has been detected. If the results exceed 10x the method detection limit, further statistical analysis discussed in EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance - March, 2009 will be conducted to verify the result is not a false positive or a sampling or analytical error.

To determine if metals have been detected when no ACL exists, the results will be compared to the current EPA Maximum Contaminant Level (MCL). Where no MCL exists, results will be compared to the existing MDEQ Target Remedial Goal (TRG).

If the metals have been detected in the background well, Chevron will calculate a statistical detection limit by calculating the 95% upper tolerance limit from the historical background well detections. This procedure is described in the EPA's statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance – March 2009. Any analysis below analytical detection limit will use one half the detection limit in calculating the mean and standard deviation.

Note: If detection of a new Appendix IX constituent above the statistical limit occurs, Chevron will either: 1) resample the affected well(s) within 30 days to confirm the presence of new constituents, report any new constituent to the Executive Director within seven days of resampling, and add them to the ACL list; or 2) report the original results to the Executive Director within seven days and add them to the ACL list. In addition, Chevron will either: 1) submit a permit modification to establish corrective action, or 2) submit a petition to establish ACLs for the additional constituents identified.

### **E-7 DETECTION MONITORING PROGRAM**

The North Landfarm is currently being monitored under the compliance monitoring program, per MHWMR 264.91(a)(1). The requirements for a detection monitoring program are not applicable to this permit application.

## **E-8 COMPLIANCE MONITORING PROGRAM**

This section provides the information required by MHWMR 264.99 relating to the requirements for a compliance monitoring program at hazardous waste facilities where migration of hazardous constituents have been detected. The current compliance monitoring program is for the North Landfarm and East Landfarm. Because it is difficult to determine the source of constituents present from solid waste management units that are co-located with the East Landfarm, Chevron is requesting a change in the compliance monitoring program that allows monitoring of all groundwater activities for the East Landfarm to be part of the groundwater monitoring activities associated with the various SWMUs on the East Hill area where the two facilities are located. This request is in accordance with MHWMR 264.90(f):

Pursuant to §264.90(f) the Executive Director may replace all or part of the requirements of §§264.91 through 264.100 applying to a regulated unit with alternative requirements for groundwater monitoring and corrective action for releases to groundwater set out in the permit (or in an enforceable document) (as defined in 40 CFR 270.1(c)(7)) where the Executive Director determines that:

- (1) The regulated unit is situated among solid waste management units (or areas of concern), a release has occurred, and both the regulated unit and one or more solid waste management unit(s) (or areas of concern) are likely to have contributed to the release; and
- (2) It is not necessary to apply the groundwater monitoring and corrective action requirements of §§264.91 through 264.100 because alternative requirements will protect human health and the environment.

The East Landfarm will be included in the annual Corrective Action monitoring program that will be reported to EPA, Region 4. All subsequent discussion of groundwater monitoring and changes will be related to the North Landfarm monitoring only.

Groundwater monitoring conducted during interim status at the North Landfarm revealed that some minor releases of contaminants occurred during its active life. Contaminant concentrations were low when they were discovered, and have declined steadily since then as operations were modified to correct the problem. The ACL petition presented in Section E-7 of the 1988 Part B permit application was based on this observation. Compliance monitoring required by MHWMR 264.91(a)(1) and described in MHWMR 264.99 will be conducted at the North Landfarm to verify that the final groundwater protection standard is met.

Chevron is requesting a reduction in compliance monitoring frequency from semi-annual to annual monitoring at the North Landfarm. Groundwater concentrations at the North Landfarm have been monitored semi-annually for more than 10 years with minimal detections and no exceedances of established ACLs. Therefore, a reduction in monitoring frequency from semi-annual to annual is requested.

In addition, Chevron is requesting a reduction in monitoring frequency for the annual Appendix IX monitoring. In over 10 years of monitoring, there have been no Appendix IX exceedances. Therefore, Chevron proposes a reduction in groundwater monitoring frequency from annual Appendix IX sampling to Appendix IX sampling every five years. All North Landfarm monitor wells will be sampled once in years

evenly divisible by five for modified suite of Appendix IX parameters provided in Table E-5. The next Appendix IX sampling event will be in 2020.

#### **E-8a Waste Description**

Wastes treated at landfarms were generally biodegradable organic materials, although some waste listed in MHWMR Part 261, Subpart D also contained lead and chromium.

#### **E-8b Characterization of Contaminated Groundwater**

The presence of very low concentrations of several contaminants was confirmed in compliance point monitoring wells at the North Landfarm in 1986. Since the first contaminant detections, however, the contaminant concentrations have steadily declined at the compliance point wells. In most cases, they are no longer detectable. Samples analyzed for ACL constituents have very few detections, and the detections are at concentrations well below their approved ACLs. This phenomenon is most likely a reflection of major operating changes adopted at the North Landfarm which are summarized in the following paragraph.

The North Landfarm was graded more frequently to encourage run-off from the treatment surface while discouraging infiltration. Waste run-off into the stormwater basin was reduced by use of a special waste application vehicle which injected wastes below the landfarm surface. Degradation of waste residues in the treatment zone was also enhanced by more prompt incorporation of wastes into the soil and by more frequent tilling. These practices were continued through the closure period in an effort to degrade all waste residues which could leach into the groundwater underlying the unit. Final grading and installation of a two foot clay cap and soil and vegetation cover reduces the long-term potential for future releases during the post-closure period. Additional information on closure and post-closure care activities appears in Appendix I of this application.

There is no evidence for an existing contaminant plume at the North Landfarm based on 10 years of compliance monitoring data. Therefore, no plume map has been constructed to delineate the horizontal and vertical extent of contamination. Likewise, no Appendix IX constituents are identified on a map.

#### **E-8c Hazardous Constituents to be Monitored in Compliance Program**

On the basis of waste analyses (Section C), and several years of monitoring data collected at the North Landfarm, the constituents shown in Table E-4 represent the contamination indicators for compliance monitoring. Also shown on this table are the approved ACLs for each constituent. Chevron is requesting the removal of constituents from the North Landfarm ACL monitoring list which have not been detected at the North Landfarm in more than 10 years of semi-annual monitoring. The following constituents have not been detected at any North Landfarm monitor well within the past 20 semi-annual sampling events: Ethylbenzene, Xylenes (total) and Phenolics (total). Chevron is requesting a removal of the aforementioned constituents.

Table E-5 presents a list of proposed constituents for the proposed five year Appendix IX groundwater monitoring. Chevron is requesting a modification to the constituent list from the extensive Appendix IX list to Skinner List Volatile Organic Compounds, Semi-Volatile Organic Compounds and metals. This list is much less extensive than the Appendix IX list, and reflects those constituents which are most likely to be found at a refinery.

#### **E-8d Concentration Limits**

The EPA and MDEQ have established alternate concentration limits as discussed in E.8.e.

#### **E-8e Alternate Concentration Limits**

An alternate concentration limit (ACL) petition was prepared in 1987, and subsequently approved by the EPA and MDEQ in 1988, for specific groundwater monitoring parameters at the North Landfarm. The ACL application, entitled "Alternate Concentration Limit Petition" (ERM-Southwest, 1987b) was submitted with the 1988 Part B Permit application and is not included with this permit renewal.

The conclusion drawn at that time was that the contaminants observed to date do not pose any tangible present or future threat to human health or the environment. Very few of the monitored constituents have been detected in the groundwater since approval of the ACLs and those that have been detected are at a concentration well below the approved ACL.

A discussion of the ACLs with respect to groundwater monitoring at the North Landfarm is presented in Sections E.5 and E.7 and the Alternate Concentration Limit (ACL) for each constituent is presented in Table E-4.

#### **E-8e(1) Adverse Effects on Groundwater Quality**

Compliance monitoring wells described in section E-6a have been completed in the upper most aquifer beneath the regulated units. This unconfined aquifer is not used as a source of drinking water. The concentration limits and alternate concentration limits are based upon levels that would be protected for potable consumption. These limits are imposed immediately downgradient of the unit and any migration would result in dilution/dispersion at any potential point of contact resulting in potential exposure well below the protective level.

#### **E-8e(2) Potential Adverse Effects**

There are no potential adverse effects since the North Landfarm was closed with a two foot clay cap, six inches of topsoil and a vegetated cover. All storm water run-off flows through the Refinery's storm water run-off system and is discharged through the NPDES permitted storm water outfall 002. In addition, the slow groundwater velocity at the North Landfarm, an average of 0.2 feet/year, results in minimal groundwater and constituent movement.

#### **E-8f Engineering Report Describing Groundwater Monitoring Systems**

The groundwater monitoring system has been described in Section E-6. Groundwater flow maps for the North Landfarm indicate that a slight groundwater mound exists below the landfarm, therefore, monitoring wells NL-1, NL-2, NL-3, and NL-4 are all in a downgradient direction. These wells are compliance point monitoring wells, and are completed around the perimeter of the waste management area in the uppermost aquifer.

Monitoring well ASR is used to monitor background water quality. As discussed previously, the background well ASR provides background water quality data for the specific compliance monitoring parameters. This well will be sampled every five years in association with Appendix IX sampling (next sampling taking place in 2020) as part of the ongoing monitoring program. Results are evaluated during the reporting process.

#### **E-8g Proposed Sampling and Statistical Analysis Procedures for Groundwater Data**

Attachment C to Section E contains the Sampling and Analysis Plan Table of Contents relating to the specific procedures that will be used for sampling and analysis of groundwater samples collected from the compliance monitoring wells. These procedures are consistent with the latest EPA Groundwater Monitoring Guidance and SW846. The following components comprise the sampling and analysis plan:

- Sample Collection Methods
- Sample Preservation and Shipment Methods
- Analytical Methods
- Chain-of-Custody Control Methods
- Documentation of Proper Sampling and Analysis Methods
- Sampling Frequency
- Procedure for Determining Groundwater Elevation

Annual evaluations to determine the direction and velocity of groundwater flowing beneath the regulated units will be performed as part of the annual monitoring event. Velocities are calculated using Darcy's formula as illustrated in Section E.3.g, using hydraulic gradient values determined from fluid elevations collected during the monitoring event. Flow directions are determined for each sampling event by constructing piezometric surface isopleths.

#### **E-8h Groundwater Protection Standard Exceeded at Compliance Point Monitoring Well**

In accordance with MHWMR 264.99 and with the conditions of their existing permit, Chevron will implement the following procedures.

For ACL monitoring, Chevron will notify the Executive Director in writing within seven calendar days identifying which concentration limits have been exceeded. Chevron will determine if a detection is the result of an artifact caused by error in sampling, analysis, or statistical evaluation or is indicative of natural variation in the groundwater. Chevron will notify the Executive Director in writing within seven days that a determination will be made. Within 90 days, Chevron will either submit a report to the Executive Director which explains the non-compliance, or Chevron will request a permit modification to make appropriate changes to the compliance monitoring program. Compliance monitoring will continue until a parameter is shown to be in exceedance of established concentration limits for two consecutive sampling events.

For Appendix IX constituent monitoring, or for those constituents presented in Table E-5, monitoring, Chevron will either: 1) resample the affected well(s) within 30 days to confirm the presence of new constituents, report any new constituent to the Executive Director within seven days of resampling, and add them to the ACL list; or 2) report the original results to the Executive director within seven days and add them to the ACL list. In addition, Chevron will either: 1) submit a permit modification to establish corrective action, or 2) submit a petition to establish ACLs for the additional constituents identified.

#### **E-9 CORRECTIVE ACTION PROGRAM**

An engineering feasibility plan and a plan for corrective action are not applicable at this time. Chevron will prepare this plan if substantial evidence shows that established concentration limits for the ACL

parameters and the modified Appendix IX constituents presented in Table E-5 are consistently present in excess concentrations in the groundwater at the compliance point.

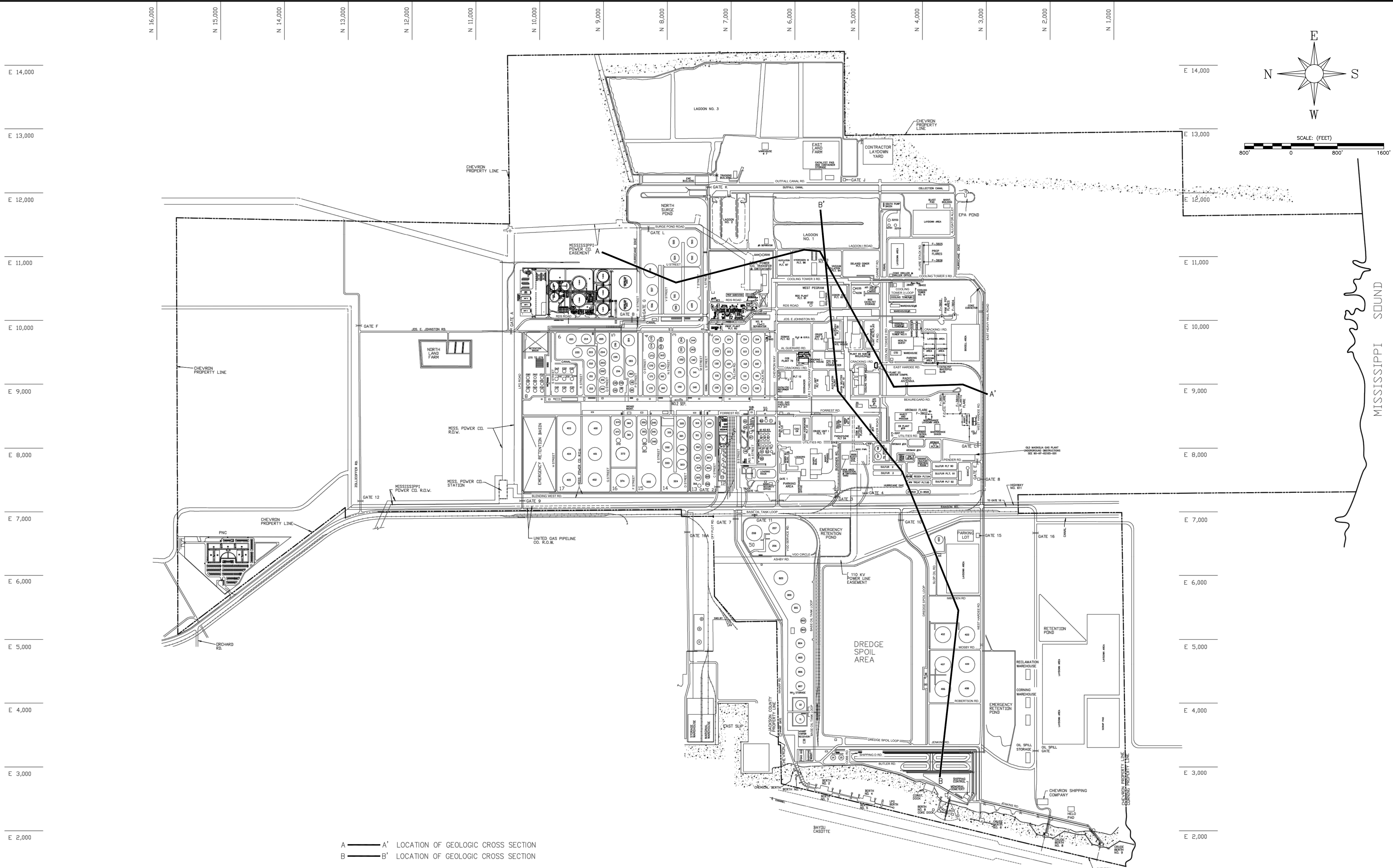
## Section E Figures






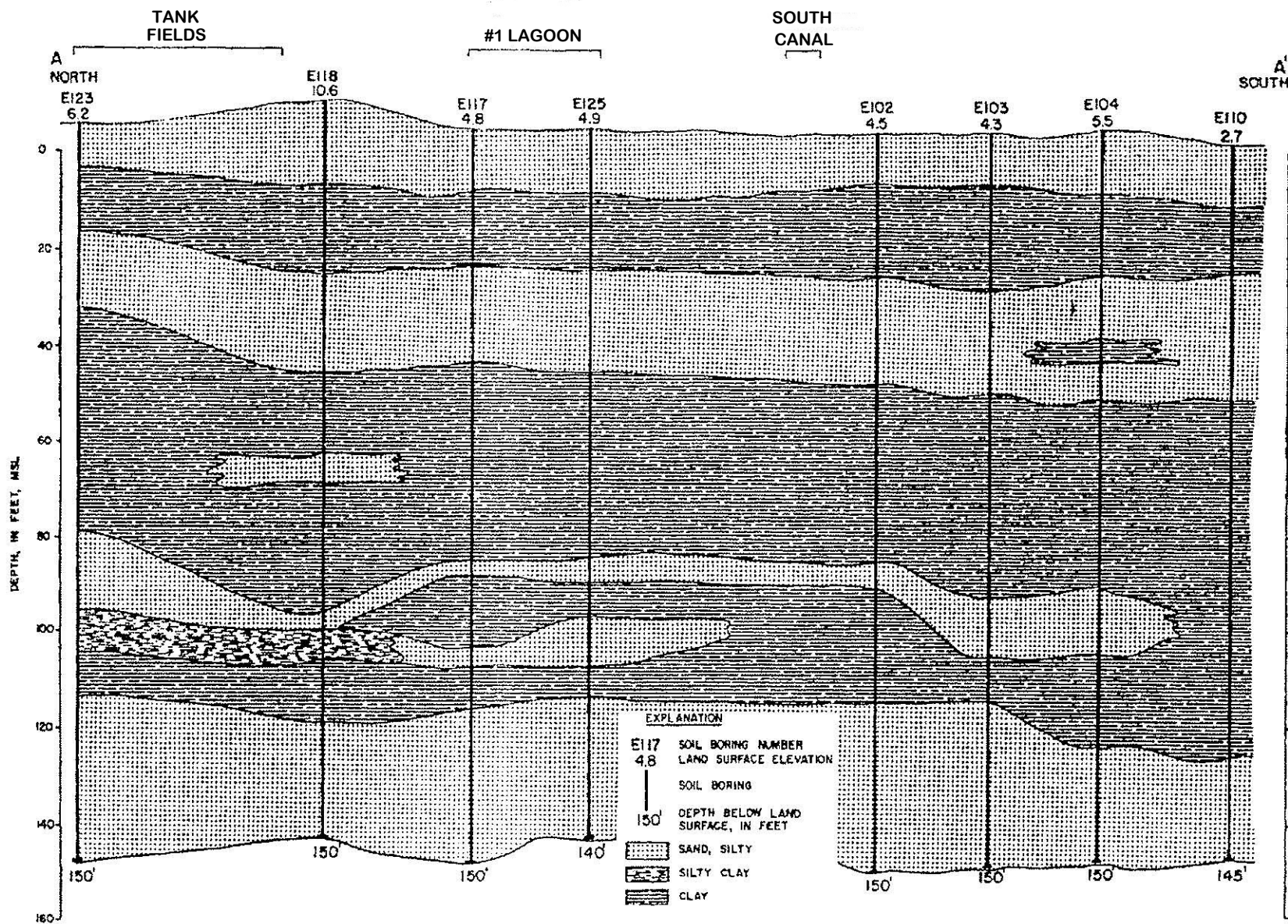


I:\PROJECTS\CAIDN\CHEVRON\TEXAS\CAIN\PASCAGOULA\6065025\2B\BASE-NAME.DWG - RORA Permit Figure E-2 - 3/18/2021



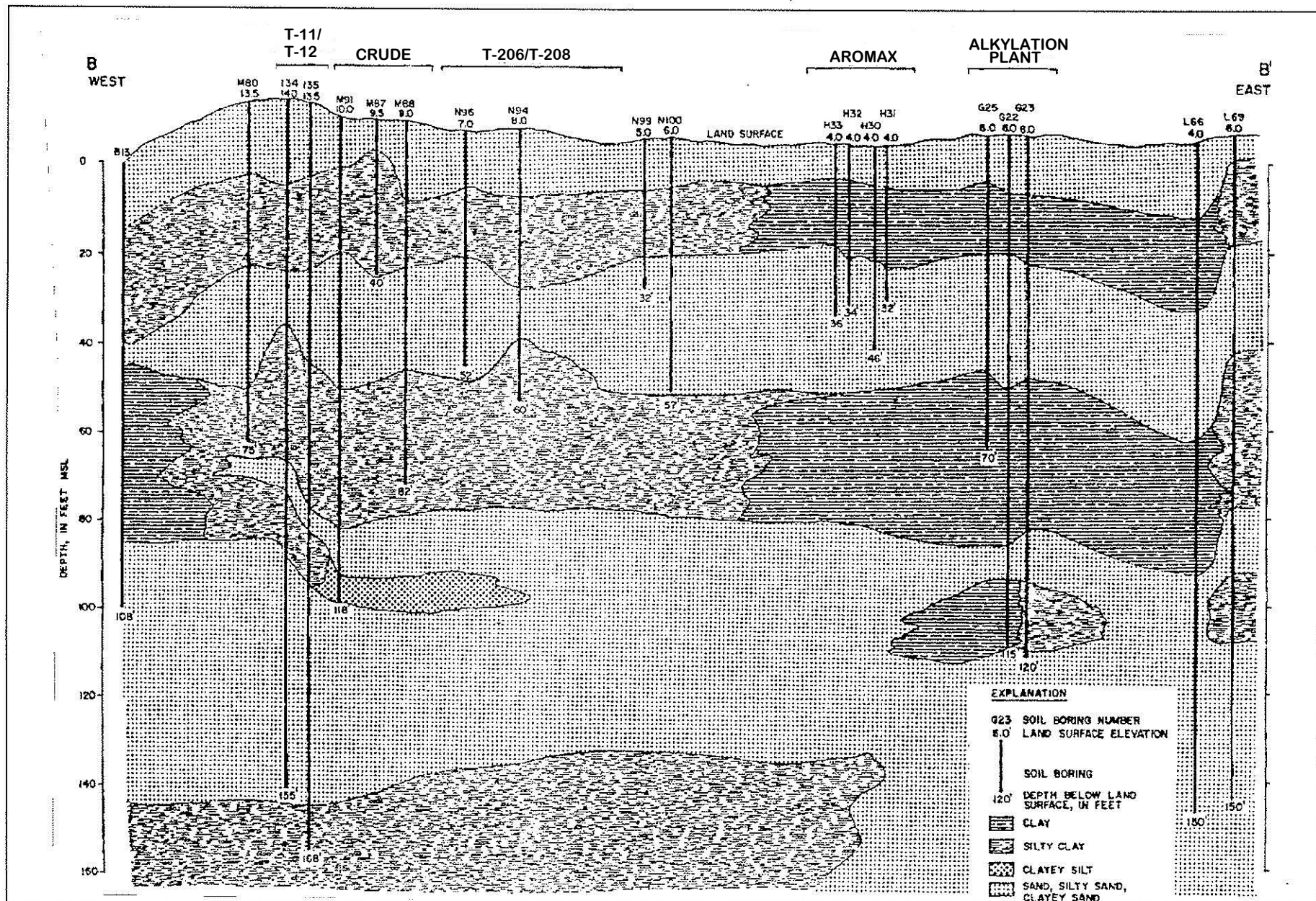
	REFERENCE DRAWINGS			REVISIONS								TECH. APPROVALS	OPER. APPROVALS	 <b>Chevron</b> Pascagoula Refinery	CROSS-SECTION LOCATION MAP		
													CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI				
													PART B PERMIT RENEWAL APPLICATION				





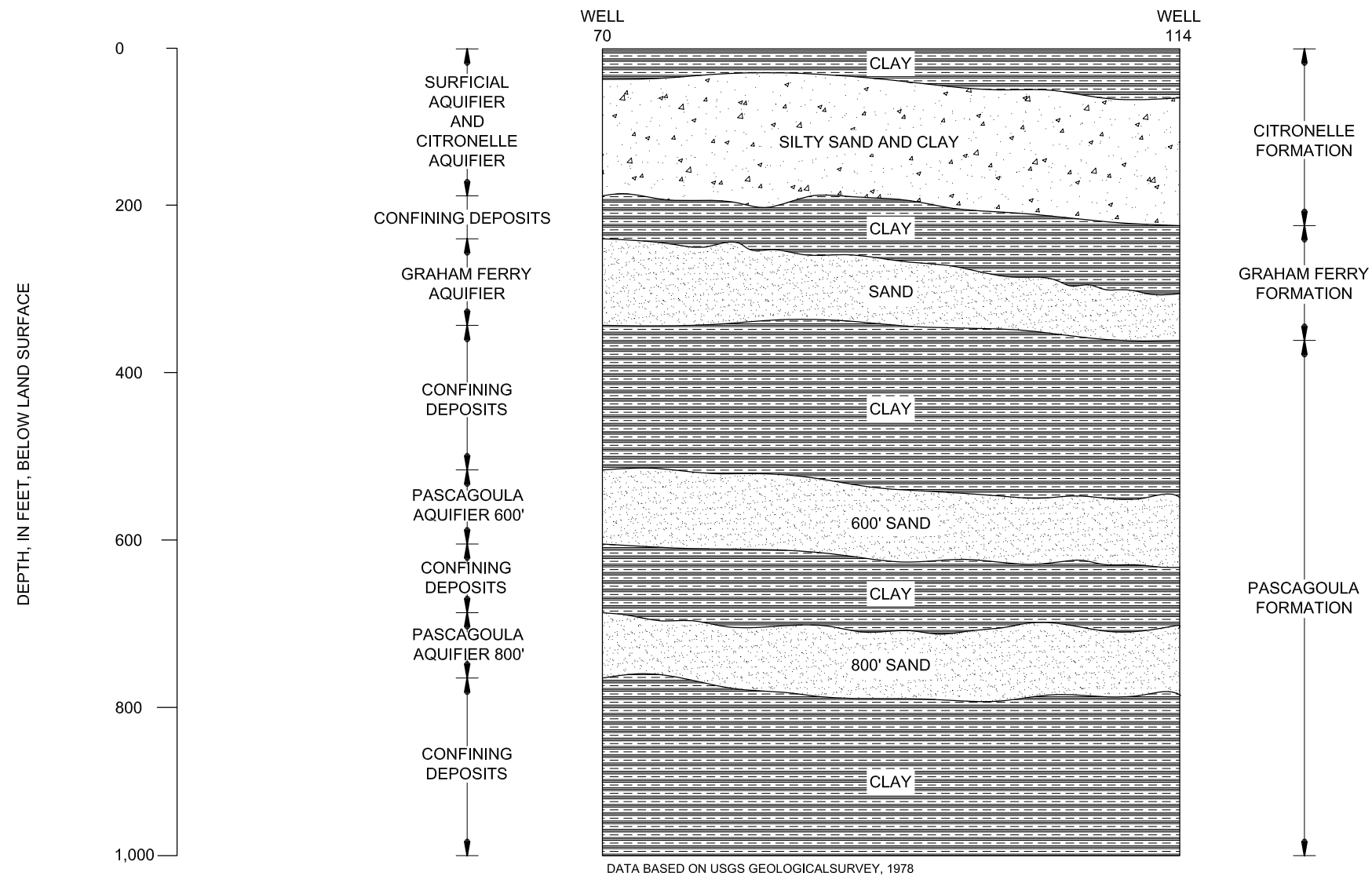
CROSS-SECTION A-A'  
CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI  
PART B PERMIT RENEWAL APPLICATION

Figure E-3



CROSS-SECTION B-B'  
 CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI  
 PART B PERMIT RENEWAL APPLICATION

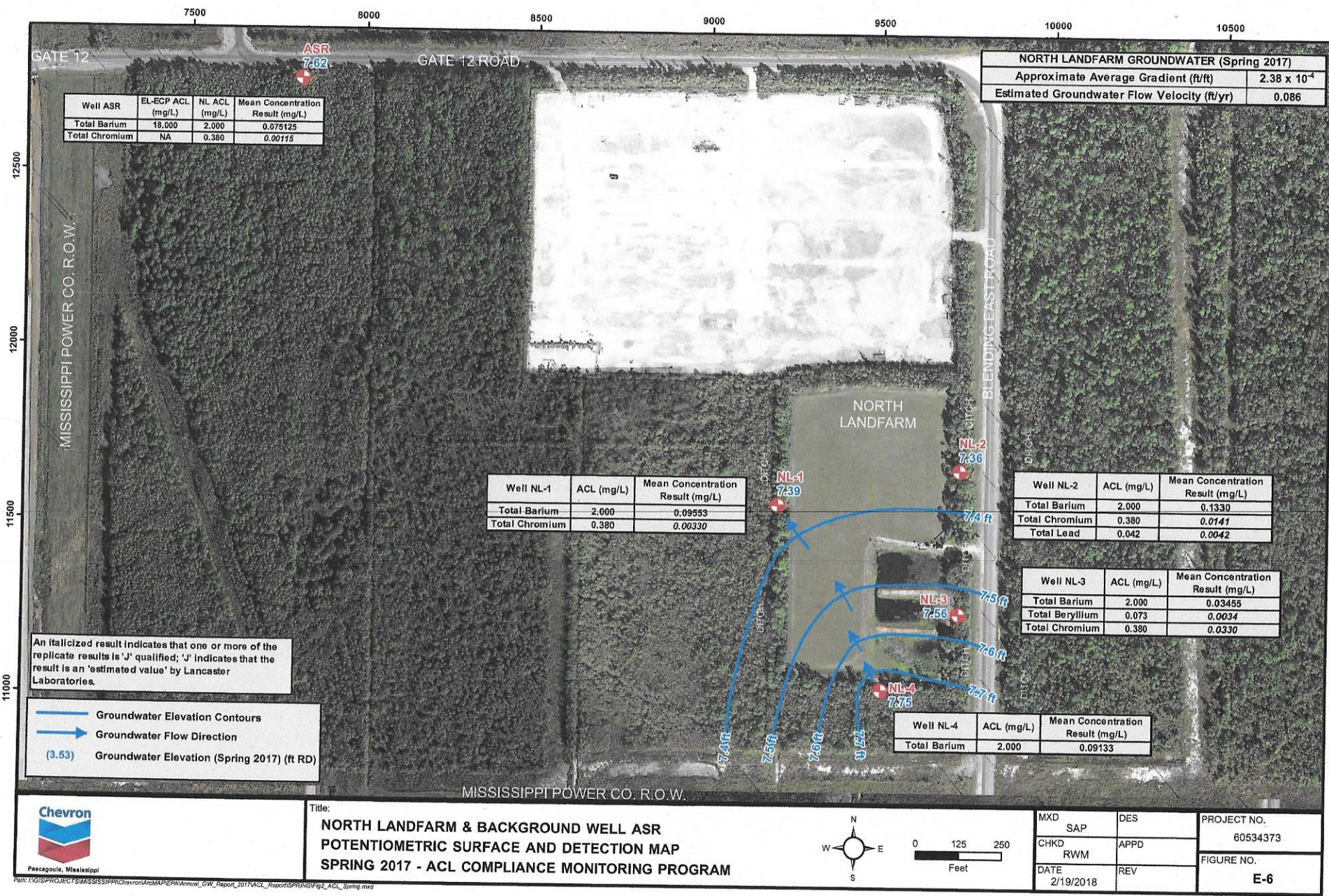
Figure E-4



STRATIGRAPHIC SECTION  
CHEVRON REFINERY, PASCAGOULA, MISSISSIPPI  
PART B PERMIT RENEWAL APPLICATION

Figure E-5





Well ASR	EL-ECP ACL (mg/L)	NL ACL (mg/L)	Mean Concentration Result (mg/L)
Total Barium	18,000	2,000	0.075125
Total Chromium	NA	0.380	0.00115

NORTH LANDFARM GROUNDWATER (Spring 2017)	
Approximate Average Gradient (ft/ft)	2.38 x 10 <sup>-4</sup>
Estimated Groundwater Flow Velocity (ft/yr)	0.086

Well NL-1	ACL (mg/L)	Mean Concentration Result (mg/L)
Total Barium	2,000	0.09553
Total Chromium	0.380	0.00330

Well NL-2	ACL (mg/L)	Mean Concentration Result (mg/L)
Total Barium	2,000	0.1330
Total Chromium	0.380	0.0141
Total Lead	0.042	0.0042

Well NL-3	ACL (mg/L)	Mean Concentration Result (mg/L)
Total Barium	2,000	0.03455
Total Beryllium	0.073	0.0034
Total Chromium	0.380	0.0330

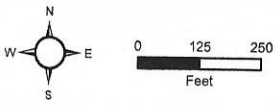
Well NL-4	ACL (mg/L)	Mean Concentration Result (mg/L)
Total Barium	2,000	0.09133

An italicized result indicates that one or more of the replicate results is 'J' qualified; 'J' indicates that the result is an 'estimated value' by Lancaster Laboratories.

- Groundwater Elevation Contours
- Groundwater Flow Direction
- (3.53) Groundwater Elevation (Spring 2017) (ft RD)



Title:  
**NORTH LANDFARM & BACKGROUND WELL ASR  
POTENTIOMETRIC SURFACE AND DETECTION MAP  
SPRING 2017 - ACL COMPLIANCE MONITORING PROGRAM**



MXD	SAP	DES	PROJECT NO.
CHKD	RWM	APPD	60534373
DATE	2/19/2018	REV	FIGURE NO.
			<b>E-6</b>

## Section E Tables



Table E-1 - Groundwater Elevations, 2017

Well Number	North Coordinate	East Coordinate	Surveyed Reference (feet RD)	4/4/2017		09/25/2017	
				Depth to Groundwater (feet)	Water Level Elevation (feet RD)	Depth to Groundwater (feet)	Water Level Elevation (feet RD)
ASR	12766	7815	10.71	3.09	7.62	3.45	7.26
NL-1	11560	9203	10.67	3.28	7.39	3.30	7.37
NL-2	11662	9733	10.31	2.95	7.36	3.01	7.30
NL-3	11252	9733	10.42	2.86	7.56	3.67	6.75
NL-4	11032	9510	10.86	3.11	7.75	3.52	7.34

**Table E-2**  
**Deep and Shallow Monitoring Wells Water Level Readings**

*Water Elevation (MLW) Datum*

<i>Well</i>	<i>9/9/1982</i>	<i>10/18/1982</i>	<i>4/25/1983</i>	<i>10/11/1983</i>	<i>11/8/1983</i>
As	+7.07	+4.74	+7.42	+7.02	+5.66
Ad	+5.27	+4.58	+6.85	+6.25	+6.44
Bs	+3.83	+3.87	+4.42	+4.00	+4.12
Bd	+4.34	+4.52	+4.92	+4.23	-----
Cs	+6.72	+5.95	+6.69	+6.08	+5.99
Cd	+5.20	+5.17	+5.22	+4.94	+4.97
Ds	+1.98	+1.27	+2.79	+3.15	+2.45
Dd	+2.68	+2.53	+2.99	+3.19	+2.96
Es	+4.41	+3.58	+4.72	+4.23	+3.91
Ed	+4.45	+4.20	+4.68	+4.54	+5.44

**NOTE:**

MLW - Mean Low Water



*Table E-4 Monitoring Concentration Limits*

North Landfarm		
Constituent	Concentration Limit (mg/L)	Basis
Barium (total)	2	ACL
Benzene	0.3	ACL
Beryllium	0.07	ACL
Chromium (total)	0.38	ACL
Lead (total)	0.042	ACL
Toluene	0.043	ACL

*Note: Ethylbenzene, xylenes (total) and phenols (total) were removed from the list of hazardous constituents to be monitored, because there were no detections of any of the analytes in over ten years of semi-annual monitoring. These constituents will still be sampled as part of the Appendix IX monitoring program (see Table E-5).*

**Table E-5**  
**Skinner List Compounds**  
**Chevron Products Company**  
**Pascagoula, Mississippi**

ANALYTES <sup>1</sup>	CAS Number
Semi Volatile Organic Compounds	
Acenaphthene	83-32-9
Anthracene	120-12-7
Benzenethiol	108-98-5
Benzo(a)anthracene	56-55-3
Benzo(b)fluoranthene	205-99-2
Benzo(k)fluoranthene	207-08-9
Benzo(a)pyrene	50-32-8
Bis(2-ethylhexyl) phthalate	117-81-7
Chrysene	218-01-9
Dibenz(a,h)acridine	226-36-8
Dibenz(a,h)anthracene	53-70-3
Di-n-butyl phthalate	84-74-2
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
Diethyl phthalate	84-66-2
2,4 Dimethylphenol	105-67-9
Dimethyl phthalate	131-11-3
2,4 Dinitrophenol	51-28-5
Fluoranthene	206-44-0
Fluorene	86-73-7
Indene	95-13-6
Indeno(1,2,3-cd)pyrene	193-39-5
Methyl tertiary butyl ether (MTBE)	1634-04-4
1-Methylnaphthalene	90-12-0
2-Methylphenol (o-Cresol)	95-48-7
3-Methylphenol (m-Cresol)	108-39-4
4-Methylphenol (p-Cresol)	106-44-5
Naphthalene	91-20-3
4-Nitrophenol	100-02-7
Phenanthrene	85-01-8
Phenol	108-95-2
Pyrene	129-00-0
Pyridine	110-86-1
Quinoline	91-22-5

ANALYTES <sup>1</sup>	CAS Number
Volatile Organic Compounds	
Benzene	71-43-2
Carbon Disulfide	75-15-0
Chlorobenzene	108-90-7
Chloroform	67-66-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethane	75-34-3
1,4-Dioxane	123-91-1
Ethylbenzene	100-41-4
Ethylene dibromide (EDB)	106-93-4
Methyl ethyl ketone (MEK)	78-93-3
Styrene	100-42-5
Toluene	108-88-3
1,1,1-Trichloroethane	71-55-6
Trichloroethene	79-01-6
Tetrachloroethylene	127-18-4
Xylenes (total)	1330-20-7

Inorganics - Metals and Cyanide	
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Beryllium	7440-41-7
Cadmium	7440-43-9
Chromium	7440-47-3
Cobalt	7440-48-4
Lead	7439-92-1
Mercury	7439-97-6
Nickel	7440-02-0
Selenium	7782-49-2
Silver	7440-22-4
Vanadium	7440-62-2
Zinc	7440-66-6
Cyanide	57-12-5

**Notes:**

1 - Skinner List compounds from Attachement 1, EPA Region 5 Skinner List, <https://archive.epa.gov/region5/waste/cars/web/html/skinner.html>

**Attachment A to Section E**  
**Aquifer Properties Calculations**

## PERMEABILITY CALCULATIONS

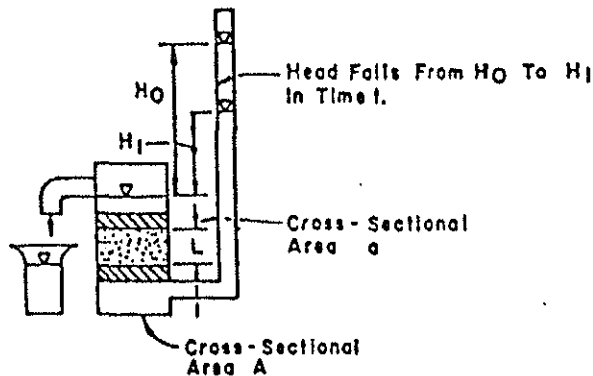
Chevron Landfarms  
Pascagoula, Mississippi

### Purpose:

To calculate the permeability of sandy soils at the North and East Landfarms at Chevron's Pascagoula Refinery.

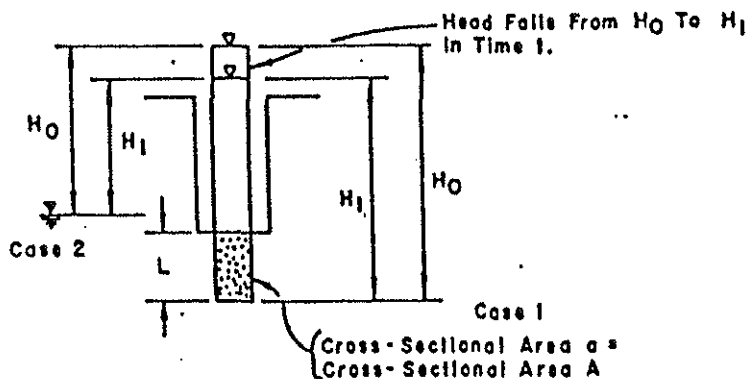
### Background:

The hydraulic conductivity of a medium can be calculated by applying Darcy's Law. In a falling-head test, the head as measured in a tube of cross sectional area,  $a$ , is allowed to fall from  $H_0$  to  $H_1$  during Time,  $t_1$ . The hydraulic conductivity is calculated from:



$$K = \frac{aL}{At} \ln(H_0/H_1)$$

Applying this to a falling-head test in the field, the hydraulic conductivity is calculated from:



$$K = \frac{L}{t} \ln(H_0/H_1)$$

Where  $a = A$

- Case 1: For unsaturated soils  
Case 2: For saturated soils as determined during the boring program or from ground water measurements made on 5/23/85.

# SUMMARY TABLES

## East Landfarm:

<u>Boring #</u>	<u>Depth (ft)</u>	<u>L (cm)</u>	<u>t (sec)</u>	<u>H<sub>0</sub> (cm)</u>	<u>H<sub>1</sub> (cm)</u>	<u>ln (H<sub>0</sub>/H<sub>1</sub>)</u>	<u>K (cm/sec)</u>
B-5	2	15.24	5040	137.16	127.71	$7.14 \times 10^{-2}$	$2.16 \times 10^{-4}$
	12	10.16	1020	441.96	426.72	$3.51 \times 10^{-2}$	$3.5 \times 10^{-4}$
B-6	3.5	15.24	1020	137.16	130.76	$4.77 \times 10^{-2}$	$7.12 \times 10^{-4}$
	10	10.16	1500	447.14	434.43	$2.88 \times 10^{-2}$	$1.95 \times 10^{-4}$
	15	15.24	900	594.36	551.08	$7.56 \times 10^{-2}$	$1.28 \times 10^{-3}$

mean =  $5.5 \times 10^{-4}$  cm/sec

range =  $1.28 \times 10^{-3}$  cm/sec to  $1.95 \times 10^{-4}$  cm/sec

## North Landfarm

<u>Boring #</u>	<u>Depth (ft)</u>	<u>L (cm)</u>	<u>t (sec)</u>	<u>H<sub>0</sub> (cm)</u>	<u>H<sub>1</sub> (cm)</u>	<u>ln (H<sub>0</sub>/H<sub>1</sub>)</u>	<u>K (cm/sec)</u>
B-1	3	15.24	2160	137.16	136.55	$4.46 \times 10^{-3}$	$3.15 \times 10^{-5}$
	10	10.16	1620	447.14	390.14	$1.36 \times 10^{-1}$	$8.53 \times 10^{-4}$
B-3	2	15.24	1500	137.16	133.35	$2.82 \times 10^{-2}$	$2.87 \times 10^{-4}$
	8	15.24	3000	289.56	288.95	$2.11 \times 10^{-3}$	$1.07 \times 10^{-5}$
	12	15.24	540	441.96	431.78	$2.33 \times 10^{-2}$	$6.58 \times 10^{-4}$

mean =  $3.7 \times 10^{-4}$  cm/sec

range =  $8.5 \times 10^{-4}$  cm/sec to  $1.1 \times 10^{-5}$  cm/sec

This boring program was completed on May 22, 1985. The determination of the hydraulic conductivity (permeability) was accomplished by augering a 3.5" Ø hole into the soil and forcing a 2"Ø PVC pipe 4" to 6", depending on the resistance of the encountered material, into the bottom of the auger hole. The PVC pipe was filled with water and the drop in water level was measured over time.

## Horizontal Flow Calculations

Chevron USA Refinery  
Pascagoula, Mississippi

### Purpose:

To calculate potential horizontal flow velocities within the unconfined surficial aquifer at Chevron's North Landfarm.

### Background/Methodology:

A May, 1985 field program was conducted at the Chevron Pascagoula Refinery North Landfarm facility. Field permeability studies indicate the mean hydraulic conductivity of the sands comprising the uppermost aquifer beneath the facility to be  $3.7 \times 10^{-4}$  cm/sec, with an associated range of  $8.5 \times 10^{-4}$  to  $1.1 \times 10^{-5}$  cm/sec (see attached calculations). Ground water measurements were collected from four monitoring wells surrounding the facility. The calculated horizontal ground water gradient of  $3.0 \times 10^{-3}$  ft/ft was derived from the ground water contour map of the North Landfarm (see Appendix E-2A). Horizontal ground water flow velocities have been calculated using Darcy's Formula:

$$V = \frac{Ki}{n_e} \quad \text{where:} \quad V = \text{Velocity of ground water flow}$$

K = Hydraulic Conductivity

i = Horizontal Hydraulic Gradient

$n_e$  = Effective Porosity  
(0.30; from Freeze & Cherry, 1979)

### CALCULATIONS

Case 1: [Using mean values for K]

$$V = \frac{3.7 \times 10^{-4} \text{ cm/sec} \times 3.0 \times 10^{-3} \text{ ft/ft}}{0.30}$$

$$= 3.70 \times 10^{-6} \text{ cm/sec or } 3.83 \text{ ft/year}$$

Case 2: [Using greatest K]

$$V = \frac{8.5 \times 10^{-4} \text{ cm/sec} \times 3.0 \times 10^{-3} \text{ ft/ft}}{0.30}$$

$$= 8.5 \times 10^{-6} \text{ cm/sec or } 8.79 \text{ ft/year}$$

Case 3: [Using lowest value for K]

$$V = \frac{1.1 \times 10^{-5} \text{ cm/sec} \times 3.0 \times 10^{-3} \text{ ft/ft}}{0.30}$$

$$= 1.1 \times 10^{-7} \text{ cm/sec or } 0.11 \text{ ft/year}$$

Case 4: [Worst case calculation, using K ( $1 \times 10^{-3}$  cm/sec)]

$$V = \frac{1 \times 10^{-3} \text{ cm/sec} \times 3.0 \times 10^{-3} \text{ ft/ft}}{0.30}$$

$$= 1.0 \times 10^{-5} \text{ cm/sec or } 10.30 \text{ ft/year}$$

### SUMMARY

<u>Case</u>	<u>K (cm/sec)</u>	<u>i (ft/ft)</u>	<u>n<sub>e</sub> (%)</u>	<u>V (ft/yr)</u>
1	$3.7 \times 10^{-4}$	$3.0 \times 10^{-3}$	0.30	3.83
2	$8.5 \times 10^{-4}$	$3.0 \times 10^{-3}$	0.30	8.79
3	$1.1 \times 10^{-5}$	$3.0 \times 10^{-3}$	0.30	0.11
4	$1.0 \times 10^{-3}$	$3.0 \times 10^{-3}$	0.30	10.30

## Horizontal Flow Calculations

Chevron USA Refinery  
Pascagoula, Mississippi

### Purpose:

To calculate potential horizontal flow velocities within the unconfined surficial aquifer at Chevron's East Landfarm and proposed Catalyst Pad facilities.

### Background/Methodology:

During May, 1985, two borings were completed in the East Landfarm to depths ranging from 14 to 26 feet below the ground surface. Falling head permeability tests were conducted at various depths in each boring (see attached calculations). The results of the field program showed the mean hydraulic conductivity (permeability) for the uppermost unconfined aquifer at this facility to be  $5.5 \times 10^{-4}$  cm/sec, with an associated range of  $1.28 \times 10^{-3}$  cm/sec to  $1.95 \times 10^{-4}$  cm/sec.

Additionally, field permeability studies from completed wells at the proposed Catalyst Pad indicate a mean hydraulic conductivity of  $4.1 \times 10^{-5}$  cm/sec, with an associated range of  $4.68 \times 10^{-5}$  cm/sec to  $3.53 \times 10^{-5}$  cm/sec (see attached calculations; field work completed during July, 1985).

Ground water measurements collected from monitoring wells surrounding the East Landfarm and adjacent proposed Catalyst Pad were used to construct ground water contour maps (see Appendix E-2A) for the uppermost aquifer of this area. Based on data collected over a two-week period, a mean horizontal hydraulic gradient of  $3.24 \times 10^{-3}$  ft/ft, with an associated range of  $4.32 \times 10^{-3}$  ft/ft to  $8.53 \times 10^{-4}$  ft/ft, was calculated at the East Landfarm. Similar data collected over a two-week period at the proposed Catalyst Pad indicates a mean horizontal hydraulic gradient of  $1.02 \times 10^{-2}$  ft/ft, with an associated range of  $1.32 \times 10^{-2}$  ft/ft to  $7.50 \times 10^{-3}$  ft/ft.



Using the above information, the horizontal ground water flow velocity through the uppermost unconfined aquifer beneath these facilities can be calculated using Darcy's Formula:

$$V = \frac{Ki}{n_e} \quad \text{where: } V = \text{Velocity of ground water flow}$$

$K = \text{Hydraulic Conductivity}$

$i = \text{Horizontal Hydraulic Gradient}$

$n_e = \text{Effective Porosity}$   
(0.30; from Freeze & Cherry, 1979)

#### CALCULATIONS

##### East Landfarm:

Case 1: [Using mean values for  $K$  ( $5.5 \times 10^{-4}$  cm/sec) and  $i$  ( $3.24 \times 10^{-3}$  ft/ft)]

$$V = \frac{5.5 \times 10^{-4} \text{ cm/sec} \times 3.24 \times 10^{-3} \text{ ft/ft}}{0.30}$$

$$= 5.94 \times 10^{-6} \text{ cm/sec or } 6.2 \text{ ft/year}$$

Case 2: [Using greatest  $K$  ( $1.28 \times 10^{-3}$  cm/sec) and greatest  $i$  ( $4.32 \times 10^{-3}$  ft/ft)]

$$V = \frac{1.28 \times 10^{-3} \text{ cm/sec} \times 4.32 \times 10^{-3} \text{ ft/ft}}{0.30}$$

$$= 1.84 \times 10^{-5} \text{ cm/sec or } 19.1 \text{ ft/year}$$

Case 3: [Using lowest value for  $K$  ( $1.9 \times 10^{-4}$  cm/sec) and lowest value for  $i$  ( $8.53 \times 10^{-4}$  ft/ft)]

$$V = \frac{1.9 \times 10^{-4} \text{ cm/sec} \times 8.53 \times 10^{-4} \text{ ft/ft}}{0.30}$$

$$= 5.4 \times 10^{-7} \text{ cm/sec or } 0.60 \text{ ft/year}$$

Case 4: [Worst case calculation, using  $K$  ( $1 \times 10^{-2}$  cm/sec) and using  $i$  ( $1 \times 10^{-2}$  ft/ft)]

$$V = \frac{1 \times 10^{-2} \text{ cm/sec} \times 1 \times 10^{-2} \text{ ft/ft}}{0.30}$$

$$= 3.33 \times 10^{-4} \text{ cm/sec or } 345.0 \text{ ft/year}$$

### Proposed Catalyst Pad

Case 1: [Using mean values for K ( $4.1 \times 10^{-5}$  cm/sec) and  $i$  ( $1.02 \times 10^{-2}$  ft/ft)]

$$V = \frac{4.1 \times 10^{-5} \text{ cm/sec} \times 1.02 \times 10^{-2} \text{ ft/ft}}{0.30}$$
$$= 1.40 \times 10^{-6} \text{ cm/sec or } 1.40 \text{ ft/year}$$

Case 2: [Using greatest K ( $4.7 \times 10^{-5}$  cm/sec) and greatest  $i$  ( $1.32 \times 10^{-2}$  ft/ft)]

$$V = \frac{4.7 \times 10^{-5} \text{ cm/sec} \times 1.32 \times 10^{-2} \text{ ft/ft}}{0.30}$$
$$= 2.06 \times 10^{-6} \text{ cm/sec or } 2.14 \text{ ft/year}$$

Case 3: [Using lowest value for K ( $3.5 \times 10^{-5}$  cm/sec) and lowest value for  $i$  ( $7.5 \times 10^{-3}$  ft/ft)]

$$V = \frac{3.5 \times 10^{-5} \text{ cm/sec} \times 7.5 \times 10^{-3} \text{ ft/ft}}{0.30}$$
$$= 8.8 \times 10^{-7} \text{ cm/sec or } 0.90 \text{ ft/year}$$

Case 4: [Worst case calculation, using K ( $1 \times 10^{-3}$  cm/sec) and  $i$  ( $1 \times 10^{-2}$  ft/ft)]

$$V = \frac{1 \times 10^{-3} \text{ cm/sec} \times 1 \times 10^{-2} \text{ ft/ft}}{0.30}$$
$$= 3.33 \times 10^{-5} \text{ cm/sec or } 34.5 \text{ ft/year}$$

### SUMMARY

#### East-Landfarm

<u>Case</u>	<u>K (cm/sec)</u>	<u>i (ft/ft)</u>	<u>n<sub>e</sub> (%)</u>	<u>V (ft/yr)</u>
1	$5.5 \times 10^{-4}$	$3.24 \times 10^{-3}$	30	6.20
2	$1.28 \times 10^{-3}$	$4.32 \times 10^{-3}$	30	19.10
3	$1.9 \times 10^{-4}$	$8.53 \times 10^{-4}$	30	0.60
4	$1.0 \times 10^{-2}$	$1.0 \times 10^{-2}$	30	345.00

#### Proposed Catalyst Pad

<u>Case</u>	<u>K (cm/sec)</u>	<u>i (ft/ft)</u>	<u>n<sub>e</sub> (%)</u>	<u>V (ft/yr)</u>
1	$4.1 \times 10^{-5}$	$1.02 \times 10^{-2}$	30	1.40
2	$4.7 \times 10^{-5}$	$1.32 \times 10^{-2}$	30	2.14
3	$3.5 \times 10^{-5}$	$7.5 \times 10^{-3}$	30	0.90
4	$1.0 \times 10^{-3}$	$1.0 \times 10^{-2}$	30	34.50

# Calculations

CP-3:

$$\begin{aligned} H &= 13.56' = 162.72'' = 413.31 \text{ cm} \\ H_o &= 26.00' = 312'' = 792.48 \text{ cm} \\ L &= 20' = 240'' = 609.60 \text{ cm} \\ r &= 1'' = 2.54 \text{ cm} \Rightarrow r^2 = 6.45 \text{ cm}^2 \\ R &= 3'' = 7.62 \text{ cm} \\ L/R &= 240''/3'' = 80'' = 203.20 \text{ cm} \\ \ln(L/R) &= 5.31 \end{aligned}$$

From Graph,  $T_o = 10 \text{ min} = 600 \text{ sec}$

$$K = \frac{r^2 \ln(L/R)}{2 L T_o}$$

$$K = \frac{(6.45 \text{ cm}^2)(5.31)}{(2)(609.60 \text{ cm})(600 \text{ sec})}$$

$$K = 4.68 \times 10^{-5} \text{ cm/sec}$$

Elapsed Time (min)	Depth (h)	$\frac{H-h}{H-H_o}$
00:00 = 0	26.00'	1.00
00:10 = .17	25.00'	.92
01:20 = 1.33	24.00'	.84
01:55 = 1.92	23.00'	.76
03:05 = 3.08	22.00'	.68
05:10 = 5.17	21.00'	.59
07:05 = 7.08	20.00'	.52
09:07 = 9.12	19.00'	.44
12:13 = 12.22	18.00'	.36
13:55 = 13.92	17.00'	.28
16:50 = 16.83	16.00'	.19
20:52 = 20.87	15.00'	.12
46:10 = 46.17	14.00'	.04

CP-2:

$$\begin{aligned} H &= 15.83' = 189.96'' = 482.50 \text{ cm} \\ H_o &= 20.00' = 240.00'' = 609.60 \text{ cm} \\ L &= 20.00' = 240.00'' = 609.60 \text{ cm} \\ r &= 1'' = 2.54 \text{ cm} \Rightarrow r^2 = 6.45 \text{ cm}^2 \\ R &= 3'' = 7.62 \text{ cm} \\ L/R &= 240''/3'' = 80'' = 203.20 \text{ cm} \\ \ln(L/R) &= 5.31 \end{aligned}$$

From graph,  $T_o = 13.25 \text{ min} = 795 \text{ sec}$

$$K = \frac{r^2 \ln(L/R)}{2 L T_o}$$

$$K = \frac{(6.45 \text{ cm}^2)(5.31)}{(2)(609.60 \text{ cm})(795 \text{ sec})}$$

$$K = 3.53 \times 10^{-5} \text{ cm/sec}$$

Elapsed Time (min)	Depth (h)	$\frac{H-h}{H-H_o}$
00:00 = 0.00	20.00'	1.00
03:15 = 3.25	19.00'	.76
07:50 = 7.83	18.00'	.52
17:30 = 17.50	17.00'	.28
47:55 = 47.92	16.00'	.04

Permeability range:  $3.53 \times 10^{-5} \text{ cm/sec}$  to  $4.68 \times 10^{-5} \text{ cm/sec}$

Mean permeability:  $4.11 \times 10^{-5} \text{ cm/sec}$



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$$\frac{H-h}{H-H_0}$$

d from  
 2

0.1

5

10

15

T = 2.35 x 10^4

20

25

and Derivative Calculated

$\frac{H-h}{H-H_0}$  is time for  $C_{H_2O}$  and  $C_{H_2O}$

## Vertical Flow Calculations

Chevron USA Refinery  
Pascagoula, Mississippi

### Purpose:

To calculate potential vertical flow velocities between the unconfined surficial aquifer and the deeper Citronelle Aquifer.

### Background/Methodology:

Ground water beneath the Chevron Pascagoula Refinery occurs in two distinct zones, an unconfined surficial aquifer and the deeper Citronelle Aquifer. These two transmissive zones are separated by an 18 foot thick clay aquitard situated 5 - 22 feet below mean sea level. Samples of this blue-clay aquitard were collected during a July, 1985 field program. Laboratory analysis indicates that this clay aquitard is characterized by a mean hydraulic conductivity of  $3.8 \times 10^{-8}$  cm/sec (see attached sheet). Additionally, ground water measurements were collected from two sets of well pairs (B-S/B-D & C-S/C-D). Using the above information, vertical flow calculations were made using the following equation:

$$V = \frac{K (H/d)}{n_e}$$

Where:

V = Velocity of ground water flow

K = Hydraulic Conductivity

H = Difference in Hydraulic Head as measured in a shallow and deep well pair

d = Thickness of clay aquitard

$n_e$  = Effective Porosity  
(values from Freeze & Cherry, 1979)

# CALCULATIONS

Case 1: [Based on data collected from wells B-S/B-D]

$$V = \frac{3.8 \times 10^{-8} \text{ cm/sec} \times 4.46 \text{ ft/18 ft}}{0.55}$$

$$= 1.7 \times 10^{-8} \text{ cm/sec or } 1.7 \times 10^{-2} \text{ ft/year}$$

Case 2: [Based on data collected from wells B-S/B-D]

Worst case where:  $K = 1 \times 10^{-7} \text{ cm/sec}$   
 $n_e = 0.40$

$$V = \frac{1 \times 10^{-7} \text{ cm/sec} \times 4.46 \text{ ft/18 ft}}{0.40}$$

$$= 6.2 \times 10^{-8} \text{ cm/sec or } 6.4 \times 10^{-2} \text{ ft/year}$$

Case 3: [Based on data collected from wells C-S/C-D]

$$V = \frac{3.8 \times 10^{-8} \text{ cm/sec} (-2.09 \text{ ft/18 ft})^{(1)}}{0.55}$$

$$= -8.0 \times 10^{-9} \text{ cm/sec or } -8.3 \times 10^{-3} \text{ ft/year}^{(1)}$$

Case 4: [Based on data collected from wells C-S/C-D]

Worst case where:  $K = 1 \times 10^{-7} \text{ cm/sec}$   
 $n_e = 0.40$

$$V = \frac{1 \times 10^{-7} \text{ cm/sec} (-2.09 \text{ ft/18 ft})^{(1)}}{0.40}$$

$$= -2.9 \times 10^{-8} \text{ cm/sec or } -3 \times 10^{-2} \text{ ft/year}^{(1)}$$

(1) Negative sign indicates upward gradient.

## SUMMARY

Case	K (cm/sec)	i (ft/ft)	$N_e$ (%)	V (ft/yr)
1	$3.8 \times 10^{-8}$	0.25	0.55	$1.7 \times 10^{-2}$
2	$1.0 \times 10^{-7}$	0.25	0.40	$6.4 \times 10^{-2}$
3	$3.8 \times 10^{-8}$	0.12	0.55	$-8.3 \times 10^{-3}$
4	$1.0 \times 10^{-7}$	0.12	0.40	$-3.0 \times 10^{-2}$



Professional Service Industries, Inc.  
National Soil Services Division

ERM Southwest, Inc.  
8989 Westheimer  
Suite 111  
Houston, Texas 77063

Report No. 286-55109  
July 31, 1985

Attention: Mr. J. Mark Schmittle

LABORATORY TEST RESULTS

Gentlemen:

We are pleased to submit the results for laboratory tests performed on samples provided by ERM. This study was authorized by your Work Order No. 54-07 dated July 23, 1985.

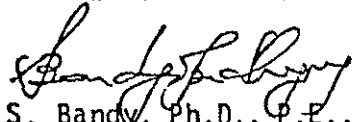
The results are as follows:

Sample No.	Depth, Feet	Moisture Content %	Dry Unit Weight pcf	Liquid Limit	Plastic Limit	Coefficient of Permeability cm/sec
CP-1	28-30	50	61	73	25	$4.1 \times 10^{-8}$
CP-2	33-35	63	56	79	29	$3.5 \times 10^{-8}$

If we can be of further assistance, please do not hesitate to call.

Very truly yours,

NATIONAL SOIL SERVICES DIVISION

  
S.S. Bandy, Ph.D., P.E.,  
Branch Manager

SSB:ig

Copies submitted: 3



**Attachment B to Section E**  
**Monitor Well Soil Boring Logs**



Consulting Firm: Radian	Site Id: AS-R	
Contractor: Walker-Hill	Location: Background location	
Logged By: Doyle Nelson	Elevation: 7.56'	Datum: RD
Certified By: Clint Palermo	Blank Casing: type: PVC                      dia: 2.00in   fm: -2.1'           to: 3.00'	
Drilling Method: Hollow Stem Auger		
Date(s): 02/23/99 - 02/23/99	Screens: type: Slotted                      size: 0.010in dia: 2.00in   fm: 3.00'           to: 13.00'	

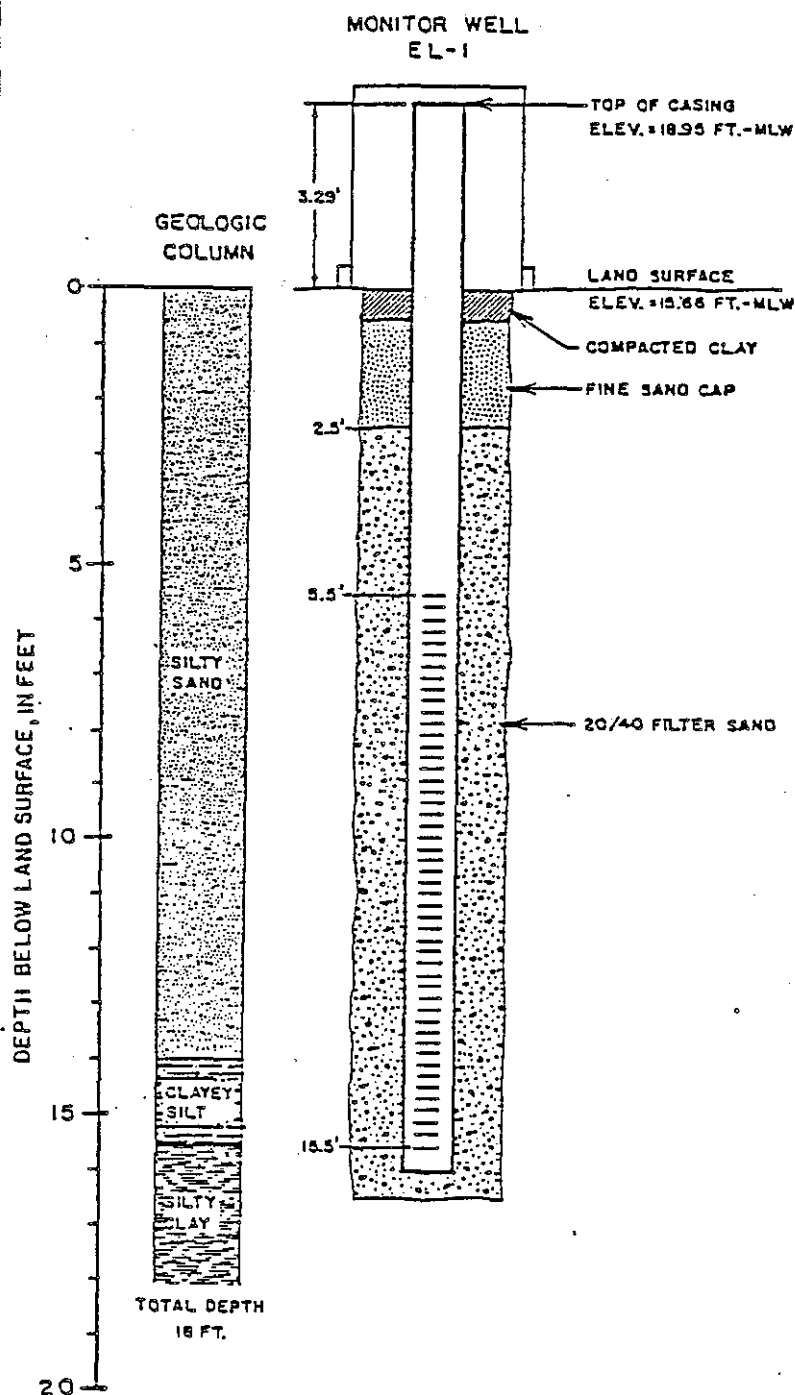
Remarks:

Annular Fill:  
type: Bentonite Grout                      fm: 0.00'           to: 1.00'  
type: Bentonite                      fm: 1.00'           to: 2.00'  
type: Sand Pack (generic)                      fm: 2.00'           to: 14.00'

Elevation (ft)	Depth (ft)	Graphic Log	USCS Code	Material Description	MP. EL. 9.77
			SC	Clayey sand (SC) trace silt, mottled gray/brown, med dense, very fine grain, moist	
				-saturated @ 2.0'	
			CL	Sandy clay (CL) mottled brown/orange, soft, plastic, iron stained, moist	
5			SC	Clayey sand (SC) brown, low density, fine grain, moist, w/roots	
			CL	Sandy Clay (CL) brown, stiff, low plasticity, moist	
0			SC	Clayey sand (SC) gray, low density, fine grain, saturated	
	10		CL	Sandy Clay (CL) gray, stiff, low plasticity, moist, w/rootlets, iron nodules	
				TD=14.0' bgs	
15					
-10					

## WELL LOG

PROJECT MONITOR WELL - RCRA  
 CLIENT CHEVRON  
 DATE PREPARED 6/1/84 BY DAH



OWNER CHEVRON  
 WELL NO. EL-1  
 LOCATION EAST PERIMETER OF  
EAST LANDFARM  
 TOPO SETTING ELEVATED SURFACE ABOVE L.F.  
 GROUND ELEV. 15.66 FT.-MLW

DRILLING STARTED 4/13/84  
 DRILLING COMPLETED 4/13/84  
 DRILLER VESTER THOMPSON  
 TYPE OF RIG TRUCK MOUNTED ROTARY

WELL DATA

HOLE DIAM. 8 IN  
 FINAL DEPTH 18 FT  
 CASING DIAM. 4-IN DIA. PVC  
 CASING LENGTH 8.8 FT  
 SCREEN DIAM. 4-IN DIA  
 SCREEN SETTING FROM 5.5-15.5 FT-BLS  
 SCREEN SLOT & TYPE 10 SLOT  
 WELL STATUS 10-IN SECURITY CASING  
AND LOCK

DEVELOPMENT  
 SURGING AND SWABBING  
 PUMPING VIA PERISTALTIC PUMPS

RESULTS: CLEAR WATER PUMPED

TEST DATA

STATIC DEPTH TO WATER 7.72 FT.-MLW  
 DATE MEASURED 4/19/84  
 TOP OF CASING ELEV. 18.95 FT.-MLW

WATER QUALITY  
 NOT AVAILABLE

REMARKS  
GRAVEL PACKED 20/40 FILTER SAND

## LITHOLOGIC LOG OF BORING EL-1

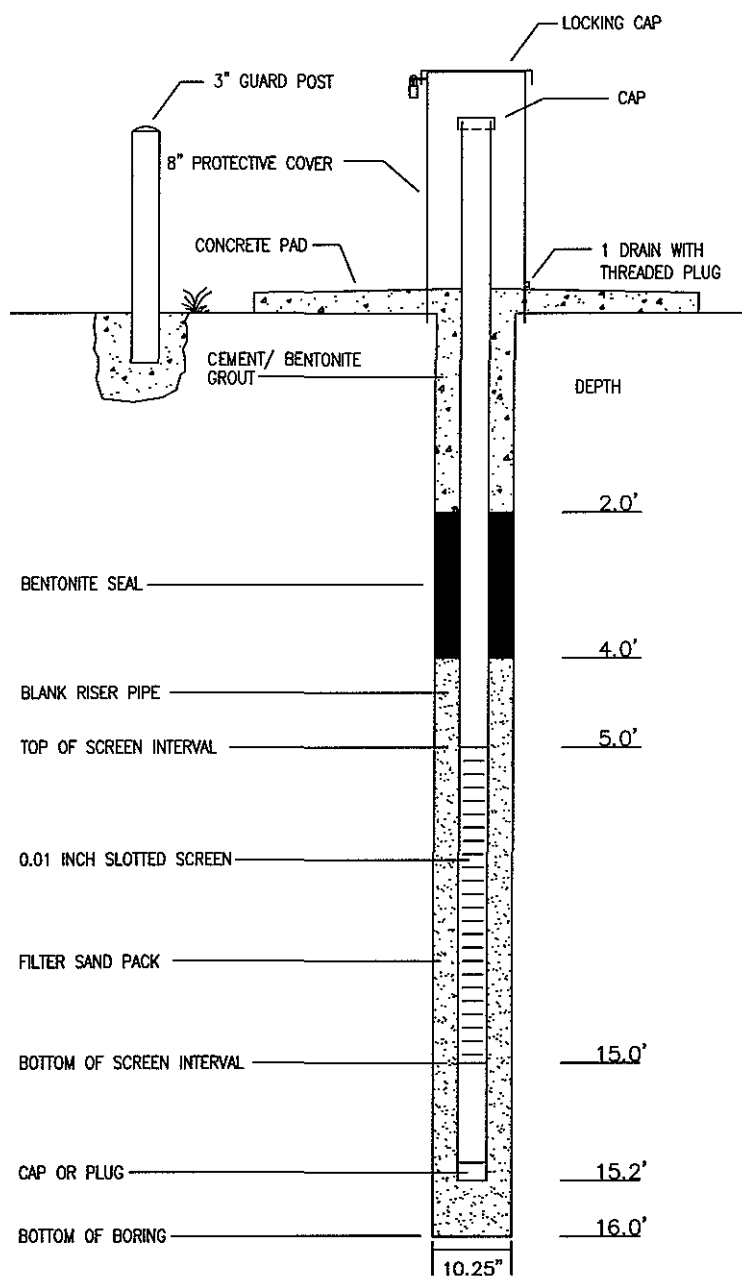
Description	Depth (ft)	Thickness (ft)
Sand, medium, tannish-brown with shell fragments and organic matter	0 - 2	2
Sand, medium, tannish-brown	2 - 4	2
Sand, medium to fine, tan with fine sand lenses on the bottom	4 - 6	2
Sand, fine, brown on top with a moist fine, tan sand on bottom	6 - 10	4
Sand, fine, silty, grey with few clay lenses	10 - 13	3
Silt, sandy, brown to black	13 - 14	1
Silt, clayey, moderately stiff, dark	14 - 15.5	1.5
Clay, silty, moderately stiff, brown to black	15.5 - 18	2.5



# Monitoring Well Construction Diagram

Well No.: EL-1R  
Project No.: 19228697.00003  
Project Name: ACL Groundwater Monitoring  
Start Date: 11/6/08  
End Date: 11/7/08

Site: EAST LANDFARM  
Geologist: JASON MURRAY  
Drilling Contractor: Walker Hill Environmental  
Top of Casing Elevation (RD): 19.35'  
Elevation of Groundwater in Well (RD): 6.25'  
Well Coordinates: N = 5602.55, E = 12823.98



## SURFACE COMPLETION

3x3 Concrete Pad, 4 Posts

## PROTECTIVE CASING

Material/Type Aluminum/ Above Grade  
Outside Diameter 8.0"

## RISER PIPE

Type Schedule 40 PVC  
Inside Diameter 4.0" Vented Cap (Y / ☒)  
Total Length (Top of Casing-Top of Screen) 8.65'

## GROUT

Composition & Proportions Portland cement

Tremied (Y / ☒)

Date 11/6/08

## CENTRALIZERS (Y / ☒)

Depth(s) \_\_\_\_\_ Type \_\_\_\_\_

## BENTONITE SEAL

Chips or Pellets Pellets  
Setup/Hydration Time 24 hrs Tremied (Y / ☒)  
Interval Below Ground Surface 2.0 - 4.0'

## SECONDARY FILTER PACK (optional)

Type NA  
Amount Used \_\_\_\_\_ Tremied (Y / ☒)

## PRIMARY FILTER PACK

Type 20/40 Filter Sand  
Amount Used 12 bags Tremied (Y / ☒)

## SCREEN

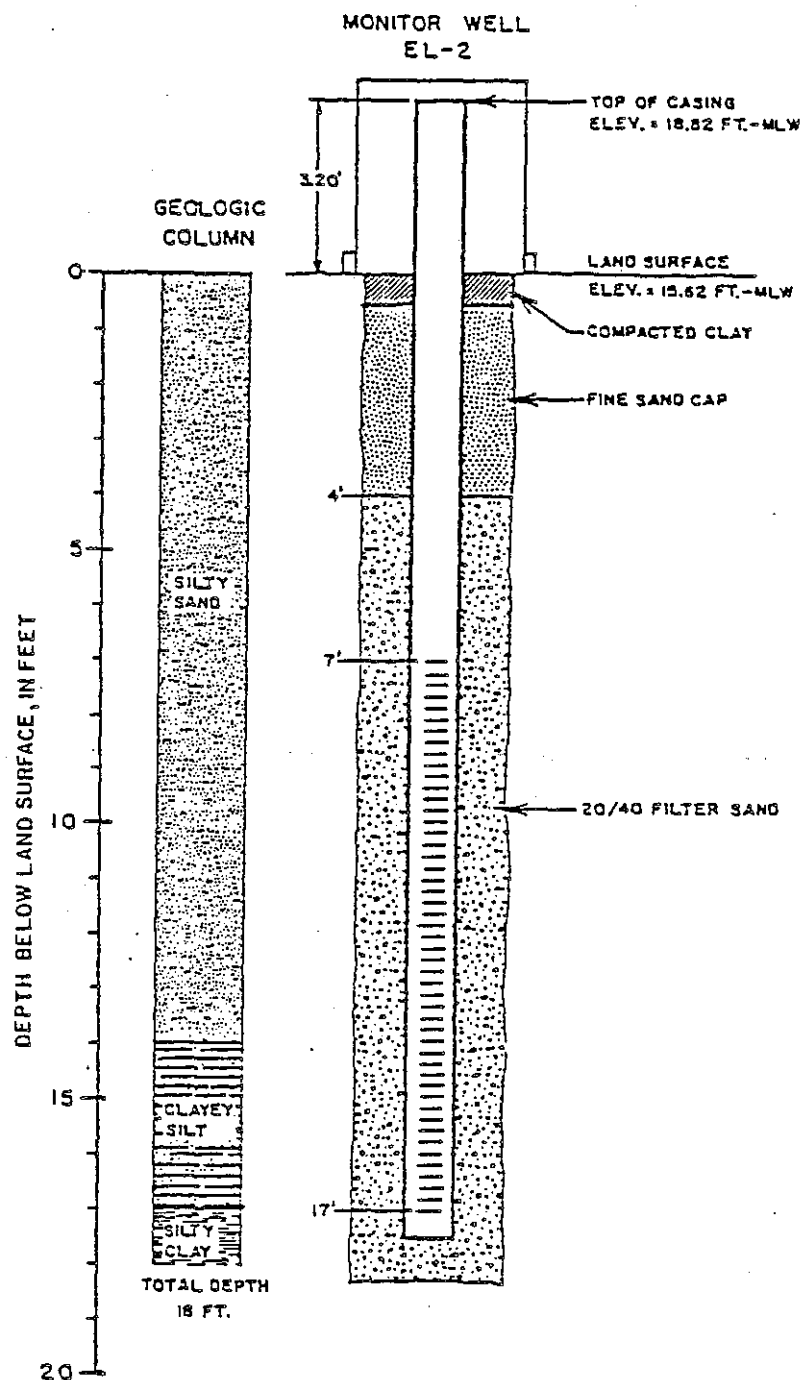
Type Schedule 40 PVC  
Inside Diameter 4.0" Flush Threaded Joint (☒ / ☐)  
Slot Size & Type 0.010" Slot  
Interval Below Ground Surface 5.0 - 15.0'

## SUMP (Y / ☒)

Length \_\_\_\_\_  
Bottom Cap (☒ / ☐)

## WELL LOG

PROJECT MONITOR WELL - RCRA  
 CLIENT CHEVRON  
 DATE PREPARED 6/1/84 BY PAH



OWNER CHEVRON  
 WELL NO EL-2  
 LOCATION SOUTHWEST PERIMETER  
OF EAST LANDFARM  
 TOPO SETTING ELEVATED SURFACE ABOVE L.F.  
 GROUND ELEV 15.62 FT.-MLW

DRILLING STARTED 4/2/84  
 DRILLING COMPLETED 4/2/84  
 DRILLER VESTER THOMPSON  
 TYPE OF RIG TRUCK MOUNTED ROTARY

WELL DATA

HOLE DIAM 8-IN  
 FINAL DEPTH 18-FT  
 CASING DIAM 4-IN DIA PVC THREADED  
 CASING LENGTH 10.20 FT  
 SCREEN DIAM 4-IN DIA.  
 SCREEN SETTING FROM 7-17 FT-BLS  
 SCREEN SLOT & TYPE 10 SLOT  
 WELL STATUS 10-IN SECURITY  
TESTING AND LOCK

DEVELOPMENT

SURGING AND SNABBING  
PUMPING VIA PERISTALTIC PUMPS

RESULTS: CLEAR WATER PUMPED

TEST DATA

STATIC DEPTH TO WATER 6.22 FT.-MLW  
 DATE MEASURED 4/19/84  
 TOP OF CASING ELEV. 18.82 FT.-MLW

WATER QUALITY  
NOT AVAILABLE

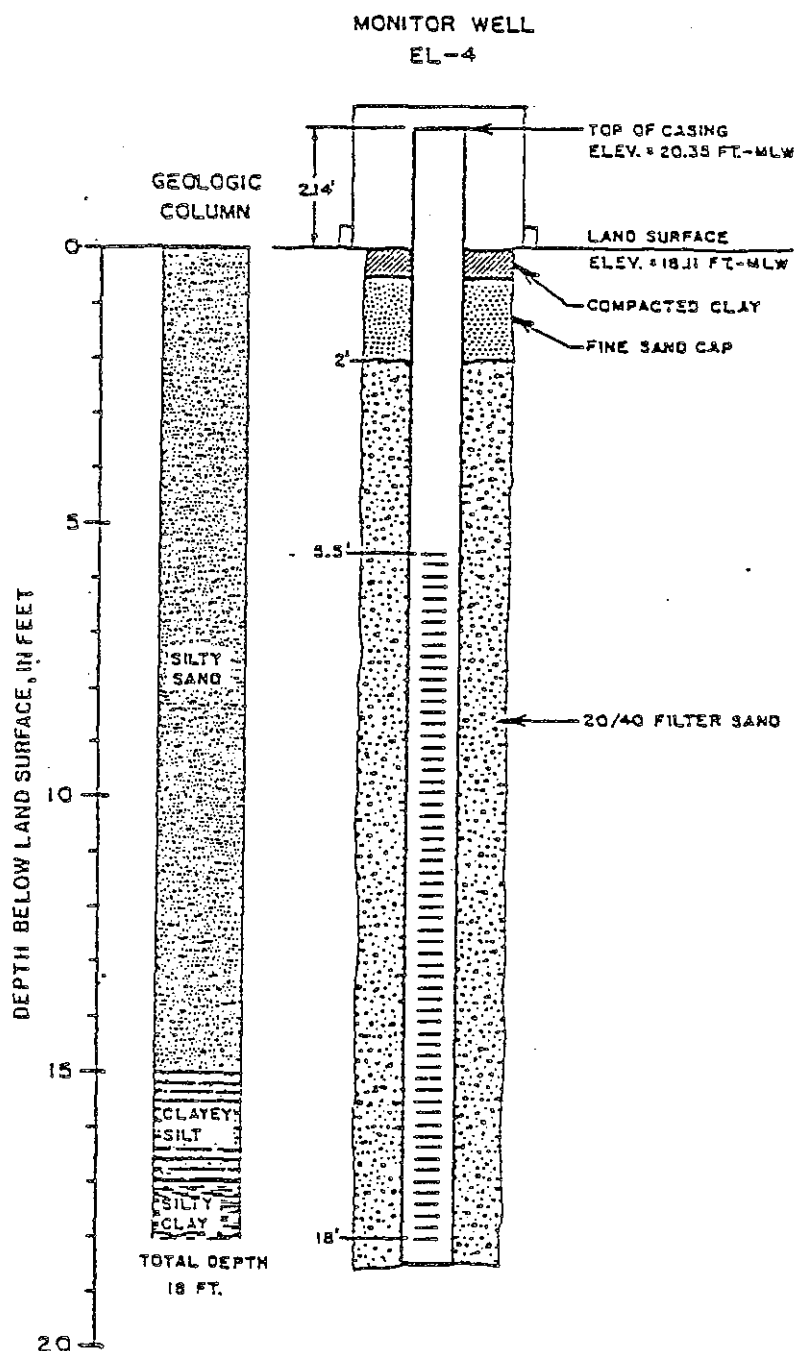
REMARKS  
GRAVEL PACKED 20/40 FILTER SAND

## LITHOLOGIC LOG OF BORING EL-2

Description	Depth (ft)	Thickness (ft)
Sand, fine, beige to tan with shell fragments and wood traces	0 - 3	3
Sand, fine, brown to black with wood traces	3 - 6	3
Sand, fine, brown to black	6 - 8	2
Sand, medium, brown to tan	8 - 10	2
Sand, medium, tan to grey	10 - 12	2
Sand, fine, slightly silty, grey	12 - 14	2
Silt, fine, slightly clayey, grey with clay traces	14 - 17	3
Clay, silty, dark, grey with clay traces	17 - 18	1
Clay, silty, grey, moderately stiff	18 - 20	2

## WELL LOG

PROJECT MONITOR WELL - RCRA  
 CLIENT CHEVRON  
 DATE PREPARED 6/1/84 BY PAH



OWNER CHEVRON  
 WELL NO. EL-4  
 LOCATION NORTHWEST PERIMETER  
OF EAST LANDFARM  
 TOPO SETTING ELEVATED SURFACE ABOVE L.F.  
 GROUND ELEV. 18.11 FT-MLW

DRILLING STARTED 4/2/84  
 DRILLING COMPLETED 4/2/84  
 DRILLER VESTER THOMPSON  
 TYPE OF RIG TRUCK MOUNTED ROTARY

**WELL DATA**

WELL DIA. 8-IN  
 FINAL DEPTH 18 FT  
 CASING DIA. 4-IN DIA. PVC THREADED  
 CASING LENGTH 7.6 FT  
 SCREEN DIA. 4-IN DIA.  
 SCREEN SETTING FROM 5.5-18 FT-BLS  
 SCREEN SLOT & TYPE 10 SLOT  
 WELL STATUS 10-IN SECURITY CASING

**DEVELOPMENT**

SURGING AND SWABBING  
PUMPING VIA PERISTALTIC PUMPS

**RESULTS:** CLEAR WATER PUMPED

**TEST DATA**

STATIC DEPTH TO WATER 7.24 FT-MLW  
 DATE MEASURED 4/19/84  
 TOP OF CASING ELEV. 20.35 FT-MLW

**WATER QUALITY**  
NOT AVAILABLE

**REMARKS**  
GRAVEL PACKED 20/40 FILTER SAND



## LITHOLOGIC LOG OF BORING EL-4

Description	Depth (ft)	Thickness (ft)
Sand, medium, orangish-grey with shell fragments	0 - 2	2
Sand, medium, orangish-brown with minimal organic matter	2 - 4	2
Sand, medium, brownish-tan	4 - 6	2
Sand, medium to fine, tan with lenses of fine sand	6 - 7	1
Sand, fine, tan with clay lenses	7 - 8	1
Sand, fine, slightly silty, dark brown to black	8 - 10	2
Sand, fine, silty, black with clay traces	10 - 12	2
Sand, fine, silty, grey, moderately stiff	12 - 15	3
Silt, clayey, grey to black, moderately stiff	15 - 17	2
Clay, silty, dark grey, moderately stiff	17 - 18	1

# ERM-Southwest, inc.

HOUSTON, TEXAS

## EL-5 DRILLING LOG

W.O. NO. 54-155 Boring/Well ID EL-5 Date Drilled 3/13/90  
 Project Chevron-Pascoquale Owner Chevron U.S.A.  
 Location East Londform Boring T.D. 27' Boring Diam. 11"  
 X Coord. \_\_\_\_\_ Y Coord. \_\_\_\_\_ Surface Elevation \_\_\_\_\_ MSL Datum \_\_\_\_\_

Screen: Type Sch 40 PVC Diam. 2" Length 15' Slot Size 0.01"  
 Casing: Type Sch 40 PVC Diam. 2" Length 9' Sump Length 3'  
 Top of Casing Elevation 0' Stickup 3'  
 Depth to Water: 1. Ft. \_\_\_\_\_ (\_\_\_\_\_) 2. Ft. \_\_\_\_\_ (\_\_\_\_\_) \_\_\_\_\_

Drilling Company Griner Drilling Service Driller Leland Beach  
 Drilling Method Hollow Stem Auger Log By Craig Eady

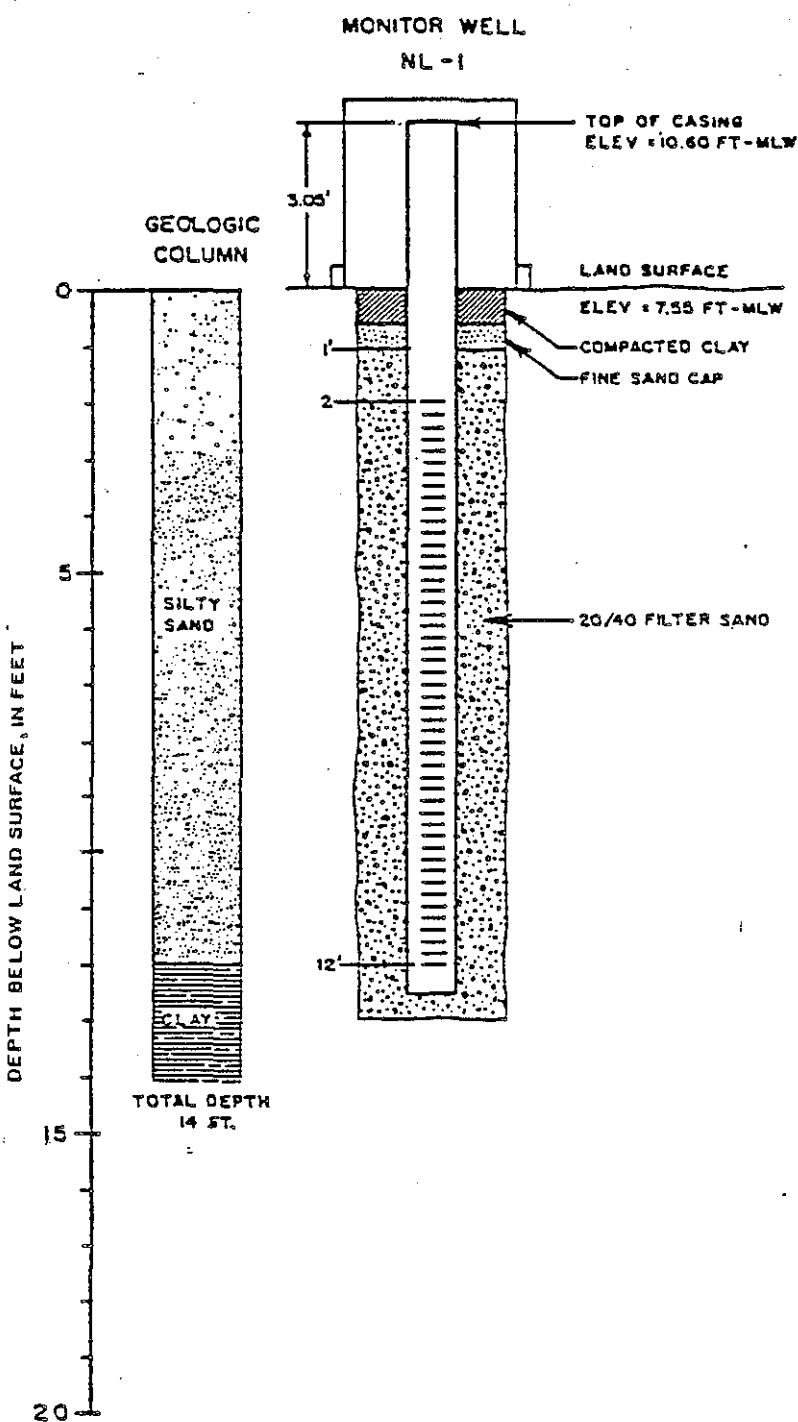
SKETCH MAP

NOTES

ELEVATION (FEET)	DEPTH (FEET)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE TYPE	P.T. BPG	SAMPLE INTERVAL (FEET)	DESCRIPTION INTERVAL (FEET)	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURE)
	0				(2-3-3-2)	0-2	0-4	FILL: Clayey sand, tan, brown, black, mottled, fine to medium grained, clay pockets, soft, dry to moist, roots, 0 ppm HNU.
					(1-2-2-1)	2-4		
					(2-2-2-2)	4-6	4-6	CLAYEY SAND: Tan, dark brown, mottled, fine grained, soft, moist to wet, 2" wood pieces @ 5.7, 0 ppm HNU.
					(2-1-2-2)	6-8	6-8	SILTY SAND: Tan, dark brown, mottled, fine grained, rootlets, soft (0 TSF), moist to wet, 0 ppm HNU.
	10				(1-3-6-6)	8-10	8-9.1	CLAYEY SAND: Dark brown, fine grained, soft to hard with depth (1.0 TSF @ 9.1') moist, 0 ppm HNU.
						10-13	9.1-10	
							10-13	SAND: Tan, medium grained, clean, moist, 0 ppm HNU.
						13-15	13-15	NO RECOVERY
					(0.5-0.5-2-5)	15-18	15-18.3	SILTY SAND: Tan, gray, orange mottled, fine to medium grained, soft to firm with depth (1.0 TSF @ 14.1'), moist to saturated, wood pieces and roots, 0 ppm HNU.
						18-20	18.3-20	NO RECOVERY
	20				3-6-9-12	20-23	20-23	SAND: Tan, light gray, medium grained, subangular grains, wet, clean, soft to slightly firm (0-0.25 TSF), wood pieces and roots, 0 ppm HNU.
					(hammer wt)	23-25	23-23.1	NO RECOVERY
						25-27	23.1-25	SILTY SAND: Tan, light gray, fine grained, wet, soft.
							25-27	CLAY: Blue gray, very soft, moist, 0 ppm HNU.
								NO RECOVERY
								T.D. = 27'
	30							
	40							
	50							

## WELL LOG

PROJECT MONITOR-WELL RCRA  
 CLIENT CHEVRON  
 DATE PREPARED 6/1/84 BY PAH



OWNER CHEVRON  
 WELL NO NL-1  
 LOCATION WEST PERIMETER OF NORTH LANDFARM  
 TOPO SETTING FLAT  
 GROUND ELEV 7.55 FT-MLW

DRILLING STARTED 3/27/84  
 DRILLING COMPLETED 3/27/84  
 DRILLER VESTER THOMPSON  
 TYPE OF RIG ROTARY TRACK RIG

WELL DATA

HOLE DIAM 8-IN DIAMETER  
 FINAL DEPTH 14 FT  
 CASING DIAM 4-IN DIA PVC THREADED  
 CASING LENGTH 5-FT  
 SCREEN DIAM 4-IN DIA  
 SCREEN SETTING FROM 2 TO 12 FT-BLS  
 SCREEN SLOT & TYPE 10 SLOT  
 WELL STATUS 10-IN SECURITY CASING AND LOCK

DEVELOPMENT

SURGING AND SWABBING  
PUMPING VIA PERISTALTIC PUMP

RESULT: CLEAR WATER PUMPED

TEST DATA

STATIC DEPTH TO WATER 5.57 FT-MLW  
 DATE MEASURED 4/19/84  
 TOP OF CASING ELEV. 10.60 FT-MLW

## WATER QUALITY

NOT AVAILABLE

## REMARKS

GRAVEL PACKED 20/40 FILTER SAND

## LITHOLOGIC LOG OF BORING NL-1

Description	Depth (ft)	Thickness (ft)
Sand, medium, mostly grey with streaks of tannish-orange fine sand	0 - 4	4
Sand, fine, mostly tan with reddish-orange streaks	4 - 6	2
Sand, fine, tannish-grey color	6 - 8	2
Sand, fine, silty, grey with clay lenses	8 - 10	2
Sand, fine, silty, grey with clay sections; grey, silty, clay begining at 11.5'	10 - 12	2
Clay, grey, stiff	12 - 14	2

# WELL LOG

PROJECT MONITOR-WELL RCRA  
 CLIENT CHEVRON  
 DATE PREPARED 6/1/84 BY PAH

OWNER CHEVRON  
 WELL NO NL-2  
 LOCATION NORTHEAST PERIMETER OF  
NORTH LANDFARM  
 TOPO SETTING FLAT  
 GROUND ELEV 7.54 FT.-MLW

DRILLING STARTED 3/28/84  
 DRILLING COMPLETED 3/28/84  
 DRILLER VESTER THOMPSON  
 TYPE OF RIG ROTARY TRACK RIG

WELL DATA  
 HOLE DIAM 8-IN DIA.  
 FINAL DEPTH 18 FT  
 CASING DIAM 4-IN DIA. PVC  
 CASING LENGTH 4.7 FT  
 SCREEN DIAM 4-IN DIA.  
 SCREEN SETTING FROM 2-17 FT-BLS  
 SCREEN SLOT & TYPE 10 SLOT  
 WELL STATUS 10-IN SECURITY  
CASING AND TUCK

DEVELOPMENT  
SURGING AND SWABBING  
PUMPING VIA PERISTALTIC PUMP  
 RESULTS: CLEAR WATER PUMPED

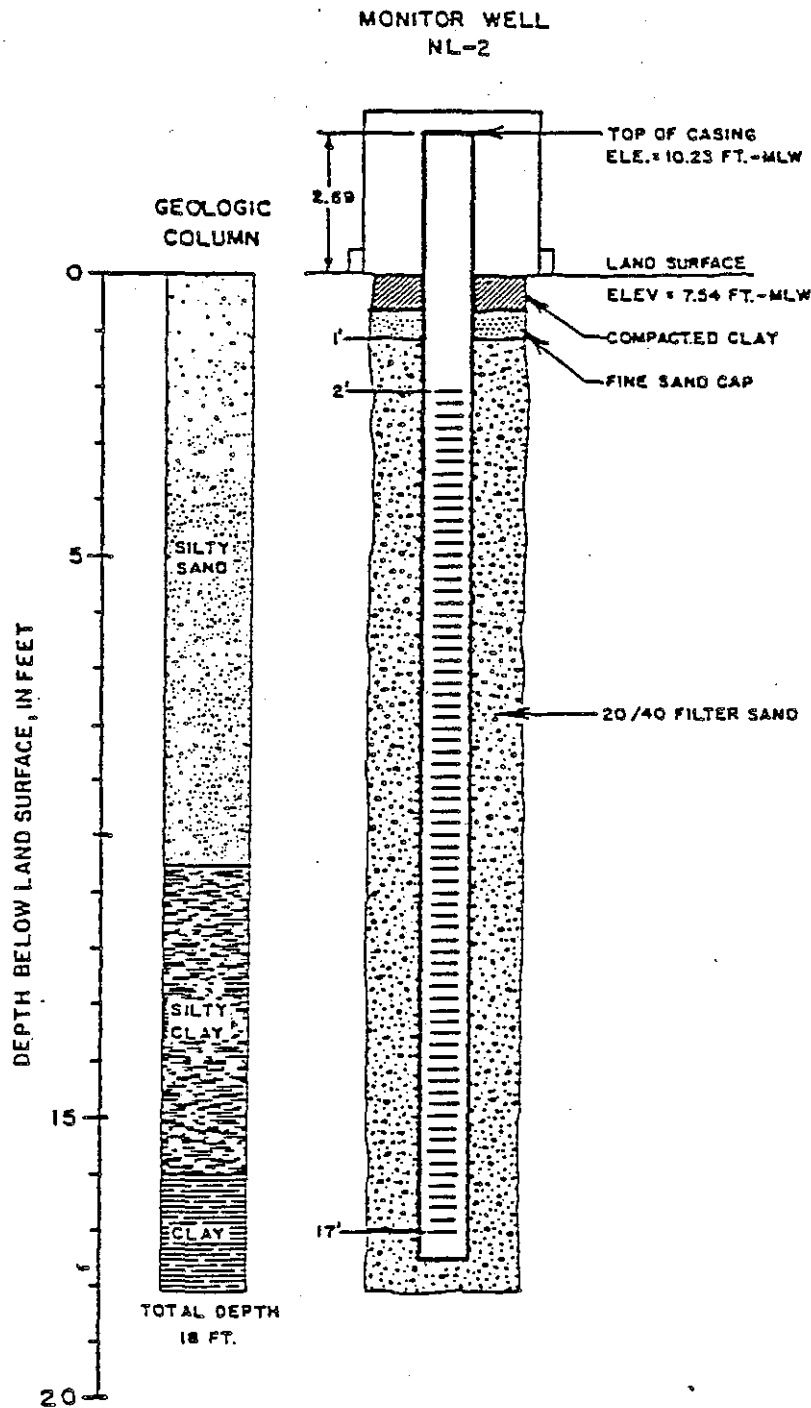
TEST DATA  
 STATIC DEPTH TO WATER 6.93 FT.-MLW  
 DATE MEASURED 4/19/84  
 TOP OF CASING ELEV. 10.23 FT.-MLW

## WATER QUALITY

NOT AVAILABLE

## REMARKS

GRAVEL PACKED 20/40 FILTER SAND



## LITHOLOGIC LOG OF BORING NL-2

Description	Depth (ft)	Thickness (ft)
Sand, medium, tannish-grey with traces of organic matter	0 - 2	2
Sand, fine, grey color	2 - 3	1
Sand, fine, tannish-orange color	3 - 6	3
Sand, medium to fine, tannish-grey color	6 - 8	2
Sand, fine, silty, grey color	8 - 10.5	2.5
Clay, sandy, grey with fine sand seams	10.5 - 11.5	1
Clay, silty, grey, moderately stiff	11.5 - 14.0	2.5
Clay, slightly silty, grey, moderately stiff; stiff grey clay in bottom portion	14 - 16	2.0
Clay, grey, stiff	16 - 18	2.0

# WELL LOG

PROJECT MONITOR WELL - RCRA  
 CLIENT CHEVRON  
 DATE PREPARED 6/1/84 BY PAH

OWNER CHEVRON  
 WELL NO NL-3  
 LOCATION SOUTHEAST PERIMETER  
OF NORTH LANDFARM  
 TOPO SETTING FLAT  
 GROUND ELEV 7.20 FT-MLW

DRILLING STARTED 3/23/84  
 DRILLING COMPLETED 3/23/84  
 DRILLER VESTER THOMPSON  
 TYPE OF RIG ROTARY TRACK RIG

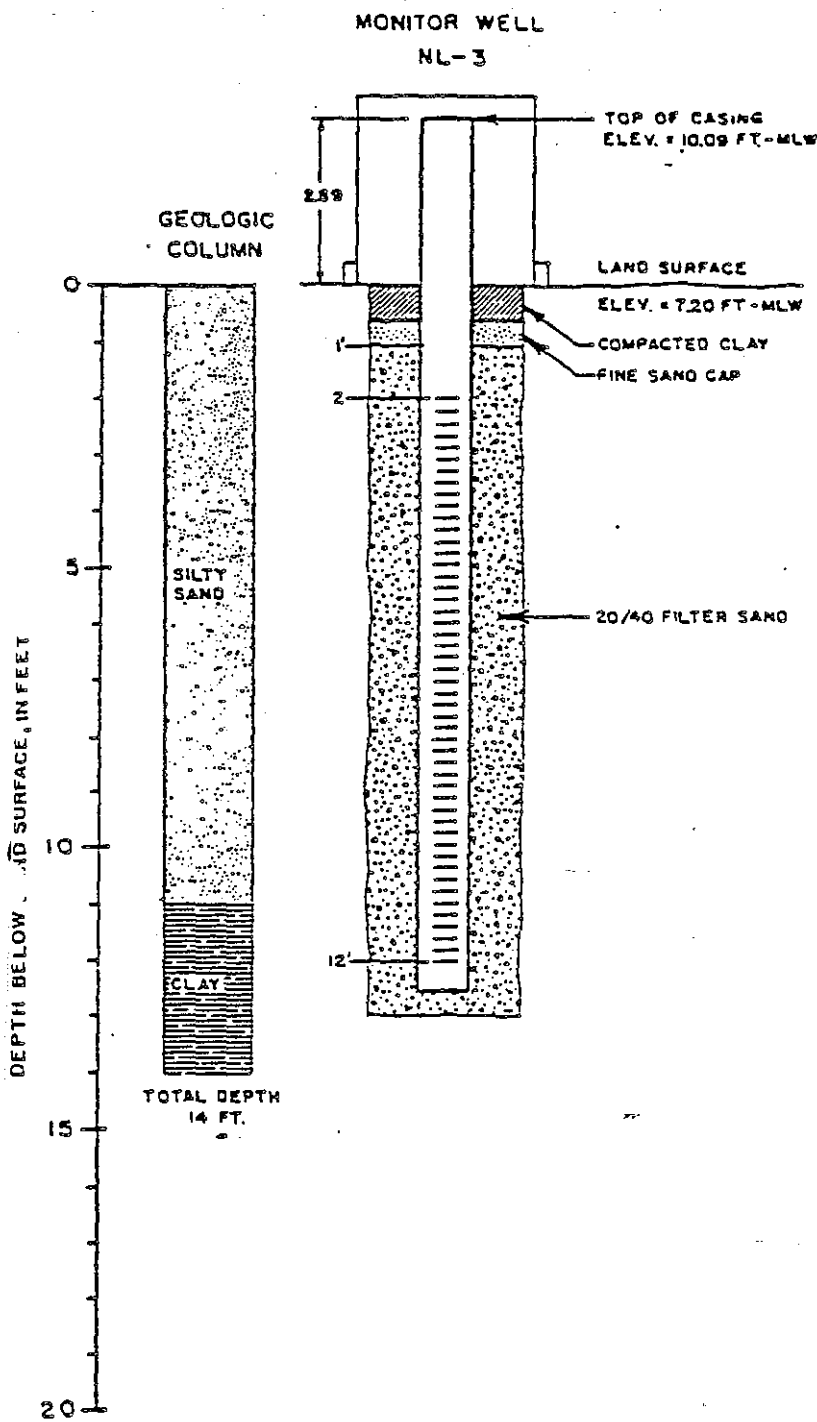
WELL DATA  
 HOLE DIAM 8-IN DIA.  
 FINAL DEPTH 14 FT  
 CASING DIAM 4-IN DIA. PVC  
 CASING LENGTH 5 FT  
 SCREEN DIAM 4-IN DIA.  
 SCREEN SETTING FROM 2-12 FT-BLS  
 SCREEN SLOT & TYPE 10 SLOT  
 WELL STATUS 10-IN SECURITY  
CASING AND LOCK

DEVELOPMENT  
SURGING AND SWABBING  
PUMPING VIA PERISTALTIC PUMP  
 RESULTS: CLEAR WATER PUMPED

TEST DATA  
 STATIC DEPTH TO WATER 5.84 FT-MLW  
 DATE MEASURED 4/19/84  
 TOP OF CASING ELEV. 10.09 FT-MLW

WATER QUALITY  
NOT AVAILABLE

REMARKS  
GRAVEL PACKED 20/40 FILTER SAND



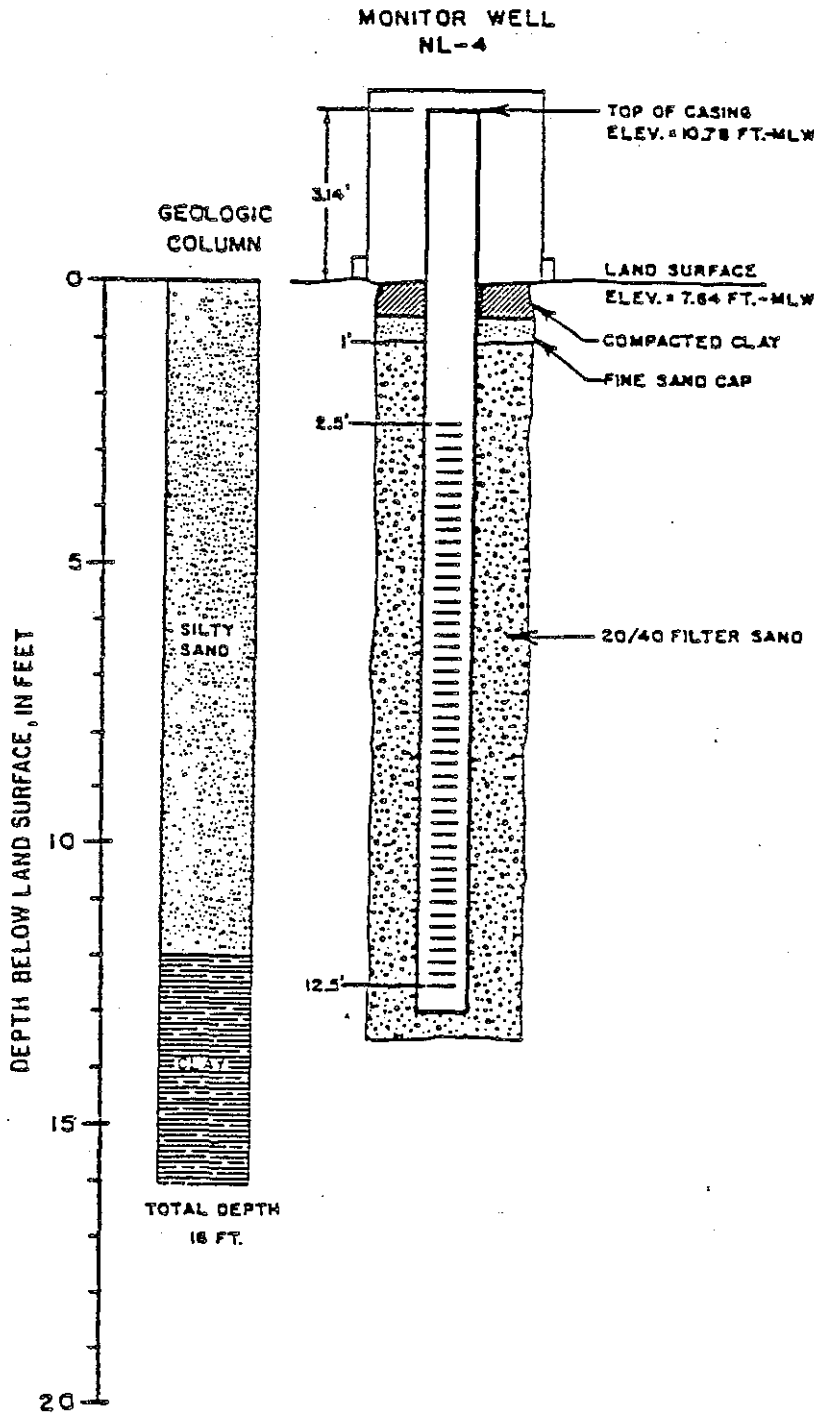
## LITHOLOGIC LOG OF BORING NL-3

Description	Depth (ft)	Thickness (ft)
Sand, fine, greyish-black with bits of organic matter	0 - 2	2
Sand, fine, tannish-grey color	2 - 4	2
Sand, medium to fine, tan color	4 - 6	2
Sand, medium to fine, tan color with grey lenses of fine sand	6 - 8	2
Sand, fine, silty, grey, with with clay lenses in bottom portion	8 - 11	3
Clay, grey, stiff	11 - 14	3



# WELL LOG

PROJECT MONITOR WELL - RCRA  
 CLIENT CHEVRON  
 DATE PREPARED 6/1/84 BY PAW



OWNER CHEVRON  
 WELL NO NL-4  
 LOCATION SOUTH PERIMETER OF NORTH LANDFARM  
 TOPO SETTING FLAT  
 GROUND ELEV 7.64 FT.-MLW

DRILLING STARTED 3/27/84  
 DRILLING COMPLETED 3/27/84  
 DRILLER VESTER THOMPSON  
 TYPE OF RIG ROTARY TRACK RIG

**WELL DATA**

HOLE DIAM 8 IN  
 FINAL DEPTH 16 FT  
 CASING DIAM 4-IN DIA. PVC  
 CASING LENGTH 5.6 FT  
 SCREEN DIAM 4-IN DIA  
 SCREEN SETTING FROM 2.5-12.5 FT-BLS  
 SCREEN SLOT & TYPE 10 SLOT  
 WELL STATUS 10-IN SECURITY CASING AND LOCK

**DEVELOPMENT**  
SURGING AND SWABBING  
PUMPING VIA PERISTALTIC PUMP

**RESULTS:** CLEAR WATER PUMPED

**TEST DATA**

STATIC DEPTH TO WATER 6.33 FT.-MLW  
 DATE MEASURED 4/19/84  
 TOP OF CASING ELEV. 10.78 FT.-MLW

**WATER QUALITY**

NOT AVAILABLE

**REMARKS**  
GRAVEL PACKED 20/40 FILTER SAND

## LITHOLOGIC LOG OF BORING NL-4

Description	Depth (ft)	Thickness (ft)
Sand, medium, greyish-black with organic matter throughout	0 - 2	2
Sand, medium to fine, tannish-grey color	2 - 4	2
Sand, fine, brownish-tan with streaks of fine, orange sand	4 - 7	3
Sand, fine, silty, grey with few clay lenses	7 - 10	3
Sand, fine, silty, tan with clay lenses	10 - 12	2
Clay, silty, moderately stiff, grey, becoming less silty and stiffer throughout	12 - 14	2
Clay, grey, stiff	14 - 16	2



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## Drilling Log

Project Cheyron - Pascagoula Owner Cheyron  
 Location \_\_\_\_\_ W.O. Number 54-07  
 Well Number CP-1 Total Depth 32' Diameter \_\_\_\_\_  
 Surface Elevation \_\_\_\_\_ Water Level: Initial \_\_\_\_\_ 24-hrs. \_\_\_\_\_  
 Screen: Dia. 2" Length 20' Slot Size 0.01 in.  
 Casing: Dia. 2" Length 10'; 5' sumo Type Sch 40 PVC  
 Drilling Company ELI Drilling Method Mud Potary  
 Driller Greg Marchese Log By M. Schmittle Date Drilled 7/18/85

Sketch Map

Notes

DEPTH (FEET)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE TYPE	CONSERVATIVE STRAIN (100%/SQ.FT.)	SAMPLE INTERVAL	DESCRIPTION INTERVAL	Description/Soil Classification (Color, Texture, Structures)
0					0-2	0-3'	Surficial shell layer grading down to reddish brown, medium grained moist sand fill material; Shells and wood pieces abundant; roots
					2-4	3-5'	Gray to brown mottled fine sand; moist; roots; slightly silty;
5					4-6		
					6-8	6-8'	Brownish-gray slightly clayey fine sand;
10					8-10	8-20'	Light and dark gray fine sand, slightly clayey, organics; moist; wood pieces;
					12-14		Same
15					16-18		Same
20					20-22	20-27	Light gray fine to medium sand, saturated;
25							
30				0.25	28-30	27-30	Gray, uniform clay, soft, moist;
35							T.D. @ 32'.



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# Drilling Log

Project Chevron - Pascagoula Owner Chevron  
Location \_\_\_\_\_ W.O. Number 54-07  
Well Number C2-3 Total Depth 37' Diameter \_\_\_\_\_  
Surface Elevation \_\_\_\_\_ Water Level: Initial \_\_\_\_\_ 24-hrs. \_\_\_\_\_  
Screen: Dia. 2' Length 20' Slot Size 0.01 in.  
Casing: Dia. 2" Length 15'/5' sum Type Sch 40 PVC  
Drilling Company STT Drilling Method Mid Rotary  
Driller Greg Marchese Log By M. Schmittle Date Drilled 7/18/85

Sketch Map

Notes

DEPTH (FEET)	GRAPHIC LOG	WELL CONSTRUCTION	SAMPLE TYPE	COHESIVE STRENGTH (TONS/SQ.FT.)	SAMPLE INTERVAL	DESCRIPTION INTERVAL	Description/Soil Classification (Color, Texture, Structures)
0					0-2	0-2	Reddish brown medium sand fill, shells
2					2-4	2-6	Gray, black and brown, fine to medium sand, slightly clayey at 4'; some wood pieces
4					4-6		
6					6-8	6-10	Gray to black clayey sand, fine-grained, shells and wood fragments
8					8-10	10-18	- Clay pockets at 7' Gray fine to medium sand, black organics, saturated
10							
12					13-15		Same
14							
16							
18				0.5	18-20	18-20	Gray and brown clayey very fine sand, some soft clay pockets; saturated; organic material
20						20-33.5	Light gray fine to medium saturated sand
22					23-25		
24							
26							
28							
30							
32					32-34	33.5-33.8 33.8-37	- Wood piece at 33.5' Gray, uniform soft clay, moist
34				0.5			
36							
37							T. D. @ 37'



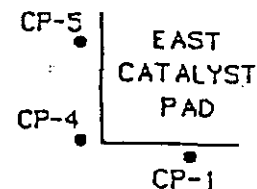
ERM - SOUTHWEST, INC.

HOUSTON, TEXAS

## Drilling Log

Project CHEVRON-PASCAGOULA Owner CHEVRON  
 Location PASCAGOULA, MISSISSIPPI W.O. Number 54-07  
 Well Number CP-4 Total Depth 40' Diameter 6"  
 Surface Elevation \_\_\_\_\_ Water level: Initial \_\_\_\_\_ 24 Hrs \_\_\_\_\_  
 Screen: Dia. 2" Length 20' Slot Size .01 IN.  
 Casing: Dia. 2" Length 20'/2.5' SUMP Type SCH. 40 PVC  
 Drilling Company PORT CITY TESTING Drilling Method MUD ROTARY  
 Driller KEN MCCARTHY Log By M. SCHMITTLE Date Drilled 5/1/86

## Sketch Map



Notes  
 Description in [ ] from  
 geotechnical test data.  
 \*Penetration tests  
 (blows per 6")

DEPTH (Feet)	GRAPHIC LOG	Well Construction	Sample Type	* Cohesive Strength (tons/sq. ft.)	Sample Interval (Ft.)	Description Interval (Ft.)	Description/Soil Classification (Color, Texture, Structures)
0					logged cuttings to 5'	0-8'	Reddish-brown fine to coarse sand fill, abundant shells throughout, roots and occasional wood fragments.
5					5-6.5'		-color becomes gray to orange-brown at 5'
					6.5-8'		-dark gray silty sand pockets at 6.5-8' interval
				(3,3,4)	8-9.5'	8-9.5'	Dark gray fine to medium sand, occasional/black pockets of sand and shell fragments.
10				(4,4,3)	9.5-11'	9.5-12.5'	Dark gray and black slightly clayey, silty sand, occasional shells and shell fragments, abundant natural organic/wood material, roots.
				(5,4,2)	11-12.5'		
				(4,2,2)	12.5-14'	12.5-14'	Tan to gray fine sand, abundant natural organic/wood fragments, shells at 14'.
				(1,1,2)	14-15.5'	14-26'	Gray to dark gray silty, fine sand, roots, occasional shell fragments; orange and light gray sand pockets at 14' abundant wood pieces at 15.5' and 16'; dark gray clayey sand pockets at 15'; saturated at 18.5'.
15				(3,3,2)	18.5-20'		-lense of light gray fine sand at 19.5' to 20'
				(3,3,2)	23-24.5'	26-37.5'	Light gray very fine to medium sand, saturated, no organics or roots. [silty sand]
20				(5,12,15)	24.5-26'		
25				(4,3,3)	28.5-30'		-same as above
				(3,3,9)	33.5-35'		
30				(15,15,19)	37.5-40'	37.5-40'	Driller notes change in bit penetration at 37.5'. Gray fine sandy, clay to 38.5' Grades to a moist silty clay.
35				(15,30,28)			
40				1.5			

# Attachment C to Section E

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