Appendix A

Geotechnical Evaluation - Long-Term Settlement

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A.1.0 INTRODUCTION

Settlement analyses were performed to predict changes in elevation and slope of the Landfarms closure units caused by consolidation of underlying soils after placement of fill and cap materials. On the basis of data collected from previous borings inside and outside the Landfarms and planned filling and covering activities, a soil profile model was constructed to illustrate the different soil layers at two representative locations within the Landfarms. The two locations were chosen to represent extremes of fill and underlying compressible soil thicknesses representative of all the Landfarms locations. Locations of the profiles are shown on Plate A-1, Settlement Analysis Profile and Section Locations. The two profiles of soil layers used in the settlement analyses are shown on Plates A-2 and A-3.

The Landfarms are underlain by approximately 1.5 to 7.5 feet of fill (upper fill), representing the zone that has been actively landfarmed. The upper fill consists of dark gray to brown silty clay with black mottling and scattered gravel and sand. This fill was placed between mid 1970s to 1987. The upper fill is underlain by artificial fill (lower fill) consisting of a gravely clay to a silty clay with variable amounts of gravel, sand, silt, and construction debris. This layer consists of isolated pockets of oily sludge in Nos. 1, 2, 3, and 4 Landfarms. The thickness of the lower fill ranges from 3 feet in No. 4 Landfarm to 19 feet in No. 1 Landfarm. For the purpose of settlement analyses, the Landfarms upper and lower fill are treated as one unit, herein referred to as the Landfarms waste fill.

The Landfarms waste fill is underlain by either Peaty Bay Mud or Young Bay Mud. The Peaty Bay Mud is laterally discontinuous, but where encountered is composed of gray, soft silty clay with a moderate to high peat content. Its thickness ranges from 0 to 4 feet with localized thickness of 6 feet in No. 1 Landfarm. Bay Mud underlies the Peaty Bay Mud, or the fill material where the Peaty Bay Mud is absent. The Bay Mud consists of gray soft to very soft silty clay. For the purpose of settlement analyses, the Peaty Bay Mud and Young Bay Mud are considered as one unit. The total thickness of this unit is estimated to range from 17 feet to 23 feet beneath No. 1 Landfarm and from 8 feet to 20 feet beneath Nos. 2 through 5 Landfarms. The Young Bay Mud is underlain sequentially by Old Bay Mud, alluvial interfingering and estuarine deposits, and Franciscan bedrock.

Soil parameters for the settlement analyses were conservatively estimated from experience with similar sites in the Refinery having similar characteristics. Dames & Moore has been performing geotechnical evaluations within Chevron's Richmond Refinery since 1942, has performed numerous laboratory consolidation tests on the different soil types encountered beneath the Refinery, and has evaluated settlements for a wide range of loading and soil conditions. The assumed soil properties and representative soil profiles used are shown on Plates A-2 and A-3. Table A-2 explains the terms and symbols used on the Settlement Analysis Profiles. Settlement analyses included consolidation of the Bay Mud under loading caused by both the existing Landfarms waste fill placed previously and the new fill to be placed for the closure. Other units shown in Plates A-2 and A-3 have negligible compressibility when compared to the Bay Mud. The fills at the site are significantly less compressible than the Bay Mud and, as they are not generally saturated, will compress only moderately during the construction operations. The underlying soils are also less compressible and are generally over-consolidated. Based on Dames & Moore's experience, the contribution of the deeper soil layers to the over-all settlement of the Landfarms is less than the uncertainty inherent in the methodology for calculating the settlements for Bay Mud. Bay Mud in the vicinity of Landfarms is assumed to have been consolidated under the weight of existing overlying soils (i.e., normally consolidated) prior to placement of new fill.

A.2.0 SETTLEMENT ANALYSIS METHODOLOGY

The settlement analyses were performed using the computer program CONSOL, which uses a one-dimensional consolidation method. The program calculates the amount and the timing of consolidation

settlement for one-dimensional drainage conditions in horizontally layered soil masses using an implicit numerical finite difference method. The program can be used for analyses involving: 1) variations of changes in stress with depth such as conditions induced by changes in groundwater level, or by placement or removal of areal fills; 2) variations of soil properties with depth; 3) single drainage, double drainage, and drainage within the consolidating soil mass; and 4) conditions where the magnitude of settlement is affected by buoyancy effects.

The elevations for the final cover were selected on the basis of the maximum amount of fill presented on Drawings D-767512 and D-767515 (Appendix J) of this report. The Landfarms new fill thickness is greatest at the center of the area to be filled, and thins out to a point where no new fill is present along the perimeter of the Landfarms. Fill loading applied to the top of existing Landfarms waste fill was assumed to take place over a large areal extent. Stress increases or decreases can be reasonably evaluated with one-dimensional assumptions for such areas fills. The final cover, existing Landfarms waste fill, and other underlying soils were assumed to have no significant compressibility. A unit weight of 135 pcf was used for the proposed 12-inch cover. Settlement magnitudes presented here represent settlements that could actually occur if the final elevation of new fill is as shown on the grading plan.

In performing the analyses, we assumed that all settlement will occur in the Bay Mud. As discussed earlier, the contributions of the other soil layers at the site will be less than the uncertainty inherent in caluculating settlements for the Bay Mud. For the CONSOL program, the Bay Mud profile was defined as one compressible unit, as shown on Plates A-2 and A-3, that is doubly drained at its surface and at its base. This unit was subdivided into 9 sublayers in No. 1 Landfarm, and 8 sublayers in No. 2 Landfarm. The change in vertical effective stress as a result of the loading is calculated by the program. The Bay Mud was assumed to be homogeneous, isotropic, and linearly elastic.

For each load case, the program calculates the ultimate long-term settlements of the Bay Mud. The program also calculates the proportion of settlement that has occurred for times prior to the completion of construction.

A.3.0 DISCUSSION OF RESULTS

Results of settlement analyses for the two profiles evaluated are summarized on Table A-1, Summary of Results of Settlement Analyses Following New Fill Placement and Final Cover Construction. The maximum anticipated settlements will occur where the maximum thickness of new fill is placed over the maximum thickness of Bay Mud, which is at the crest of the new fill slope located approximately at the center of the Landfarms. Based on the two cross sections analyzed, the maximum settlement estimated for this location over a 50-year period of time is approximately 1.4 feet in No. 1 Landfarm and 0.9 feet in No. 2 Landfarm.

The resulting fill elevations and grades after long-term settlements were evaluated along two cross sections identified on Plate A-1: Sections A-A' and B-B'. The sections are illustrated on Plates A-4 and A-5, showing the initial new fill and cap surface profiles, and the resulting surface profiles after long-term settlements.

The resulting grades for both cross sections initially designed as 4 percent will retain slopes steeper than 3 percent after settlement. Based on the results of the settlement analyses, BEDM anticipates that the closure units will perform satisfactorily with the overburden expected to be placed prior to closure.

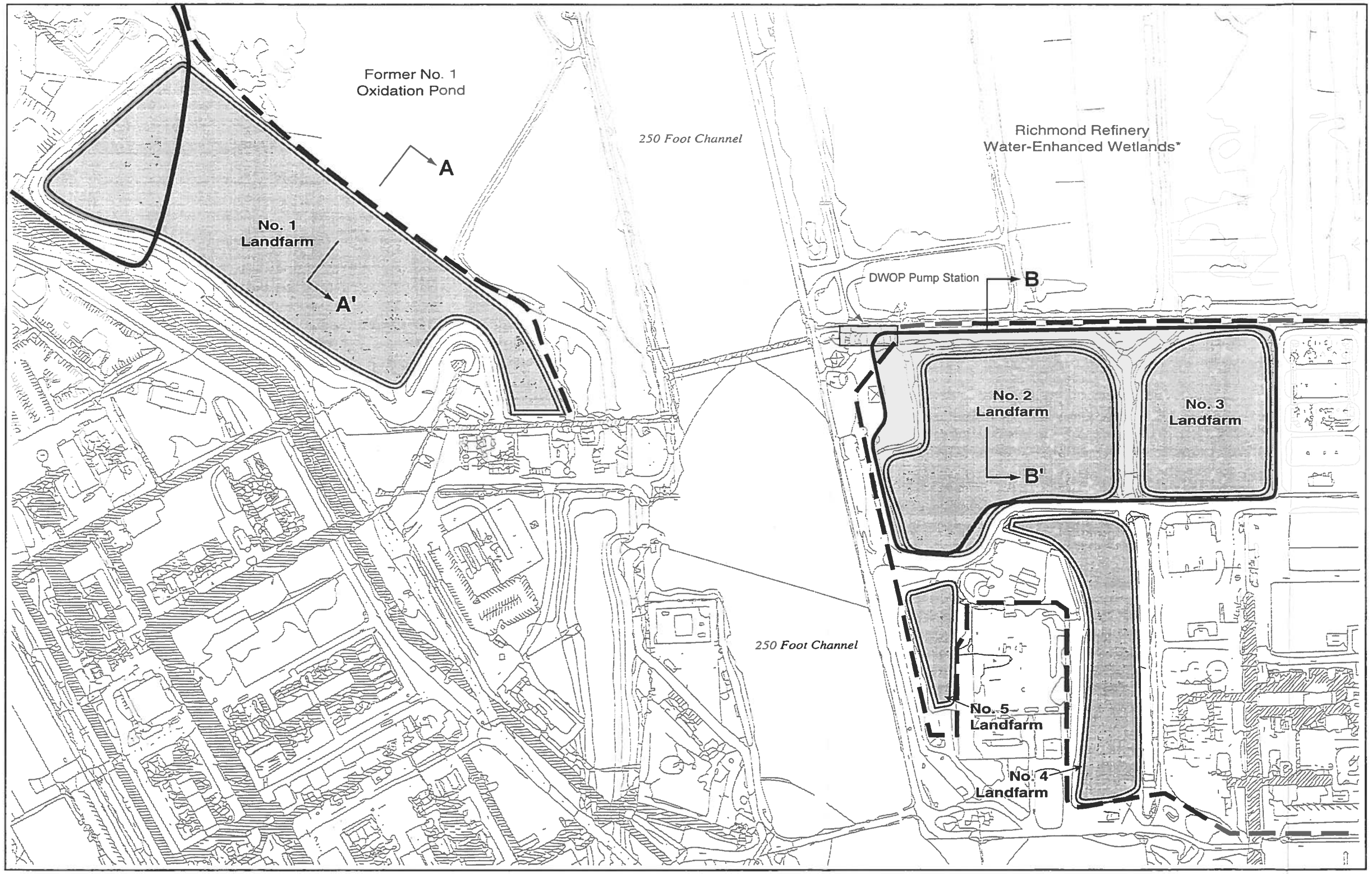
Table A-1. Summary of Results of Settlement Analyses
Following Final Cover Construction
Landfarms Closure Plan
Appendix A
Chevron Richmond Refinery

Profile No.	Estimated Settlement (feet)[1]
1 (Section A-A')	1.4
2 (Section B-B')	0.9

[1] Settlements calculated for time of 50 years following construction.

Table A-2. Explanation of Terms and Symbols Used in the Settlement Analyses Profile
Landfarms Closure Plan
Appendix A
Chevron Richmond Refinery

γ	=	Unit Weight (pcf or lb/ft^3)
e	=	Void Ratio
C_c	=	Compression Index
C_r	=	Recompression Index
C_v	=	Coefficient of Consolidation (ft^2/yr)
C_{vr}	=	Coefficient of Reconsolidation (ft^2/yr)



EXPLANATION:

- Limits of Existing Landfarms
- Limits of Landfills under Landfarms
- Groundwater Protection System (GPS) Alignment
- Proposed Vegetative Cover
- A A' Location of Settlement Analyses Sections

N

0 300

Feet

NOTE

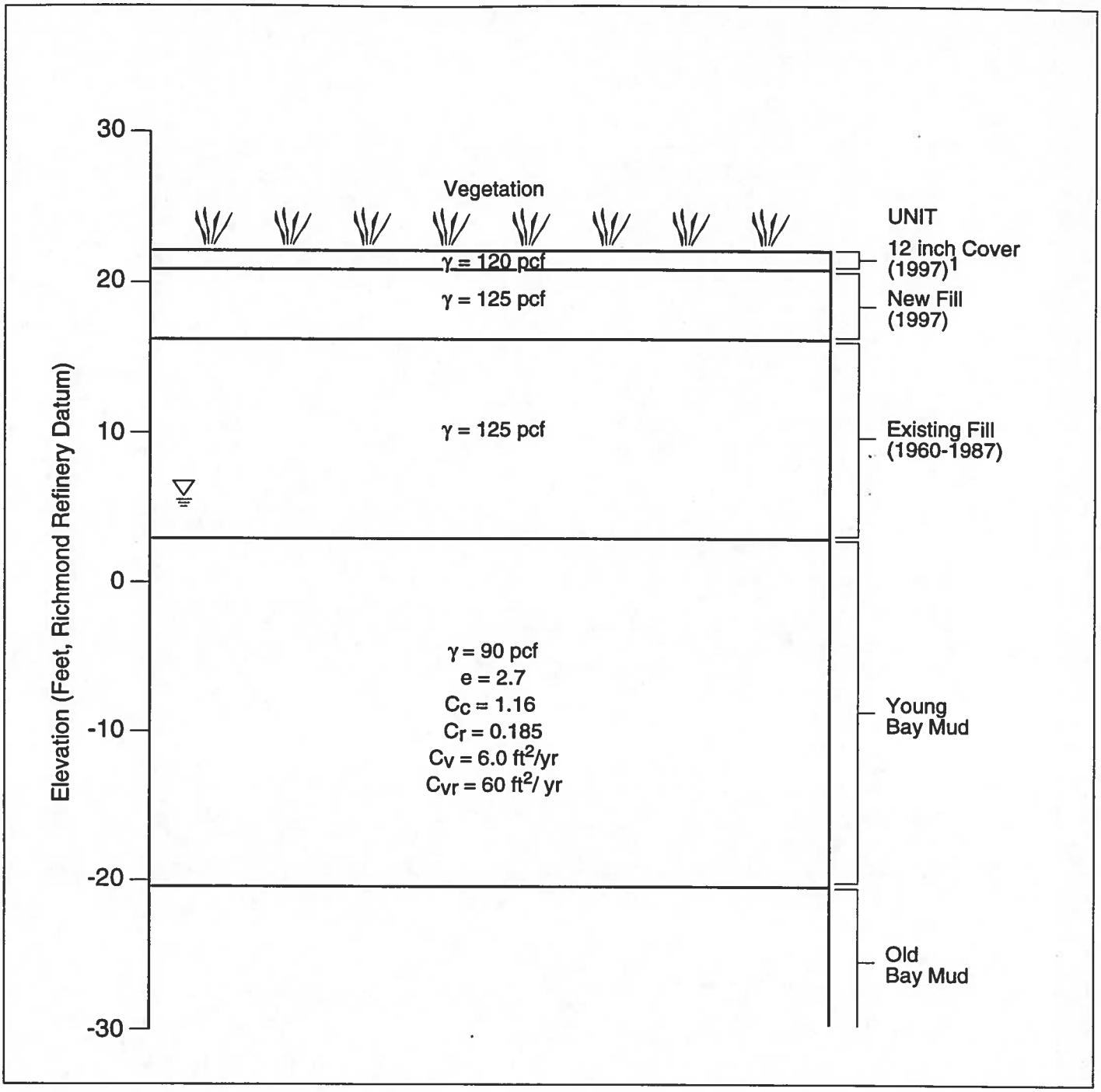
1. * Active wetlands used for tertiary treatment of Refinery effluent.

SITE PLAN
SETTLEMENT ANALYSES
SECTION LOCATIONS

Landfarms Closure Plan

PLATE A-1

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

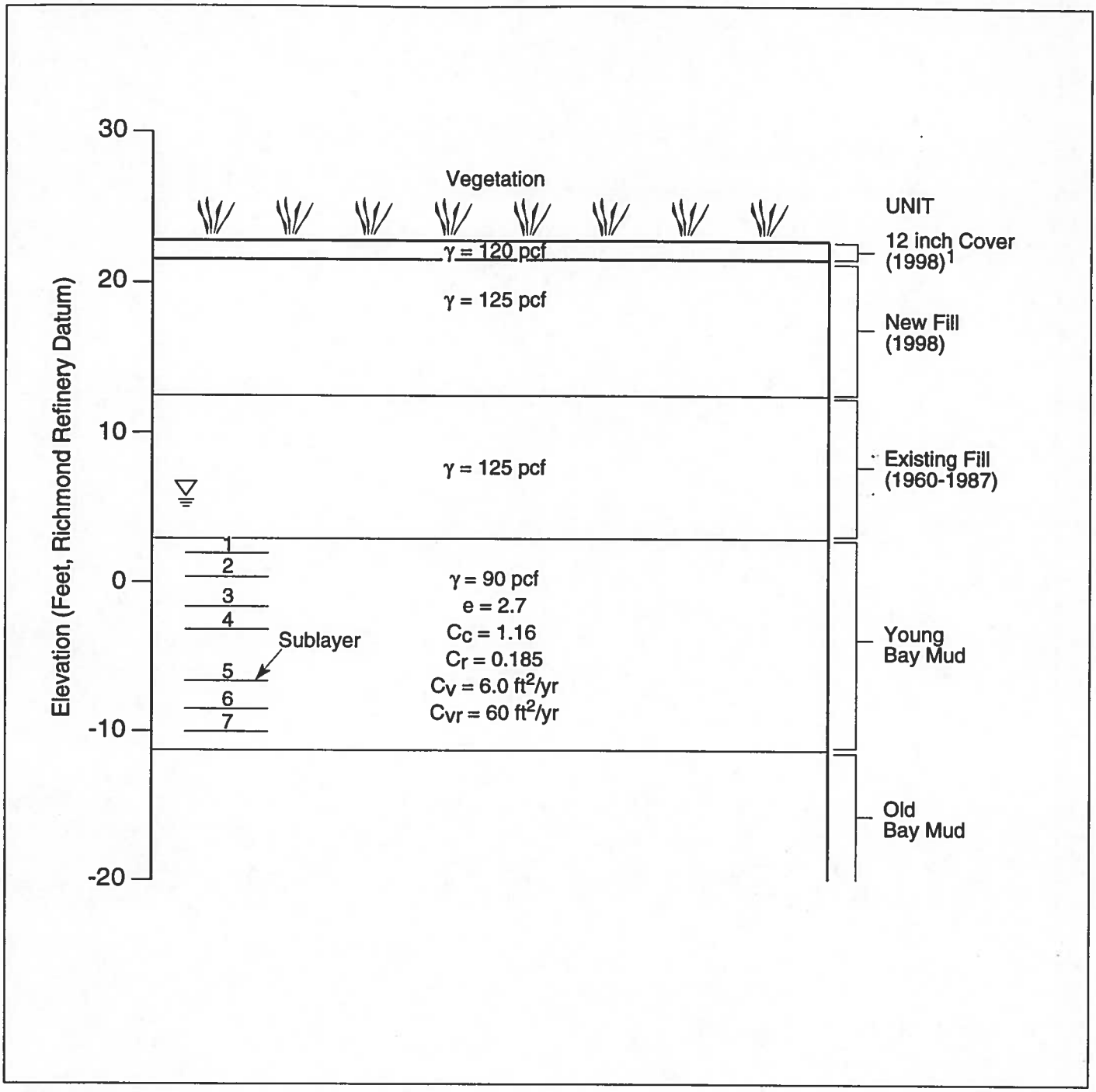


1 Year Material Applied

NOTES:
1. See Table A-2 for definition of terms.
2. The Young Bay Mud layer includes the sludge layer when present.

SETTLEMENT ANALYSES
NO. 1 LANDFARM SOIL PROFILE (Section A-A')

Landfarms Closure Plan



[1] Year Material Applied

NOTES:
1. See Table A-2 for definition of terms.

SETTLEMENT ANALYSES
NO. 2 LANDFARM SOIL PROFILE (Section B-B')
Landfarms Closure Plan

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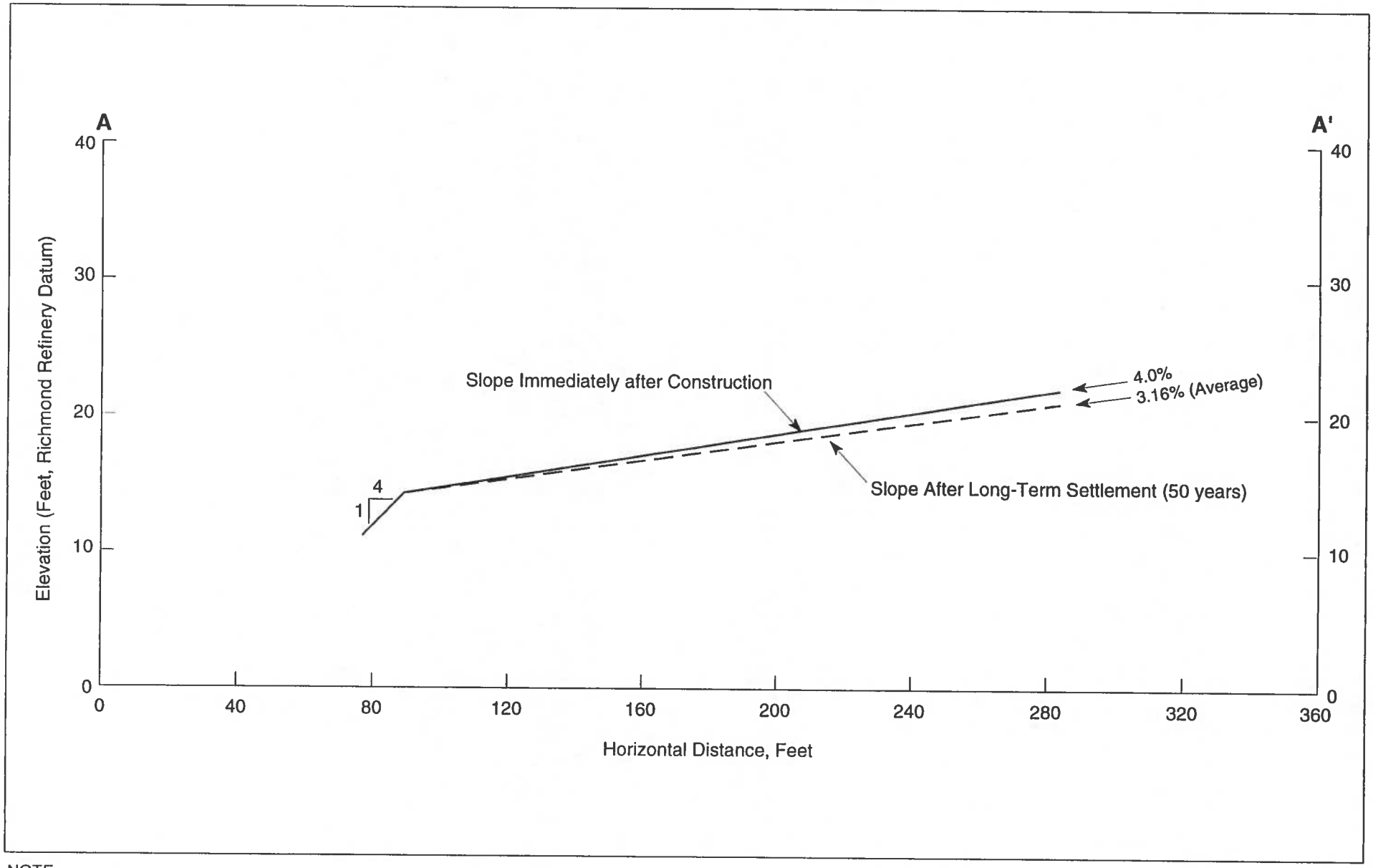
BECHTEL ENVIRONMENTAL/DAMES & MOORE

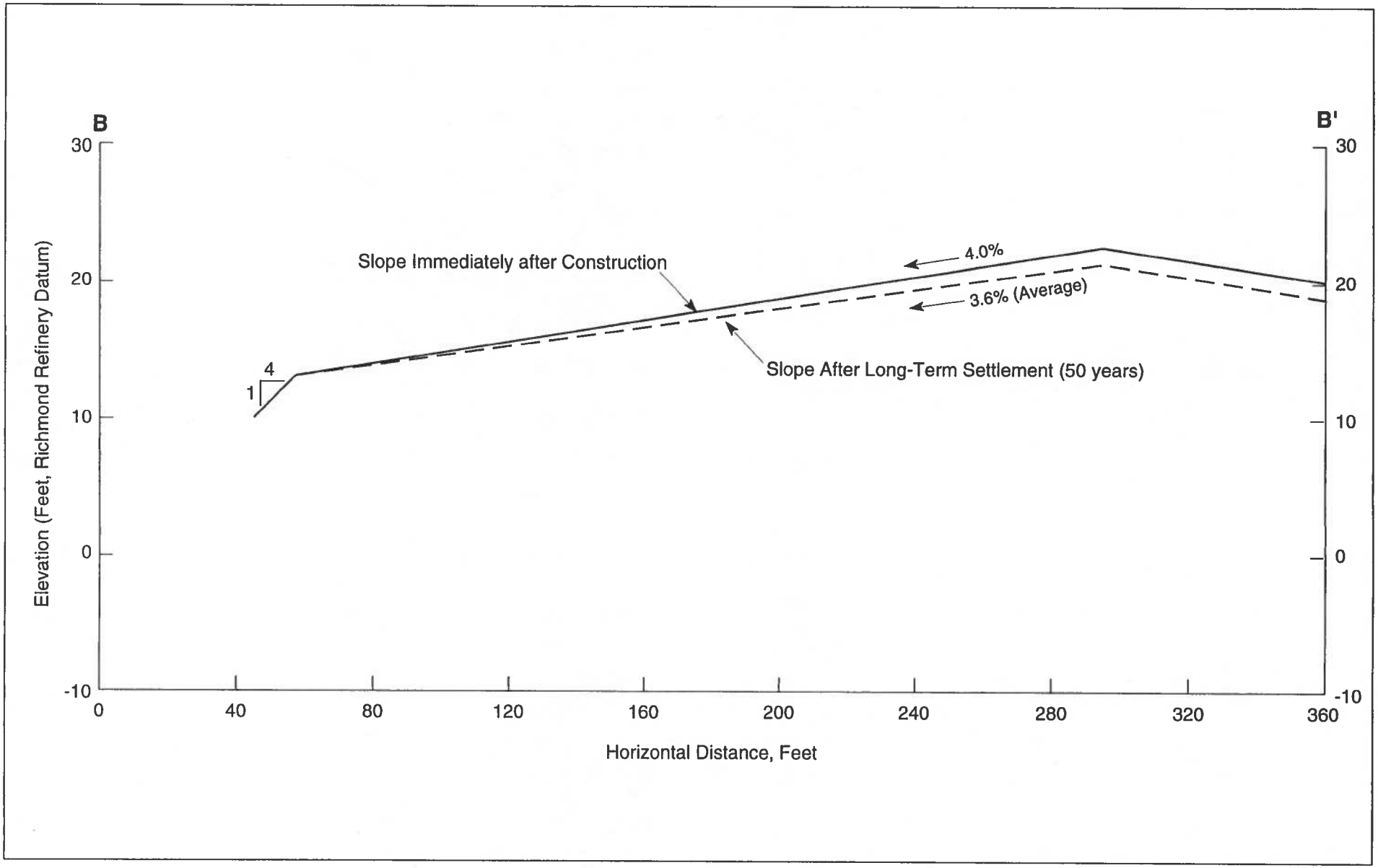
PLATE A-3



NOTE:
1. See Plate A-1 for section location.
2. Elevations are based on Richmond Refinery Datum which is -2.2' National Geodetic Vertical Datum, 1929.
3. Reference Plate A-2, No. 1 Landfarm Soil Profile.

FILL SETTLEMENT ALONG SECTION A-A' (NO. 1 LANDFARM)

Landfarms Closure Plan
LANDFARM/LANDFILL SECTOR



NOTE:
1. See Plate A-1 for section location.
2. Elevations are based on Richmond Refinery Datum which is -2.2' National Geodetic Vertical Datum, 1929.
3. Reference Plate A-3, No. 2 Landfarm Soil Profile.

FILL SETTLEMENT ALONG SECTION B-B' (NO. 2 LANDFARM)

Landfarms Closure Plan
LANDFARM/LANDFILL SECTOR

APPENDIX B

Appendix B

Geotechnical Evaluation - Slope Stability

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B.1.0 INTRODUCTION

A series of slope stability analyses were undertaken to evaluate the stability of the slopes associated with the maximum amount of fill expected to be placed within the Landfarms. Based on existing information obtained during evaluations of previous versions of the Landfarms closure, and experience gained over 15 years of performing stability analyses within the Refinery by the Dames & Moore engineers performing the evaluations, the slope geometry and soil parameters were evaluated at the two most critical locations representative of the Landfarms. The Section A-A' location was chosen within No. 1 Landfarm at the west side of the Landfarm (Plate B-1). This location is characterized by the greatest thickness of Young Bay Mud and is adjacent to the former No. 1 Oxidation Pond, which is immediately underlain by weak soils (dredge spoils and Bay Mud). The location for Section B-B' was selected within No. 3 Landfarm, and represents a significant thickness of the new fill, and is most adjacent to No. 2 Oxidation Pond, which is immediately underlain by Young Bay Mud (Plate B-1). Experience has shown that these were likely to be the most critical locations for each site.

B.2.0 STABILITY ASSESSMENT METHODOLOGY

B.2.1 General

Stability analyses were performed using the computer program SSTABM, which uses the generalized method of slices with interslice forces as described by Spencer (1967), and searches for the circular shear surface with the lowest factor of safety. The program initially written by Wright (1969) at the University of Texas, has been modified by Dames & Moore to improve the format of input and output data.

The geometry of the proposed slope at the location selected for analyses is shown on Plates B-2 and B-3. Slope geometry, after construction, was developed from information shown on drawings D-767512 and D-767515 (Appendix J) illustrating existing and final topography for the placement of new fill and cap.

Depending on the layer types and thicknesses, the soils below the slope were modeled as discrete layers with either: (a) gradually increasing strength with depth; (b) uniform strength throughout the extent of the layer for cohesive material; or (c) frictional shear strength for cohesionless materials. Typically, Bay Mud layers were modeled to exhibit gradually increasing strength with depth, whereas other soils were modeled as discrete layers with uniform strength or frictional shear strength.

The shear strength parameters for Bay Mud and the fill properties were conservatively estimated from experience with similar sites in the Refinery having similar characteristics. The shear strength profile for Bay Mud reflects a consolidation strength gain due to the overburden load of the fill soils. Higher soil strengths are observed in Bay Muds under fills (giving higher overburden stresses) than for Bay Muds located in areas where they are perpetually inundated and without overlying fills. Consolidation strength gain refers to a process where the presence of an overlying load squeezes water from the soil, reducing the void space in the soil and causing the soil to become stronger.

B.2.2 Dynamic Stability

Evaluation of seismic slope stability requires development of several site-specific seismic criteria, including the estimated peak acceleration of the earthquake, the peak particle (or ground) velocity occurring during the earthquake, and the equivalent horizontal force coefficient at which the embankment might be expected to yield. Displacement induced by shaking during earthquakes is assessed, and the probability of this movement occurring is estimated. This type of analysis is described below.

B.2.2.1 Displacement Mechanisms

Both natural and constructed embankment slopes are susceptible to movements induced by shaking during earthquakes. The source of movement can be attributed to two different mechanisms: 1) strength loss due either to soil liquefaction or to strain softening from cyclic stress; and 2) embankment displacement as a result of earthquake-induced stresses.

B.2.2.1.1 Strength Loss

The first type of movement occurs when materials within an embankment or portions of an embankment lose a large proportion of their strength during or following the shaking produced by the earthquake. The strength loss can be due to either liquefaction or to significant strain imposed on strain-softening soils. Examples of earthquake-induced failures because of strength loss include embankments in San Francisco during the 1906 event and the well publicized near-failure of the Van Norman Dam during the San Fernando earthquake of 1971. Based on our evaluation of the soils that compose both the embankment materials and the supporting soils in the Landfarms areas, we believe these soils are not susceptible to strength loss during an earthquake. This conclusion is based on the facts that: 1) soils susceptible to liquefaction were not encountered under the embankments; and 2) numerous cyclic triaxial tests performed on Bay Mud samples taken at nearby facilities on the Refinery confirmed that these soils do not undergo significant loss of strength during repeated cyclic loading.

B.2.2.1.2 Embankment Displacement Due to Earthquake-Induced Stresses

The second type of movement, which is not related to significant strength loss, is the direct result of the large amplitudes of stress induced in the soil by an earthquake. Where a pre-existing shear stress exists, as in an embankment slope, there may be momentary periods during the earthquake when the soil yields and deforms in response to the high directional stresses imposed by the earthquake motion. After the motion ceases or reverses direction, the earthquake-induced stresses are reduced to levels below the soil's shear strength or are actually reversed. This reduction or reversal halts the deformation. At the end of the earthquake, there may be a net down-hill deformation associated with a number of peak stress waves during the earthquake which exceeded the shear strength of the soil. The key reference regarding this form of deformation is Newmark (1965), describing a relatively simple relationship for estimating the total deformation that may occur in an embankment slope during an earthquake. The procedure takes into account the vibratory nature of earthquake motion and the likelihood that for short periods of time the stresses induced in an embankment by an earthquake may exceed the strength of the embankment to resist these loads. When this occurs, some yielding displacement of the embankment crest is likely to occur, but the magnitude of this movement will be limited by reversals in the direction of the earthquake-imposed stress. The intensity of the earthquake will govern both the amount of movement that may occur with each reversal in loading and the number of reversals likely to occur.

A seismic event of given intensity with regard to peak motions and direction is assumed. When the earthquake motion in a given direction produces stresses that exceed the resistance of the soils, the embankment will displace with the magnitude dependent on both the ground motion velocity and the amount of time available before acceleration decreases to below the yield horizontal acceleration. When motion is again in the same direction, further displacement can occur. Based on this behavior, the Newmark method allows computation of the total cumulative dike crest displacement during a given seismic event. Crest displacement is measured from the original height of the slope to the new height after slumping has occurred.

The Newmark procedure requires development of several site-specific seismic criteria including the estimated peak acceleration of the earthquake, the peak particle (or ground) velocity occurring during the

earthquake, and the equivalent horizontal force coefficient at which the embankment might be expected to yield. This latter coefficient is normally computed as a lateral force coefficient for which a slope stability analysis will yield a factor of safety to unity because displacement would not be expected to occur in an earthquake where the accelerations were always less than this horizontal force coefficient. Because of the method used for computation, the coefficient is also referred to as the pseudo-static yield acceleration. For this assessment of dike performance, the required pseudo-static yield acceleration was derived using the computer program SSTABM, as described in Section B.2.1. A series of pseudo-static analyses was performed, using various horizontal seismic coefficients, to evaluate the magnitude of static horizontal force required to reduce the calculated factor of safety to unity.

B.2.2.2 Seismic Hazards

Once the yield acceleration is known, it is still necessary to evaluate the magnitudes of displacement associated with earthquakes producing accelerations higher than the yield acceleration. Two distinct approaches are generally used for site-specific estimates for developing seismic design criteria for engineered projects: the deterministic procedure and the probabilistic procedure. A probabilistic seismic hazard study was performed for the Refinery and is described in the *Refinery-Wide ROWD*, Section 6.3 (Dames & Moore, August 31, 1988). This report also presents a detailed discussion on the seismic setting and seismic hazards at the Refinery. The study has been included in Appendix C of this document.

B.2.2.2.1 Deterministic Assessment of Seismic Hazard

The peak accelerations associated with the Maximum Credible Earthquake (MCE) were computed deterministically. In a deterministic approach, ground motions at a site are estimated by considering a single event of a specified magnitude and distance from the site. In order to perform a deterministic analysis, the following data are required:

- Definition of an earthquake source (e.g., a known geologic fault) and its location relative to the site;
- Definition of a design earthquake that the source is capable of producing; and
- A relationship that describes the attenuation of the ground motion parameter of interest (e.g., peak ground acceleration or response spectral ordinates).

An earthquake source in most cases is a known active or potentially active geologic fault. A site may have several faults in close proximity. For the Richmond Refinery, the major active faults in the site vicinity are all part of the San Andreas fault system. These faults include the Hayward fault (from 4.2 to 5.2 kilometers [kms] east), the San Andreas fault 22 kms west, the Calaveras fault 38 kms northeast, and Seal Cove-San Gregorio fault zone 26 kms from the site. Based on the length and characteristics of the fault, a maximum magnitude potential of each source is specified. The maximum magnitude potential of a source is determined from empirical relationships between magnitude and rupture length or through historical knowledge of past earthquakes on the particular source. Generally, the earthquake corresponding to the maximum magnitude is referred to as the Maximum Credible Earthquake (MCE), which represents the maximum earthquake potential of a source. This information is then used as input to an attenuation relationship, which relates the ground motion parameter of interest to magnitude and distance.

Attenuation of ground motion is known to vary significantly during any earthquake. Research using statistical analysis of large ground motion data sets has shown that the scatter of ground motion values about a mean attenuation relationship can be represented by a log-normal distribution. Attenuation relationships are empirical relationships developed by using regression analyses techniques on ground motion data recorded during earthquakes. Several attenuation relationships have been published describing

the dependence of peak ground acceleration (pga) on earthquake magnitude and distance from the earthquake to the site.

In the deterministic evaluation, the MCE choice for the Refinery was confined to possible events on the Hayward fault because of its relatively close proximity to the site. The maximum ground motions were computed using a weighted average between recent attenuation relationships by Boore et al. (1994 with 1995 addenda) and by Crouse and McGuire (1995). In the evaluation, the site was classified as Site Class C, where the average shear wave velocity in the upper 30 meters is between 180 and 360 meters per second. Using these attenuation relationships, maximum ground motion for possible event on the Hayward fault at a distance of approximately 4.7 kms are expected to give a pga of 0.47 g, for a moment magnitude of 7.0 (as measured on the Richter Scale).

B.3.0 RESULTS OF STABILITY ANALYSES

The results of the static and dynamic stability analyses are presented in Table B-1 and are summarized below. Based on the results of both static and dynamic slope stability analyses, BEDM anticipates that the slopes will perform satisfactorily at the Landfarms with the overburden expected to be placed prior to closure.

B.3.1 Static Slope Stability

On the basis of results of our analyses at the end of construction, the factor of safety analyzed under static conditions for Section A-A' (No. 1 Landfarm) is 2.72. Results of static analyses indicate a factor of safety of 2.06 for Section B-B' in No. 3 Landfarm. Because these values exceed the generally accepted criteria of 1.5 for the factor of safety, the sections are considered stable under static conditions.

The critical circular failure surfaces corresponding to these minimum factors of safety are shown on Plates B-2 and B-3. The elevations of the fill and final cover shown on the plates are the actual grades used in the analyses.

B.3.2 Seismic Slope Stability

The pseudo-static accelerations that would be required to reduce the static factor of safety to unity for Sections A-A' and B-B' were computed for conditions at the end of construction. The results of the pseudo-static analyses for conditions at the end of construction show that, for Section A-A' (No. 1 Landfarm), a yield acceleration of 0.139 g results in a factor of safety of unity (1.0). Results of analyses for these conditions at Section B-B' in No. 3 Landfarm indicate that yield accelerations of 0.130 g result in a factor of safety of unity (1.0).

The magnitudes of displacement that might occur during the MCE were estimated using the computer program NMDISP. The program was originally written by Mr. Neville Donovan of Dames & Moore and has been later modified for improvement of output readability. This program uses the Newmark displacement analysis method. The displacements were estimated for 0.47 g using a set of yield accelerations computed by seismic slope stability analysis. Based on the yield acceleration results, the estimated displacement for Sections A-A' and B-B' are 11 inches and 12 inches, respectively.

The results of these analyses, as well as the critical failure surfaces and required accelerations for Sections A-A' and B-B' analyzed, are shown on Table B-2, Plates B-2 and B-3.

B.4.0 REFERENCES

Boore, D.M., Joyner, W.B., and Fumal, T.E., 1994. *Estimation of Response Spectra and Peak Accelerations from Western North American Earthquakes: An Interim Report*, Open File Report 93-509 and 94-127, U.S. Geological Survey, Menlo Park, California.

California Department of Conservation Division of Mines and Geology, "Proceedings, Conference on Earthquake Hazards in the Eastern San Francisco Bay Area," Special Publication 62, 1982.

Crouse, C.B. and McGuire, J.W., 1994. "Site Response Studies for Purpose of Revising NEHRP Seismic Provisions," *Proceedings of Strong Motion Instrumentation Program (SMIP94)*, California Division of Mines and Geology, Sacramento, California.

Ladd and Foott, 1974, *The new Design Procedure for Stability of Soft Clays*, Geotechnical Engineering Journal, July.

Newmark, Nathan M., 1965, *Effects of Earthquakes and Dams and Embankments*, Geotechnique, pp. 139-160, June.

Spencer, E., 1967, A Method of Analysis of the Stability of Embankments Assuming Parallel Inter-Slice Forces, Geotechnique, Vol. 17, No. 1, pp. 11-26.

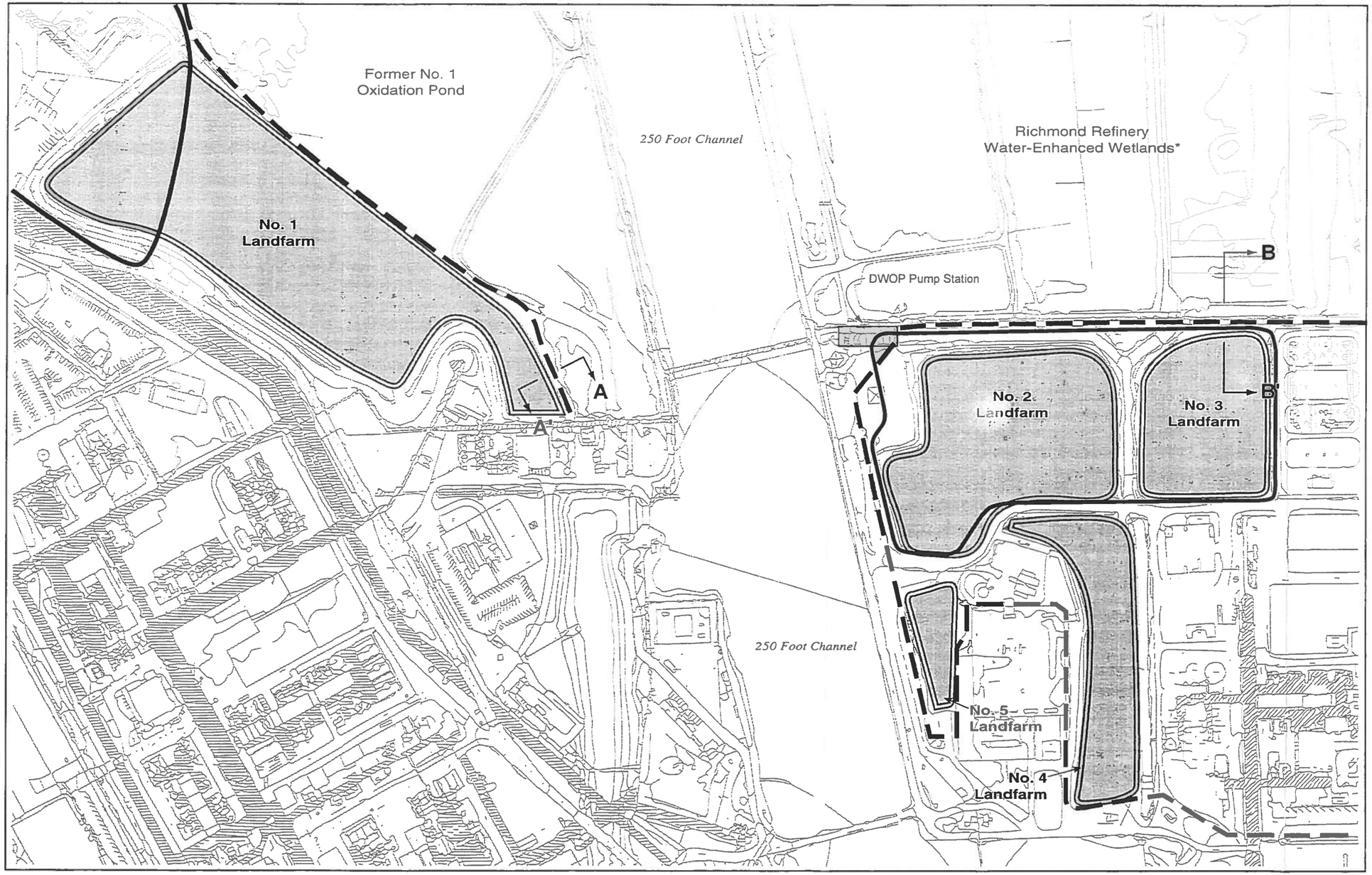
Wright, S.G., 1969, A Study of Slope Stability and the Undrained Shear Strength of Clay Shales, Ph.D. Thesis, University of California, Berkeley.

Table B-1. Soil Parameters Used in the Static and Dynamic Stability Analyses
Landfarms Closure Plan
Appendix B
Chevron Richmond Refinery

Soil	Unit Weight (pcf)	Angle of Internal Friction (°)	Cohesion (psf)
Top Soil	130	35	0
Existing Berm	130	20	300
Landfarmed Soils	125	30	0
Young Bay Mud (non-filled areas)	90	0	100 psf @ El. 5'+5 psf/ft
Young Bay Mud (filled areas)	90	0	250 psf @ El. 5'+5 psf/ft
Underlying Alluvial Soils	120	0	1,000

Table B-2. Results of the Static and Dynamic Stability Analyses
Landfarms Closure Plan
Appendix B
Chevron Richmond Refinery

Section	Factor of Safety	Yield Acceleration (g)
A-A' (No. 1 Landfarm)	2.64	0.139
B-B' (No. 3 Landfarm)	2.06	0.130



EXPLANATION:

- Limits of Existing Landfarms
- Limits of Landfills under Landfarms
- Groundwater Protection System (GPS) Alignment
- Proposed Vegetative Cover
- A — A' Location of Stability Analyses Sections

N

0 300

Feet

NOTE

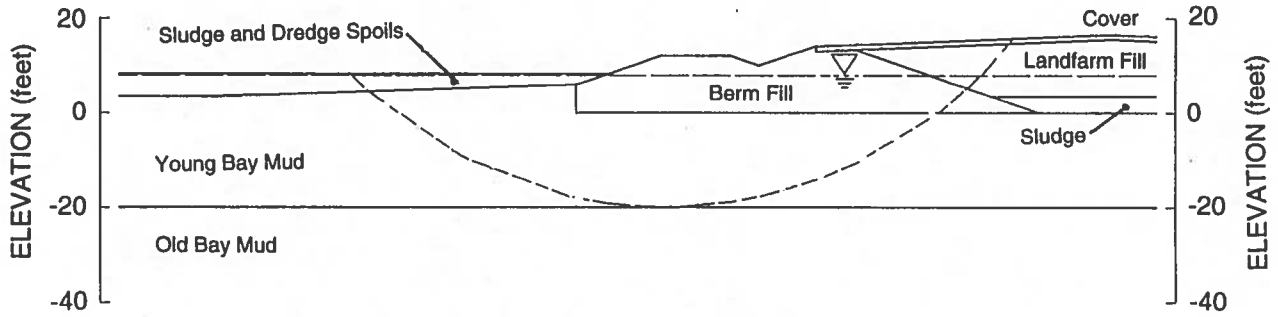
1. * Active wetlands used for tertiary treatment of Refinery effluent.

SITE PLAN
STABILITY ANALYSES
SECTION LOCATIONS

Landfarms Closure Plan

PLATE B-1

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE



EXPLANATION

- - - - - - Static Failure Surface Immediately After End of Construction. Factor of Safety = 2.64

——— Contact Between Soil Layers

Water Surface

NOTE:

1. Elevations are approximate and are referenced to Richmond Refinery Datum.

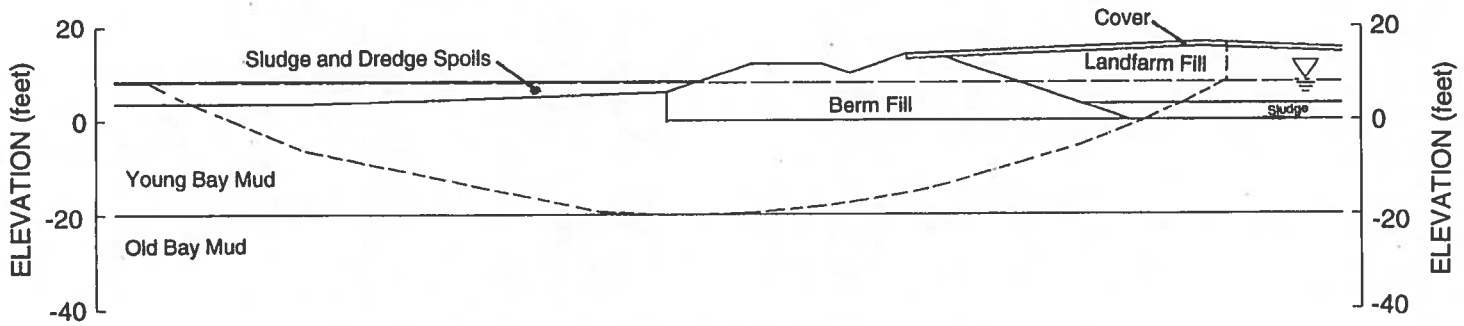
0 10 20 30 40
Feet
Horizontal Scale

STABILITY ANALYSIS
NO. 1 LANDFARM SECTION A-A'

Landfarms Closure Plan

PLATE B-2

BEDM



EXPLANATION

- - - - - - Critical Pseudo-static Failure Surface. Yield Acceleration = 0.139 g

——— Contact Between Soil Layers

Water Surface

NOTE:

1. Elevations are approximate and are referenced to Richmond Refinery Datum.

0 10 20 30 40

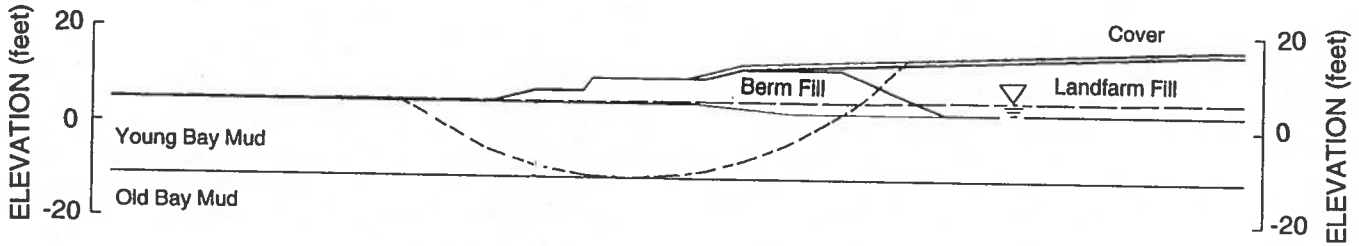
Feet
Horizontal Scale

SEISMIC STABILITY ANALYSIS NO. 1 LANDFARM SECTION A-A'

Landfarms Closure Plan

PLATE B-3

BEDM



EXPLANATION

- Static Failure Surface Immediately After End of Construction. Factor of Safety = 2.06
- Contact Between Soil Layers
- Water Surface

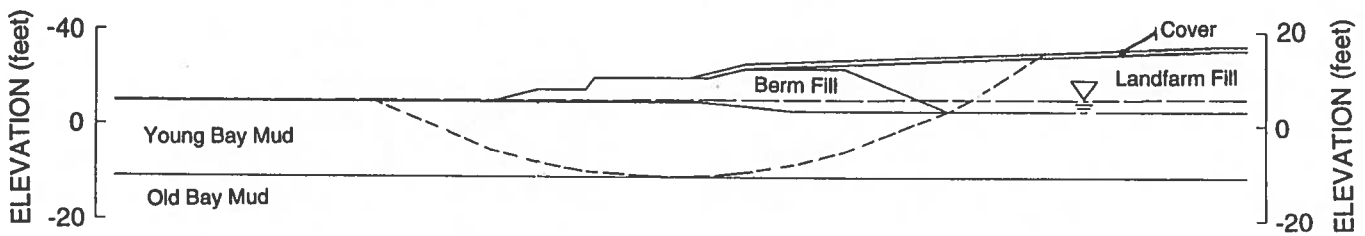
NOTE:

1. Elevations are approximate and are referenced to Richmond Refinery Datum.

0 10 20 30 40
Feet
Horizontal Scale

STABILITY ANALYSIS
NO. 3 LANDFARM SECTION B-B'

Landfarms Closure Plan



EXPLANATION

- - - - - - Critical Pseudo-static Failure Surface. Yield Acceleration = 0.130 g

——— Contact Between Soil Layers

Water Surface

NOTE:

1. Elevations are approximate and are referenced to Richmond Refinery Datum.

0 10 20 30 40

Feet
Horizontal Scale

SEISMIC STABILITY ANALYSIS
NO. 3 LANDFARM SECTION B-B'

Landfarms Closure Plan

PLATE B.5

BEDM

Appendix C

Seismic Hazard Study

Reprinted from Section 6.0 of
Dames & Moore, 1988, "Refinery-Wide Report of Waste Discharge",
Richmond, California, Refinery for Chevron U.S.A. Inc., August 31.

6.0 SEISMIC SETTING

6.1 FAULTS

The Chevron Refinery at Richmond, California is located in a tectonically active region, near the contact between the North American and Pacific crustal plates. This seismic regime is characterized by northwest trending faults. These faults exhibit mainly right lateral strike-slip movement, which means that the movement is predominantly horizontal, and when viewed from one side of a fault the zone on the opposite side of the fault has moved to the right.

The major active faults in the site vicinity are all part of the San Andreas fault system. A schematic map of the regional faults and the site location map are presented on Plate 6-1. These faults include the Hayward fault 5 kilometers to the northeast, the San Andreas fault 22 kilometers to the southwest of the site, the Calaveras fault 38 kilometers to the east, and the Seal Cove-San Gregorio fault zone 26 kilometers to the southwest.

Other significant faults in the site region are the Rodgers Creek fault 23 kilometers north of the site and the Maacama fault 80 kilometers to the north. In addition, there are several smaller, less active faults in the site region which also contribute to the regional seismicity. These faults include the Concord fault 28 kilometers to the east, the Green Valley fault 31 kilometers to the northeast, the Antioch fault 50 kilometers to the east, the Kirby Hills-Vacaville fault system 50 kilometers to the northeast, and the Greenville-Mt. Diablo fault system 43 kilometers to the east.

No active or potentially active faults have been identified at the site and the site does not lie within an Alquist-Priolo Special Study Zone as defined by the California Division of Mines and Geology (Division 2, Chapter 7.5 of the State of California Public Resources Code). One structure, the San Pablo fault, is located along the eastern edge of the Potrero-San Pablo

Ridge. This fault has been classified as inactive based on the lack of near-surface expression of the fault and the absence of any historical seismicity. This is consistent with the interpretations of the U.S. Geological Survey (Wesson and others, 1975) and the California Division of Mines and Geology (Jennings, 1975).

6.2 SEISMICITY

Four major earthquakes have occurred in the San Francisco Bay Area since 1800; of these, two were on the San Andreas fault, while two were on the Hayward fault. The two earthquakes on the San Andreas fault occurred in 1838 and 1906 at distances of 45 and 27 kilometers from the site; the two events on the Hayward fault occurred in 1836 and 1868 at distances of 30 and 45 kilometers from the site. The 1906 event on the San Andreas fault with a magnitude of 8 and the 1868 event on the Hayward fault with a magnitude of 7.5 caused very strong shaking and significant damage in San Francisco. The earlier earthquakes probably caused significant shaking but damage reports are sketchy because of the smaller population living in the area. The largest historic events in the immediate vicinity of the site were two magnitude 4.3 events approximately 9 kilometers northeast of the site which occurred in 1864 on the Hayward Fault.

A plot of the seismic activity in the San Francisco area since 1850 is presented in Plate 6-2. Not all seismic data on this plot were instrumentally recorded, nor are all the epicenters known with a high degree of certainty. The first seismological instruments were installed in Northern California on Mount Hamilton in 1887. Not until the 1930s was there a sufficient number of seismographic stations to record all Bay Area earthquakes greater than magnitude 4. The tabulated epicentral location of almost all of the events prior to 1932 are thus recorded as occurring at the location at which the strongest motion was felt. As a result, early events appear to be clustered in population centers such as San Jose and San Francisco, although the "instrumental" epicenters were most likely elsewhere. The locations of early

events are often identified only to the nearest quarter degree, as a means of showing the uncertainty in their locations. The heavy squares on Plate 6-2 represent locations where multiple events were reported.

6.3 SEISMIC HAZARDS

6.3.1 Surface Rupture

As discussed in Section 6.1, no active or potentially active faults have been identified at the Richmond Refinery and the refinery does not lie within an Alquist-Priolo special study zone as defined by the California Division of Mines and Geology. Based on this information, we believe the possibility of surface rupture at the refinery due to faulting is very remote.

6.3.2 Tsunami

A tsunami is a sea wave generally produced by a seismic event. No tsunamis are known to have originated in San Francisco Bay; they are generally associated with distant events. A tsunami originating in the Pacific Ocean would be significantly attenuated as it passed through the Golden Gate. Near the entrance to Castro Cove, the anticipated 100 year tsunami runup is 4.6 feet, based on work by Garcia and Houston (1975). Runup is defined as the rush of water up a structure on the breaking of a wave. It should be noted that the runup at the flat bay margin zone would be significantly less due to an additional attenuation of the tsunami as it passed through Castro Cove.

6.3.3 Seiche

A seiche is a standing wave set up in an enclosed body of water caused by seismic shaking. Seiche is not considered a significant hazard at the site due to the shallowness of the ponds and the small size of the ponds at the refinery combined with the presence of numerous interior dividers in many of the ponds.

6.3.4 Probabilistic Assessment of Seismic Hazard

The probabilistic seismic hazard analysis technique used for this study includes procedures that have been developed and expanded over a period of approximately 14 years. The method basically follows that published by Cornell (1968), Cornell and Vanmarcke (1969) and further extended by Cornell (1971) and Merz and Cornell (1973) and involves careful consideration and incorporation of the geology, seismic history, and tectonics of the site region into a seismotectonic source model.

The procedure first considers the probability of an earthquake occurring within a small source area in the site vicinity. The probability of this earthquake being of a specific size and the attenuation of its motion to the site are then combined to give a probability of occurrence of a ground motion at this site. Combinations of these individual values at each ground motion level for the entire study area then are expressed in total annual probabilities.

In the application of this seismic risk procedure, special emphasis is placed on relationships between attenuation of ground motion with distance and the areal distribution of sizes of events with respect to local seismological and geological observations. These are discussed more fully in Donovan and Bornstein (1978).

A seismic risk study, in general, requires the acceptance of several assumptions regarding earthquakes. The three principal assumptions are:

1. That the seismic history and the geology are sufficiently well known to permit an estimate of the seismic activity of the region.

2. That the distribution between large and small earthquakes is understood. This is most commonly expressed by the recurrence relation equation developed by Gutenberg and Richter (1956):

$$\log N = a - b_s M$$

where N is the number of events of magnitude M or greater for the period being studied, and a and b_s are constants dependent on the seismicity of the area; and

3. That the attenuation of motion with distance from the seismic source is known and can be expressed in the form of attenuation relationships between response spectral parameters sensitive to both magnitude and distance.

The necessary input to the seismic risk analysis consists of: (1) a source model; (2) seismic activity rate and magnitude limits for each seismogenic source; and (3) the attenuation relationship for peak response spectral acceleration.

6.3.4.1 Source Model

The source area for the seismic hazard model has been selected based on consideration of the location of the site with respect to regional tectonic features and the distribution of historic seismicity. The boundaries of the model have been chosen such that the contribution to the overall seismic risk at the site from activity outside the model region would be negligible. The seismic activity in the computational model we use is represented by a grid of point sources. The model used for this study is shown in Plate 6-3. The use of this point source model allows faults with varied orientations and unusually curved shapes to be easily considered in the geologic model of seismic activity.

6.3.4.2 Seismic Activity and Seismic Recurrence Rates

The most common procedure for examining the relationships between the relative occurrence of small and large earthquakes in a seismic region is that

derived by Gutenberg and Richter (1956) where the magnitude of an event is plotted against the logarithm of the number of events equal to or greater than the magnitude. A plot of this type for the Richmond site for events with a magnitude greater than 4.0 is presented on Plate 6-4.

The list of historical events used in the compilation of the data shown on Plate 6-4 contains early events where only the epicentral intensity is known. To include these early events in the data shown on Plate 6-4, the Modified Mercalli Intensity values were converted to magnitude values using an empirical relationship developed by Richter (1958):

$$M = 2/3\ I + 1.0$$

where I is the Modified Mercalli Intensity.

A least squares fit to the data for the events shown on Plate 6-4 gives the following regional seismic recurrence relationship:

$$\text{Log } N = 4.93 - 0.61M$$

where N is the number of events having a magnitude equal to or greater than M within the area defined on Plate 6-4 during the 132-year period in the historical data set. Equation (3) defines the activity rate and the magnitude distribution of the activity, which may be used in the probability calculations for the seismic risk assessment.

The activity is distributed to the faults based on historic seismicity and estimated slip rates. In addition, 15 percent of the activity was modeled as background activity, not assigned to a known seismogenic source. The limiting magnitude for the background was 6.0. Modeling background seismicity takes into consideration the possibility, although small, that an event could occur on a structure not previously identified.

Limiting magnitudes were assigned to each of the faults based on known historic seismicity and on the length of the fault. It is important to note the magnitude scale to be used in this study will be moment magnitude which is a function of the slip on a fault and the length and width of the fault rupture surface. Using this scale, the 1906 earthquake has been estimated as having a moment magnitude of 7.7 to 7.8 (Thatcher, 1975). Therefore, a limiting moment magnitude of 7.75 has been selected for the San Andreas fault. Moment magnitude has been selected for the present study because it is believed to more correctly represent the seismic behavior of earthquakes and is compatible with observed slip rates.

6.3.4.3 Attenuation Relationship

Since the San Fernando earthquake of 1971 there has been an increasing interest in the attenuation of ground motion with distance from the source. After occurrence of this event, several relationships were proposed based both on professional judgment and the data recorded during the event. The Imperial Valley and the Coyote Lake earthquakes of 1979 and the Livermore earthquakes of 1980 greatly extended the data base for the development of attenuation relationships. There is now a reasonable consensus regarding attenuation of peak ground acceleration in California (Donovan, 1983). These additional data have also allowed the development of attenuation equations of spectral response values in addition to the peak ground motion parameters, such as the spectral attenuation parameters developed by Joyner and Boore (1982). Very recently, this work has been extended by Joyner and Fumal (1985) to more closely represent site effects. We have incorporated these Joyner and Fumal parameters into our analysis of seismic risk at the Richmond Refinery. The form of their attenuation equation for peak acceleration is as follows:

$$\log y = 0.43 + 0.23(M-6) - \log r - 0.0027r$$

$$\text{for } 5.0 \leq M \leq 7.7$$

where $r = (d^2 + 64\ km^2)^{1/2}$

where y is the ground motion parameter to be predicted, M is moment magnitude (Hanks and Kanamori, 1979), and d is the closest distance from the site where ground motion is being predicted to the vertical projection of the earthquake fault rupture to the surface of the earth.

6.3.4.4 Assessment of Seismic Performance of Facilities

The regional seismotectonic model, the rate of seismic activity and the attenuation equation have been combined in the above-discussed probabilistic seismic hazard analysis to estimate mean recurrence intervals (return periods) at the refinery for different levels of mean peak acceleration. These results are presented in Table 6-1. Using these results and taking into consideration the soils underlying a particular facility and the construction details of the facility, Dames & Moore will evaluate the seismic performance of the facilities in the site specific Reports of Waste Discharge.

REFERENCES

Cornell, C. Allin (1968) "Engineering Seismic Risk Analysis," Bulletin of the Seismological Society of America, Vol. 58, No. 5, October, pp. 1583-1606.

Cornell, C. Allin (1971) "Probabilistic Analysis of Damage to Structures under Seismic Loads," Dynamic Waves in Civil Engineering, Wiley-Interscience (edited by D.A. Howells, I.P. Haigh, and C. Taylor), Great Britain.

Cornell, C. Allin and Erik H. Vanmarcke (1969) "The Major Influences of Seismic Risk," Proceedings of the Fourth World Conference on Earthquake Engineering, Santiago, Chile, Vol. I, pp. 69-83.

Donovan, N.C. (1983) "A Practitioner's View of Site Effects on Strong Ground Motion" U.S.G.S. Workshop on "Site Specific Effects of Soil and Rock on Ground Motion and the Implications for Earthquake-Resistant Design," Santa Fe, New Mexico, July 26-28.

Donovan, N.C. and Bornstein, A.E. (1978) "Uncertainties in Seismic Risk Procedures," Journal of the Geotechnical Engineering Division, ASCE, Vol. 104, No. GT7, Proc. Paper 13896, July, pp. 869-887.

Garcia,, A.W., and Houston, J.R. (1975); Tsunami Predictions for Monterey and San Francisco Bays and Puget Sound, Type 16 Flood Insurance Study. Technical Report H-75-17. Prepared for Federal Insurance Administration, Department of Housing and Urban Development, Washington, D.C.

Gutenberg, B. and C.F. Richter (1956) "Earthquake Magnitude, Intensity, Energy and Acceleration (Second Paper," Bulletin of the Seismological Society of America, Vol. 46, No. 2, pp. 105-145.

Hanks, T.C. and Kanamori, H. (1979) "A Moment Magnitude Scale," Journal of Geophysical Research, Vol. 84, No. B5, May 10, pp. 2348-2349.

Jennings (1975); Fault Map of California, California Division of Mines and Geology. California Geologic Map Series, Map No. 1 - Faults, Volcanoes, Thermal Springs and Wells.

Joyner, W.B. and Boore, P.M. (1982) "Prediction of Earthquake Response Spectra," Proceedings of the 51st Annual Convention of Structural Engineers Association of California, October.

Joyner, W.B. and Fumal, T.E. (1985) "Predictive Mapping of Ground Motion," Evaluating Earthquake Hazards in the Los Angeles Region, USGS Professional Paper 1360, October.

Merz, H.A. and Cornell, C.A. (1973) "Seismic Risk Analysis Based on a Quadratic Frequency Law," Bulletin of the Seismological Society of America, Vol. 63, No. 6, December, pp. 1999-2006.

Real, C.R., Toppozada, T.R. and Parke, D.L. (1978) "Earthquake Catalog of California, January 1, 1900 - December 31, 1974," California Division of Mines and Geology, Special Publication 52.

Richter, C.F. (1958) Elementary Seismology, W.H Freeman & Company, 768 p.

Thatcher, W. (1975) "Strain Accumulation and Release Mechanism of the 1906 San Francisco Earthquake," Journal of Geophysical Research, Vol. 80, pp. 4862-2872.

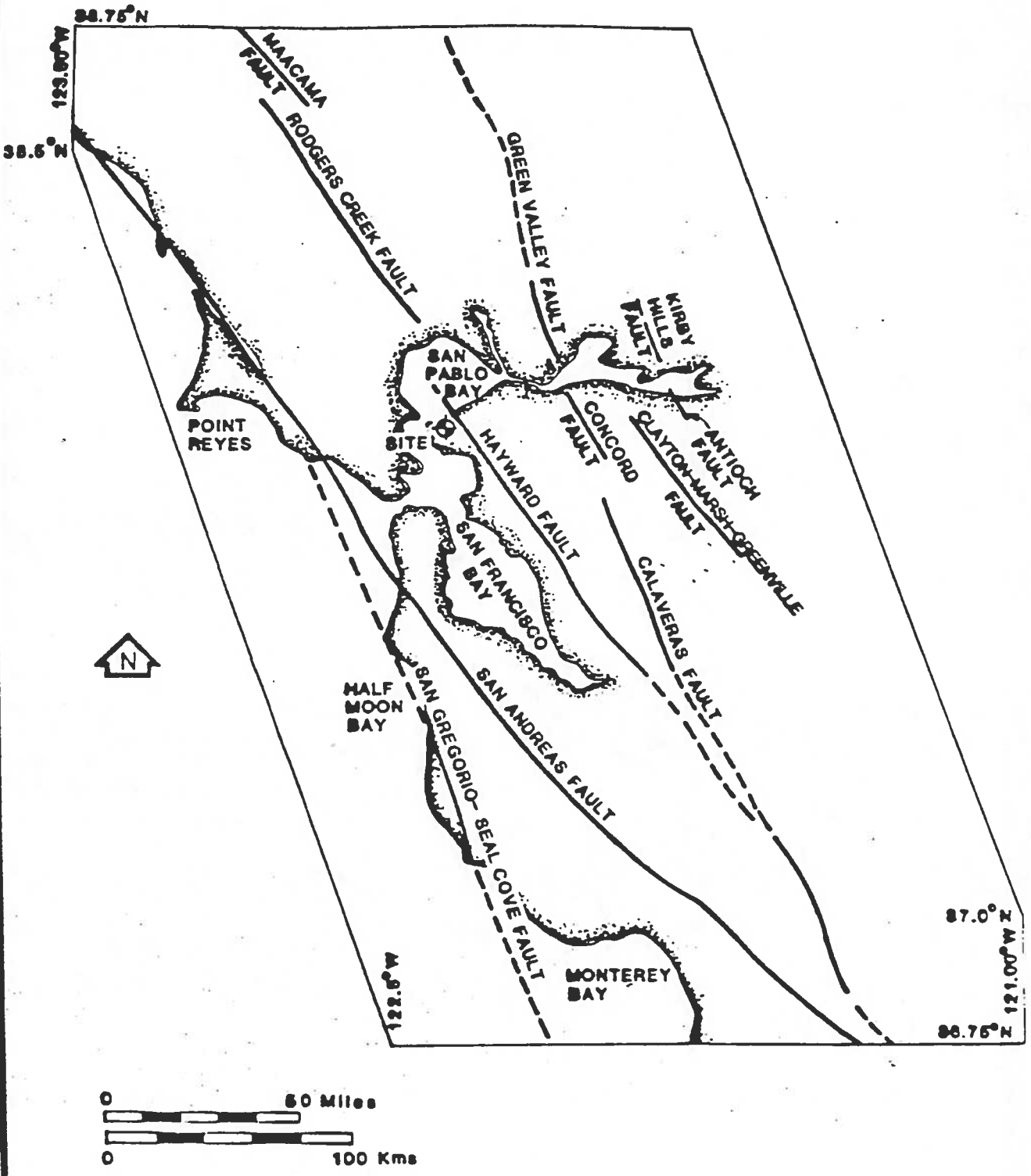
Townley, S.D. and Allen, M.W. (1939) "Descriptive Catalog of Earthquakes of the Pacific Coast of the United States, 1769 to 1928," Bulletin of the Seismological Society of America, Vol. 29, No. 1, January, pp. 1-297.

Wesson, R.L., and others (1975); Faults and Future Earthquakes. Studies for Seismic Zonation of the San Francisco Bay Region, Geological Survey Professional Paper 941-A.

Table 6-1

MEAN PEAK ACCELERATION AND MEAN RECURRENCE INTERVALS

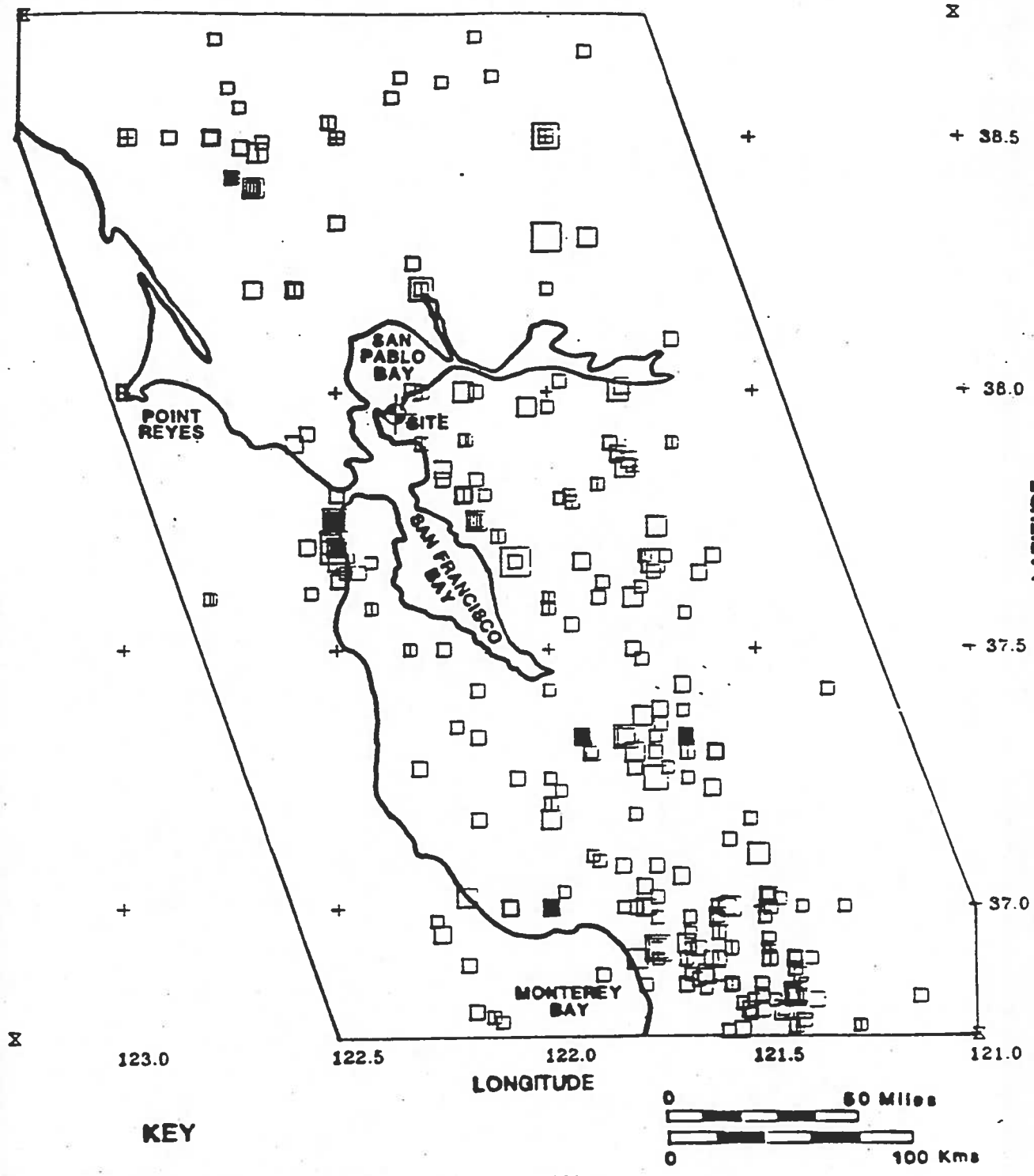
Mean Peak Acceleration (% G)	Mean Recurrence Interval (years)
5	5
10	17
15	40
20	85
25	160
30	280
35	450
40	700
50	1600
60	3300



LOCATION MAP (FAULTS WITHIN STUDY AREA)

Dames & Moore

Plate 6-1



KEY

SYMBOL → □ 4 ← MAGNITUDE

□ 5

□ 6

□ 7

□ 8

□ 9

■ Multiple events reported

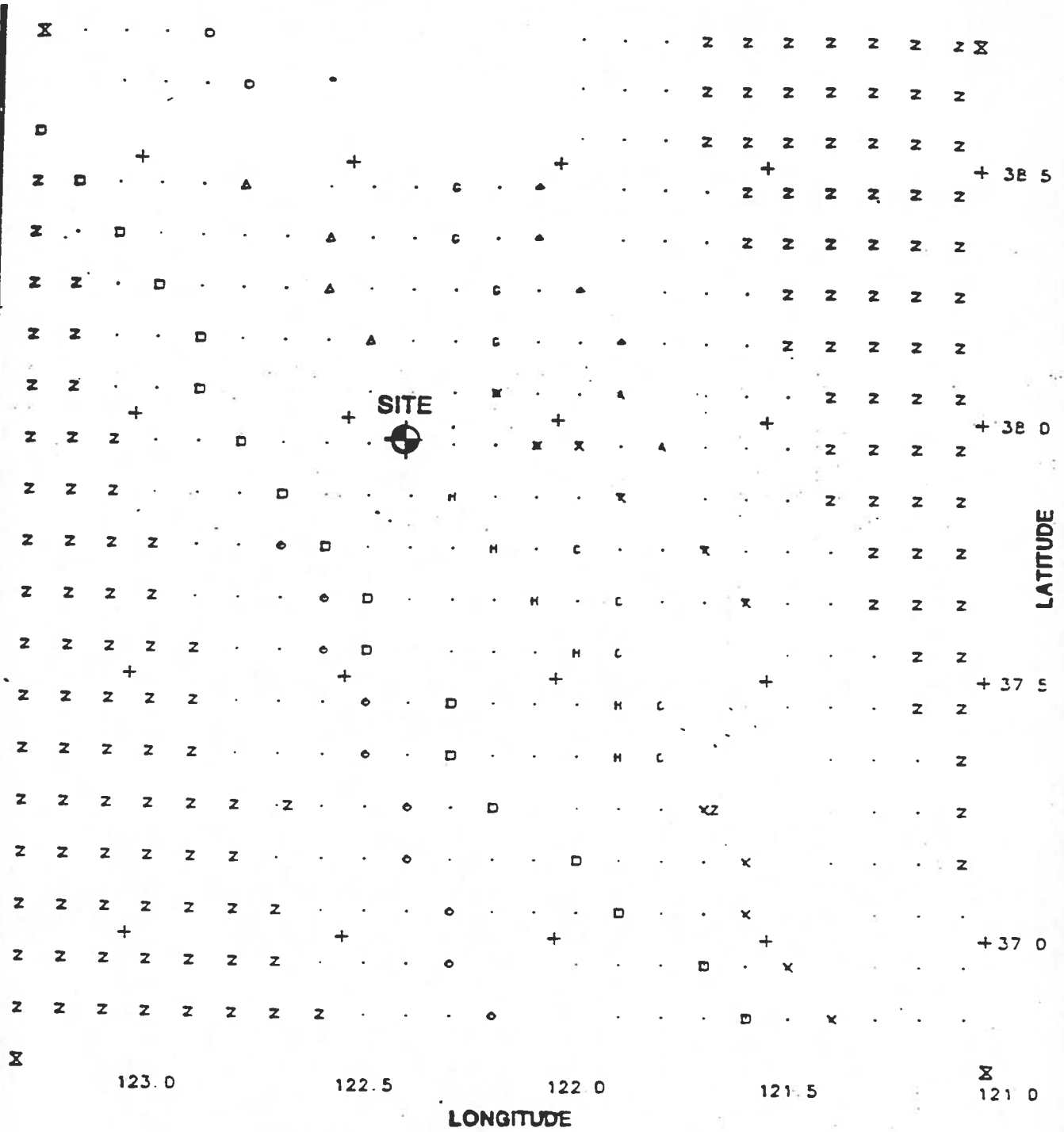
NOTES:

1. PLOT BASED ON LAMBERT PROJECTION.
2. VERTICAL BARS REPRESENT ADDITIONAL EVENTS OF THE SAME SIZE AT THE SAME LOCATION.

HISTORICAL SEISMICITY MAP

Dames & Moore

Plate 6-2



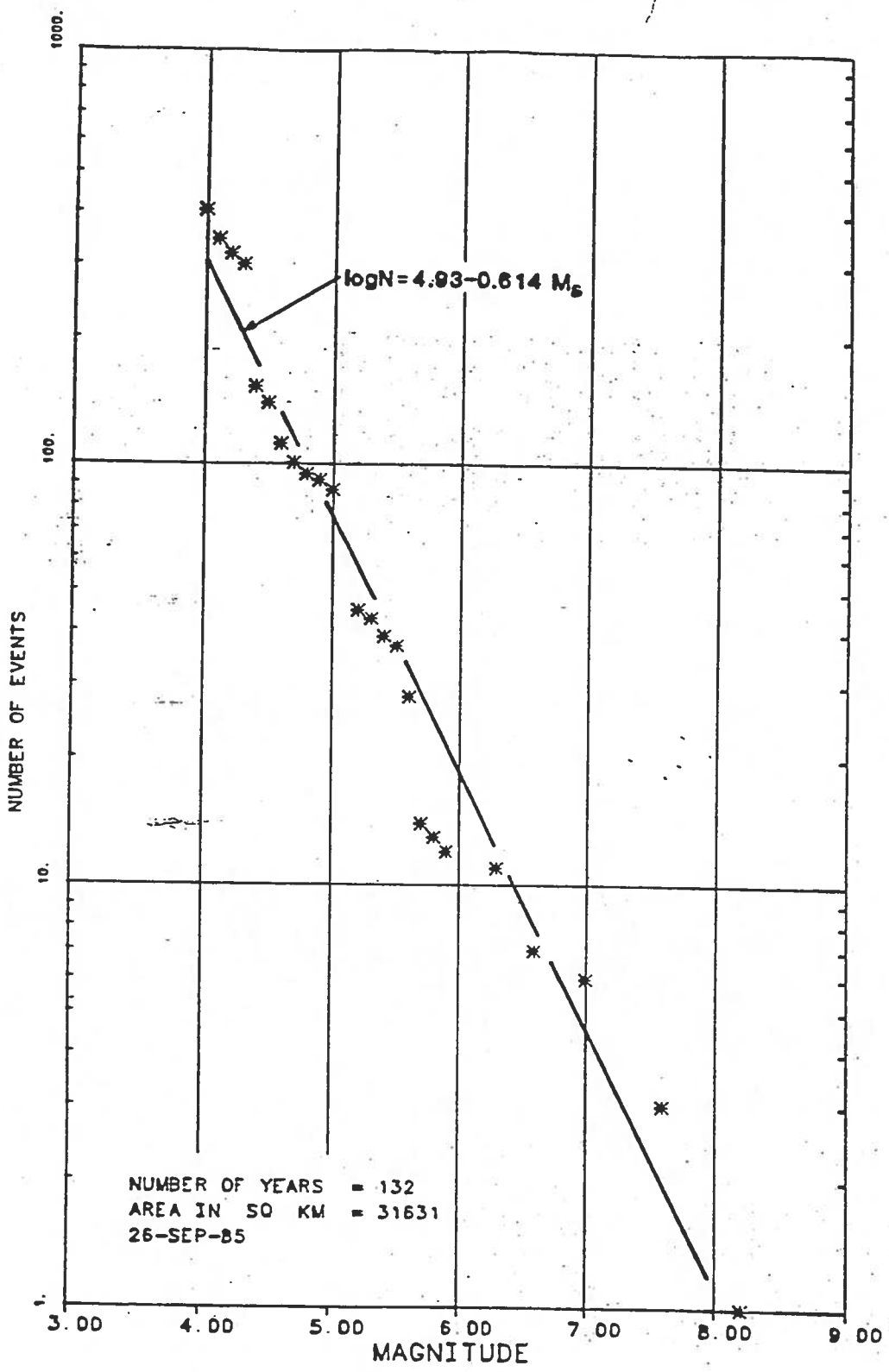
SEISMOGENIC SOURCES

- BACKGROUND
- SAN ANDREAS
- MAACAMA
- RODGERS CREEK
- HAYWARD-CALAVERAS
- SAN GREGORIO-SEAL POINT
- KIRBY HILLS-VACAVILLE
- GREENVILLE-MOUNT DIABLO
- OUTSIDE OF MODEL
- CONCORD
- ANTIOCH
- CALAVERAS
- GREEN VALLEY
- HAYWARD

SEISMIC RISK MODEL

Dames & Moore

Plate 6-3



HISTORICAL SEISMIC ACTIVITY RATE

Dames & Moore

Plate 6-4

APPENDIX D

Appendix D

Hydrogeologic Evaluation - Infiltration

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Table D-3 Summary of HELP Modeling Output Average Annual Totals and Peak Daily Values (1951-1994)

D.1.0 INTRODUCTION

Evaluation of surface runoff and potential percolation through the proposed final cover profile for the Chevron Richmond Refinery Landfarm Sites was performed utilizing the Hydraulic Evaluation of Landfill Performance Model (HELP Model)(Schroder, 1995). The HELP Model utilizes site-specific information such as local climatological data, vegetation type and density, soil type, and landfill cover design in order to evaluate daily water movement (runoff and percolation). To perform the water balance analysis, daily precipitation is partitioned into surface storage, surface runoff, surface evaporation, infiltration, evapotranspiration, stored soil moisture, and percolation.

The purpose of the HELP Model simulation is to evaluate the performance of the proposed final cover design by projecting the potential infiltration and runoff. This evaluation analyzes the ability of design materials, thicknesses, construction specifications, and surface runoff controls to minimize the percolation of precipitation to the underlying wastes. The following sections describe the HELP modeling process and present the results of the HELP Model simulations.

D.2.0 INPUT PARAMETERS

To perform the daily water balance simulation the HELP Model utilizes local climatological data, soil characteristics, vegetative cover, and the physical characteristics of the Landfarm Sites. Table D-1 presents a summary of the general input parameters used the simulate the site-specific conditions for the Landfarms.

D.2.1 Climatological Data

Local climatological data utilized in the HELP Model simulations was obtained from the CLIMATEDATA database (Hydrosphere, 1995). Daily temperature (maximum and minimum), and daily precipitation data used in this evaluation were compiled at the National Weather Service Station No. 7414, Richmond California. This weather station is located less than 5 miles from the Chevron Landfarm sites at latitude 37:56:00, longitude 122:21:00, and an elevation of 60 feet above mean sea level (msl). Daily temperature and precipitation data available for this weather station covers a 44-year period from 1951 through 1994. During this period, the mean annual precipitation at the weather station was 21.83 inches.

The solar radiation values for the site were calculated by the HELP Model utilizing the climatological coefficients for San Francisco which are assumed to be representative of the climate at the site. Daily solar radiation is a function of latitude, daily rainfall, average daily dry-day solar radiation, and average daily wet-day solar radiation.

The values of average relative humidity for each quarter were estimated using the weather data compiled at the Fremont weather station (Table D-1). The Fremont weather station is the closest weather station to the site for which relative humidity data is available. This weather station is located approximately 30 miles southeast of the site at latitude 37:31:30, longitude 121:58:03, and an elevation of 40 feet above msl. Average relative humidity data were available for the Fremont weather station covers a three-year period from 1992 to 1994.

D.2.2 Proposed Cap Design

The proposed final cover design for the Landfarms sites is illustrated in drawing no. D-767519 (Appendix J). The design soil profile consists of a six-inch thick topsoil layer of silty loam overlying a six-inch thick imported fill layer. The geometry of the design is shown in drawings D-767512 and D-767515 (Appendix I). When mature, the proposed vegetative cover will consist of approximately 95-percent ground coverage with fast-growing grasses and herbaceous plants and 50-percent canopy coverage with mature trees. As

shown, the vegetative areas will be sloped at 4-percent at the time of construction in order to promote runoff. Only vegetated areas were included in the HELP model, all paved areas were considered impermeable and were excluded.

The approximate sizes of the vegetative areas for each Landfarm are:

- Landfarm No. 1 - 13.9 acres,
- Landfarm No. 2 - 7.0 acres,
- Landfarm No. 3 - 3.1 acres,
- Landfarm No. 4 - 3.2 acres,
- Landfarm No. 5 - 0.7 acres.

D.2.3 Vegetative Cover

Default data for the vegetative cover parameter of the HELP Model include a selection of grasses ranging from "poor to excellent" cover, evaporative zone depth, and Leaf Area Indices. The vegetative cover parameter of the model estimates the volume of runoff resulting after a precipitation event. A "good grass" vegetative cover was assumed for the Landfarms sites, given that a vegetative cover will be maintained to promote the long-term bioremediation of the Landfarms soils. See Section 4.2.4.4.2.

D.2.4 Soil Characteristics

The physical characteristics of the soil, listed in Table A-2, were utilized in the HELP modeling. As the actual sources of the imported fills to be used can not be identified until a construction contractor has been selected, typical values for soils similar to those specified for the cover were taken from the HELP model supporting documentation. In order to represent the three phases of vegetative cover establishment proposed for the Landfarms (outlined in Section 4.2.4.4.2 of the main text to this report) three evapotranspiration depth zones were modeled. The depths modeled were one-, three-, and five-feet below ground surface (bgs), and one-foot above the assumed average depth to the water table. The Soil Conservation Service Runoff Curve Number was calculated by the HELP Model based on the physical characteristics of the topsoil, the soil surface slopes, and establishment of a "good grass" cover.

For the No. 1 Landfarm, groundwater from the higher elevations to the west may flow under the site towards the groundwater extraction trench to the east of the Landfarm. While the presence of this water may impact the evaporation pattern for the Landfarm, the impact is believed to be negligible due to the likely depth of the groundwater beneath the final surface of the closed Landfarm.

D.3.0 RESULTS

A total of 15 HELP Model simulations were performed for the evaluation of infiltration and runoff of precipitation on the proposed final cover profile of the Landfarms (3 evapotranspiration depths for each of 5 Landfarms). The results indicate that approximately 69-percent of annual precipitation will be lost due to evapotranspiration, 1-percent of annual precipitation will be lost due to surface runoff, and 30-percent will percolate through the Landfarm soils to the underlying water table after the first phase of the vegetative cover is established. After the vegetative cover is fully established, the model indicates that approximately 95-percent will be lost due to evapotranspiration, 0.3-percent will be lost due to surface runoff, and less than 5-percent will percolate through the Landfarm soils. The results of each of the fifteen HELP Model simulations are presented in Table D-3.

D.4.0 CONCLUSIONS

Based on the assumptions presented above, and the results of the HELP Model simulations, it appears that long term percolation through the Landfarm soils is relatively insignificant, with most of the anticipated precipitation being utilized by the proposed vegetation.

D.5.0 REFERENCES

CLIMATEDATA, Hydrosphere, Inc., 1995.

Schroder, et al., 1995. The Hydraulic Evaluation of Landfill Performance (HELP) Model version 3.4.

Table D-1. Summary of HELP Modeling Input - General Parameters
Landfarms Closure Plan
Appendix D
Chevron Richmond Refinery

Parameter	Unit	Value Used
Fraction of Area Allowing Runoff	%	100.0
Evaporative Zone Depth	inch	6.0 - 18.0
Total Subsurface Inflow	inch/year	0.0
Maximum Leaf Area Index		4.5
Start of Growing Season (Julian Date)	day	0.0
End of Growuing Season (Julian Date)	day	365.0
Average Area Wind Speed	mph	18.0
Average 1st Quarter Relative Humidity	%	73.0
Average 2nd Quarter Relative Humidity	%	66.0

Table D-2. Summary of HELP Modeling Input - Soil Parameters
Landfarms Closure Plan
Appendix D
Chevron Richmond Refinery

PARAMETER	Unit	Top Soil	Imported Fill	Existing Fill
Thickness	inch	6.000	12.000	Varies
Porosity	vol/vol	0.453	0.471	0.471
Field Capacity	vol/vol	0.190	0.342	0.342
Wilting Point	vol/vol	0.085	0.210	0.210
Initial Soil Water Content	vol/vol	0.210	0.408	0.408
Saturated Hydraulic Conductivity	cm/sec	7.20E-04	4.20E-05	4.20E-05

Table D-3. Summary of HELP Modeling Output -
Average Annual Totals and Peak Daily Values (1951-1994)
Landfarms Closure Plan
Appendix D
Chevron Richmond Refinery

Landfarm	Area	Slope	Slope Length	Evaporation Depth	SCS R.C.N*	Rainfall	ET**	Runoff		Percolation	
						Annual	Annual	Annual	Daily Peak	Annual	Daily Peak
	acres	%	feet	feet		inches	inches	inches	inches	inches	inches
No. 1	12.0	4	200.0	3.0	62.6	21.83	15.20	0.22	3.84	6.61	0.45
	12.0	4	200.0	5.0	62.6	21.83	17.43	0.14	3.12	4.48	0.53
	12.0	4	200.0	12.0	62.6	21.83	21.38	0.06	1.70	0.62	1.70
No. 2	7.0	4	200.0	3.0	62.6	21.83	15.20	0.22	3.84	6.61	0.53
	7.0	4	200.0	5.0	62.6	21.83	17.43	0.14	3.12	4.47	0.52
	7.0	4	200.0	11.0	62.6	21.83	21.09	0.07	1.91	0.89	0.39
No. 3	3.1	4	150.0	3.0	63.3	21.83	15.20	0.22	3.84	6.61	0.56
	3.1	4	150.0	5.0	63.3	21.83	17.42	0.14	3.20	4.47	0.52
	3.1	4	150.0	10.0	63.3	21.83	20.76	0.08	2.17	1.22	0.49
No. 4	3.2	4	75.0	3.0	65.0	21.83	15.20	0.24	3.84	6.59	0.59
	3.2	4	75.0	5.0	65.0	21.83	17.43	0.16	3.43	4.44	0.61
	3.2	4	75.0	8.5	65.0	21.83	20.05	0.10	2.58	1.89	0.57
No. 5	0.7	4	50.0	3.0	66.0	21.83	15.20	0.25	3.84	6.57	0.69
	0.7	4	50.0	5.0	66.0	21.83	17.42	0.17	3.48	4.43	0.66
	0.7	4	50.0	7.0	66.0	21.83	19.08	0.13	2.76	2.81	0.77

* : SCS runoff curve number was calculated by the HELP program based on slope, slope length, surface soil type and vegetative cover.

** : Evapotranspiration

APPENDIX E

APPENDIX E

Appendix E

Hydrogeologic Evaluation - Erosion

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E.1.0 INTRODUCTION

This soil erosion control plan has been prepared to assess the potential for erosion of soil from the proposed Landfarms closure cap at the Chevron Richmond Refinery. Erosion caused by rainfall runoff is expected to constitute the most significant type of erosion on the Landfarms cap. Rainfall erosion has been predicted for the planned cap of Nos. 1 and 2 through 5 Landfarms based on the Universal Soil Loss Equation (USLE), using preliminary cap construction specifications, local climatological conditions, and the anticipated type of soil and vegetative cover.

E.2.0 SOIL LOSS

Soil loss of less than 2 tons per acre per year for a landfill cap is recommended to minimize the potential of gullying (U.S.EPA, 1982). In order to minimize the potential future maintenance requirements of the final cover, this standard has been set as the maximum allowable rate of soil erosion at the Landfarms.

The USLE predicts annual average soil loss as the product of four quantitative factors (slope length, slope percent, soil erodibility, and rainfall erosivity) and two qualitative factors (cover/management and practice). The USLE was designed to calculate average soil loss due to rainfall runoff episodes. The USLE estimates sheet and rill erosion from initial detachment and transport of soil particles, and does not account for soil losses due to gullying. The USLE does not consider the effects of soil redeposition.

The Universal Soil Loss Equation is defined as:

$$A = RKLSCP$$

Each factor of the equation is described below:

- A = The computed soil loss per unit area, in tons per acre per year.
- R = The rainfall and runoff factor. R is the number of rainfall erosion index units.
- K = The soil erodibility factor. K is the soil loss rate per erosion index unit for a specified soil as measured on a unit plot, which is defined as a 72.6-foot length of uniform 9 percent slope in clean tilled continuous fallow.
- L = The slope length factor. L is the ratio of soil loss from the field slope length to that from a 72.6-foot length under identical conditions.
- S = The slope percent factor. S is the ratio of soil loss from the field slope gradient to that from a 9 percent slope under otherwise identical conditions.
- C = The cover and management factor. C is the ratio of soil loss from an area with specified cover and management to that from an identical area in tilled continuous fallow.
- P = The support practice factor. P is the ratio of soil loss with a farming support practice like contouring, strip cropping, or terracing to that with straight-row farming up and down the slope.

The values and sources for the specific terms of the USLE are presented below.

E.2.1 Rainfall Factor, R

The Landfarms site is located within R Zone 1 (SCS, 1991). The *R* value is based on the R Zone 1 equation:

$$R = 16.55\ D^{(2.17)}$$

Where: *D* is the total rainfall resulting from a 2-year return period, 6-hour duration storm for the site.

Based on a 41-year period rainfall record for the Berkeley, California Weather Station, California Department of Water Resources (DWR) station number E40 0693 00, the 2-year, 6-hour precipitation is 1.34 inches (DWR, 1986). Accordingly:

$$R = 16.55\ D^{(2.17)}$$

$$R = 16.55\ (1.89)$$

$$R = 31.3$$

E.2.2 Soil Erodibility Factor, K

The *K* factor value for each soil type was derived from an equation that accounts for soil particle size distribution, permeability, structure, and organic matter content (SCS, 1978). The soil erodibility factor (K) is solved by the equation:

$$100\ K = 2.1\ M^{1.14}\ (10^{-4})\ (12-a) + 3.25\ (b-2) + (c-3)$$

Where:
- M = particle size parameter,
- a = percent organic matter,
- b = the soil structure code used in soil classification, and
- c = the profile-permeability class.

Using the above equation, the *K* factor for sandy loam was calculated to be 0.113. The assumptions made in this calculation were a grain size distribution for an average sandy loam (M = 2250: sand = 65%, silt = 25%, and clay = 10%); an organic matter content (a) of 3 to 7 percent (5 percent was used for calculation purposes); very slow permeability (c = 6: less than 0.06 inches/hour [4 x 10^{-5} cm/s]); and fine granular structure (b = 2).

E.2.3 Cover Factor, C

Three possible vegetative cover types were considered for the cap: 1) fast-growing grasses and herbaceous plants covering 80 percent of the ground and having at least a 2-inch-thick layer of decaying organic debris (e.g., grass clippings, straw, shredded bark, hydro-seed binding material, etc.); 2) scenario above except with a ground cover of 95+ percent; and 3) scenario number two above except with mature trees that provide 50 percent canopy cover.

The following values for the *C* factor were derived for each vegetative cover type (SCS, 1978):

- 80 percent coverage with grass and herbaceous plants — 0.028
- 95+ percent coverage with grass and herbaceous plants — 0.007

- 95+ percent coverage with grass and herbaceous plants and 50 percent canopy coverage with mature trees— 0.007

As seen above, once a 95+ percent coverage of grass and herbaceous plants is established, the addition of trees does not significantly affect the rate of erosion.

E.2.4 Practice Factor, P

A *P* value of 1.0 was used to approximate a no-cultivation scenario (Lutton, et al., 1979).

E.2.5 Slope-Length and Steepness Factor, LS

The *LS* factor for slopes of 9 percent (5 degrees) or flatter for LS Zone 3 of California may be calculated by the following equations (SCS, 1991):

$$LS = \left[\frac{\lambda}{72.6}\cos\theta\right]^{m}\left[65.41\sin^{2}\theta + 4.56\sin\theta + 0.065\right]$$

where: LS = the Length-Slope factor

λ = the field length of the slope (in feet)

θ = the slope angle (in degrees)

m = an exponential constant factor for a set, given range of slope steepness.

For slopes between 3.6 to 4.5 percent, m has been assigned a value of 0.4 (SCS, 1991). From the equations, it can be seen that *LS* is directly proportional to slope angle and steepness.

Construction specifications for the Landfarms cover slopes indicate that slopes will all be constructed at 4 percent. Table E-1 presents *LS* factors for Landfarms slopes constructed at 4 percent with lengths varying from 50 to 200 feet in length. As shown on Table E-1, the LS factors range form a high of 0.529 for a 200-foot-long slope to a low of 0.303 for a 50-foot-long slope.

E.2.6 Soil Erosion Rate, A

The predicted soil erosion rate using the USLE for each vegetative cover type and representative slope length are presented in Table E-2 for each slope length. As shown on the table, the highest predicted soil erosion rate is 0.052 tons per acre per year for a 200-foot-long slope with 80 percent vegetative coverage of grass and herbaceous plants. The lowest predicted soil erosion rate is 0.008 tons per acre per year for a 50-foot-long slope with 95+ percent vegetative coverage of grass and herbaceous plants and/or a 95+ percent coverage of grass and herbaceous plants and 50 percent canopy coverage with mature trees.

E.3.0 RESULTS

The results indicate that even the least protective of the three vegetative cover types considered is predicted to limit soil erosion to levels lower than the U.S. EPA recommended maximum of 2 tons/acre/year on a 4 percent slope.

E.4.0 CONCLUSIONS

It can be seen from Table E-2 that with the proposed vegetative cover and slopes constructed at 4 percent, the expected rate of soil erosion is considered to be minimal. Additionally, the rate of erosion will decrease as the vegetative cover is established.

E.5.0 REFERENCES

DWR - See State of California, Department of Water Resources.

U.S.EPA - See United States Environmental Protection Agency.

SCS - See United States Department of Agriculture, Soil Conservation Service.

Lutton, R. J. et al. 1979. Design and Construction of Covers for Solid Waste Landfills. EPA 600/2-79-165.

State of California, Department of Water Resources, Division of Planning. 1986. Short-Term Precipitation-Depth-Duration-Frequency microfiche updated August, 1986.

United States Department of Agriculture. 1978. Predicting Rainfall Erosion Losses. Agricultural Handbook No. 537.

United States Department of Agriculture, Soil Conservation Service. 1991D. Guides for Erosion and Sediment Control in California. September, 1977. Revised February 1985, January 1991.

United States Environmental Protection Agency. 1982. Draft Guidance Document: Landfill Design, Liner System, and Final Cover. July 1982.

Table E-1 Calculated *LS* Factors for Representative Slope Lengths
Landfarms Closure Plan
Appendix E
Chevron Richmond Refinery

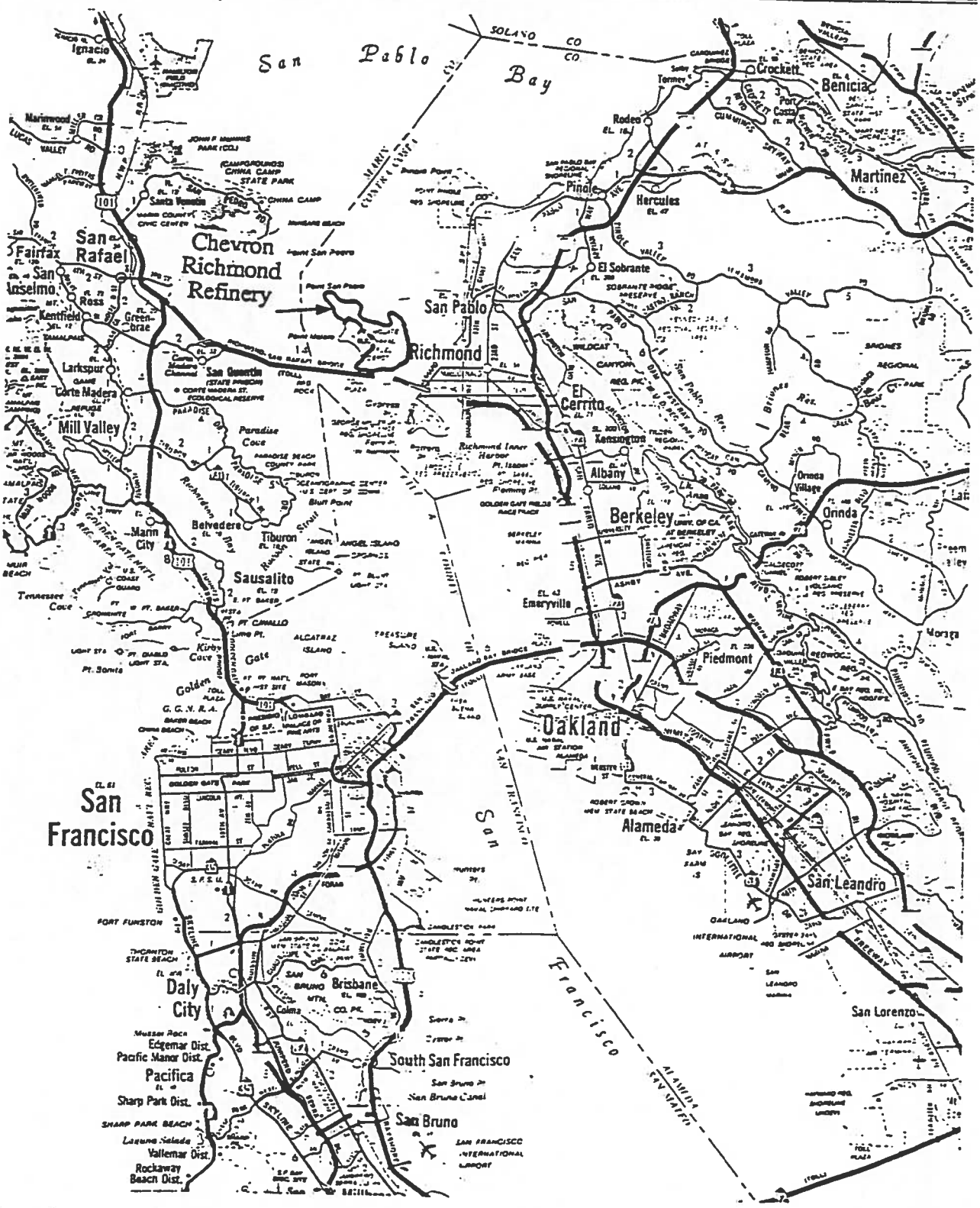
Slope Steepness (%)	Slope Steepness (degrees)	Slope Length (feet)	Calculated *LS* Factor
4	2.3	200	0.529
		150	0.472
		100	0.401
		75	0.375
		50	0.303

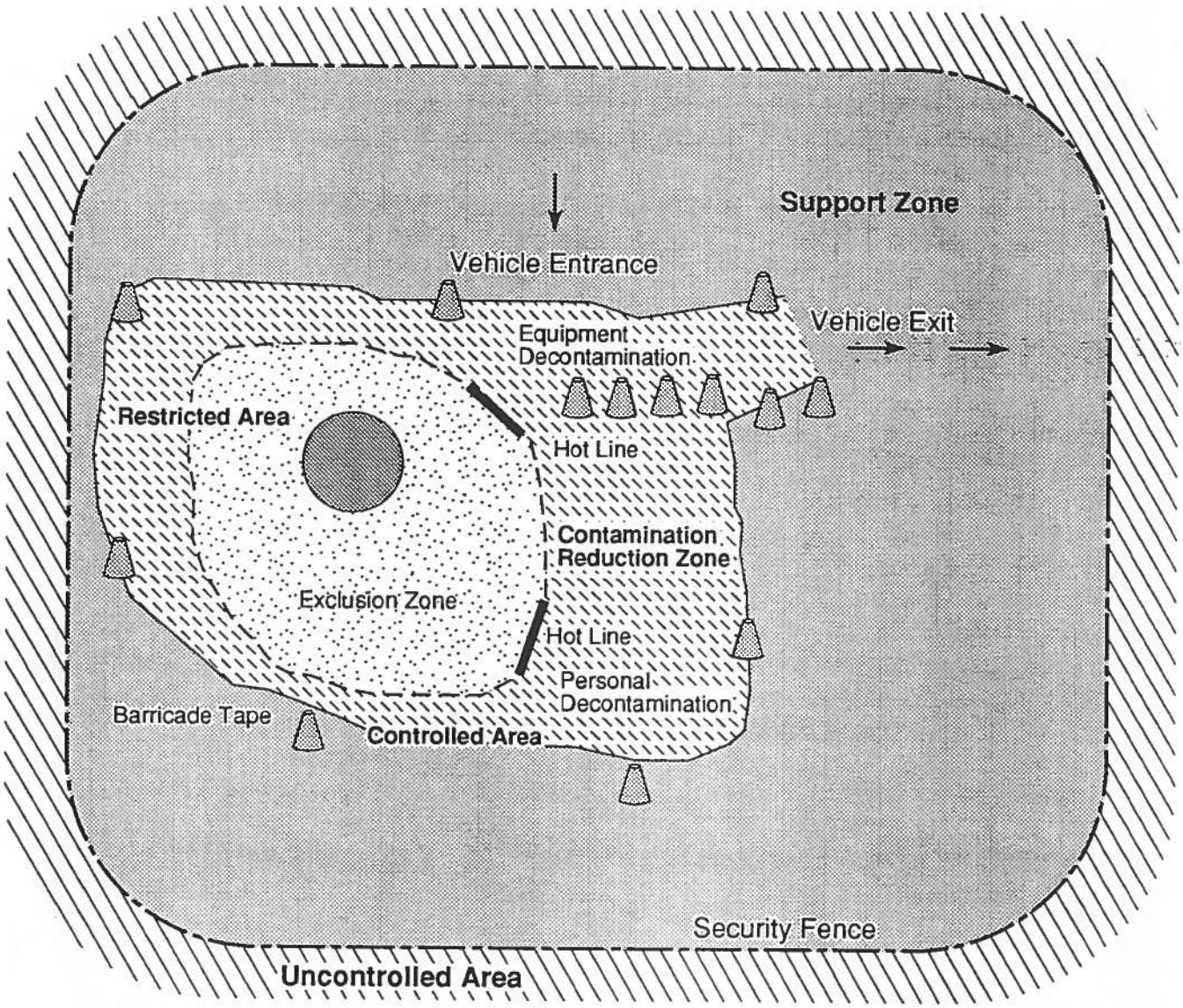
Table E-2 Predicted Soil Erosion for Representative Slope Lengths and Three Vegetative Cover Types
Landfarms Closure Plan
Appendix E
Chevron Richmond Refinery

Slope Steepness (%)	Slope Length (feet)	Vegetative Cover Type(1)	Predicted Soil Erosion Rate (tons/acre/year)
4	200	(1)	0.052
		(2)	0.013
		(3)	0.013
	150	(1)	0.047
		(2)	0.012
		(3)	0.012
	100	(1)	0.040
		(2)	0.010
		(3)	0.010
	75	(1)	0.030
		(2)	0.009
		(3)	0.009

1. Vegetative cover types are as follows:
   1) 80 percent coverage with grass and herbaceous plants
   2) 95+ percent coverage with grass and herbaceous plants
   3) 95+ percent coverage with grass and herbaceous plants and 50 percent canopy coverage with mature trees

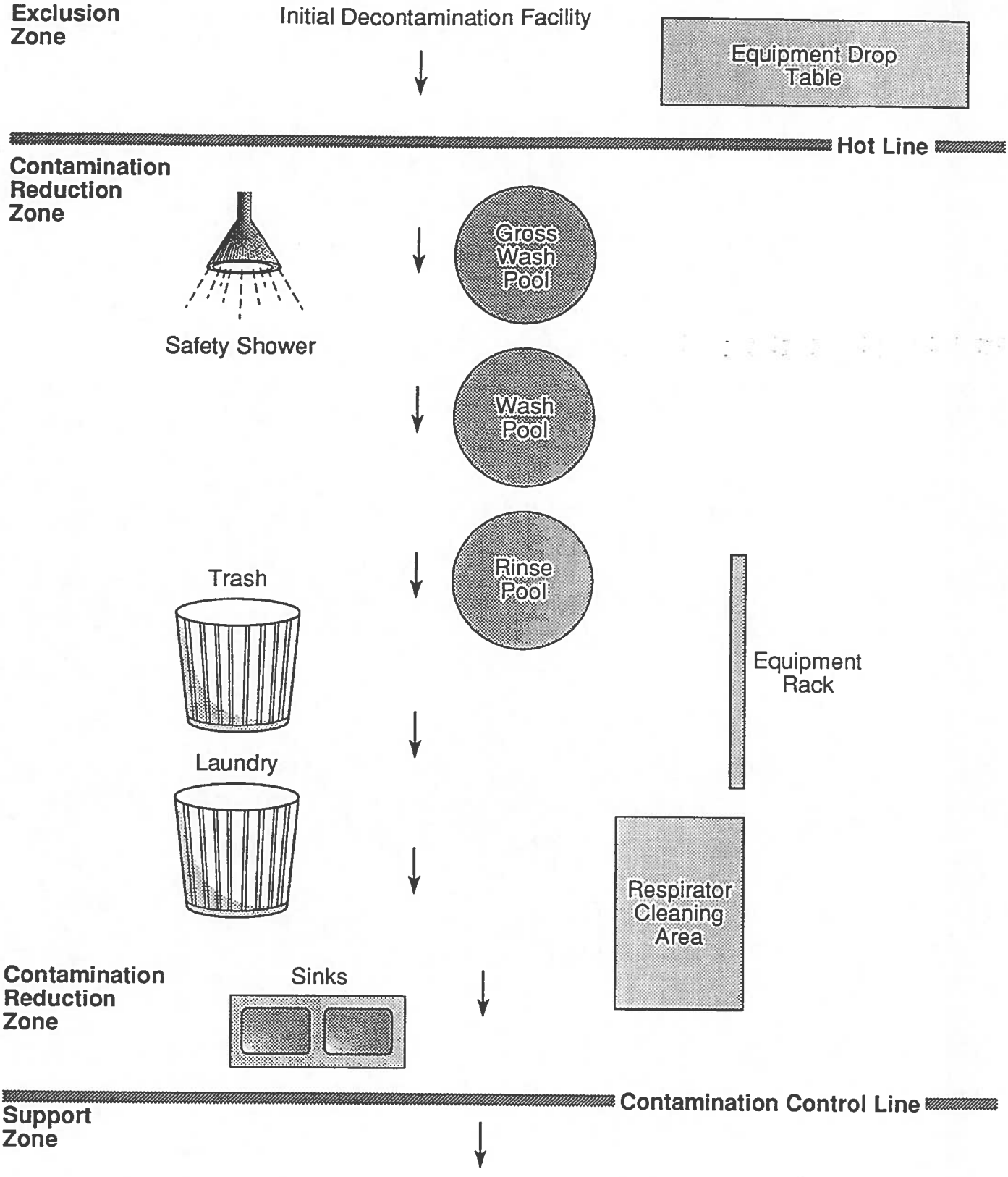
Figure 2-1. Vicinity Map

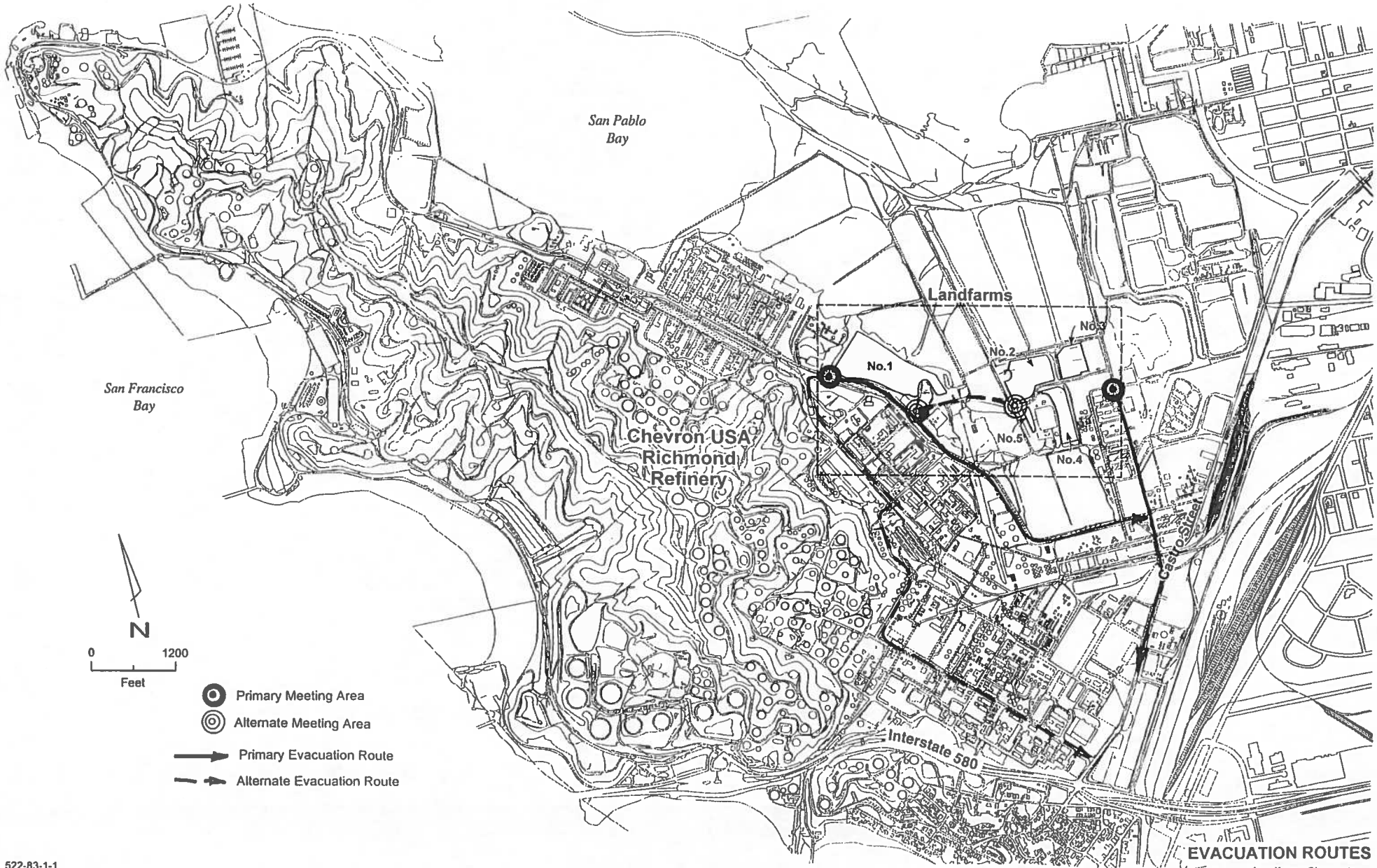




EXPLANATION

Traffic Direction	Restricted Area
Traffic Cones	Exclusion Zone
Barricade Tape	Contamination Reduction Zone
Security Fence	Support Zone
Hot Line	Uncontrolled Area


Exclusion Zone
Initial Decontamination Facility
Equipment Drop Table
Hot Line
Contamination Reduction Zone
Safety Shower
Gross Wash Pool
Wash Pool
Rinse Pool
Trash
Laundry
Equipment Rack
Respirator Cleaning Area
Contamination Reduction Zone
Sinks
Contamination Control Line
Support Zone



EVACUATION ROUTES

Landfarms Closure Plan

522-83-1-1

BEDM

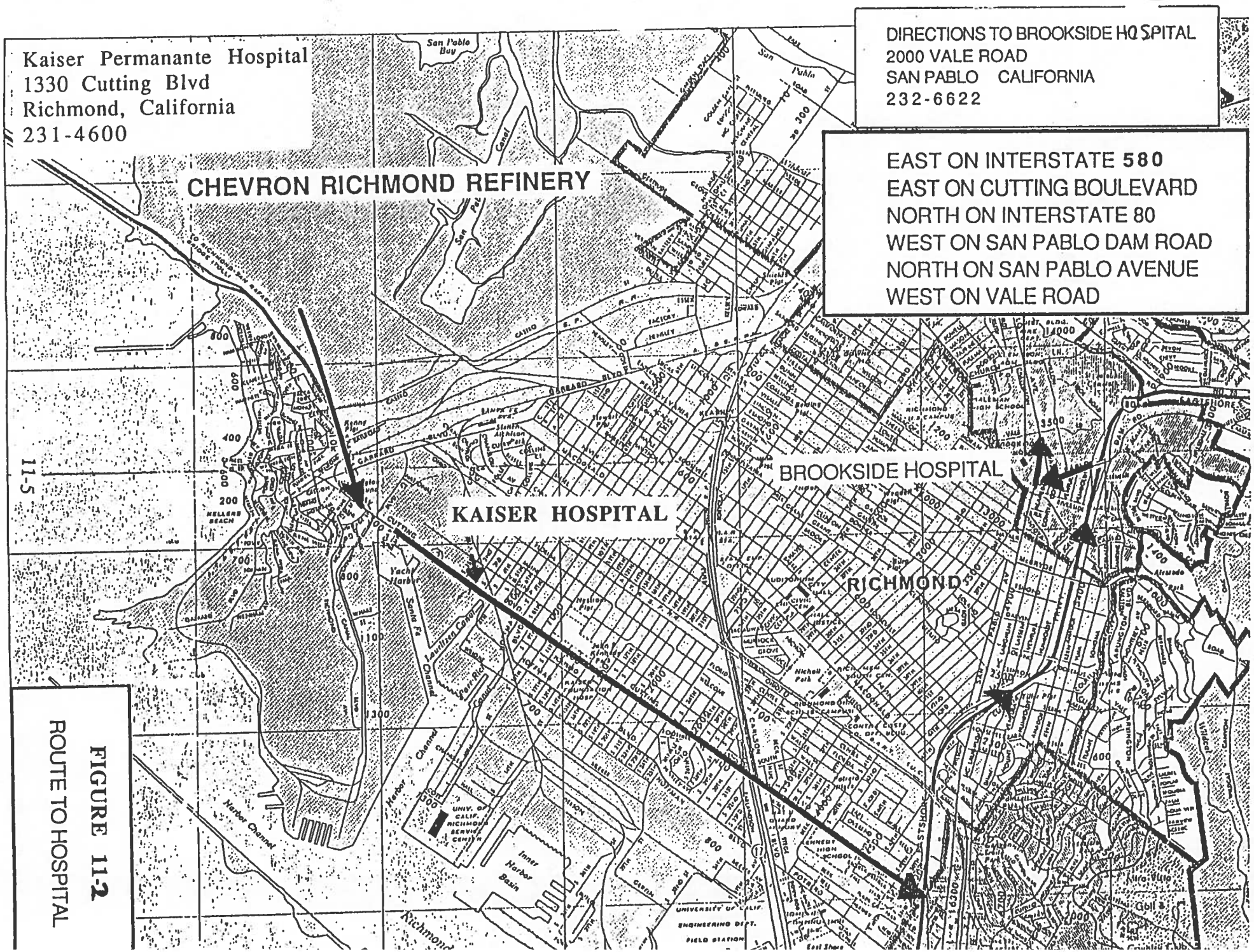


FIGURE 11-2
ROUTE TO HOSPITAL

APPENDIX J

Appendix J
Construction Drawings

Appendix J
Construction Drawings

Monitoring Well Logs

244A	384A	551A
610A	103C	104C
104B (supplements 104C)	114C	186C
251C		

GPS As-Built and Consruction Drawings

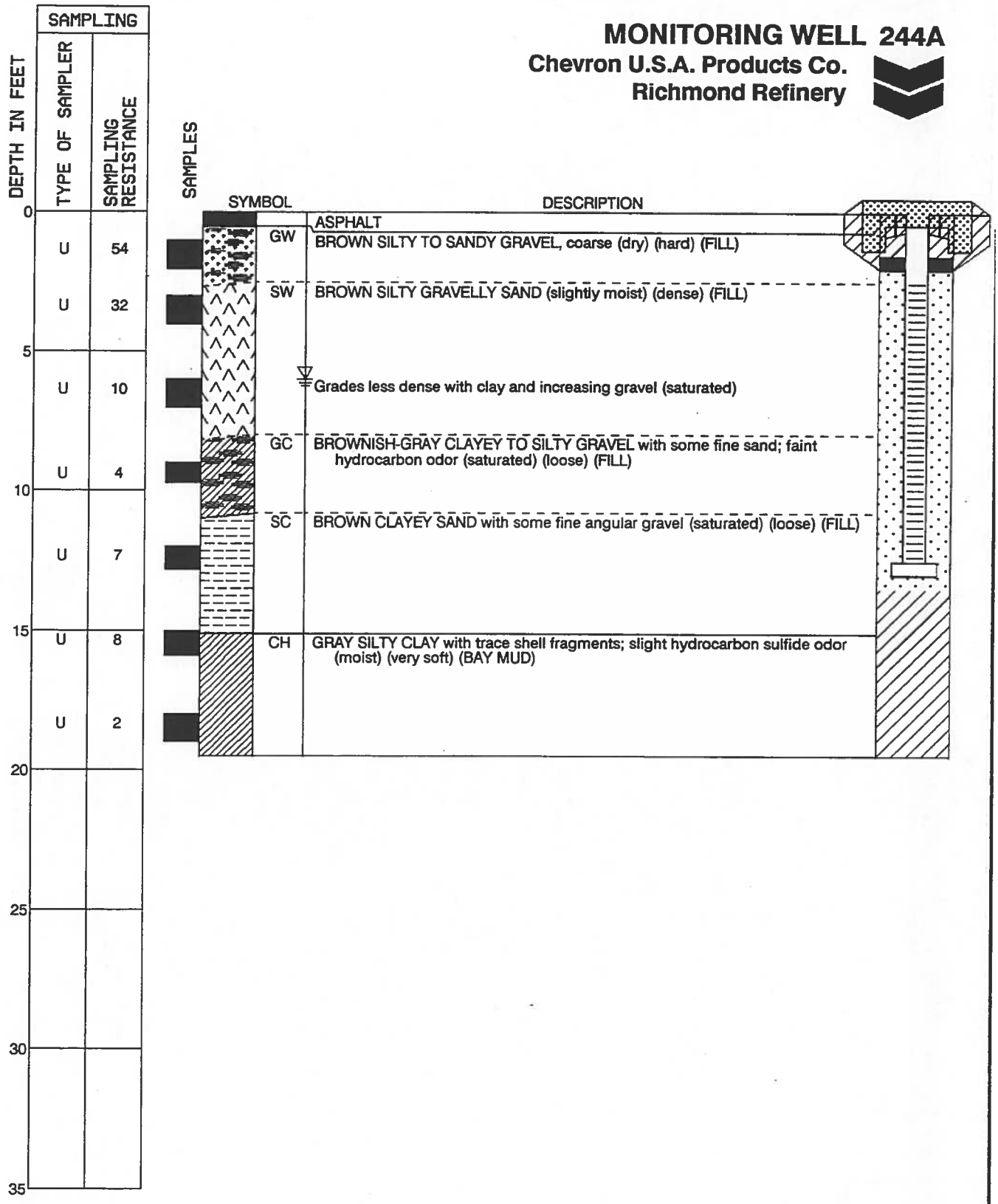
Drawing No.	Title
D-318632-3	Extraction Trench Location Plan & Profile 2 of 4, Isomax Segment
D-318633-1	Extraction Trench Location Plan & Profile 3 of 4, Isomax Segment
D-318634-1	Extraction Trench Location Plan & Profile 4 of 4, Isomax Segment
D-782125-4	Standard Extraction Trench, Sump Section & Details
D-782400-2	Extraction Trench Location Plan, Landfarm 2/250 Ft Channel
D-782401-3	Extraction Trench Location Plan, Landfarm 2/250 Ft Channel
D-782402-2	Extraction Trench Location Plan, Landfarms 2 & 5
D-782403-3	Extraction Trench Location Plan, Landfarms 2 & 5
D-782404-2	Extraction Trench Location Plan, Landfarms 2 & 5
D-782437-1	Extraction Trench Location Plan, Landfarm No. 3
D-782452-0	150 Ft Barrier Wall - Plan, Profile & Sections, Landfarm 5
D-782458-2	Extraction Trench Location Plan & Profile, Landfarm No. 2
D-318541-1	Location Plan - Barrier Wall, Sector 83: Landfarms Nos, 2-5
D-318542-0	Barrier Wall Profile, Sector 83: Landfarms Nos, 2-5
D-318543-1	Barrier Wall Sections, Sector 83: Landfarms Nos, 2-5
D-318544-1	Extraction Trench Sections and Details, Sector 83: Landfarms Nos, 2-5

Landfarms Closure Drawings

Drawing No.	Title
D-767512-C	Finished Grading Plan - No. 1 Landfarm
D-767513-C	No. 1 Landfarm Sections
D-767515-C	Finished Grading Plan - Nos. 2 Through 5 Landfarms
D-767516-C	Closure Cap Sections, Nos. 2 Through 5 Landfarms
D-767517-C	Closure Cap Sections, Nos. 2 Through 5 Landfarms

MONITORING WELL 244A

Chevron U.S.A. Products Co.
Richmond Refinery



CCC Installation # : 89-046

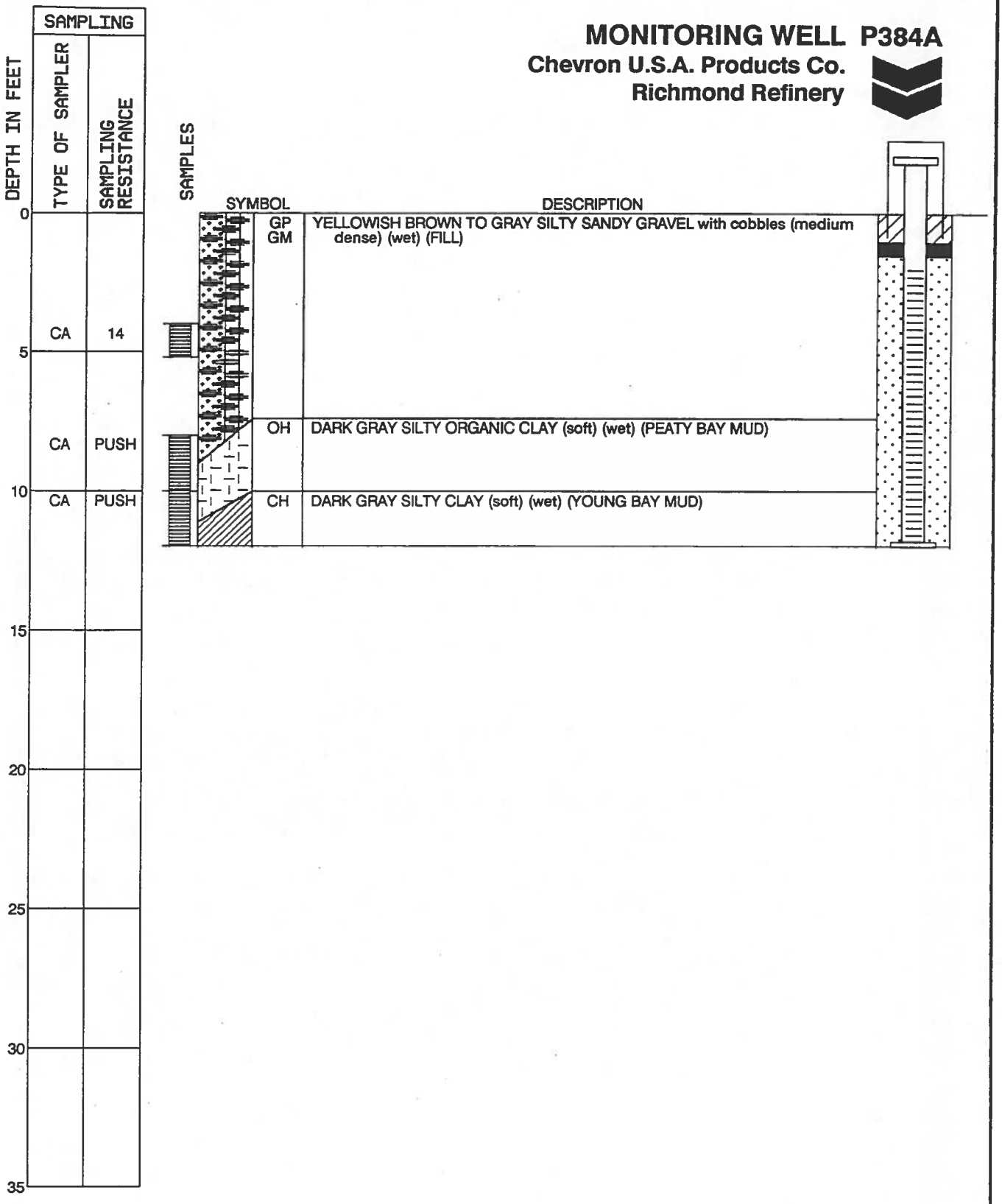
Job No.: 19000-007-114 Ser. No.: I08-531	Dames & Moore	**Log of Boring**
Date Completed: 2/21/89 Boring Depth: 19.5 ft.	Grade Elev: 9.32 ft. Richmond Refinery Datum (RRD) Coordinates: 2172239.74 N ; 6017851.78 E (Lamb. Grid)	Location:

Top of Casing Elev:	8.72 ft. RRD	Casing Type:	Sch 40 PVC	Screened Interval:	2.5-12.5 ft.	Slot Size:	0.020 in.
PVC Casing Depth:	12.5 ft.	Casing Diam:	4.0 in.	Effective Interval:	2.0-13.5 ft.	Sand Pack:	

Log Template: WELL | June 15, 1995 |

MONITORING WELL P384A

Chevron U.S.A. Products Co.
Richmond Refinery

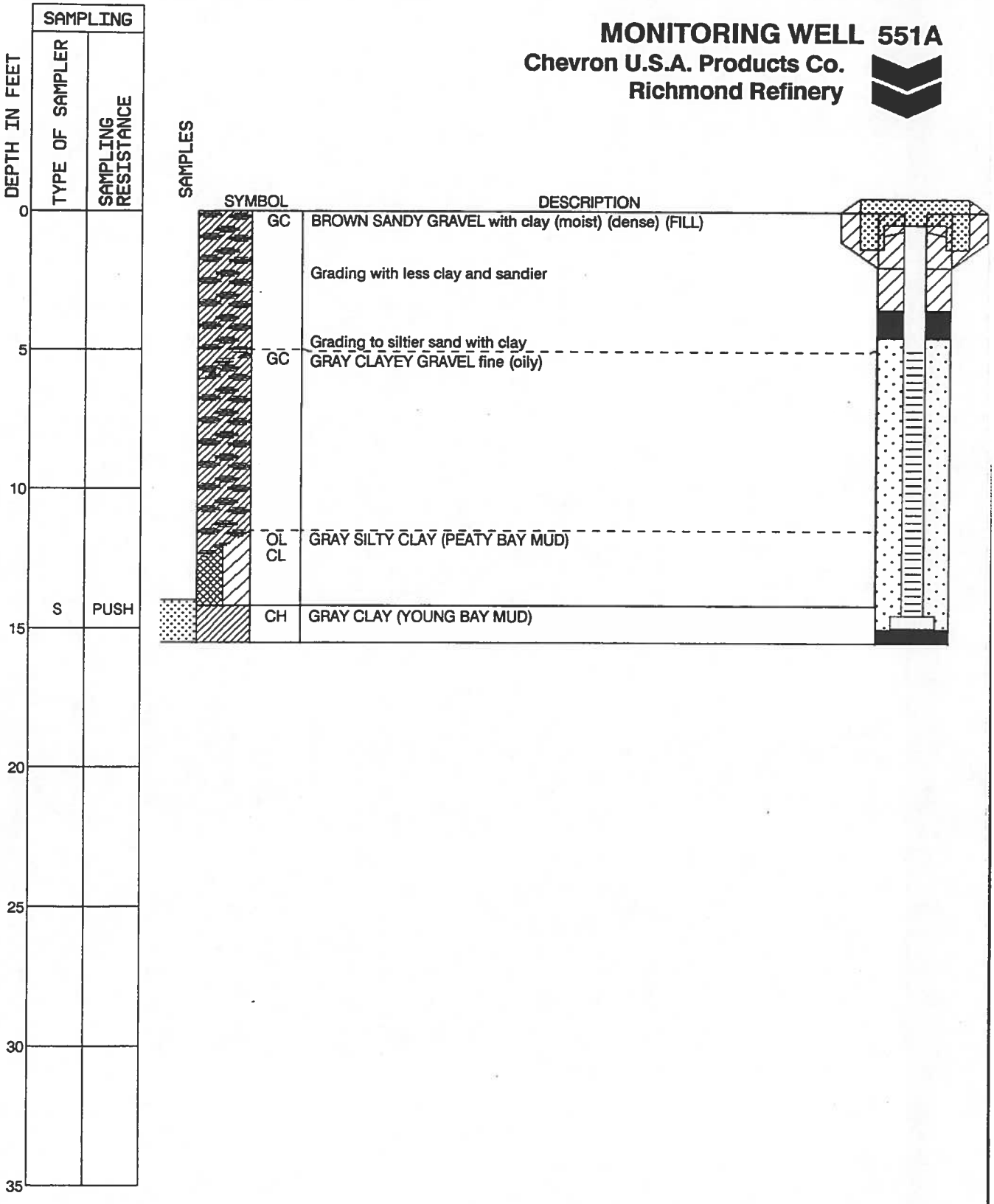


CCC Installation # : M91-1502

Job No.: 19000-483-114 Ser. No.: I09-026	BEDM	**Log of Boring**
Date Completed: 8/29/91 Boring Depth: 12.0 ft.	Grade Elev: 8.50 ft. Richmond Refinery Datum (RRD) Coordinates: 2171412.10 N ; 6018070.70 E (Lamb. Grid)	Location: Nos. 2 and 5 Landfarms
Top of Casing Elev: 11.28 ft. RRD PVC Casing Depth: 12.0 ft.	Casing Type: Sch 40 PVC Casing Diam: 4.0 in.	Screened Interval: 2.0-12.0 ft. Effective Interval: 1.5-12.0 ft.	Slot Size: 0.020 in. Sand Pack: #3 Monterey

MONITORING WELL 551A

Chevron U.S.A. Products Co.
Richmond Refinery

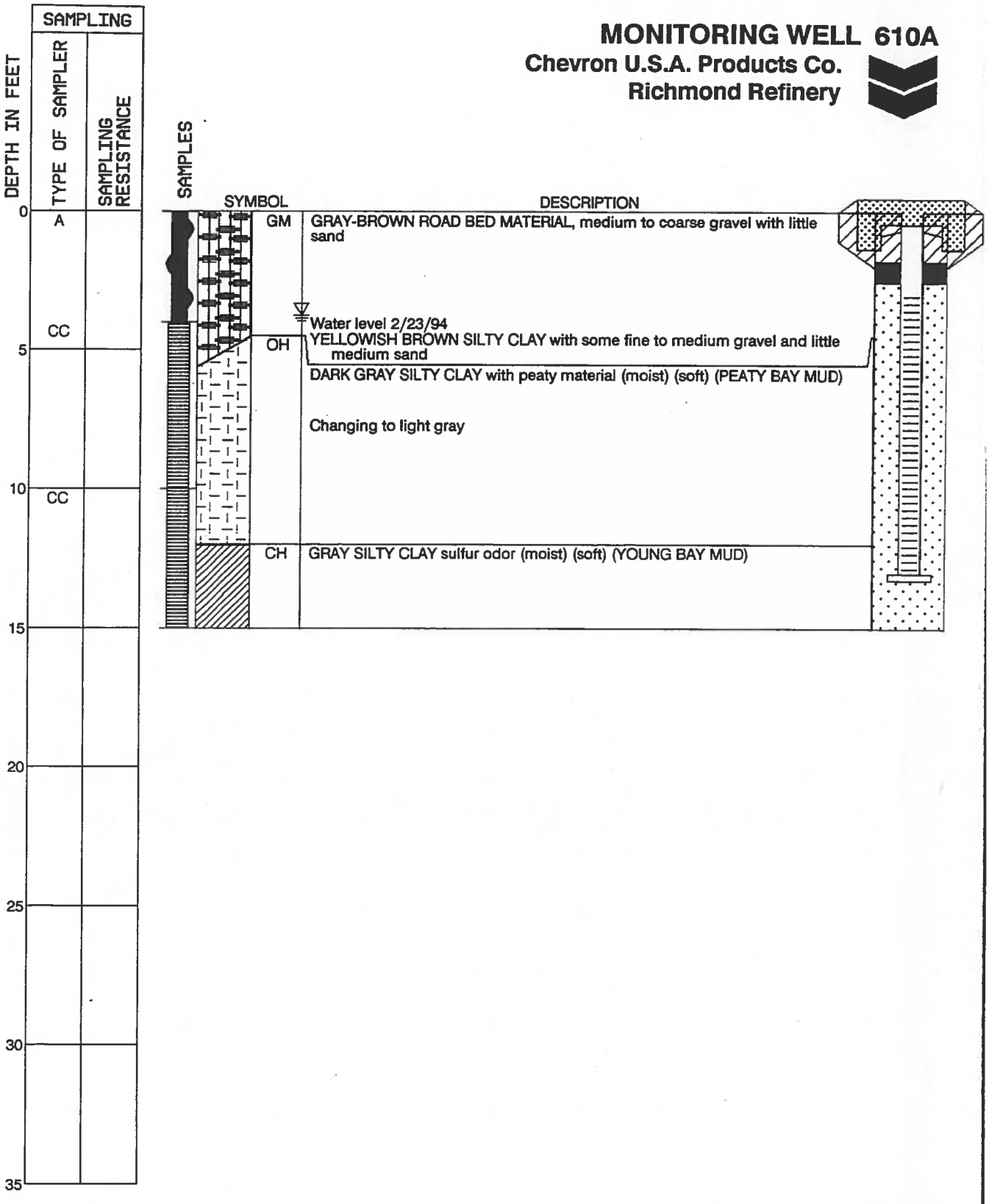


CCC Installation # : M93-1191

Job No.: 19000-580-114 Ser. No.: I08-049	BEDM	**Log of Boring**
Date Completed: 2/25/93 Boring Depth: 15.5 ft.	Grade Elev: 10.10 ft. Richmond Refinery Datum (RRD) Coordinates: 2172434.40 N ; 6019399.74 E (Lamb. Grid)	Location: Landfill 15
Top of Casing Elev: 9.42 ft. RRD PVC Casing Depth: 15.0 ft.	Casing Type: Sch 40 PVC Casing Diam: 4.0 in.	Screened Interval: 5.0-15.0 ft. Effective Interval: 4.5-15.0 ft.	Slot Size: 0.020 in. Sand Pack: #3 Lonestar

MONITORING WELL 610A

Chevron U.S.A. Products Co.
Richmond Refinery



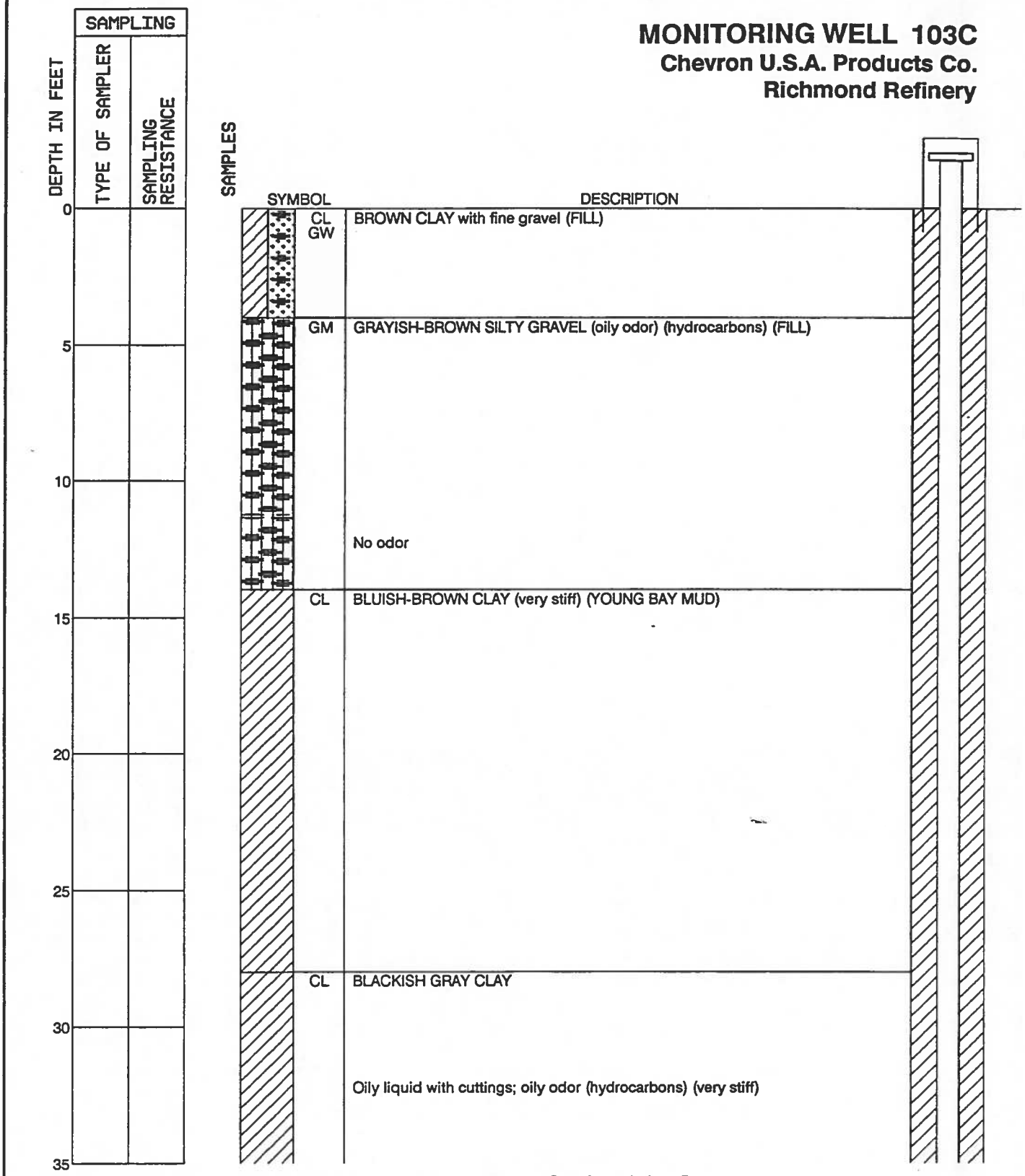
CCC Installation # : M94-1131

Job No.: 19000-683-114 Ser. No.: I08-070	BEDM	**Log of Boring**
Date Completed: 2/15/94 Boring Depth: 15.0 ft.	Grade Elev: 9.79 ft. Richmond Refinery Datum (RRD) Coordinates: 2172421.99 N ; 6018441.47 E (Lamb. Grid)	Location: No. 2 Landfarm

Top of Casing Elev:	9.51 ft. RRD	Casing Type:	Sch 40 PVC	Screened Interval:	3.0-13.0 ft.	Slot Size:	0.020 in.
PVC Casing Depth:	13.0 ft.	Casing Diam:	4.0 in.	Effective Interval:	2.5-15.0 ft.	Sand Pack:	#3 Monterey

MONITORING WELL 103C

Chevron U.S.A. Products Co.
Richmond Refinery



See Plate A-1 for general log notes and explanation of the terms and symbols.

Continued Next Page

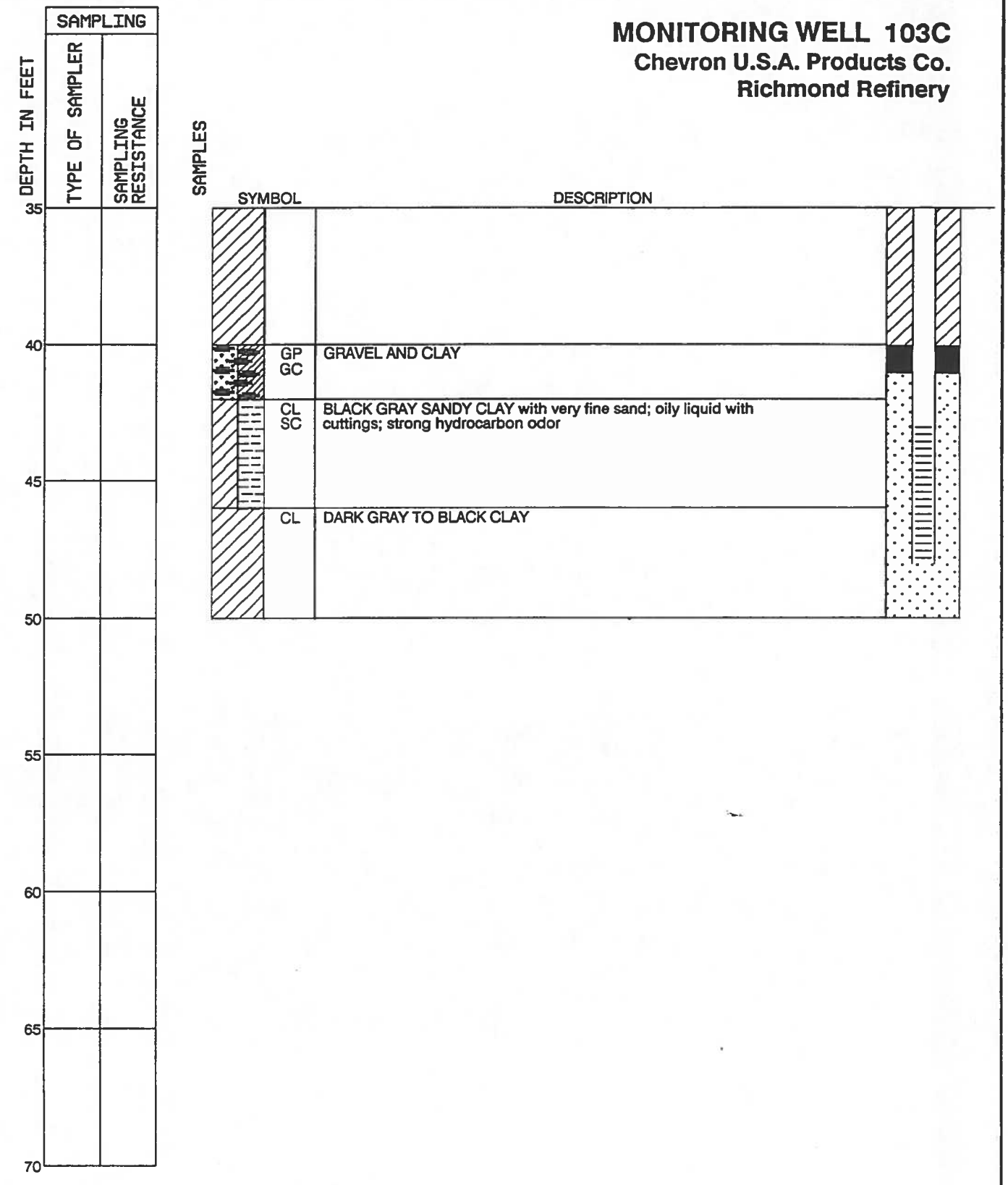
CCC Installation # :

Job No.: Ser. No.: G07-516	BEDM*	**Log of Boring**
Date Completed: 1/17/84 Boring Depth: 50.0 ft.	Grade Elev: 14.19 ft. Richmond Refinery Datum (RRD) Coordinates: 2173167.99 N ; 6016047.28 E (Lambert Grid)	Location:

Top of Casing Elev:	15.13 ft. RRD	Casing Type:	Sch 40 PVC	Screened Interval:	43.0-48.0 ft.	Slot Size:	0.020 in.
Casing Depth:	48.0 ft.	Casing Diam:	4.0 in.	Effective Interval:	41.0-50.0 ft.	Sand Pack:	

MONITORING WELL 103C

Chevron U.S.A. Products Co.
Richmond Refinery



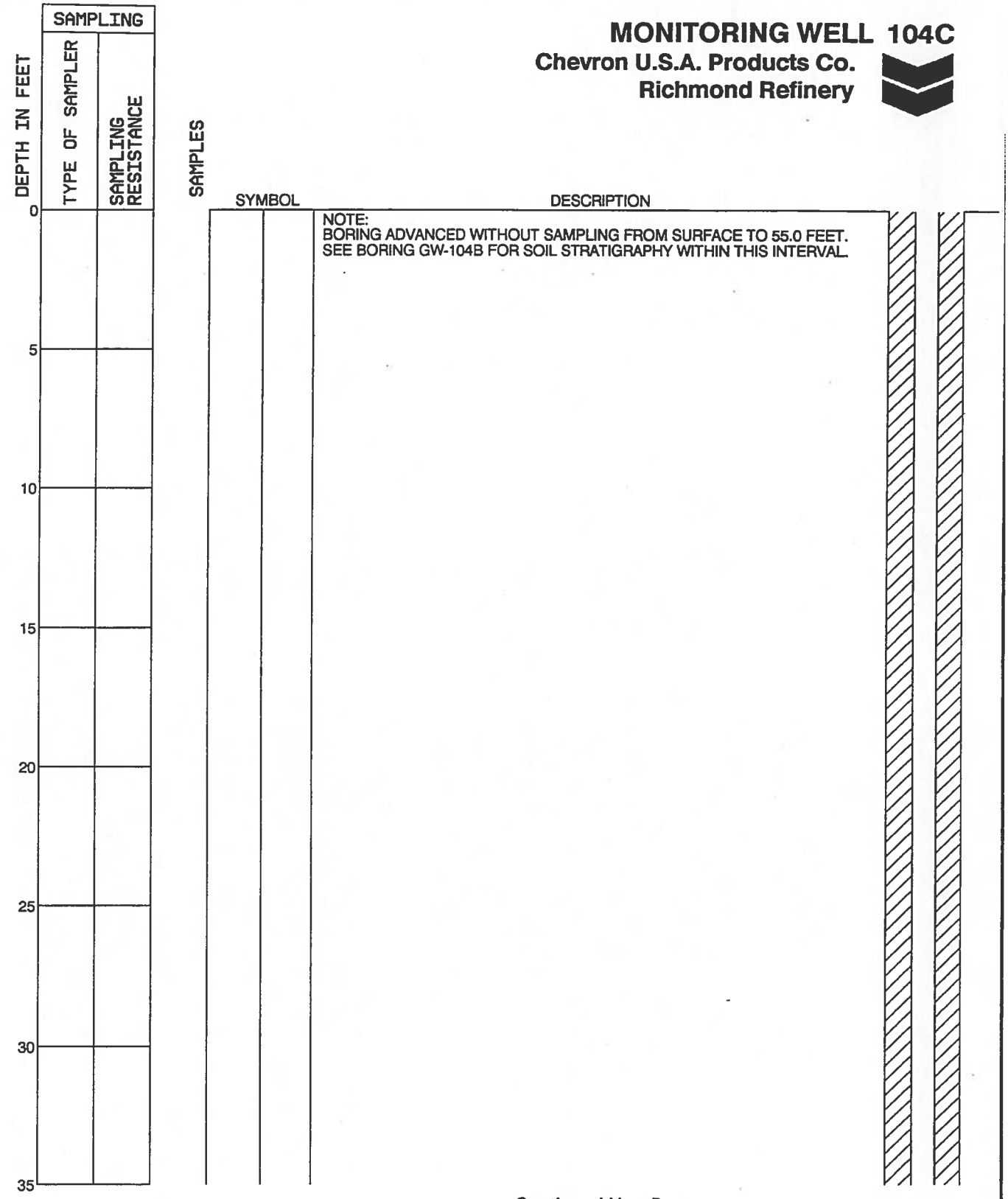
See Plate A-1 for general log notes and explanation of the terms and symbols.

Job No.: Ser. No.: G07-516	BEDM*	**Log of Boring**

Log Template: WELL | July 23, 1993 | PAGE 2 of 2

MONITORING WELL 104C

Chevron U.S.A. Products Co.
Richmond Refinery



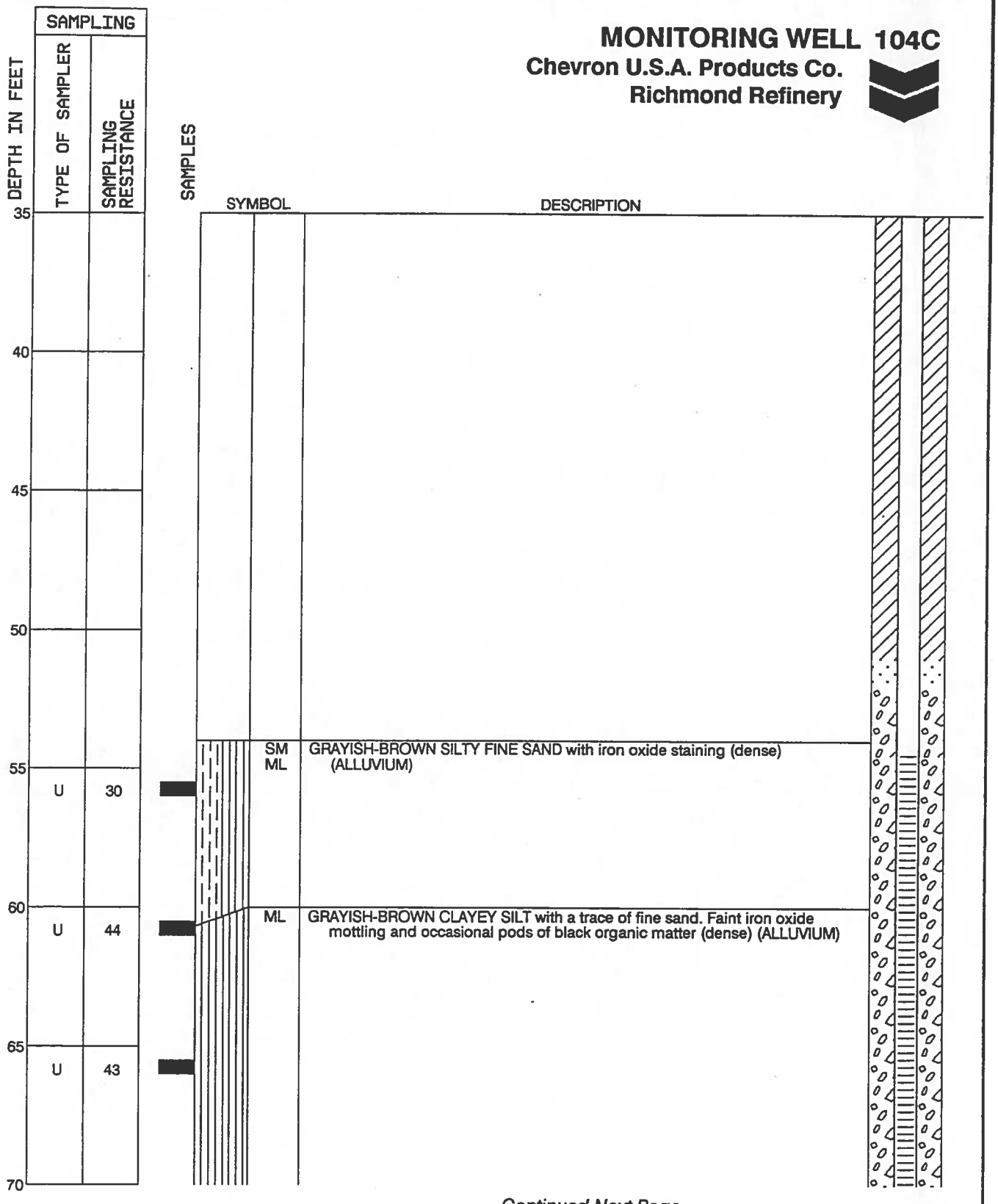
Continued Next Page

CCC Installation # :

Job No.: 113-531-03 Ser. No.: I08-513	Dames & Moore	**Log of Boring**
Date Completed: 9/17/80 Boring Depth: 73.5 ft.	Grade Elev: 8.70 ft. Richmond Refinery Datum (RRD) Coordinates: 2172363.53 N ; 6018688.82 E (Lamb. Grid)	Location:
Top of Casing Elev: 11.91 ft. RRD PVC Casing Depth: 72.5 ft.	Casing Type: Sch 40 PVC Casing Diam: 4.0 in.	Screened Interval: 54.5-71.5 ft. Effective Interval: 52.0-72.5 ft.
Slot Size: in. Sand Pack: Pea Gravel		

MONITORING WELL 104C

Chevron U.S.A. Products Co.
Richmond Refinery

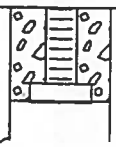


Continued Next Page

MONITORING WELL 104C

Chevron U.S.A. Products Co.
Richmond Refinery

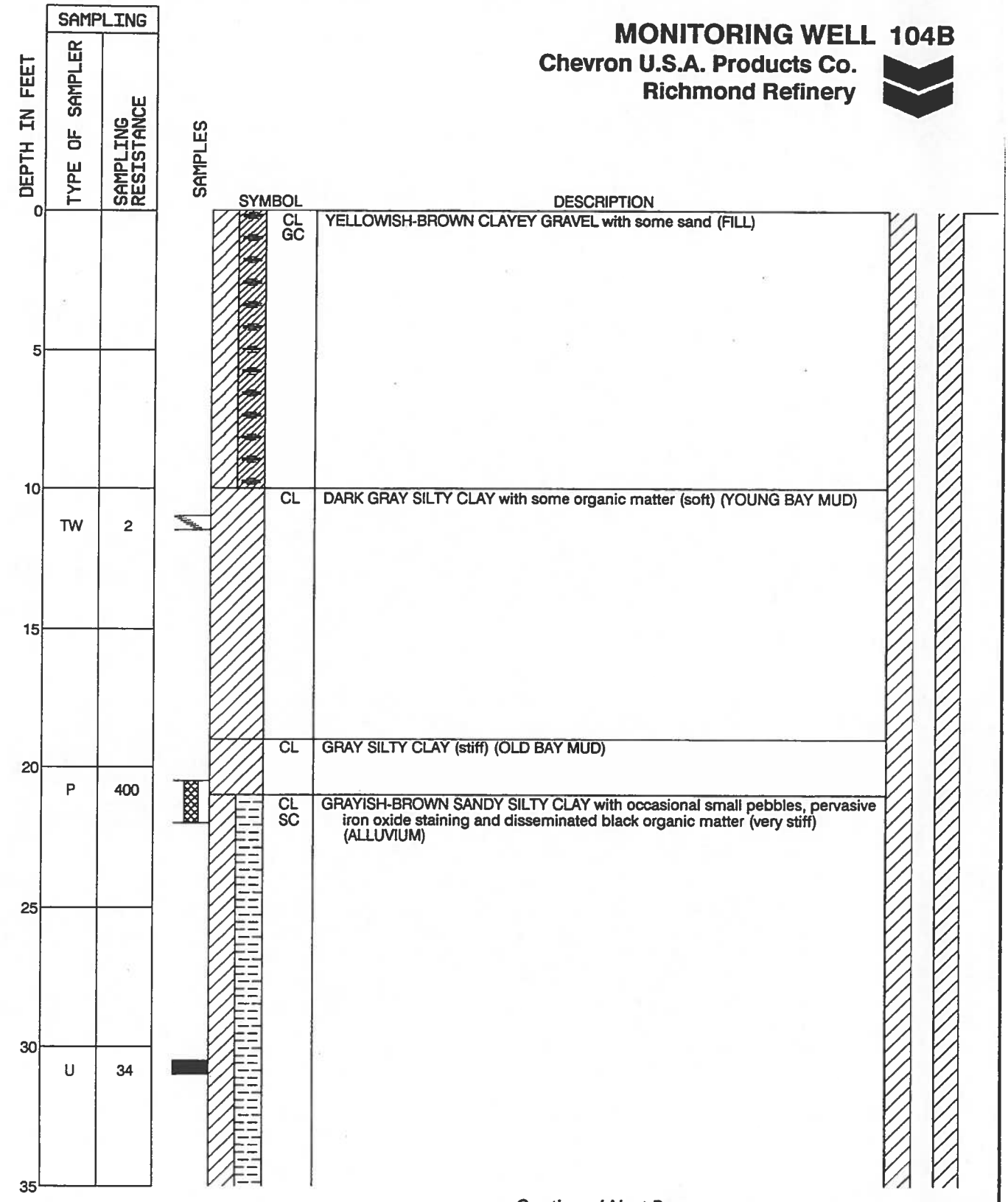
DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: SAMPLING RESISTANCE	SAMPLES: SYMBOL	DESCRIPTION
70	U	63		Grades with occasional thin sandy lenses
	U	38		Amount of clay increases
75				
80				
85				
90				
95				
100				
105				



Job No.: 113-531-03 Ser. No.: I08-513	Dames & Moore	**Log of Boring**

MONITORING WELL 104B

Chevron U.S.A. Products Co.
Richmond Refinery



Continued Next Page

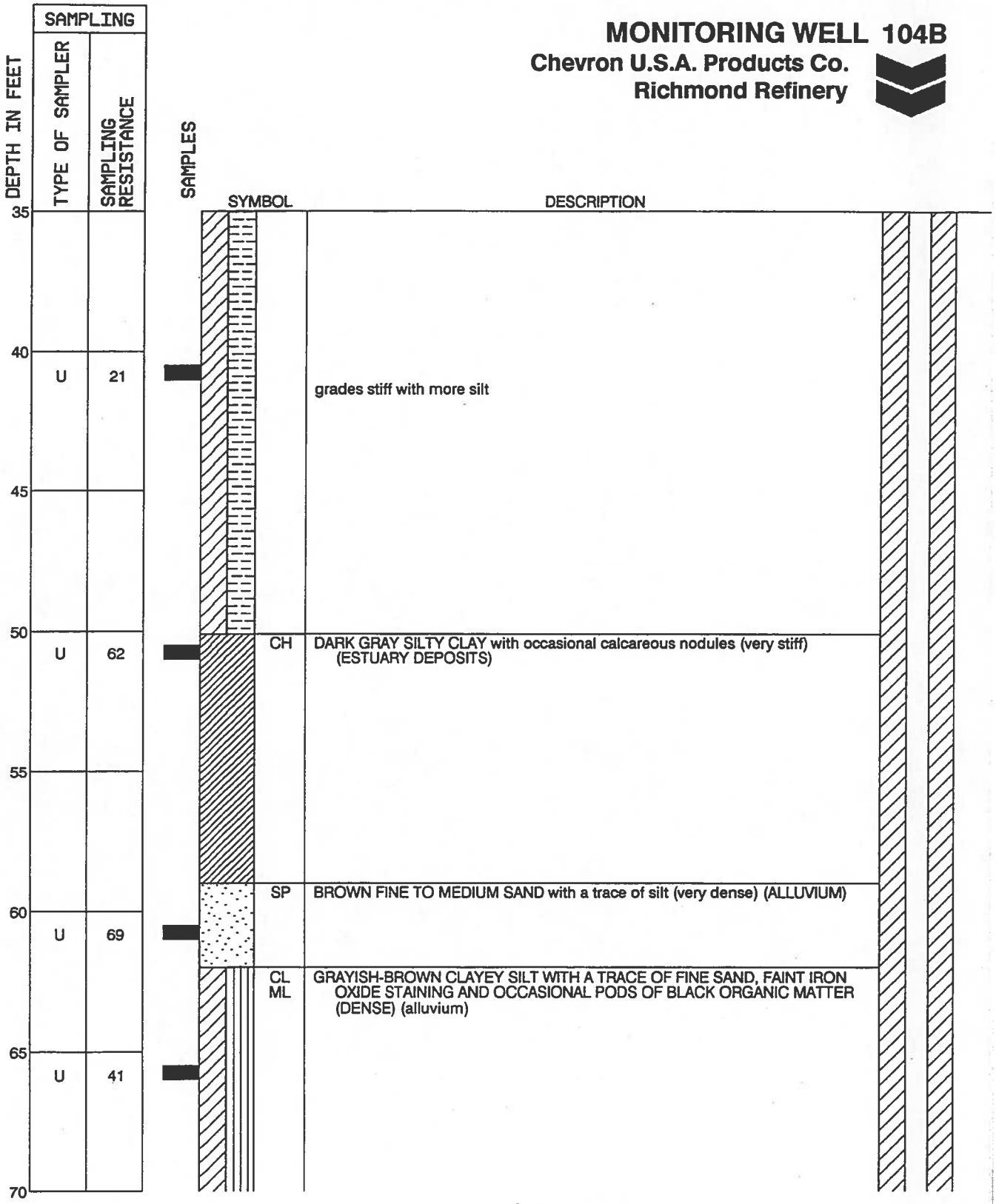
CCC Installation # :

Job No.: 113-531-03 Ser. No.: I08-512	Dames & Moore	**Log of Boring**
Date Completed: 9/11/80 Boring Depth: 136.5 ft.	Grade Elev: 10.15 ft. Richmond Refinery Datum (RRD) Coordinates: 2172406.79 N ; 6018636.22 E (Lamb. Grid)	Location:

Top of Casing Elev:	13.48 ft. RRD	Casing Type:	Sch 40 PVC	Screened Interval:	114.0-134.0 ft.	Slot Size:	in.
PVC Casing Depth:	136.0 ft.	Casing Diam:	4.0 in.	Effective Interval:	109.0-136.0 ft.	Sand Pack:	Pea Gravel

MONITORING WELL 104B

Chevron U.S.A. Products Co.
Richmond Refinery

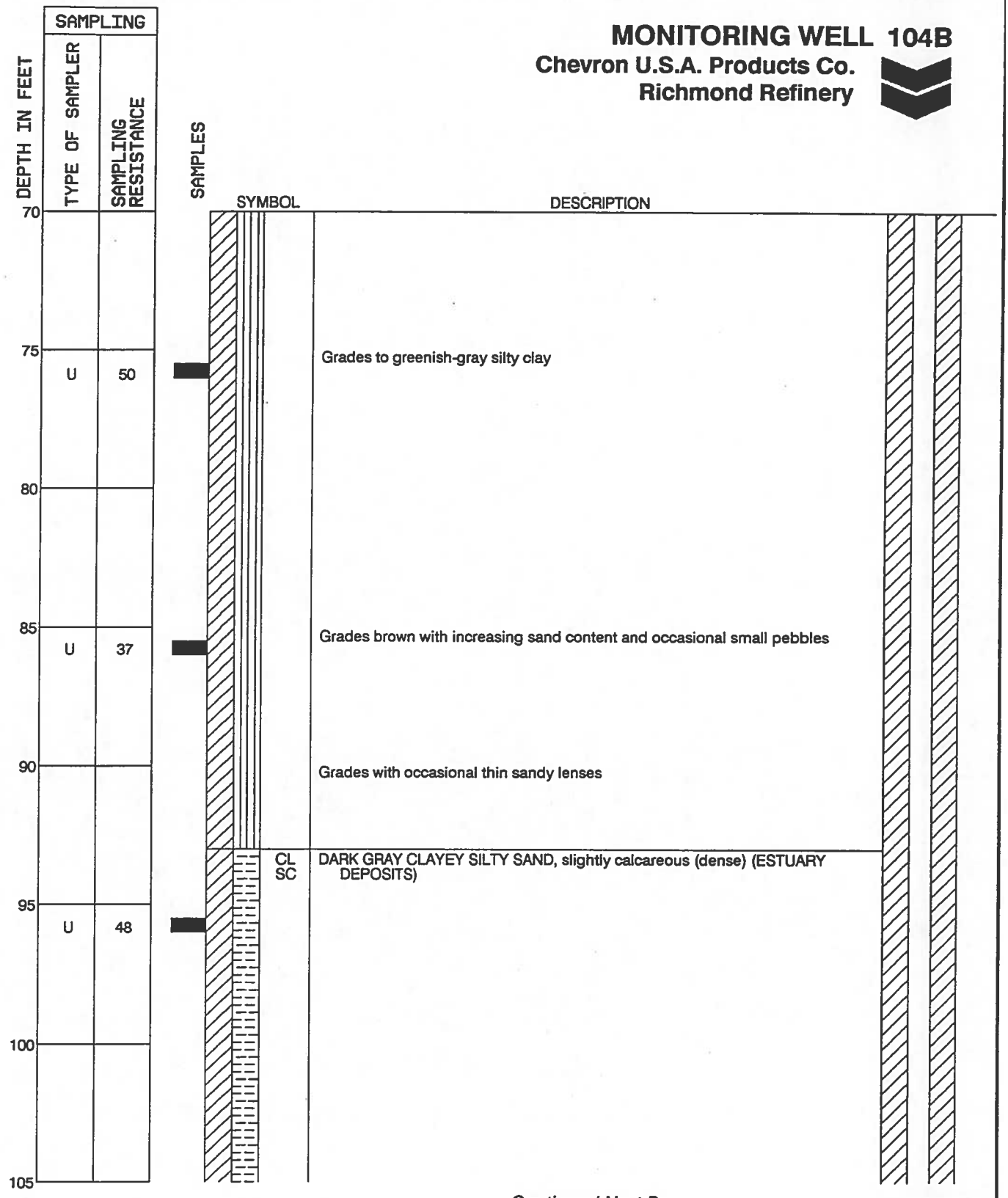


Continued Next Page

Job No.: 113-531-03 Ser. No.: I08-512	Dames & Moore	**Log of Boring**

MONITORING WELL 104B

Chevron U.S.A. Products Co.
Richmond Refinery

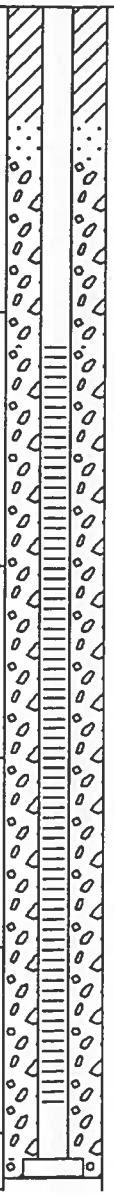


Continued Next Page

MONITORING WELL 104B

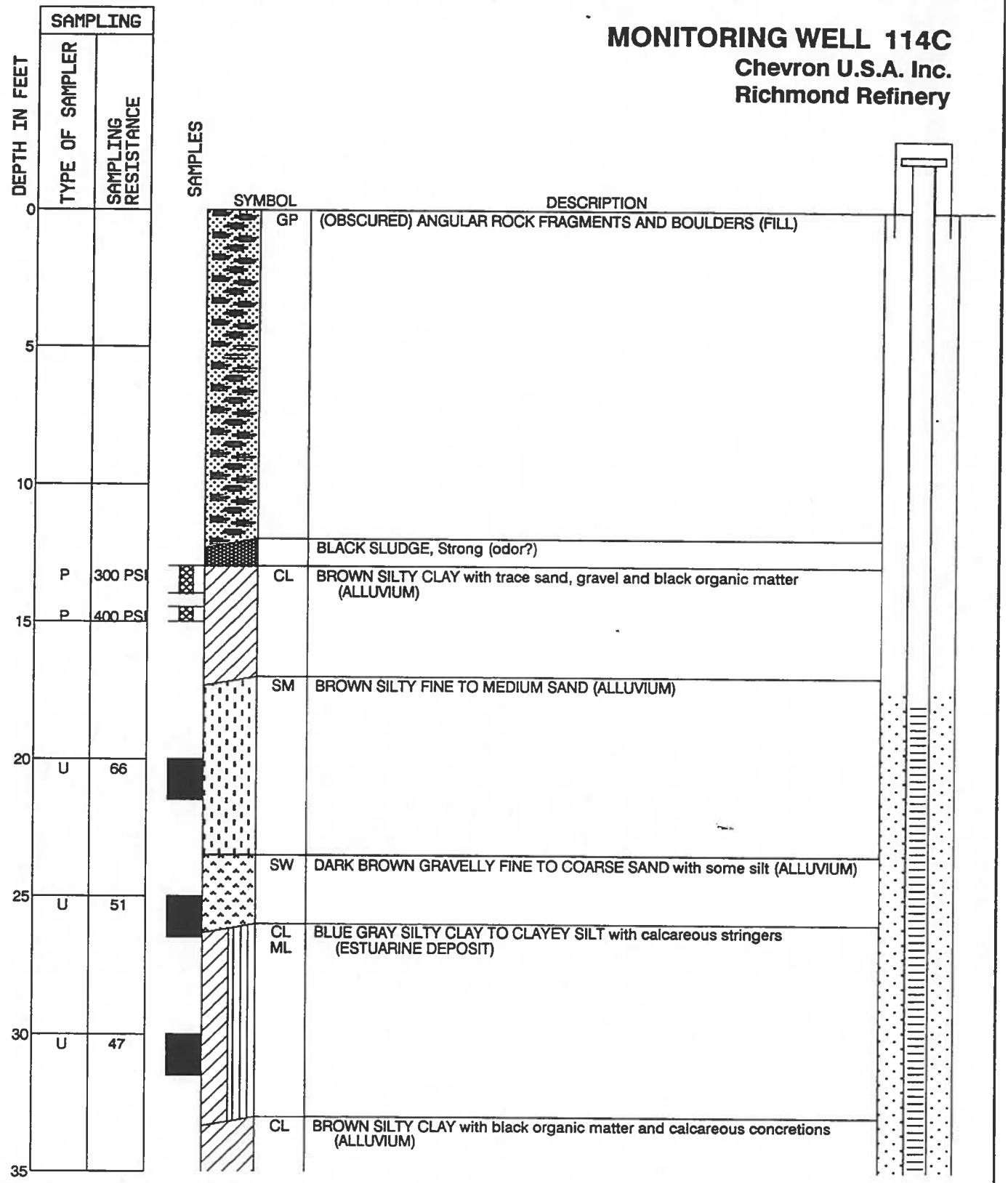
Chevron U.S.A. Products Co.
Richmond Refinery

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: SAMPLING RESISTANCE	SAMPLES	SYMBOL	DESCRIPTION
105	U	58			Grades with occasional thin lenses of sandy silt
110	U	40			
115	U	36		CL	LIGHT GRAY SILTY CLAY with some fine sand, calcareous with faint iron oxide mottling (stiff) (ESTUARY DEPOSITS)
120	U	156		SM	GRAY SILTY FINE SAND with trace of clay, slightly calcareous with faint iron oxide mottling (very dense) (ESTUARY DEPOSITS)
125	U	50		ML	BROWN CLAYEY SILT with trace of fine sand (dense) (ALLUVIUM)
130	U	95		SM	BROWNISH-GRAY SILTY FINE TO MEDIUM SAND (very dense) (ALLUVIUM)
135	U	33		CH	Amount of silt increases GRAY SILTY CLAY with trace of fine sand and occasional calcareous nodules (very stiff) (ESTUARY DEPOSIT)
140					



MONITORING WELL 114C

Chevron U.S.A. Inc.
Richmond Refinery



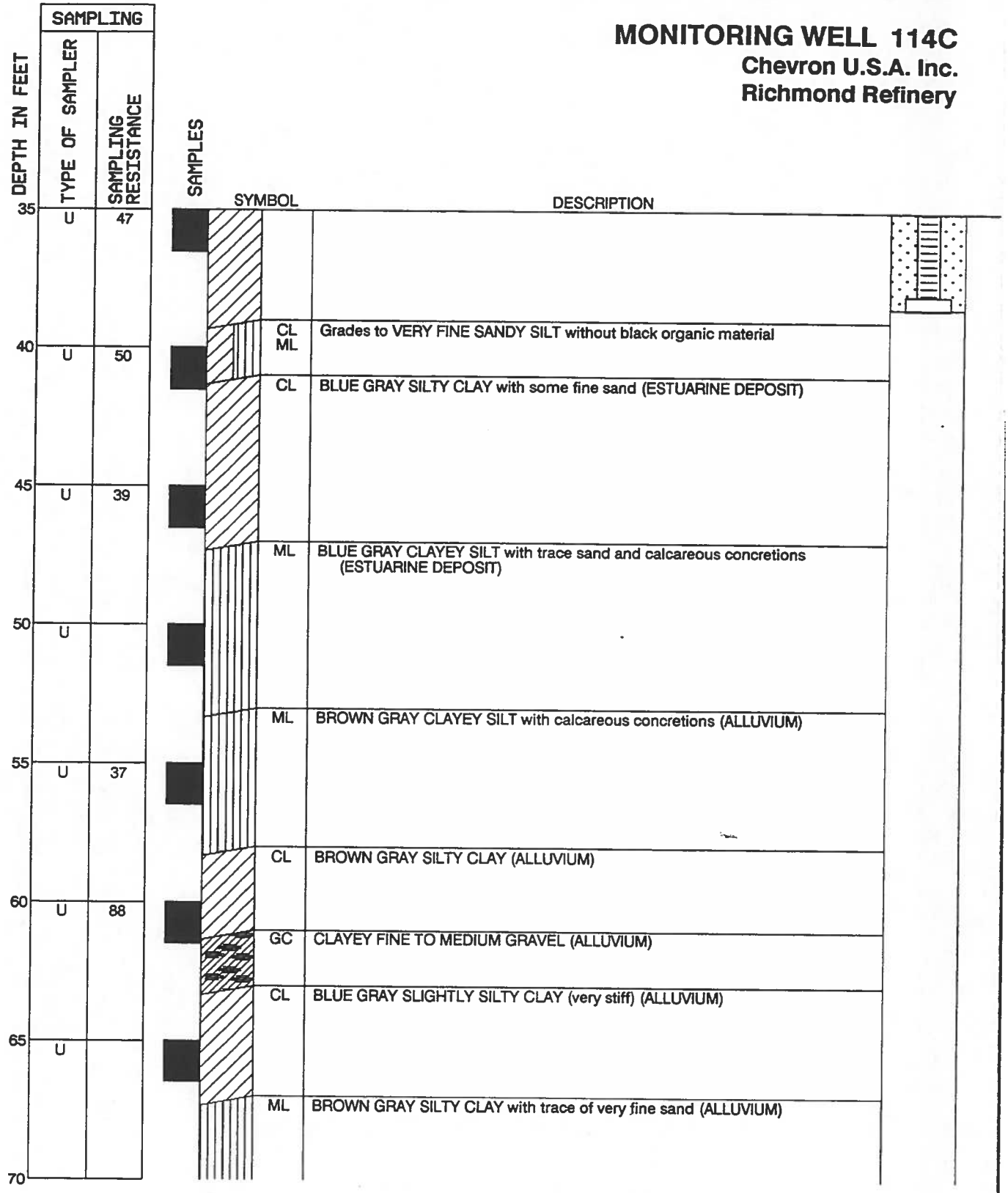
See Plate A-1 for general log notes and explanation of the terms and symbols.

Continued Next Page

Job No.: Ser. No.: 109-522	Dames & Moore	**Log of Boring**
Date Completed: 8/10/86 Boring Depth: 72.0 ft.	Grade Elev: 9.07 ft. Richmond Refinery Datum (RRD) Coordinates: 2170922.33 N ; 6018843.63 E (Lambert Grid)	Location:
Top of Casing Elev: 11.30 ft. RRD Casing Depth: 38.5 ft.	Casing Type: Casing Diam: 4.0 in.	Screened Interval: 18.0-38.0 ft. Effective Interval: 17.5-38.5 ft.	Slot Size: in. Sand Pack:

MONITORING WELL 114C

Chevron U.S.A. Inc.
Richmond Refinery



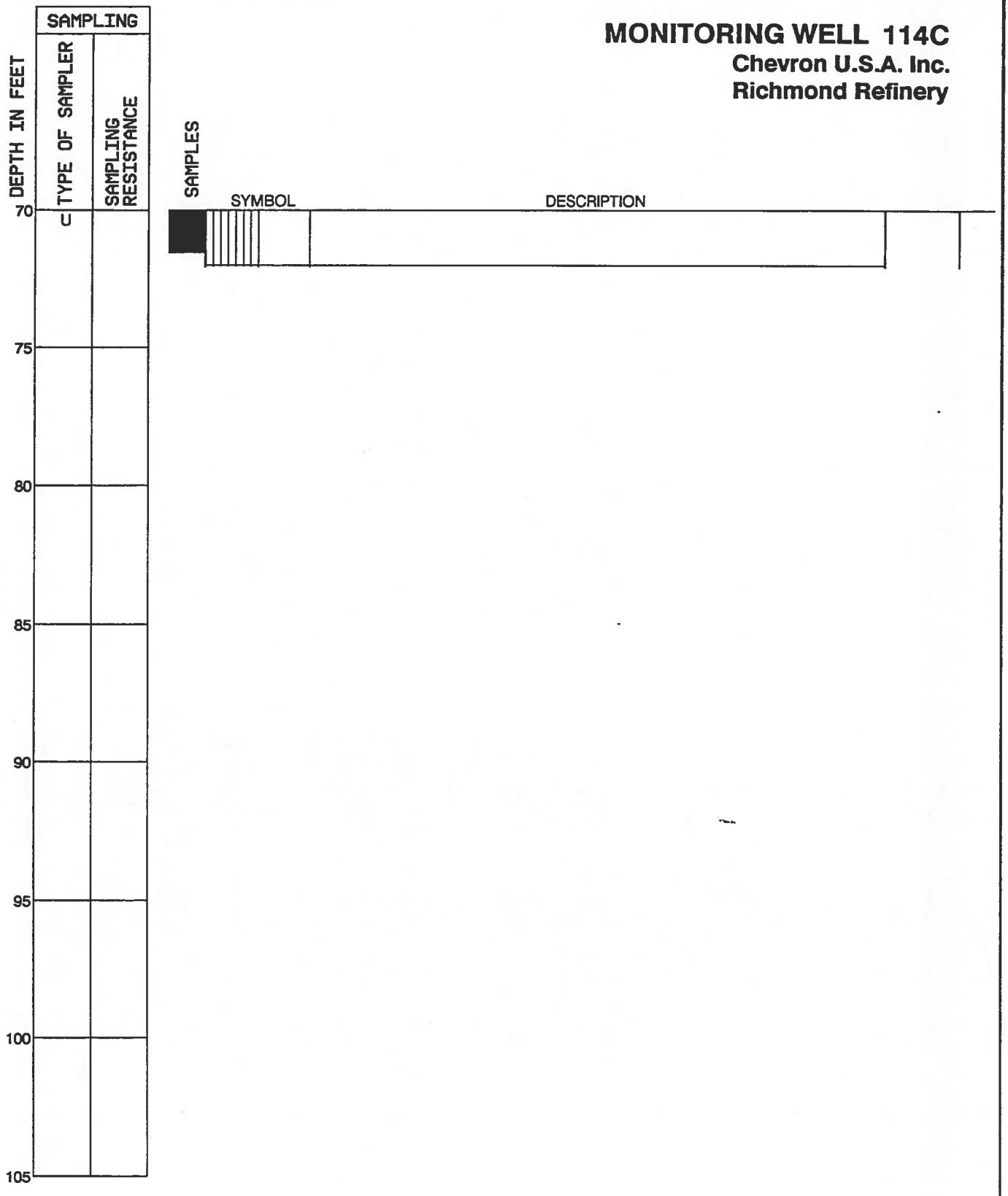
Continued Next Page

See Plate A-1 for general log notes and explanation of the terms and symbols.

Job No.: Ser. No.: 109-522	Dames & Moore	**Log of Boring**

MONITORING WELL 114C

Chevron U.S.A. Inc.
Richmond Refinery



See Plate A-1 for general log notes and explanation of the terms and symbols.

Job No.: Ser. No.: 109-522	Dames & Moore	**Log of Boring**

MONITORING WELL 186C

Chevron U.S.A. Products Co.
Richmond Refinery

DEPTH IN FEET	SAMPLING: TYPE OF SAMPLER	SAMPLING: SAMPLING RESISTANCE	SAMPLES	SYMBOL	DESCRIPTION
0	S	14		CL	BLACK TO GRAYISH BROWN WELL GRADED GRAVELLY CLAY with some oily zones (dense) (sandy) (gravel to 2" max) (FILL)
	S	10			Less gravel, some debris (bricks, etc.)
	S	13			Less coarse material
5	S	0			BLACK OILY SLUDGE (consists of silt, sand and clay) (soft)
	S	7		CL	GRAY SILTY CLAY with some sand (soft) (FILL)
					BLACK OILY SLUDGE (consists of silt and clay) (soft)
10	S	0		CH	BLUISH GRAY SILTY PLASTIC CLAY with organics (soft) (YOUNG BAY MUD)
	PT	0			
	S	0			Very soft, silt % increases
15					Less organics, oily sheen
	S	0			
20					High silt content Shells
	S	13			
25				CL	GREENISH BLUISH GRAY MOTTLED LIGHT GRAY SILTY PLASTIC CLAY with trace organics (stiff) (OLD BAY MUD)
	S	9			
30					Becoming grayish brown Trace sand
	S	9			
35					

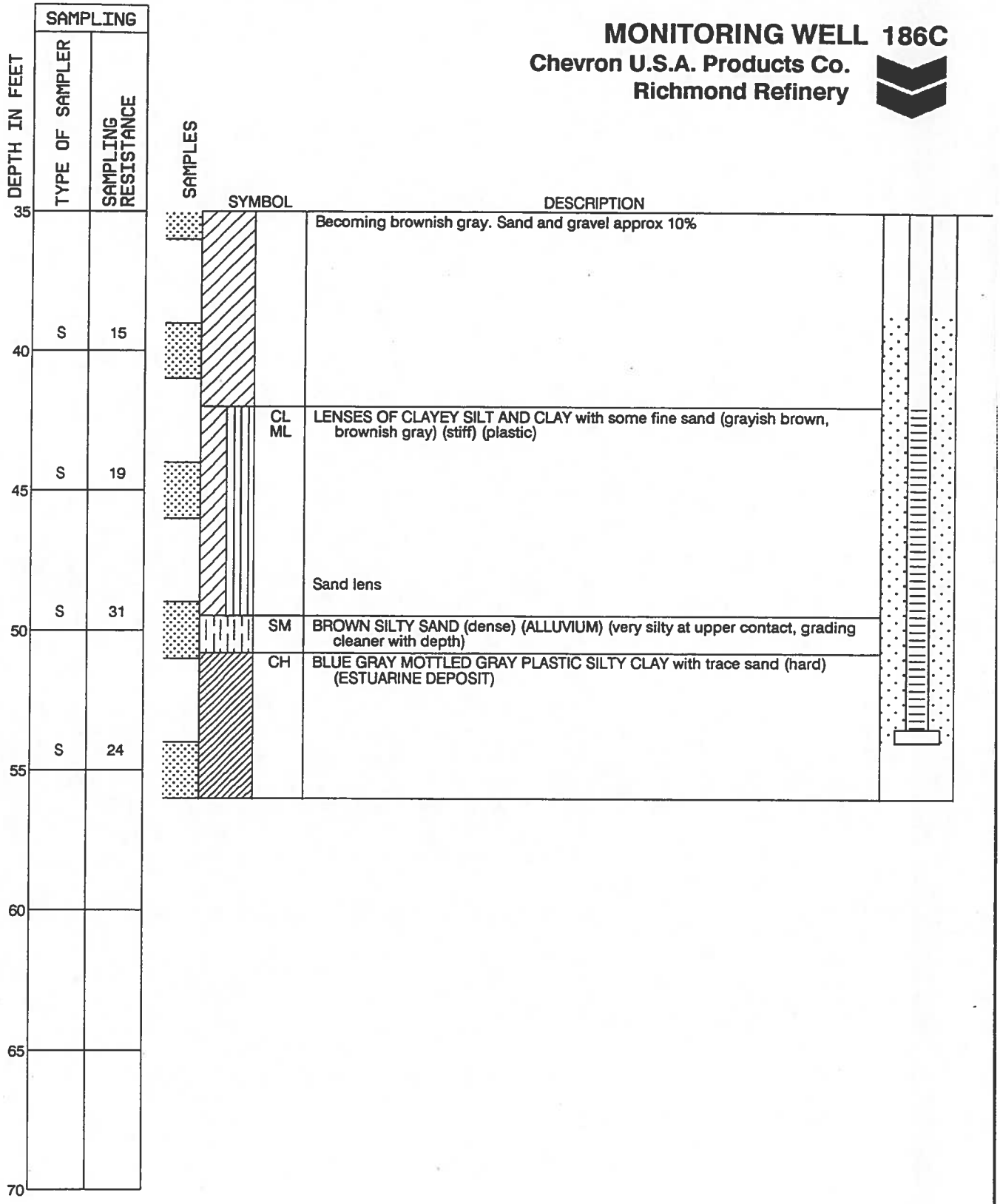
Continued Next Page

CCC Installation # :

Job No.: Ser. No.: 108-902	BEDM*	**Log of Boring**
Date Completed: 10/16/85 Boring Depth: 56.0 ft.	Grade Elev: 13.04 ft. Richmond Refinery Datum (RRD) Coordinates: 2172285.47 N ; 6018089.29 E (Lamb. Grid)	Location:
Top of Casing Elev: 14.33 ft. RRD PVC Casing Depth: 54.0 ft.	Casing Type: Casing Diam: 4.0 in.	Screened Interval: 42.0-54.0 ft. Effective Interval: 38.5-56.0 ft.
Slot Size: in. Sand Pack:		

MONITORING WELL 186C

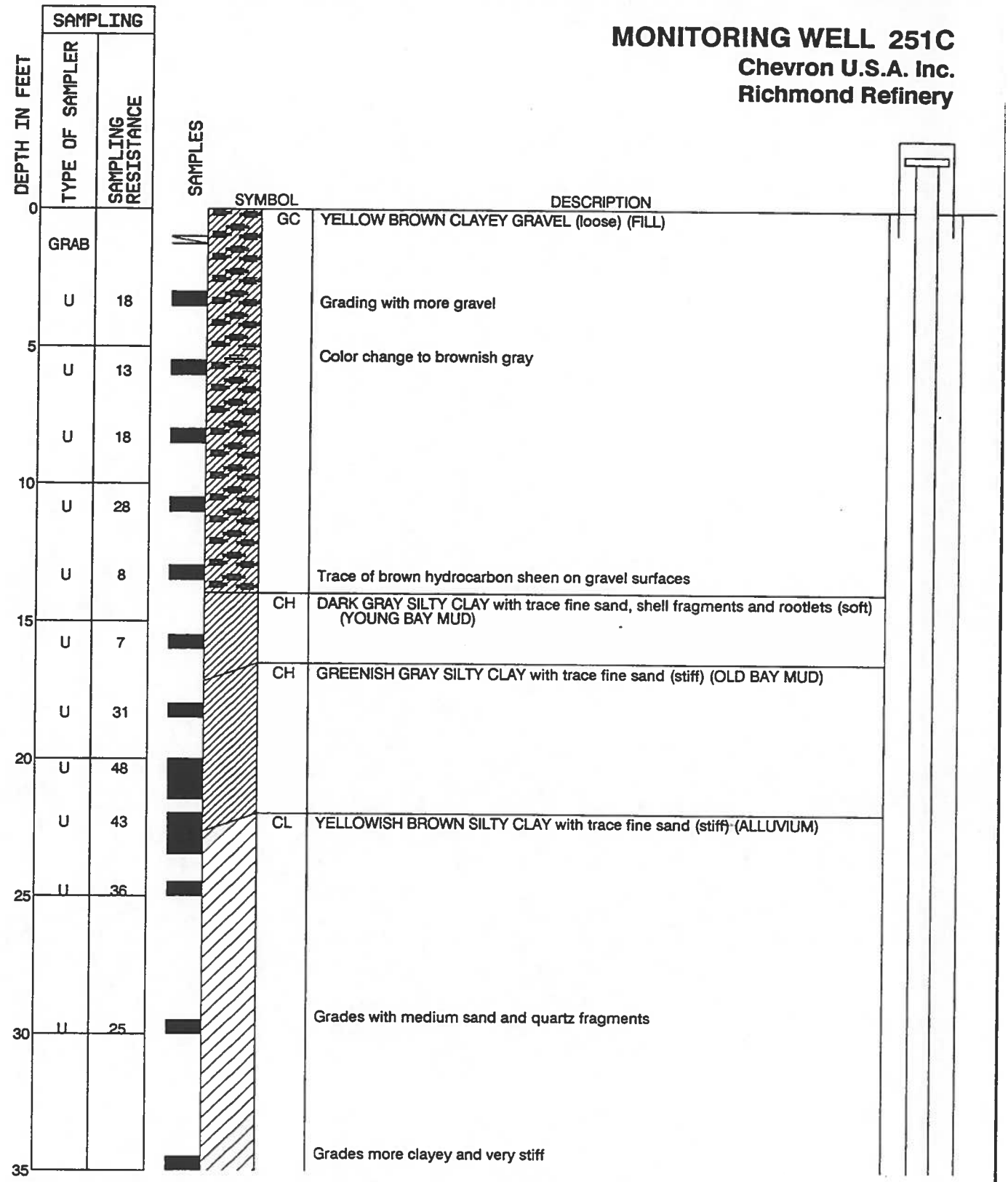
Chevron U.S.A. Products Co.
Richmond Refinery



Job No.: Ser. No.: 108-902	BEDM*	Log of Boring

MONITORING WELL 251C

Chevron U.S.A. Inc.
Richmond Refinery



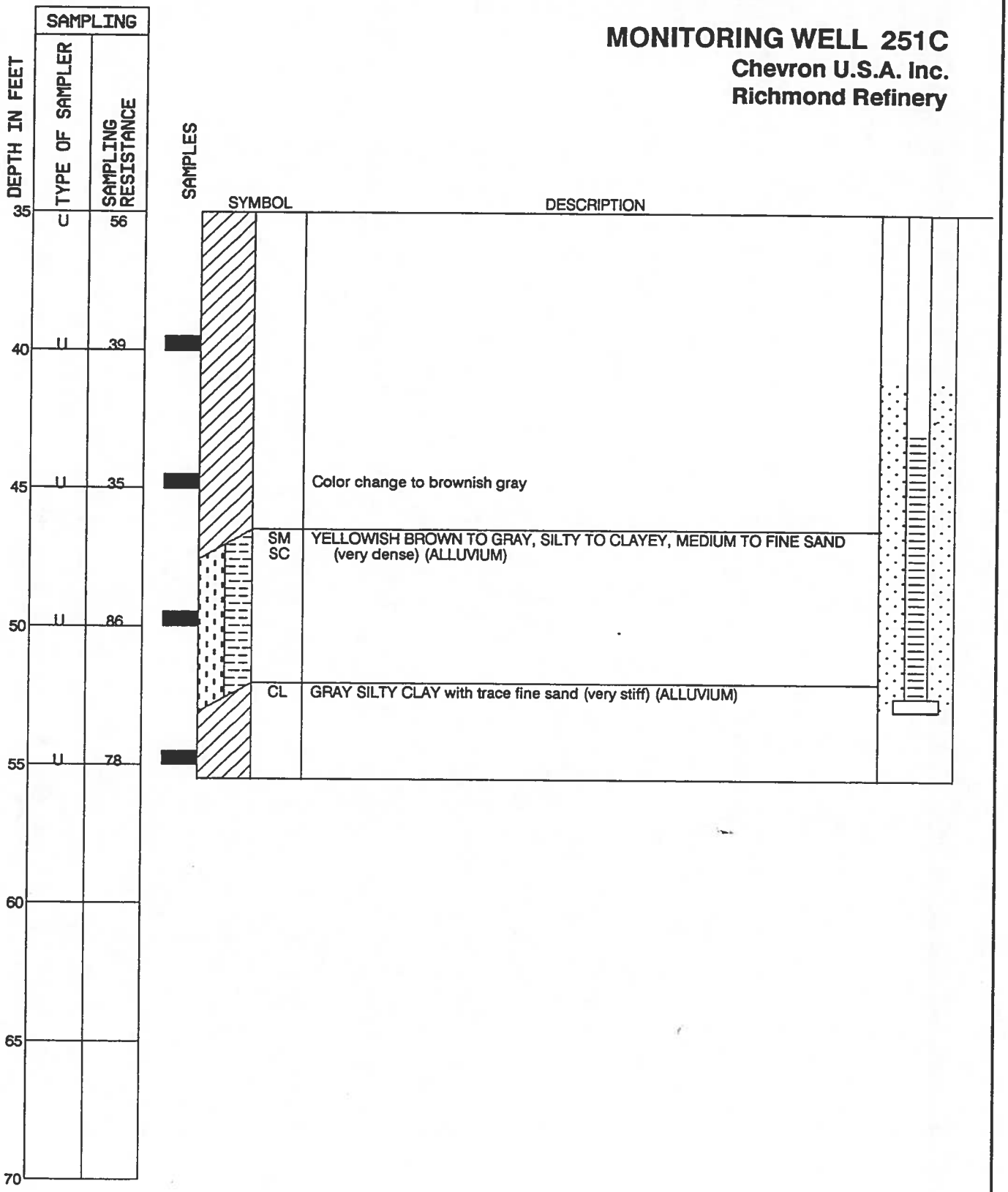
See Plate A-1 for general log notes and explanation of the terms and symbols.

Continued Next Page

Job No.: Ser. No.: I09-010	BEDM	**Log of Boring**
Date Completed: 3/13/89 Boring Depth: 55.5 ft.	Grade Elev: 10.78 ft. Richmond Refinery Datum (RRD) Coordinates: 2171076.84 N ; 6018410.36 E (Lambert Grid)	Location:
Top of Casing Elev: 13.55 ft. RRD Casing Depth: 53.0 ft.	Casing Type: Casing Diam: in.	Screened Interval: 43.0-53.0 ft. Effective Interval: 41.0-55.5 ft.
Slot Size: in. Sand Pack:		

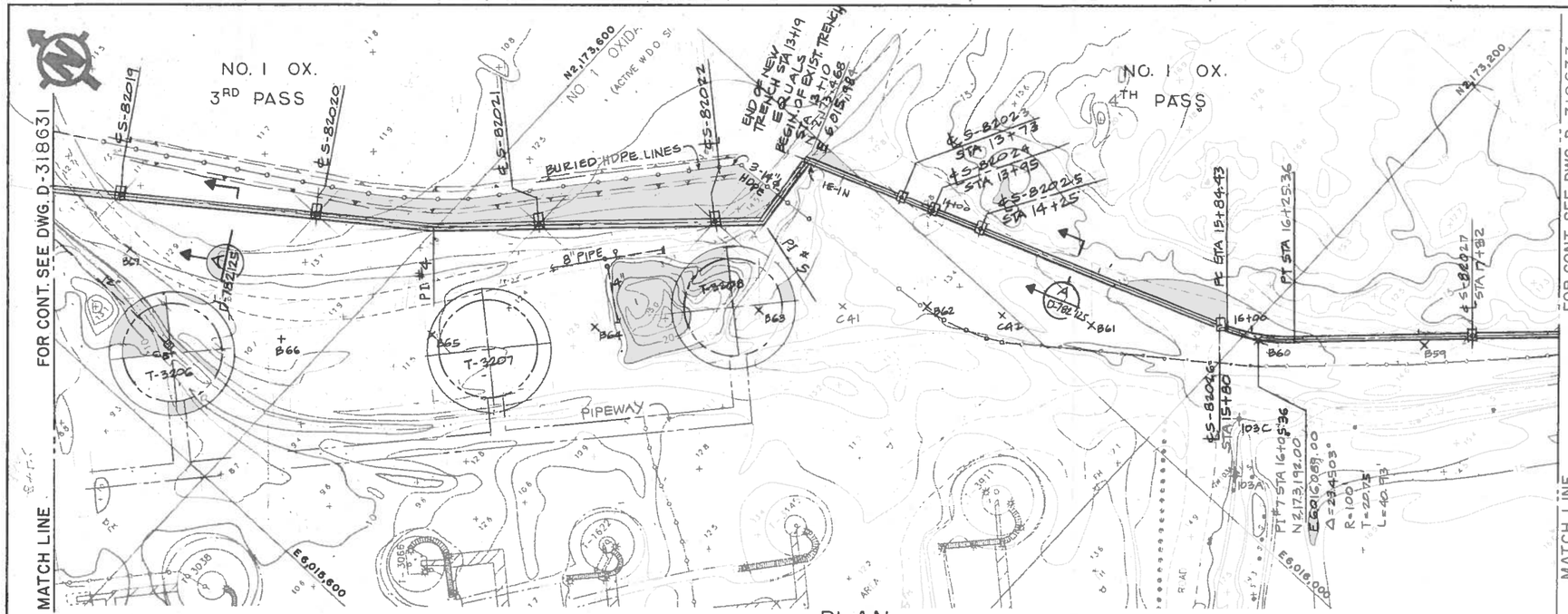
MONITORING WELL 251C

Chevron U.S.A. Inc.
Richmond Refinery



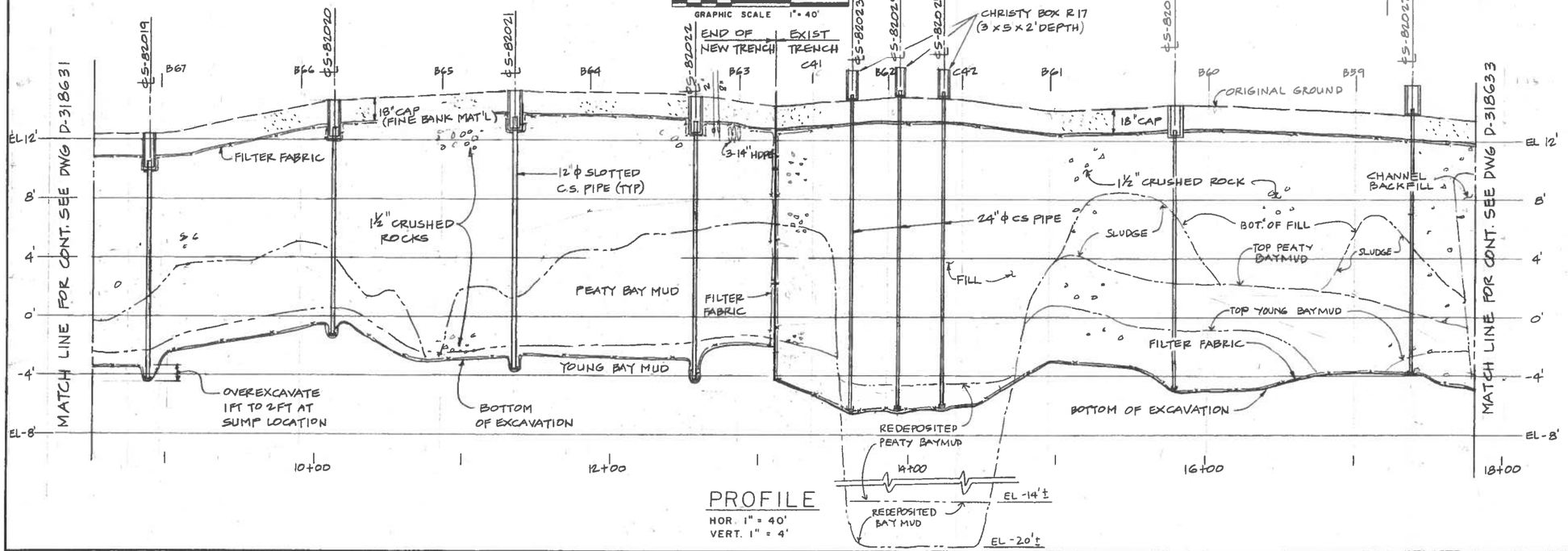
See Plate A-1 for general log notes and explanation of the terms and symbols.

Job No.: Ser. No.: 109-010	BEDM	Log of Boring



PLAN

GRAPHIC SCALE 1" = 40'



PROFILE

HOR. 1" = 40'
VERT. 1" = 4'

LIST OF MATERIALS

(FROM STA. 8+25 TO STA 13+19 ONLY) 494 LF

ITEM	QTY	DESCRIPTION	FURNISHED BY
1	1500T	1½" CRUSHED ROCKS (WASHED)	COMPANY
2	200T	FINE BANK MATERIAL (CAP)	↓
3	4 EA.	SANTA ROSA BOX MODEL #3L (2'x4'x2'D)	↓
4	25000 SF	FILTER FABRIC (MIRAFI 140 N)	CONTRACTOR
5	4 EA.	12" ϕ CS PIPE SCH. 40 SCREENED AS SHOWN ON DWG D-782125	↓

NOTES

1. FOR OTHER LIST OF MATERIALS AND GENERAL NOTES SEE DWG D-318631.
2. CONTRACTOR SHALL USE SHORING DURING TRENCH CONSTRUCTION.

Waste Discharge Order Project

BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 — D & M Project No. 19000

EXTRACTION TRENCH LOCATION PLAN & PROFILE 2 OF 4
SECTOR B2 - NORTH YARD (ISOMAX SEGMENT)
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

Chevron U.S.A. Inc. Richmond Refinery

SCALE AS SHOWN — DATE 3/5/93 — APPROVED

DR. AOL CH. RJS DR. APP. RJS ENGR. DMH

OPRS DEPT. ENG. DEPT.

S — W.O. — S.O. — D-318632-3

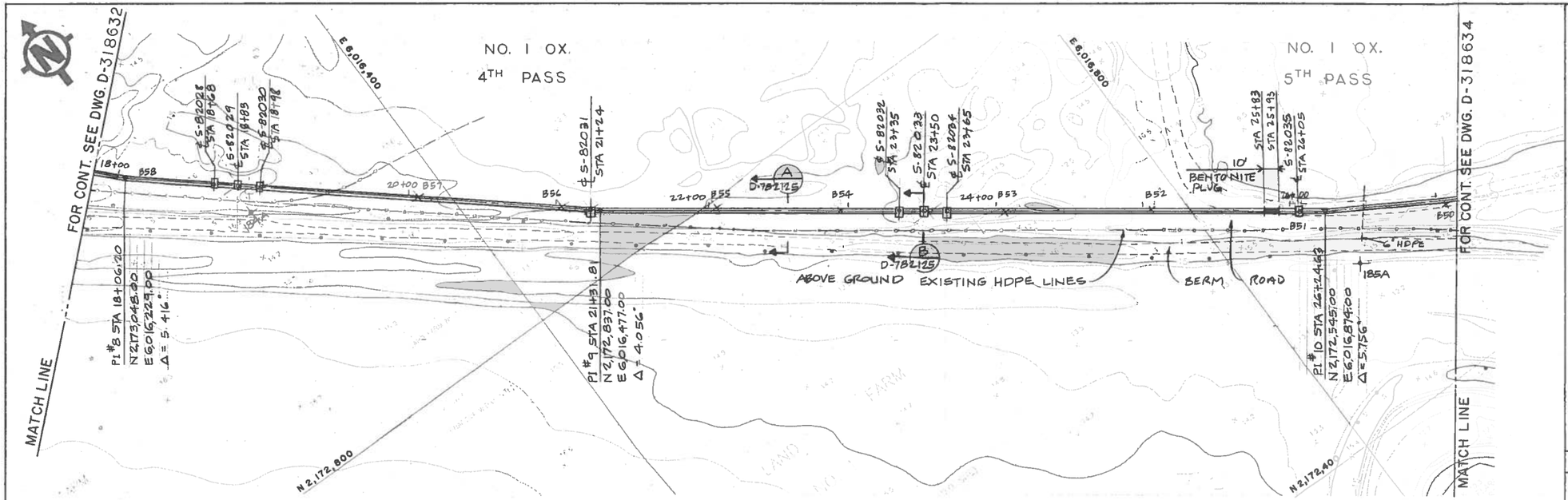
REFERENCE DRAWINGS

STANDARD EXTRACTION TRENCH SECT D-782125

REVISIONS

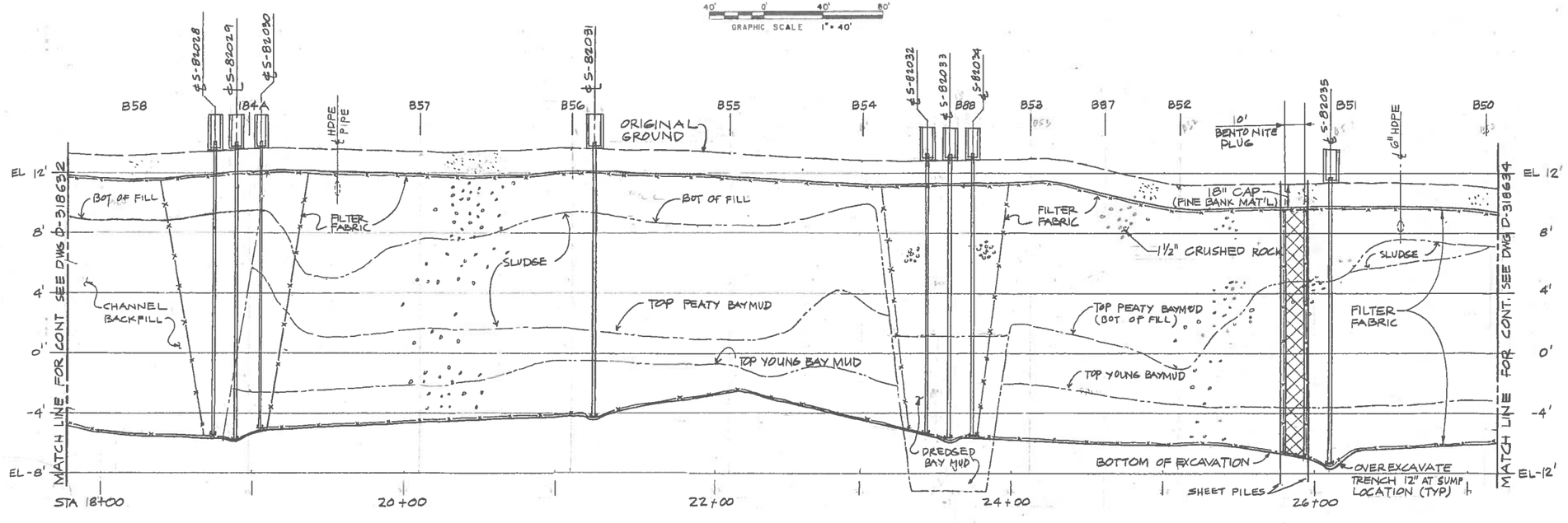
0	ISSUED FOR CONSTRUCTION 4/20/93	RJS	CM	DMH	2	ADDED TRENCH FROM STA 8+50 TO STA 13+19. ISSUED FOR CONSTRUCTION 5/5/95	RJS	DMH	GB
1	AS-BUILT 1/25/94	RJS	DMH	RJH	3	AS-BUILT ADDED TRENCH AT NO.1 OX. 3RD PASS 11/8/95	RJS	DMH	DMH
		STM	DRH	MMD			GM	PJD	

GO-880-D (8.18 ea. FL) (3-92)



PLAN

GRAPHIC SCALE 1" = 40'



PROFILE

HOR. 1" = 40'
VERT. 1" = 4'

NOTES:

1. FOR GENERAL NOTES AND LIST OF MATERIALS, SEE DWG. D-318631.

Waste Discharge Order Project

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

EXTRACTION TRENCH LOCATION PLAN & PROFILE 3 OF 4
SECTOR B2 - NORTH YARD (ISOMAX SEGMENT)
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

REFERENCE DRAWINGS	
STD. EXTRACTION TRENCH, SUMP SECTIONS & DET.	D-782125
EXTRACTION TRENCH LOCATION PLAN & PROFILE	D-318631

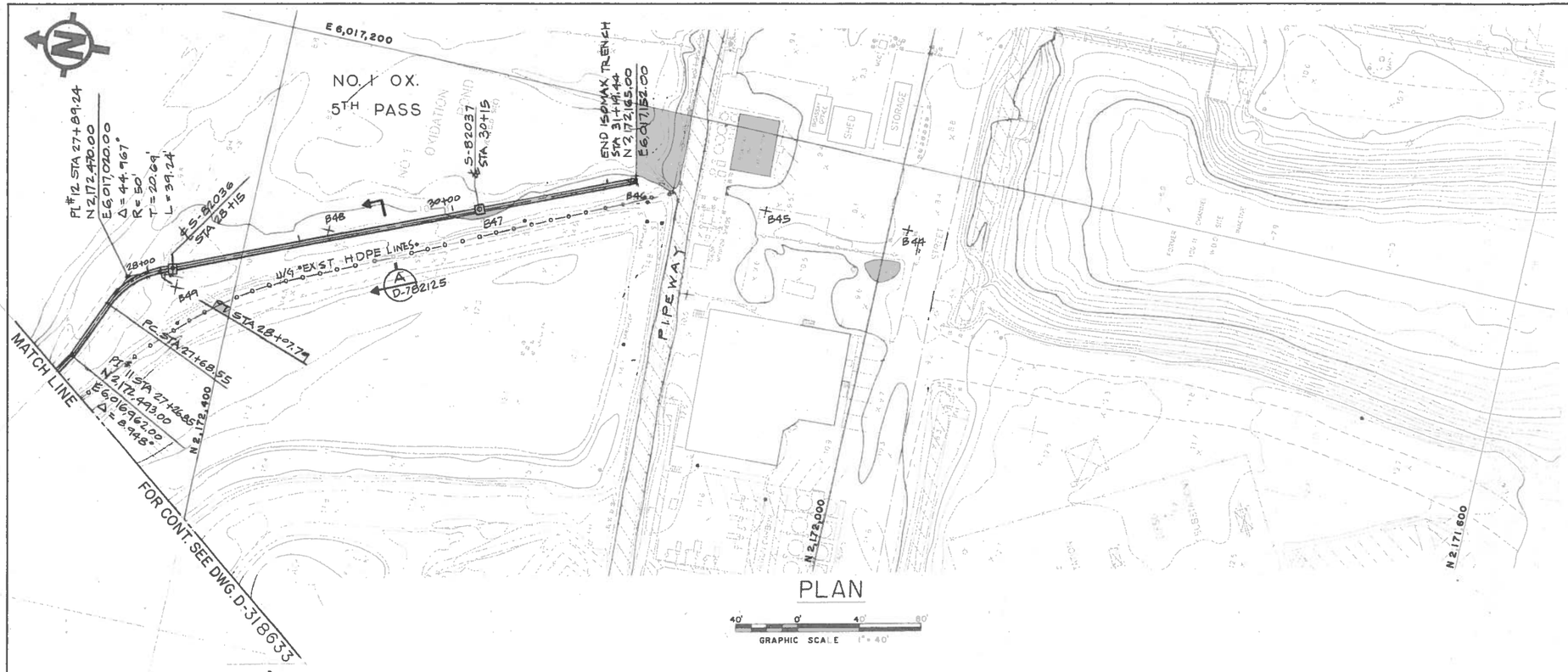
REVISIONS			
0 ISSUED FOR CONSTRUCTION 4/20/93	R/S	DMC	
1 AS-BUILT 1/25/94	RS	DMC	

Chevron U.S.A. Inc.
Richmond Refinery

SCALE AS SHOWN DATE 3/8/93 APPROVED
DR. AOL CH. R/S DR. APP. R/E ENGR. DMC
OPR'G DEPT. ENG. DEPT. SAM RKS

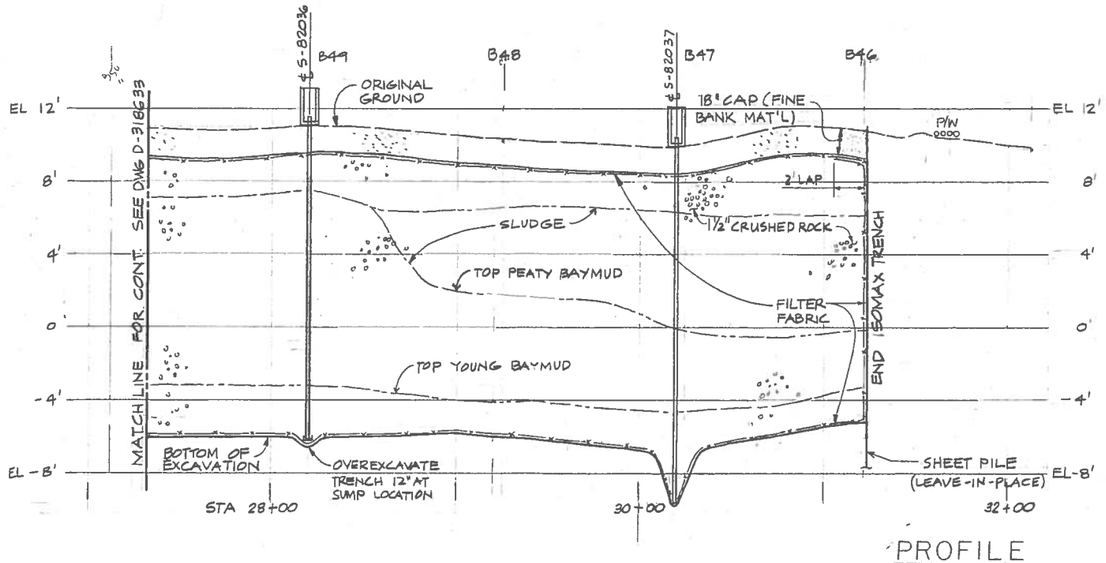
S W.O. S.O. D-318633-1

GO-580-D (9.19 sq. ft.) (3-82)



PLAN

GRAPHIC SCALE 1" = 40'



PROFILE

HOR. 1" = 40'
VERT. 1" = 4'

NOTES:

1. FOR GENERAL NOTES AND LIST OF MATERIALS, SEE DWG. D-318631.

Waste Discharge Order Project

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 — D & M Project No. 19000

REFERENCE DRAWINGS	
STD. EXTRACTION TRENCH, SUMP SECTIONS & DETAILS	D-782125
EXTRACTION TRENCH LOCATION PLAN & PROFILE	D-318631

REVISIONS			
0 ISSUED FOR CONSTRUCTION 4/20/93	R/S	GM	DM
	RKS	DBM	TQ
1 AS-BUILT 1/25/94	R/S	DM	GM
	STM	RKS	

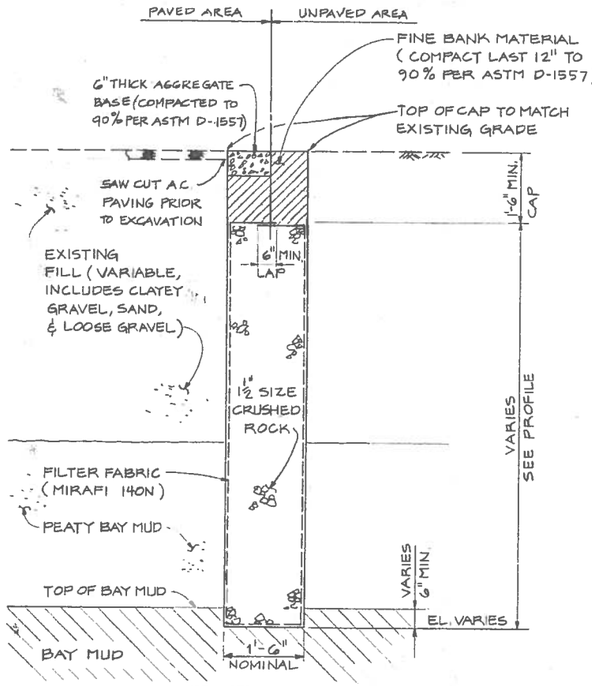
Chevron U.S.A. Inc.
Richmond Refinery

SCALE AS SHOWN — DATE 3/5/93 — APPROVED
DR. AOL — CH. R/S — DR. APP. R/S — ENGR. DM
OPR'G DEPT. — ENG. DEPT. GRM RKC — 4/15/93

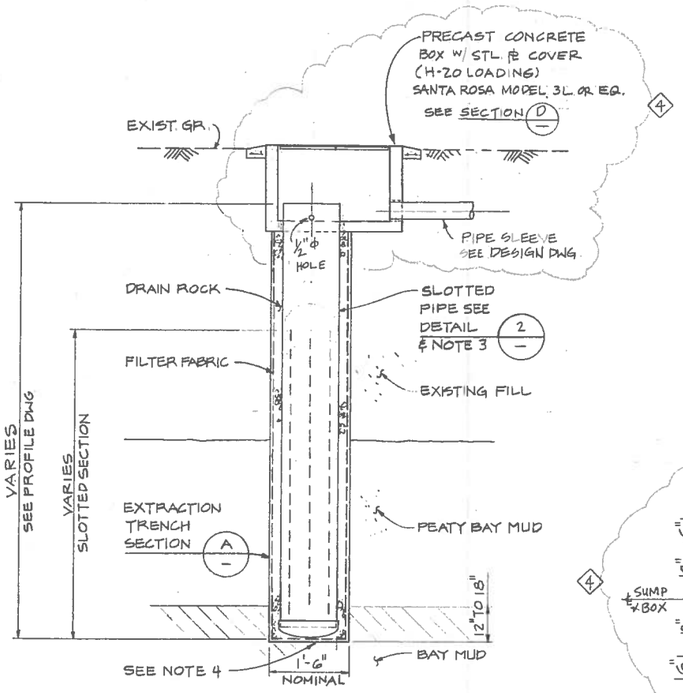
EXTRACTION TRENCH LOCATION PLAN & PROFILE 4 OF 4
SECTOR 82 - NORTH YARD (ISOMAX SEGMENT)
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

S — W.O. — S.O. — D-318634-1

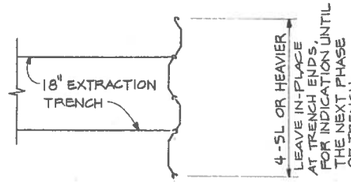
GO-580-D (5.18 sq. ft.) (3-82)



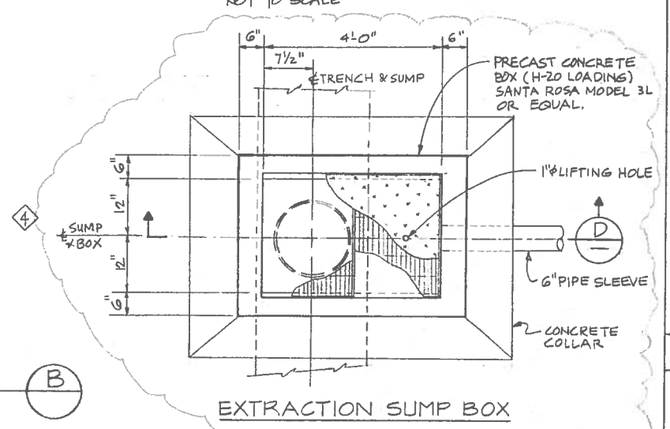
TYP. EXTRACTION TRENCH SECTION (A)



TYP. BELOW GRADE EXTRACTION SUMP SECTION (B)

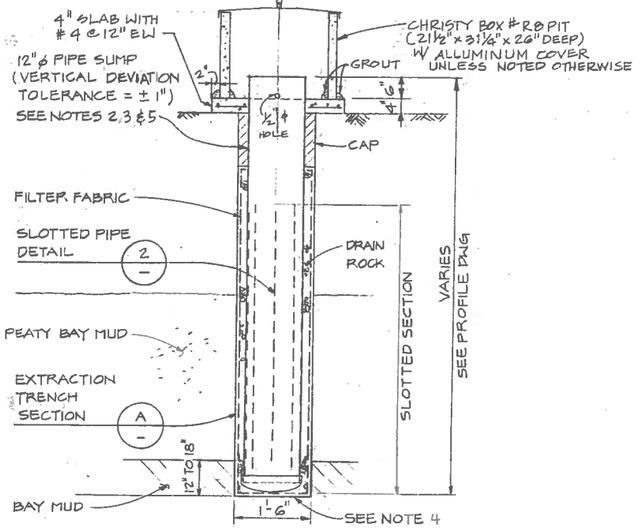


SHEET PILE PLAN
NOT TO SCALE

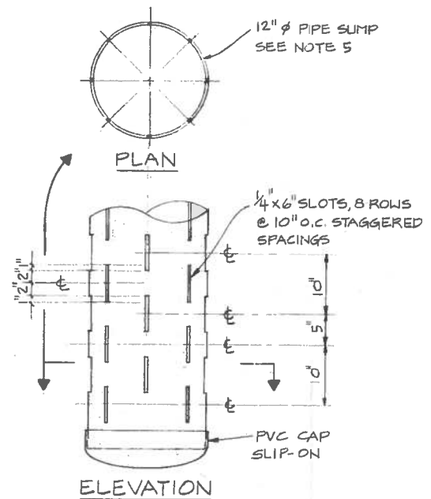


EXTRACTION SUMP BOX PLAN
NO SCALE

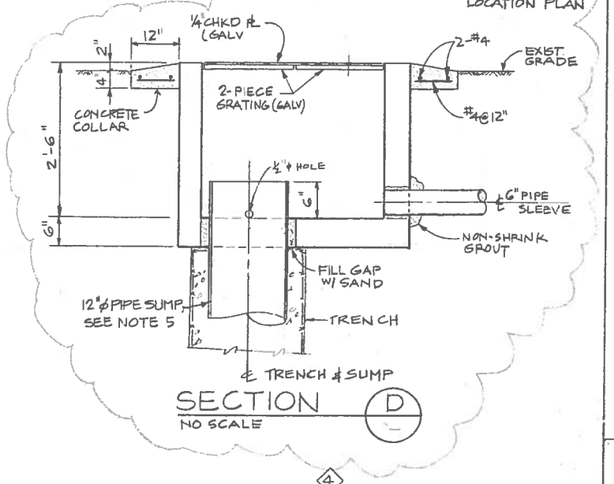
NOTE: FOR BOX ORIENTATION SEE LOCATION PLAN



TYP. ABOVE GRADE EXTRACTION SUMP SECTION (C)
SCALE: ½" = 1'-0"



TYP. PIPE SLOTS DETAIL (2)
SCALE: 1" = 1'-0"



SECTION (D)
NO SCALE

NOTES

1. CRUSHED ROCK MATERIAL SHALL BE HARD, DURABLE CLEAN CRUSHED STONE 100 % PASSING 1½" SEIVE AND 0-3 % PASSING ¾" SEIVE.
2. DELETED
3. SUPPORT PIPE SUMP IN-PLACE UNTIL ROCK IS INSTALLED AROUND PIPE.
4. OVEREXCAVATE TRENCH 6" TO 12" DEEPER WITHIN 3' ± FROM CENTER OF SUMP AT THE SUMP LOCATION.
5. SUMP MATERIAL SELECTION SHALL BE DETERMINED BY CORROSION ENGINEER, BASED ON SITE SPECIFIC DATA.

Waste Discharge Order Project

BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 — D & M Project No. 19000

STANDARD EXTRACTION TRENCH, SUMP SECTIONS & DETAILS
SITE 80 - REFINERY WIDE
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATION DIVISION

REFERENCE DRAWINGS

EXTRACTION TRENCH LOCATION PLAN		
EXTRACTION TRENCH LOCATION PLAN		
EXTRACTION TRENCH PROFILE		

REVISIONS

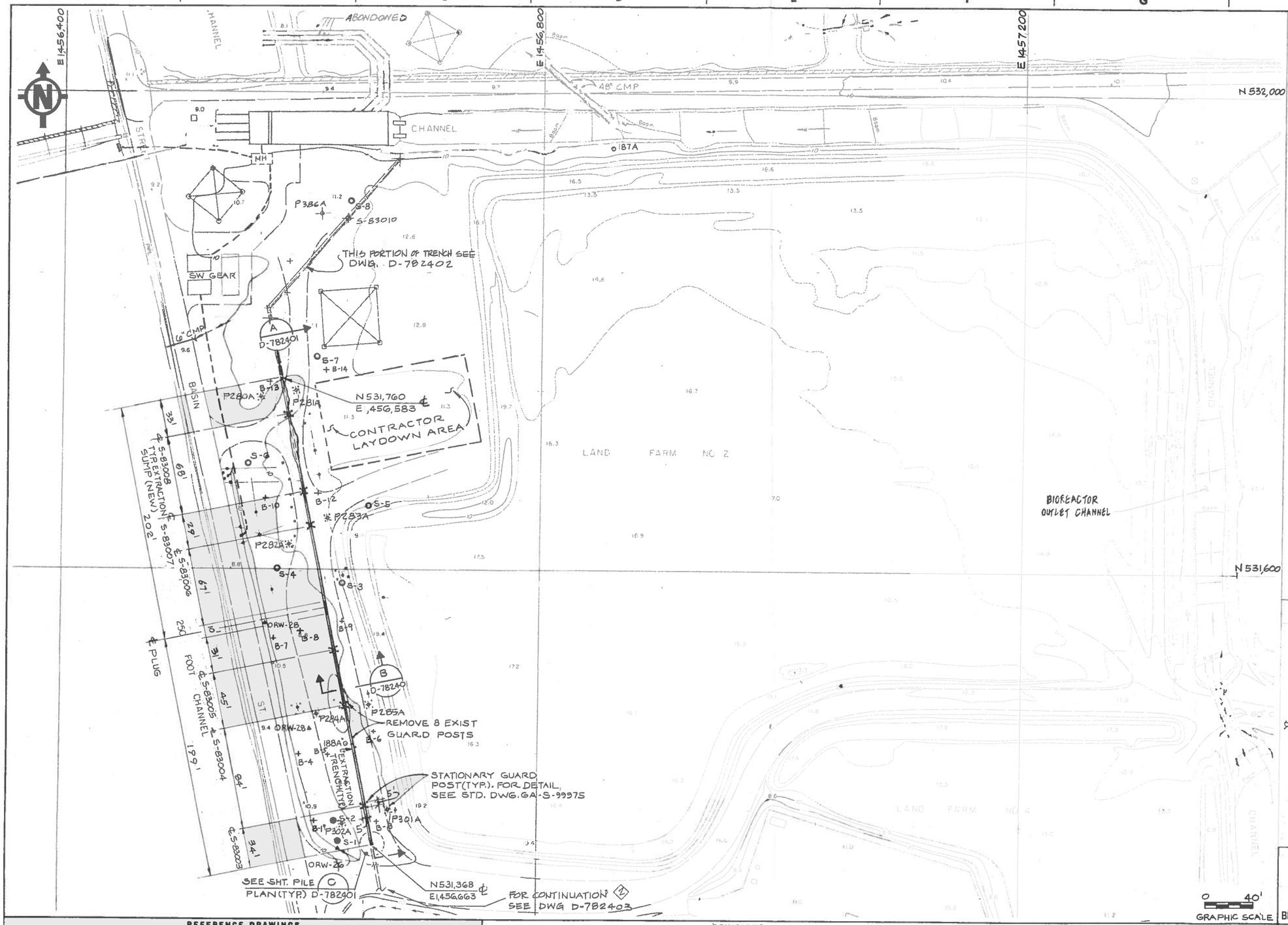
4 REVISED BELOW GRADE EXTRACTION SUMP BOX PLAN, SECTION-B AND SECTION-D. 10/25/93	2 ADDED BOX ON SECT. "C"; REPLACED PIPE TRENCH WITH PIPE SLEEVE & REVISED CAP 2/14/92
1 REVD SECT. A, B & D AS SHOWN 3/19/91	3 REVISED SUMP BOTTOM & ADDED WEEP HOLE. DELETED NOTE 2 5/21/93

Chevron U.S.A. Inc.
Richmond Refinery

SCALE AS SHOWN — DATE 11/14/90 — APPROVED
DR. ZLC — CH. — DR. APP. R/S — ENGR. MEH
OPR'G DEPT. — ENG. DEPT. GJH

S — W.O. — S.O. — D-782125 - 4

GD-580-OR (0.25 sq. ft.) Printed in U.S.A.



GENERAL NOTES:

1) COORDINATES SHOWN ARE BASED ON REFINERY COORDINATES SYSTEM (1927 NAD). ELEVATIONS SHOWN ARE BASED ON REFINERY DATUM.
2) CONTOURS AND POINT ELEVATIONS ARE TAKEN FROM REFINERY BASE MAP DRAWINGS AND MAY NOT BE TRUE TO DATE.
3) ALL EXCAVATED MATERIALS SHALL BE CONSIDERED CONTAMINATED AND SHALL BE DISPOSED BY CHEVRON ACCORDINGLY.
4) NO ACCESS PERMITTED TO LANDFARM NO. 2 OR 250 FT. CHANNEL.

LEGEND

- SUMP W/CMP CASING (EXIST.)
- SUMP W/O CASING (EXIST)
- OBSERVATION WELLS (EXIST)
- MONITORING WELLS (EXIST)
- POWER POLE (EXIST)
- NEW EXTRACTION TRENCH
- NEW EXTRACTION SUMP (S-830xx)
- EXIST. SOIL BORINGS (B-x)
- PIEZOMETER (PxxxA)

Waste Discharge Order Project

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 — D & M Project No. 19000

EXTRACTION TRENCH LOCATION PLAN
SECTOR 83 - LANDFARM 2/250 FT CHANNEL
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

REFERENCE DRAWINGS	
EXTRACTION TRENCH SECT. & DETAILS	D-782401
EXTRACTION TRENCH LOCATION PLAN (PHASE II)	D-782402
EXTRACTION TRENCH LOCATION PLAN (PHASE II)	D-782403

REVISIONS

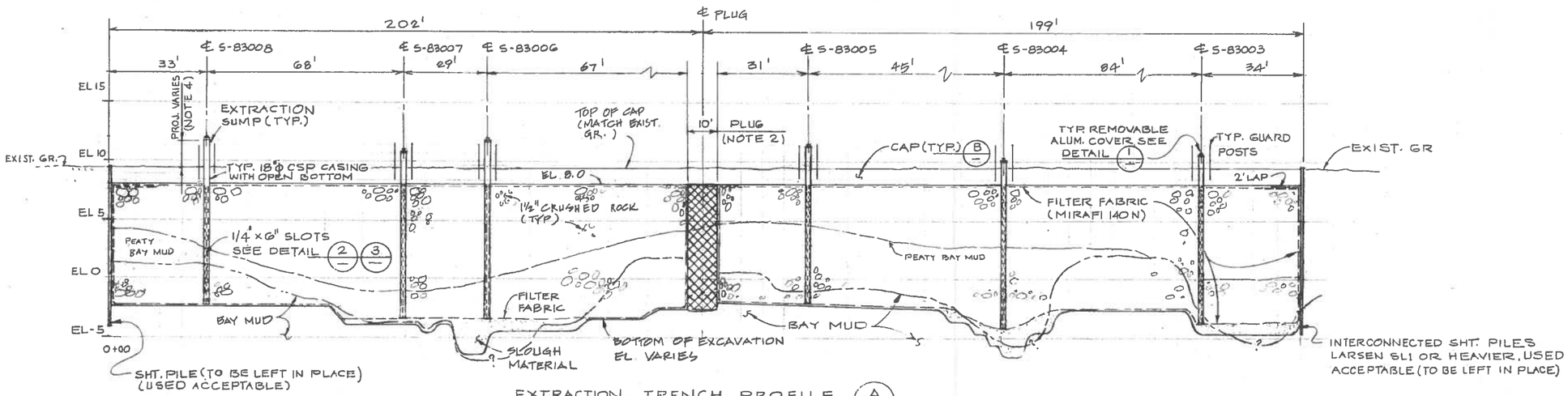
0 ISSUED FOR CONSTRUCTION	BL	RLS	HSH
4/03/90		MJ	
1 REVISED TRENCH WIDTH AS BUILT			
8-6-90	RLS	JMD	
2 "AS BUILT"	RLS	RKS	PMA
11/19/91	HSH	WEB	

Chevron U.S.A. Inc.
Richmond Refinery

SCALE 1" = 40'-0" — DATE 3/5/90 — APPROVED
DR. BL — CH. RLS — DR. APP. RLS — ENGR. HSH
OPR'G DEPT. — ENG. DEPT. — 1/5/90

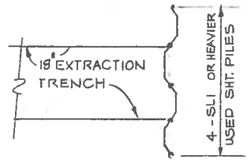
S — W.O. — S.O. — D-782400-2

GO 580-D (5 18 sq. ft.) (3-82)



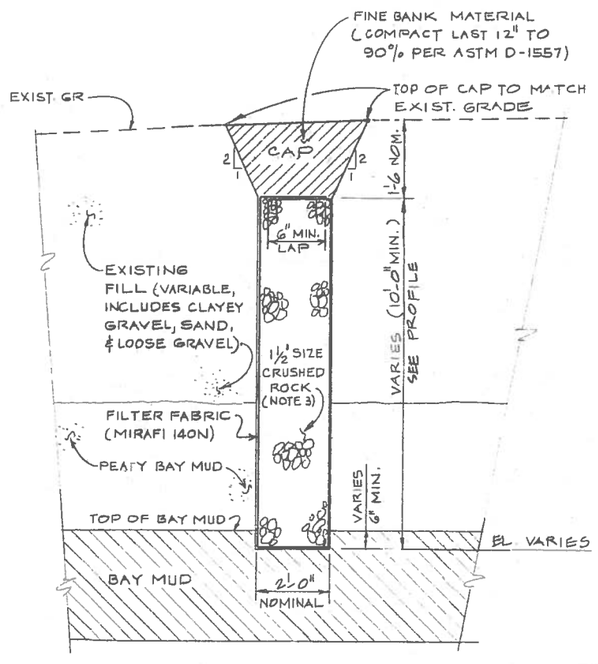
EXTRACTION TRENCH PROFILE (A) D-782400

SCALE: 1" = 20'-0" HORIZ
1' = 5'-0" VERT.



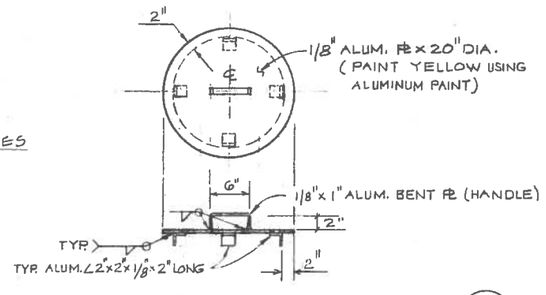
SHEET PILE PLAN (C) D-782400

NOT TO SCALE



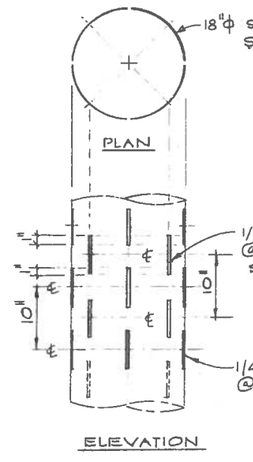
TYP. EXTRACTION TRENCH SECTION (B) D-782400

SCALE: 1/2" = 1'-0"



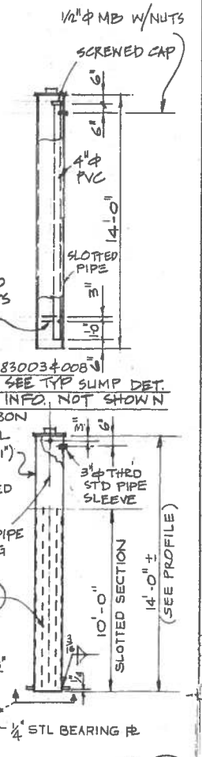
REMOVABLE ALUM. COVER DETAIL (1)

SCALE: 1" = 1'-0"



TYP. PIPE SLOTS DETAIL (2)

SCALE: 1" = 1'-0"



TYP. SLOTTED PIPE DET. (3)

SCALE: 1" = 4'-0"

LIST OF MATERIALS

ITEM	QTY	DESCRIPTION	FURNISHED BY
1	1 LOT	CRUSHED STONE: 1½" MAX. SIZE 100% PASSING, ¾" MIN., 0 TO 3% PASSING	CONTRACTOR
2	1 LOT	FILTER FABRIC (MIRAFI 140N)	CONTRACTOR
3	6 EA.	18"ϕ CARBON STEEL PIPE, SCH 40 SCREENED AS SHOWN & ALUM. COVER	CONTRACTOR
4	1 LOT	AMERICAN ASPHALT INC. #701 FINE BANK MATERIAL	CONTRACTOR
5	1 LOT	SAND & BENTONITE PLUG	CONTRACTOR
6	1 LOT	SHEET PILES	CONTRACTOR
7	24 EA	STATIONARY GUARD POST PER STD. DWG. GA-5-99975	CONTRACTOR

NOTES:

1) FOR GENERAL NOTES, SEE DWG. D-782400

2) USE 10:1 MIXTURE OF SAND TO BENTONITE FOR TEN FEET LONG PLUG.

3) CRUSHED ROCK MATERIAL TO BE USED FOR EXTRACTION TRENCH SHALL BE HARD, DURABLE CRUSHED STONE PER GRADATION SHOWN ON THE LIST OF MATERIALS (ITEM NO. 1).

4) EXPOSED PORTION OF SUMP SHALL BE PAINTED YELLOW SIMILAR TO GUARD POST DETAIL SHOWN ON STD. DWG. GA-5-99975.

Waste Discharge Order Project

BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

REFERENCE DRAWINGS

EXTRACTION TRENCH LOCATION PLAN	D-782400

REVISIONS

0	ISSUED FOR CONSTRUCTION 4/03/90	BL	RLS	WEH	
1	REVISED TRENCH WIDTH FROM 24" TO 18" 4/30/90				
2	REVISED TRENCH BOTTOM, WIDTH AND DEPTH AS BUILT 8-6-90				
3	"AS BUILT" 11/19/91				

Chevron U.S.A. Inc. Richmond Refinery

SCALE AS SHOWN DATE 3/4/90 APPROVED

DR. BL CH. RLS DR. APP. RLS ENGR. WEH

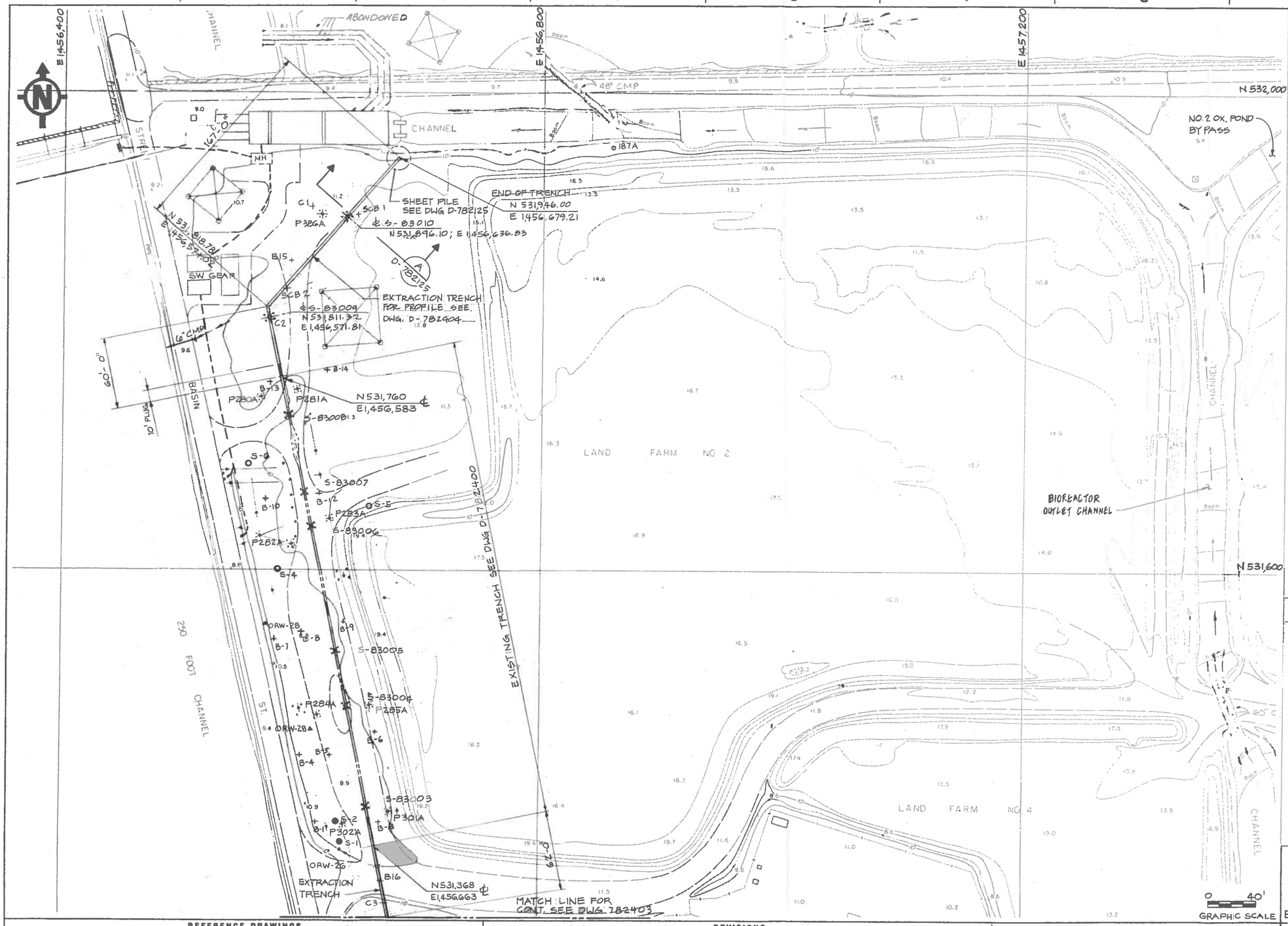
OPR'G DEPT. ENG. DEPT.

EXTRACTION TRENCH SECTIONS & DETAILS
SECTOR B3 - LANDFARM 2/250 FT CHANNEL
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

S W.O. S.O.

D-782401-3

GO-580 D (5,18 sq. ft.) (3-82)



GENERAL NOTES:

1) COORDINATES SHOWN ARE BASED ON REFINERY COORDINATE SYSTEM (1927 NAD). ELEVATIONS SHOWN ARE BASED ON REFINERY DATUM.
2) CONTOURS AND POINT ELEVATIONS ARE TAKEN FROM REFINERY BASE MAP DRAWINGS AND MAY NOT BE TRUE TO DATE.
3) ALL EXCAVATED MATERIALS SHALL BE CONSIDERED CONTAMINATED AND SHALL BE TRANSPORTED TO A LOCATION WITHIN THE REFINERY AS DESIGNATED BY THE CO. REP.
4) NO ACCESS PERMITTED TO LANDFARMS 2 & 5 OR 250 FT. CHANNEL.

LEGEND:

- ● SUMP W/ CMP CASING (EXIST.)
- ○ SUMP W/O CASING (EXIST.)
- ▲ OBSERVATION WELLS (EXIST.)
- ○ MONITORING WELLS (EXIST.)
- ✗ POWER POLE (EXIST.)
- NEW EXTRACTION TRENCH
- EXIST. EXTRACTION TRENCH
- EXTRACTION SUMPS (S-830xx)
- \+ EXIST. SOIL BORINGS, CPT's AND SPOILS CHARACTERIZATION BORINGS (SCB-X)

REFERENCE DRAWINGS

STANDARD EXTRACTION TRENCH & SUMP SECTIONS & DETAILS	D-782125
EXTRACTION TRENCH LOCATION PLAN	D-782403
EXTRACTION TRENCH PROFILE AND SECTIONS	D-782404
FINISHED GRADING PLAN	D-782407

REVISIONS

0	ISSUED FOR CONSTRUCTION	11/26/90	ZLC	MH		
1	ADDED SCB-1 & 2, DELETED S-7 & S-8 & REV. NOTE 3	2/1/91	ZLC	MH	PMB	
2	"AS BUILT"	11/19/91		RJS	PMB	

Chevron U.S.A. Inc.
Richmond Refinery

SCALE 1" = 40' DATE 11/26/90 APPROVED
DR. ZLC CH. DR. APP. RJS ENGR. MH
OPR'G DEPT. ENG. DEPT. PMB

Waste Discharge Order Project

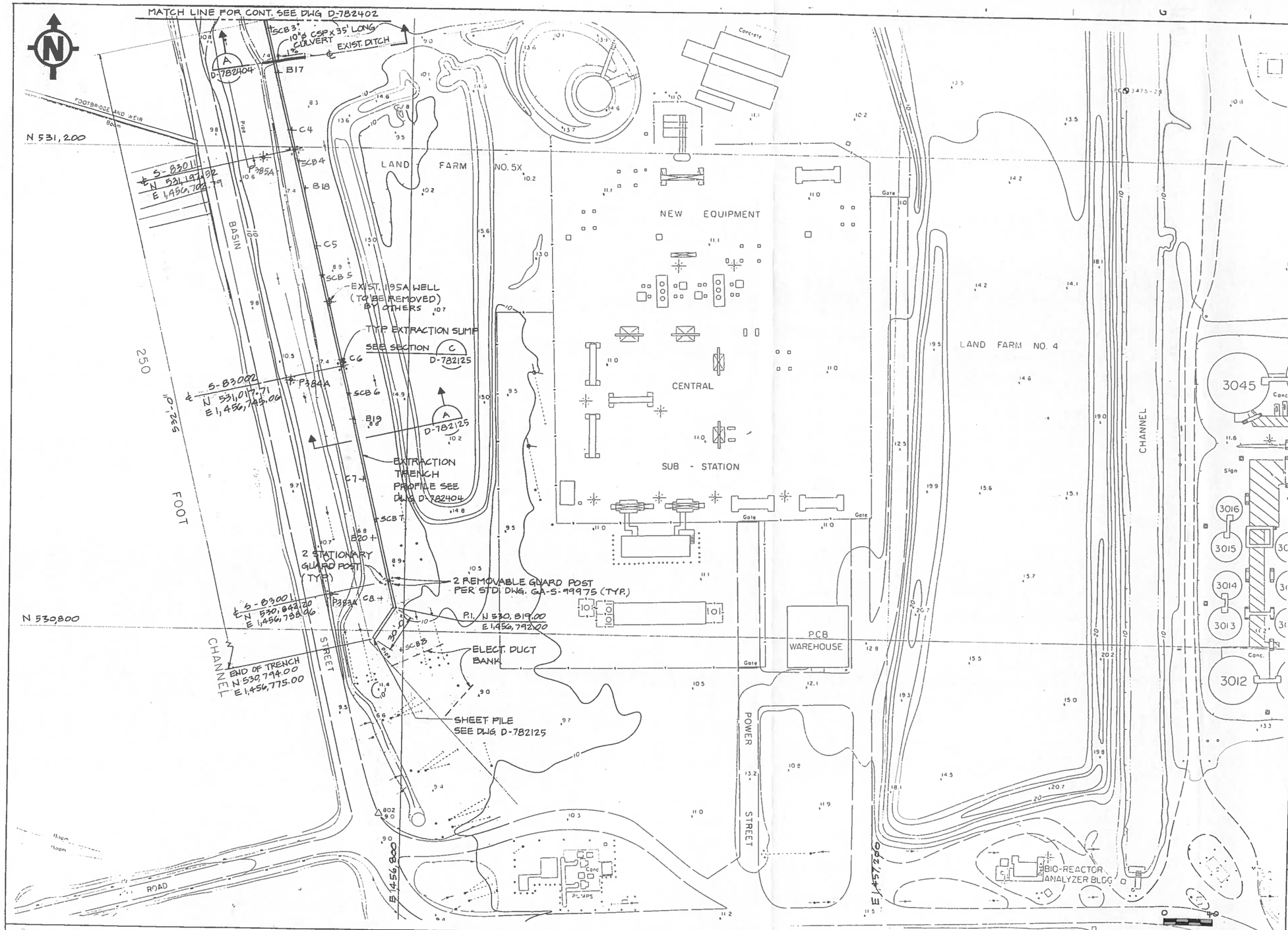
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

EXTRACTION TRENCH LOCATION PLAN
SECTOR 83 - LANDFARMS 2 & 5
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

S W.O. S.O. D-782402-2

GD 580-D (6 1/8 sq. fl.) (3-82)



LIST OF MATERIALS

ITEM	QTY	DESCRIPTION	FURNISHED BY
1	1 LOT	CRUSHED STONE: 1½" MAX. SIZE 100% PASSING; ¾" MIN., 0 TO 3% PASSING	BY COMPANY
2	1 LOT	FILTER FABRIC (MARAFI 140N)	CONTRACTOR
3	3 EA.	12"ø PIPE LIGHT WALL TYPE 304L SS SCREENED AS SHOWN & ALUM COVER	CONTRACTOR
4	1 LOT	AMERICAN ASPHALT INC. # 701 FINE BANK MATERIAL (CAP)	BY COMPANY
5	1 LOT	SAND & BENTONITE PLUG	CONTRACTOR
6	1 LOT	SHEET PILES (USED ACCEPTABLE)	
7	6 EA.	REMOVABLE GUARD POST PER STD. DWG. GA-S-99975	
8	6 EA.	STATIONARY GUARD POST PER STD DWG. GA-S-99975	
9	35 LF	10"ø CSP CULVERT STD WT	
10	1 LOT	FINE SAND BEDDING MATERIAL & CLEAN FILL	
11	1 LOT	GUNITE	CONTRACTOR

NOTES

1. FOR GENERAL NOTES & LEGEND SEE DWG D-782402
2. FOR EXTRACTION TRENCH PROFILE SEE DWG D-782404

REFERENCE DRAWINGS	
STANDARD EXTRACTION TRENCH & SUMP SECTIONS & DETAILS	D-782125
EXTRACTION TRENCH LOCATION PLAN	D-782402
EXTRACTION TRENCH PROFILE AND SECTIONS	D-782404
FINISHED GRADING PLAN	D-782407

REVISIONS

0 ISSUED FOR CONSTRUCTION	11/26/90	ZLC	HEN PMA
1 ADDED SCB-3 THRU SCB-8 REV'D ITEM 3 LIST OF MAT'L & RELEASED HOLD	2/1/91	ZLC	HEN LLS PMA
2 REVISED TRENCH ALIGNMENT AS SHOWN	3/21/91	RLS	RES HEN PMA
3 "AS BUILT"	11/19/91	RLS	RES PMA

Chevron U.S.A. Inc.
Richmond Refinery

SCALE 1" = 40' DATE 11/26/90
DR. ZLC CH. DR. APP. RLS ENGR. HEN
OPR'G DEPT. ENG. DEPT. PMA
APPROVED

Waste Discharge Order Project

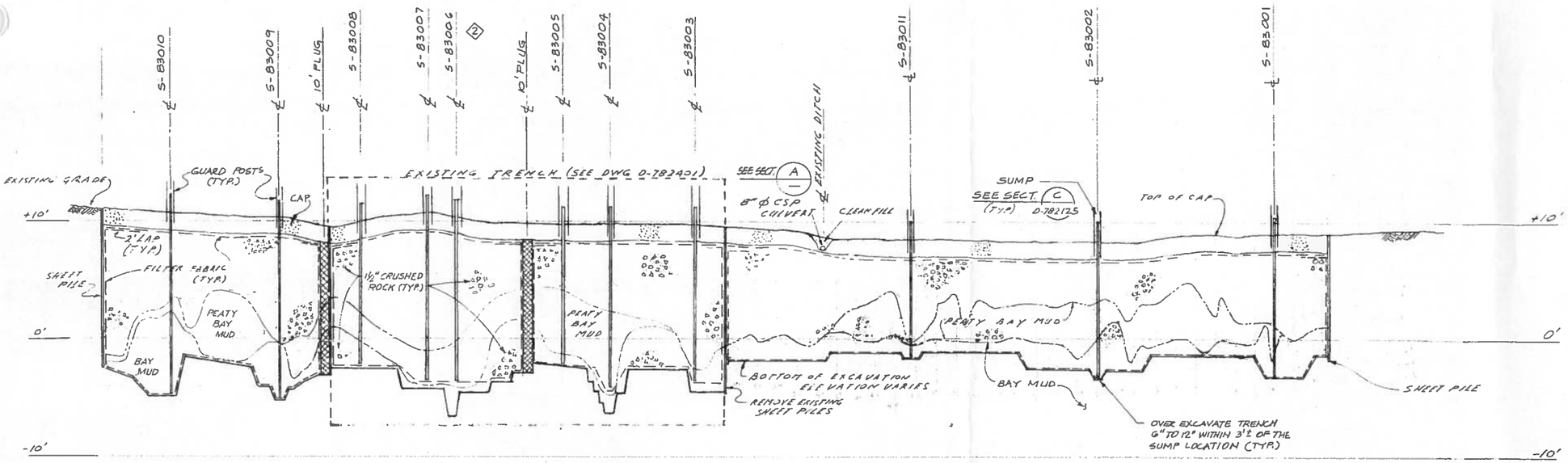
BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

EXTRACTION TRENCH LOCATION PLAN
SECTOR 83 - LANDFARMS 2 & 5
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

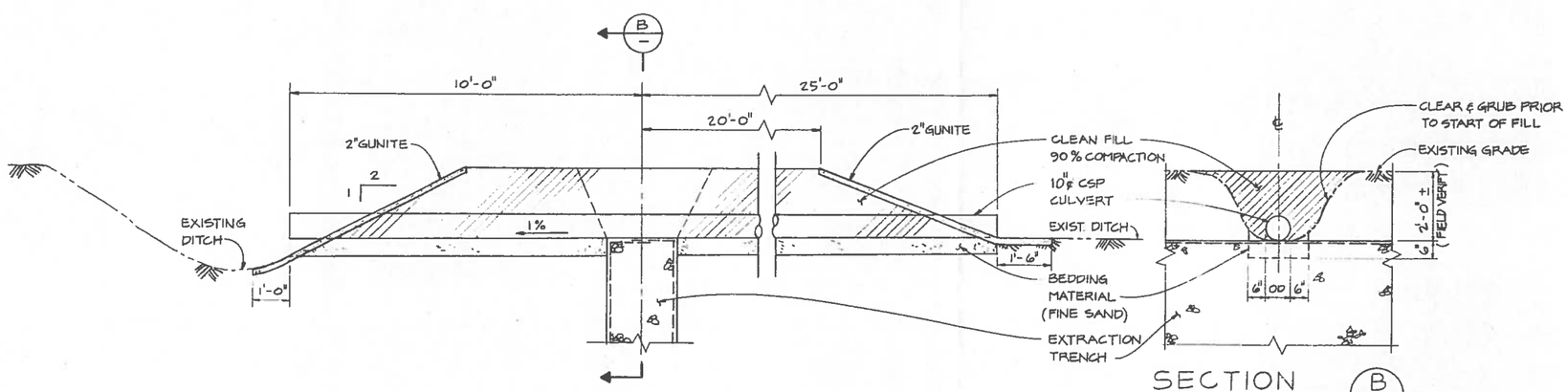
S W.O. S.O.

D-782403-3



EXTRACTION TRENCH PROFILE

HOR. 1" = 60'
VERT. 1" = 5'



SECTION A
SCALE: ½" = 1'-0"
D-782403

SECTION B
SCALE: ½" = 1'-0"

NOTES:

1. FOR GENERAL NOTES & LEGEND SEE DRAWING D-782402
2. EXTRACTION TRENCH LOCATION PLAN SEE DRAWINGS D-782402 & D-782403
3. USE 10:1 MIXTURE OF SAND TO BENTONITE FOR TEN FEET LONG PLUGS.
4. EXPOSED PORTION OF SUMP SHALL BE PAINTED YELLOW SIMILAR TO GUARD POST DETAIL SHOWN ON STD DWG GA-S-99975

REFERENCE DRAWINGS	
STANDARD EXTRACTION TRENCH & SUMP SECTIONS & DETAILS	D-782125
EXTRACTION TRENCH LOCATION PLAN	D-782402
EXTRACTION TRENCH LOCATION PLAN	D-782403

REVISIONS

0	ISSUED FOR CONSTRUCTION	11/26/90	ZLC
1	UPDATED BAY MUD LINE PER SPOILS CHARACTERIZATION BORINGS & REV. SUMP REFERENCE	2/1/91	ZLC
2	"AS BUILT"	11/19/91	

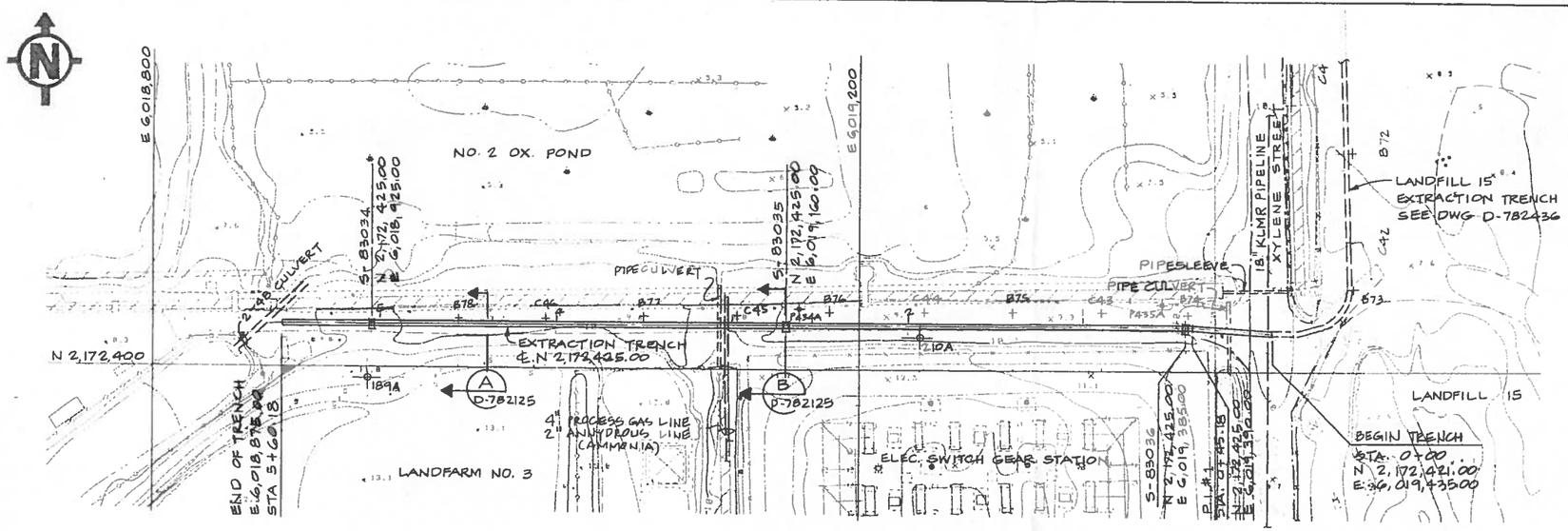
Chevron U.S.A. Inc.
Richmond Refinery

SCALE AS SHOWN
DATE 11/26/90
DR. PVV CH. DR. APP. RJS ENGR. MSB
OPR'G DEPT. ENG. DEPT.
APPROVED

EXTRACTION TRENCH PROFILE AND SECTIONS
SECTOR 83 - LANDFARMS 2 AND 5
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

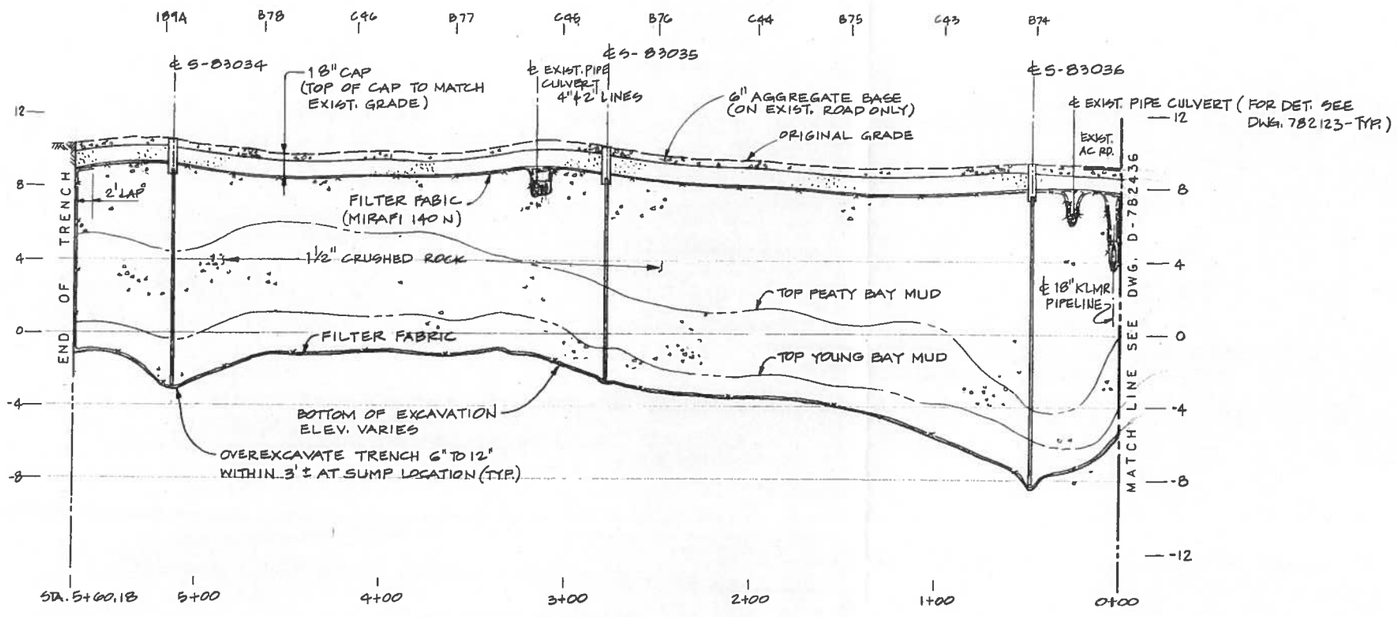
S W.O. S.O. D-782404-2

CO-580-DR (5.18 sq. ft.) (7-83) Printed in U.S.A.



PLAN
1"=40'

0' 40' 80'
GRAPHIC SCALE



PROFILE
HOR. 1"= 40' VERT. 1"= 4'

LIST OF MATERIALS

ITEM	QTY	DESCRIPTION	FURNISHED BY
1	2242 TONS	1½" CLEAN CRUSH ROCK (NOTE 4)	COMPANY
2	283 TONS	CLAYEY CAP FILL (NOTE 6)	CONTRACTOR
3	20 TONS	AGGREGATE BASE	COMPANY
4	1 LOT	FABRIC FILTER (MIRAFI 140 N)	CONTRACTOR
5	3	12" ϕ PIPE CARBON STEEL A53, SCH. 40 SCREENED AS SHOWN	↓
6	3 EA.	CHRISTY BOX WITH EXTENSION BOX & FLCOVER, B 1730 BOX.	↓

NOTES

1. COORDINATES SHOWN ARE BASED ON 1983 NORTH AMERICAN DATUM (N.A.D) COORDINATE SYSTEM.
2. ELEVATION SHOWN ARE BASED ON RICHMOND REFINERY DATUM.
3. ALL EXCAVATED MATERIALS SHALL BE DISPOSED OF IN ACCORDANCE WITH CONSTRUCTION SPECIFICATION.
4. CRUSHED ROCK MATERIAL SHALL BE HARD, DURABLE CLEAN CRUSHED STONE, 100% PASSING 1½" SIEVE AND 0-3% PASSING ¾" SIEVE.
5. THE SUBSURFACE SECTION SHOWN REPRESENTS OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED ON INTERPRETATION OF AVAILABLE DATA, LOCAL GEOLOGY AND OUR GENERAL EXPERIENCE IN THE AREA.
6. CLAYEY CAP FILL SHALL BE FINE BANK MATERIAL WITH HIGH CLAY CONTENT. APPROXIMATELY 2% WET OPTIMUM MOISTURE CONTENT TO REDUCE PERMEABILITY AND COMPACTED TO 90% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557.

LEGEND

- EXTRACTION TRENCH
- EXTRACTION SUMP
- RECOVERY WELL
- \+ CPT LOCATION (CX)
- \+ BORING LOCATION (BX)

Waste Discharge Order Project

BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

GPS LOCATION PLAN AND PROFILE
SECTOR B3 - LANDFARM NO. 3
GROUNDWATER PROTECTION SYSTEM
ENVIRONMENTAL OPERATIONS DIVISION

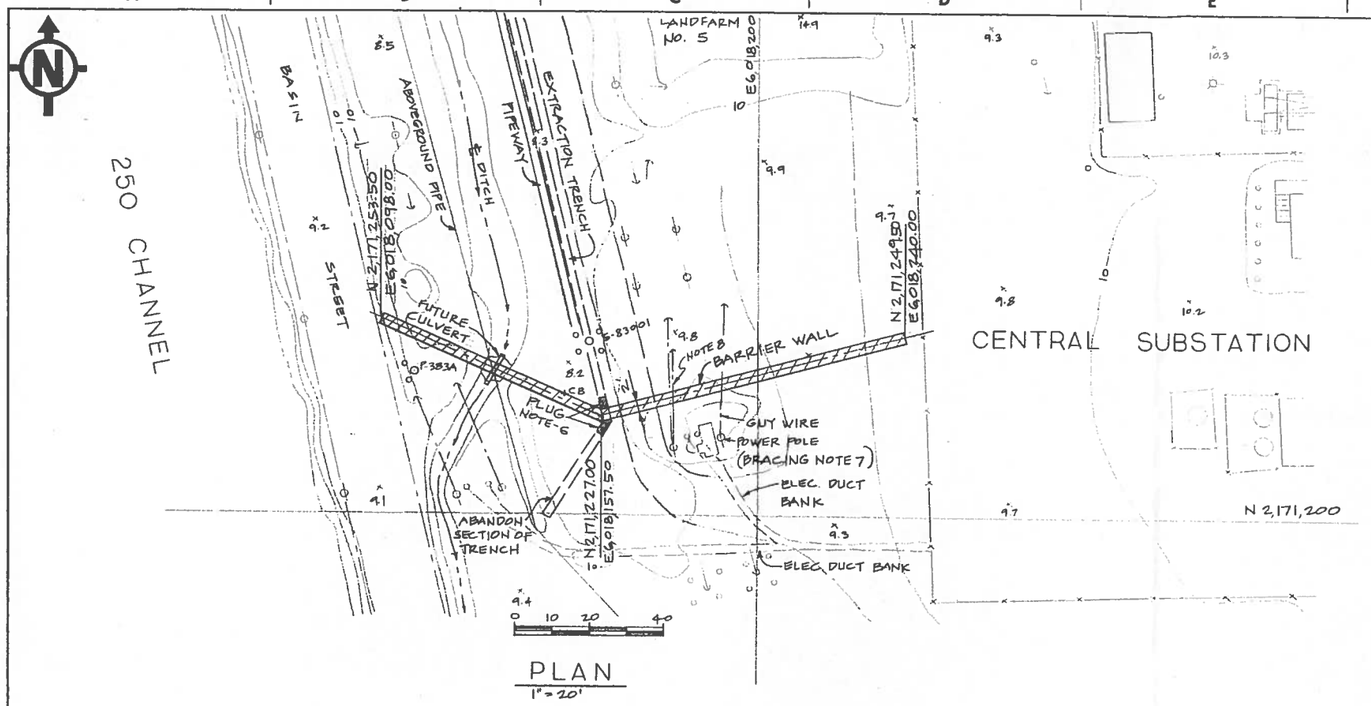
REFERENCE DRAWINGS	
GPS LOCATION PLAN & PROFILE (LF-15)	D-782436
EXTRACTION TRENCH SECTIONS & DETAILS	D-782125
TRENCH - PIPE OR DUCT BANK CROSSING	D-782123

REVISIONS			
0 ISSUED FOR CONSTRUCTION 11/1/91	OSB	DWS	SSK
1 AS-BUILT 12/2/92	RLS	DCW	DPL

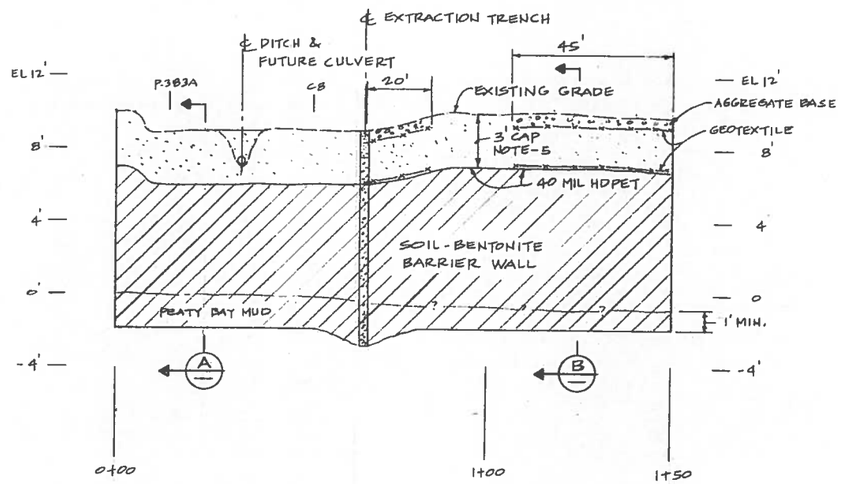
Chevron U.S.A. Inc.
Richmond Refinery

SCALE AS SHOWN DATE 10/3/91 APPROVED
DR. OSB CH. DR. APP. RLS ENGR. MEW
OPR'G DEPT. ENG. DEPT.

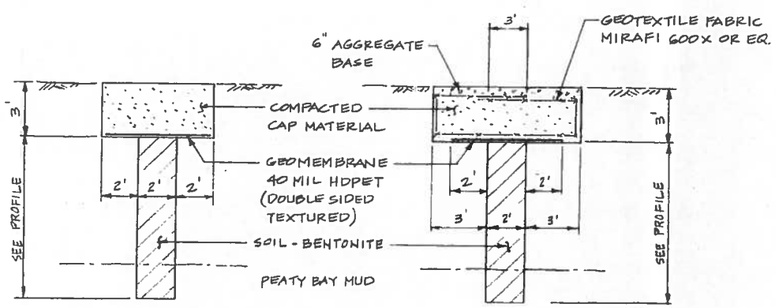
S W.O. S.O. D-782437-1



PLAN
1" = 20'



PROFILE
HOR: 1"=20'
VERT: 1"=4'



SECTION A
1"=4'

SECTION B
1"=4'

GENERAL NOTES

1. COORDINATES SHOWN ARE BASED ON 1983 NORTH AMERICAN DATUM COORDINATE SYSTEM.
2. ELEVATIONS SHOWN ARE BASED ON RICHMOND REFINERY DATUM.
3. ALL EXCAVATED MATERIAL SHALL BE DISPOSED OF IN ACCORDANCE WITH CONSTRUCTION SPECIFICATION RS-233.
4. SOIL-BENTONITE BACKFILL MIX SHALL BE IN ACCORDANCE WITH CONSTRUCTION SPEC. RS-233.
5. CAP MATERIAL SHALL BE FINE BANK MATERIAL WITH HIGH CLAY CONTENT. APPROXIMATELY 2% WET OPTIMUM MOISTURE CONTENT TO REDUCE PERMEABILITY AND COMPACTED TO 90% OF MAX. DRY DENSITY PER ASTM D-1557.
6. INSTALL PHYSICAL BARRIER PLUG AT THE EXTRACT. TRENCH & BARRIER WALL CROSSING TO PREVENT WATER-BENTONITE FLOW INTO THE EXTRACTION TRENCH.
7. BRACING OF POWER POLE SHALL BE DONE BY OTHERS PRIOR TO BARRIER WALL CONSTRUCTION.
8. OVERHEAD CLEARANCE OF GUY WIRE IS APPROX. 15'.

REFERENCE DRAWINGS

REVISIONS

0	ISSUED FOR CONSTRUCTION	9/21/92	RLS	RLS	LEV

Chevron U.S.A. Inc.
Richmond Refinery

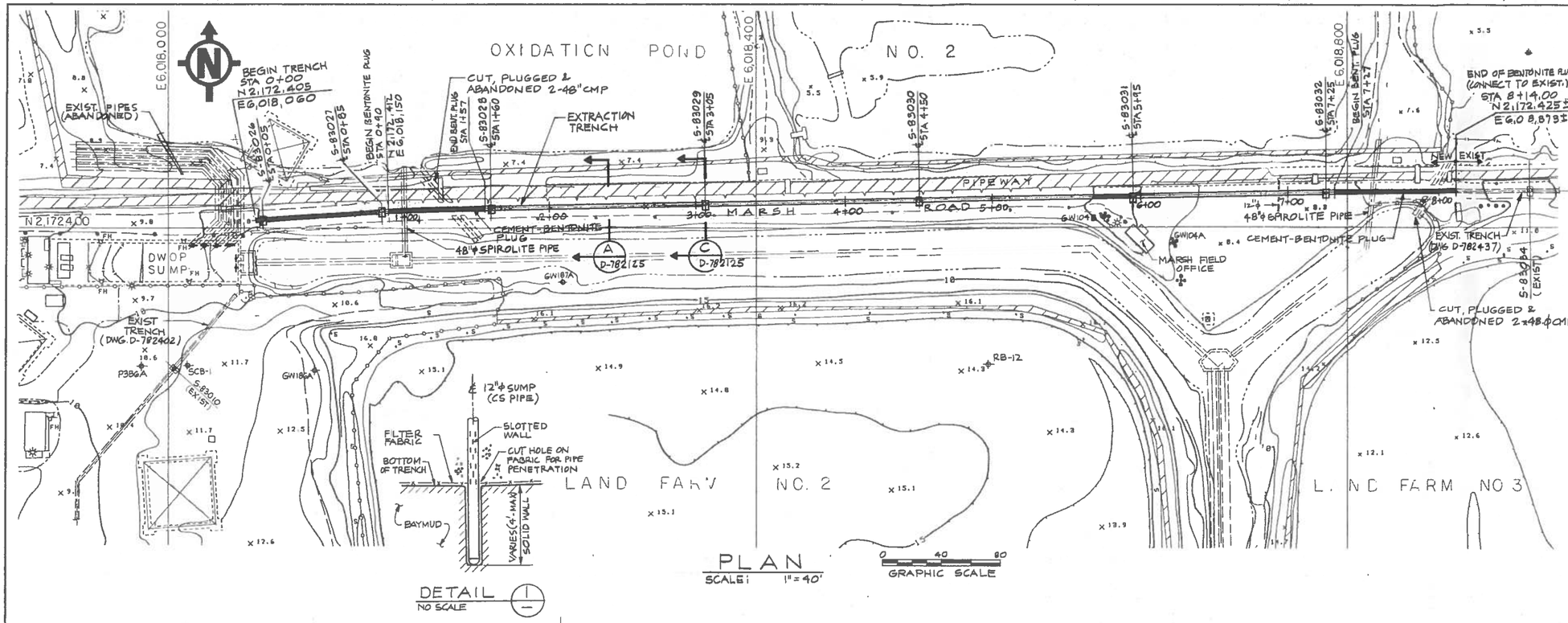
SCALE AS SHOWN DATE 7/30/92
DR. RLS CH. DR. APP. RLS ENGR. DWL
OPR'G DEPT. CJC ENG. DEPT.

APPROVED

150 FT BARRIER WALL - PLAN, PROFILE & SECTIONS
SECTOR B3 - LANDFARM 5
GROUNDWATER PROTECTION SYSTEM
ENVIRONMENTAL OPERATIONS DIVISION

S W.O. S.O.

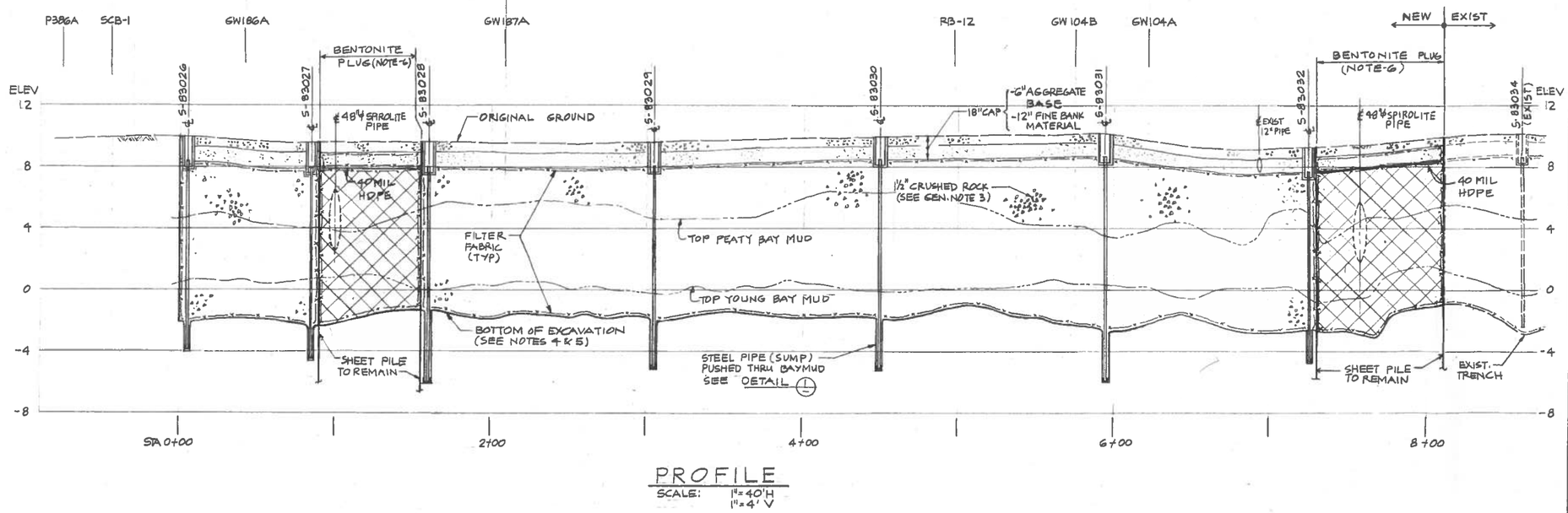
D-782452-0



DETAIL (1) NO SCALE

PLAN
SCALE: 1"=40'

GRAPHIC SCALE 0 40 80



PROFILE
SCALE: 1"=40'H
1"=4'V

LIST OF MATERIALS

ITEM NO.	QUANTITY	DESCRIPTION	FURNISHED BY
1	600 CY	1½" CRUSHED ROCK MATERIAL (NOTE 3)	COMPANY
2	30 CY	AGGREGATE BASE (ARA 104)	↓
3	60 CY	FINE BANK MATERIAL	
4	1-LOT	FILTER FABRIC (MIRAFI 140 N)	CONTRACTOR
5	7 EA	12"ϕ C.S. PIPE, SCH 40, SCREENED AS SHOWN ON DWG D-782125	↓
6	7 EA	PRECAST CONC. BOX W/ COVER (SANTA ROSA MODEL 3L OR EQ)	COMPANY
7	1-LOT	SAND-BENTONITE-CEMENT PLUG	CONTRACTOR

GENERAL NOTES:

1. COORDINATES SHOWN ARE BASED ON 1983 N.A.D CALIFORNIA COORDINATE SYSTEM, ZONE 3. ELEVATIONS SHOWN ARE BASED ON RICHMOND REFINERY DATUM.
2. ALL EXCAVATED MATERIALS SHALL BE DISPOSED OF WITHIN THE REFINERY PER COMPANY REPRESENTATIVE INSTRUCTION.
3. CRUSHED ROCK MATERIAL SHALL BE HARD, DURABLE WASHED CLEAN CRUSHED STONE, 100% PASSING 1½" SIEVE AND 0-3% PASSING ¾" SIEVE.
4. THE SUBSURFACE SECTION SHOWN REPRESENTS OUR EVALUATION OF THE MOST PROBABLE CONDITIONS BASED ON INTERPRETION OF AVAILABLE DATA, AND OUR GENERAL EXPERIENCE IN THE AREA.
5. BOTTOM OF EXCAVATION SHOWN IS APPROXIMATE. FIELD TO EXCAVATE TRENCH A MINIMUM OF 6" INTO YOUNG BAYMUD.
6. MIXTURE OF SAND-CEMENT-BENTONITE PLUG.
   - SAND — 80%
   - CEMENT — 10%
   - BENTONITE — 10%

Waste Discharge Order Project

BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

EXTRACTION TRENCH LOCATION PLAN & PROFILE
SECTOR B3 - LANDFARM NO. 2/NO. 2 OX. POND
GROUNDWATER PROTECTION SYSTEM (GPS)
ENVIRONMENTAL OPERATIONS DIVISION

REFERENCE DRAWINGS		
EXTRACTION TRENCH SECTIONS & DETAILS	D-782125	

REVISIONS								
0 ISSUED FOR CONSTRUCTION 9/8/93	RJS	DMC	GSM	2 AS-BUILT 1/25/94	RJS	DMC	GSM	
	TG				TG	TGS	pmb	
1 REVISED DEPTH OF SUMPS, ADDED DET. 1, REVISED LOCATION OF S-83032 & END OF TRENCH AND REVISED TYPE OF BOX (ITEM 6) 11/10/93	RJS	DMC	GSM					
	TGS	TGS	pmb					

Chevron U.S.A. Inc.
Richmond Refinery

SCALE AS SHOWN DATE 8-9-93 APPROVED
DR. AOL CH. RJS DR. APP. RJS ENGR. DMC
OPR'G DEPT. ENG. DEPT. TGS 9/9/93

S W.O. S.O. D-782458-2

111884

GO-580-DR (0.15 sq. ft.) (7-83) Printed in U.S.A.

GENERAL NOTES

1. COORDINATES SHOWN ARE BASED ON 1983 NORTH AMERICAN DATUM (N.A.D.) COORDINATE SYSTEM.
2. ELEVATIONS SHOWN ARE BASED ON RICHMOND REFINERY DATUM.
3. CONTRACTOR SHALL REPORT IMMEDIATLY TO THE COMPANY REPRESENTATIVE ANY UNDERGROUND UTILITIES DISCOVERED DURING EXCAVATION THAT ARE NOT SHOWN ON THE DRAWING.
4. CONTRACTOR SHALL TAKE SPECIAL SAFETY PRECAUTION WHEN WORKING IN THE VICINITY OF ELECTRICAL POLES, GUY WIRES, AND OVERHEAD LINES.

BARRIER WALL NOTES

1. CONSTRUCTION OF SOIL-BENTONITE BARRIER WALL SHALL BE IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATION RS-903.
2. EXCAVATED MATERIALS SHALL BE DISPOSED OF PER CONSTRUCTION SPECIFICATION RS-903, AND U/E DIVISION "YELLOW BOOK".
3. SOIL-BENTONITE MIX SHALL BE IN ACCORDANCE WITH SPECIFICATION RS-903.
4. CONTRACTOR SHALL REPLACE ~3 PIPE SUPPORTS, SURVEY MON. #2650, AND GUARD RAIL REMOVED DURING EXCAVATION.

EXTRACTION TRENCH NOTES

1. CONSTRUCTION OF SHALLOW EXTRACTION TRENCH SHALL BE IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATION RS-914.

INSERT

REFERENCE DRAWINGS	
BARRIER WALL PROFILE	D-318542
BARRIER WALL SECTIONS	D-318543
STOCKPILES & MIXING PAD LOCATION	SKC-400
BARRIER WALL WORK DELINEATION	SKC-402
EXTRACTION TRENCH SECT.& DETAIL	D-318544

REVISIONS			
0 ISSUED FOR CONSTRUCTION 9/3/96	RLS	MJW	
1 EXTRACTION TRENCH ISSUED FOR CONSTRUCTION 9/19/96	RLS	MJW	

Chevron
Richmond Refinery

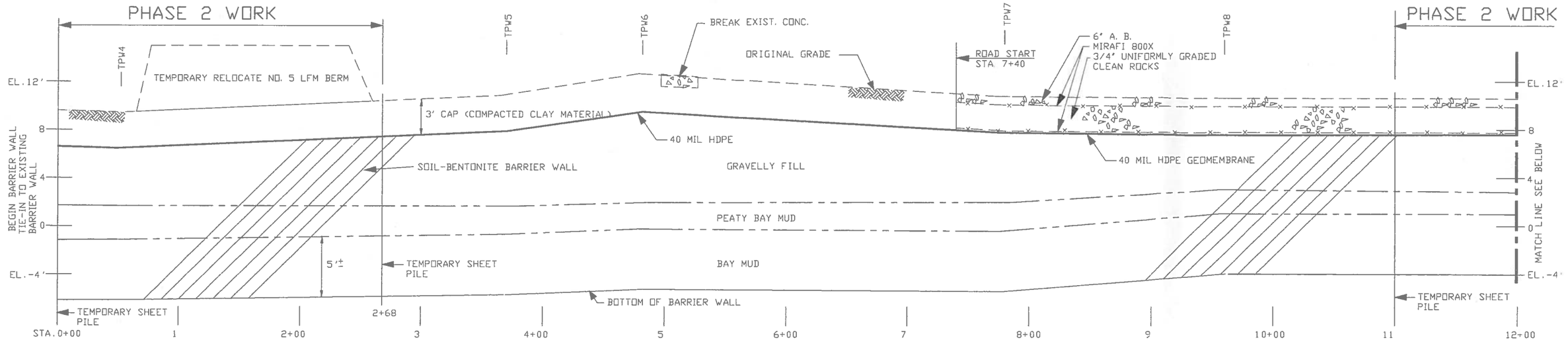
SCALE 1"=40' DR. RLS DR. APP. DATE 7/9/96
ENGR. ENGR. DEPT. GEM 9/3/96
DRG. DEPT. ASH III 9/6/96
APPROVED PJD 9/3/96

Waste Discharge Order Project
BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE
BEI Job 20081 D & M Project No. 19000

LOCATION PLAN – BARRIER WALL AND EXTRACTION TRENCH
SECTOR 83: LANDFARMS NO. 2-5
GROUNDWATER PROTECTION SYSTEM
UTILITIES/ENVIRONMENTAL ABU

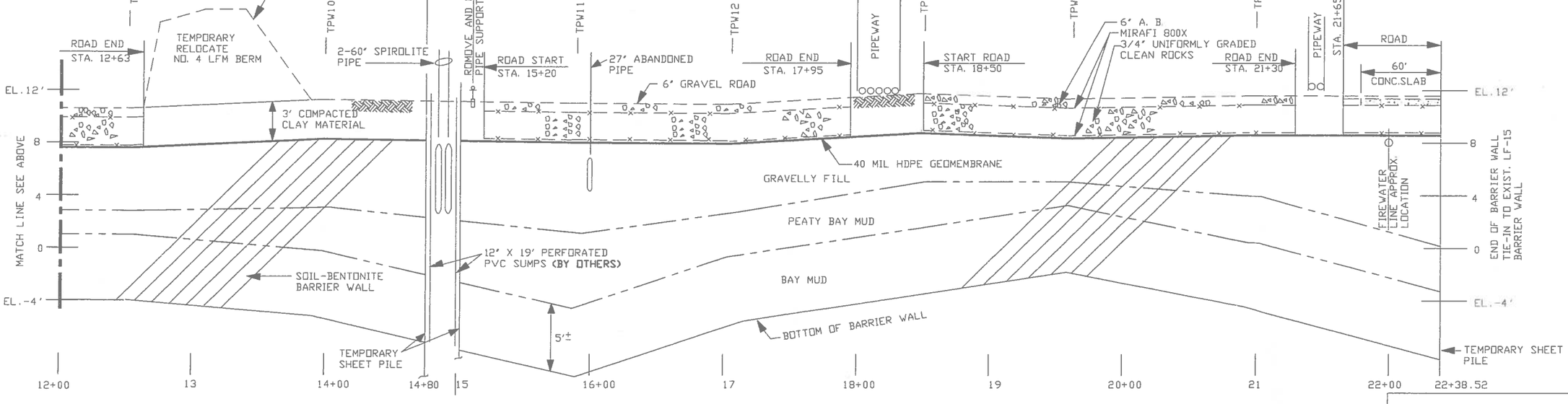
S W.O. ____ S.O. ____

D-318541-1



PROFILE

H: 1'=40'
V: 1'=4'



PROFILE

H: 1'=40'
V: 1'=4'

NOTE:

1. FOR GENERAL NOTES SEE DRAWING D-318541.

Waste Discharge Order Project

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

REFERENCE DRAWINGS		REVISIONS	
LOCATION PLAN	D-318541	0 ISSUED FOR CONSTRUCTION	RLS
BARRIER WALL SECTIONS	D-318543	9/3/96	

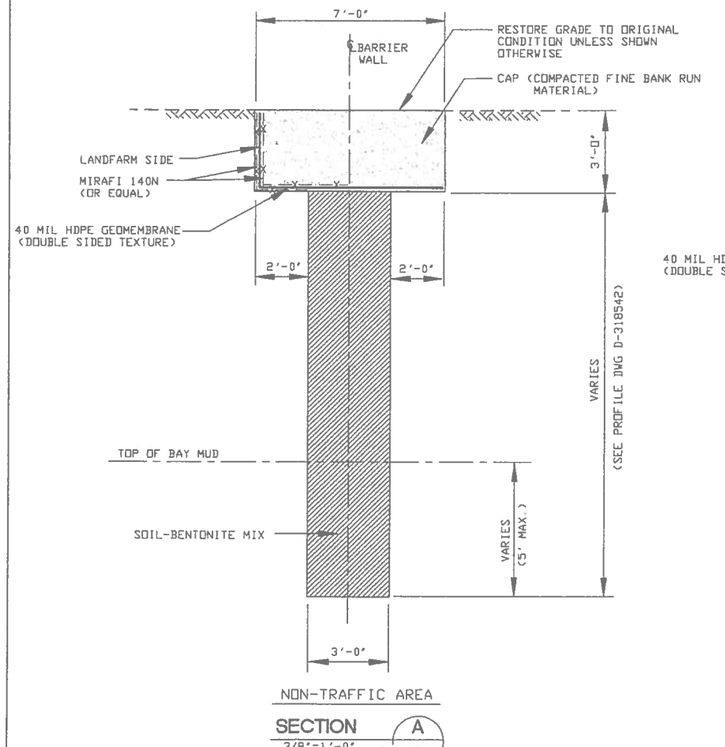
Chevron
Richmond Refinery

SCALE AS SHOWN DR. RLS DR. APP. DATE 8/12/96 APPROVED
ENGR ENGR. DEPT. 9/11/96
DPR'G. DEPT. 9/12/96

BARRIER WALL PROFILE
SECTOR 83 - LANDFARMS 2-5
GROUNDWATER PROTECTION SYSTEM
UTILITIES/ENVIRONMENTAL ABU

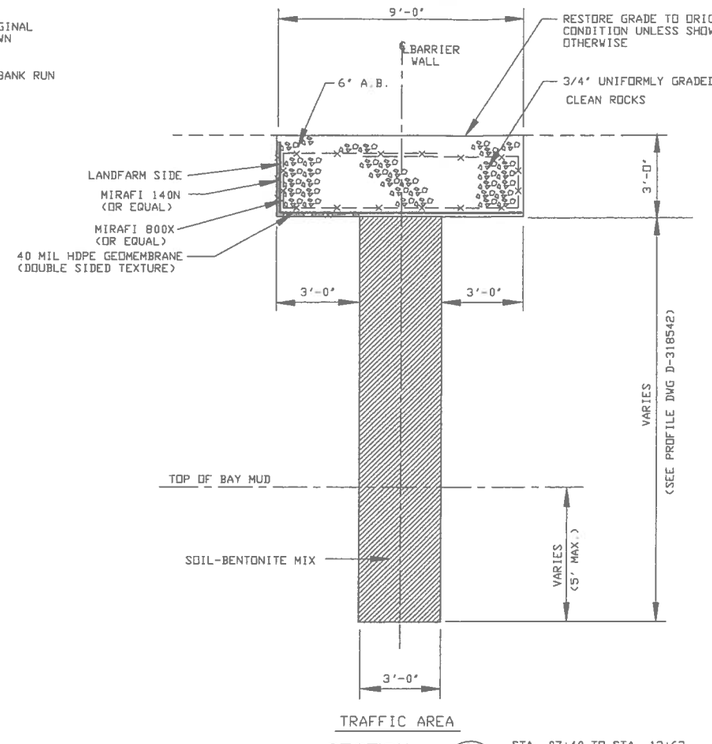
S W.O. ____ S.O. ____

D-318542-0



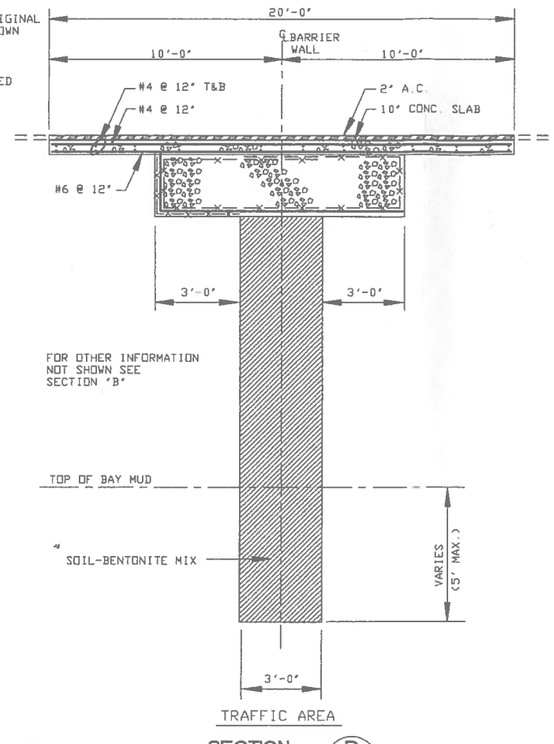
NON-TRAFFIC AREA

SECTION A
3/8"=1'-0" D-318541



TRAFFIC AREA

SECTION B
3/8"=1'-0" D-318541

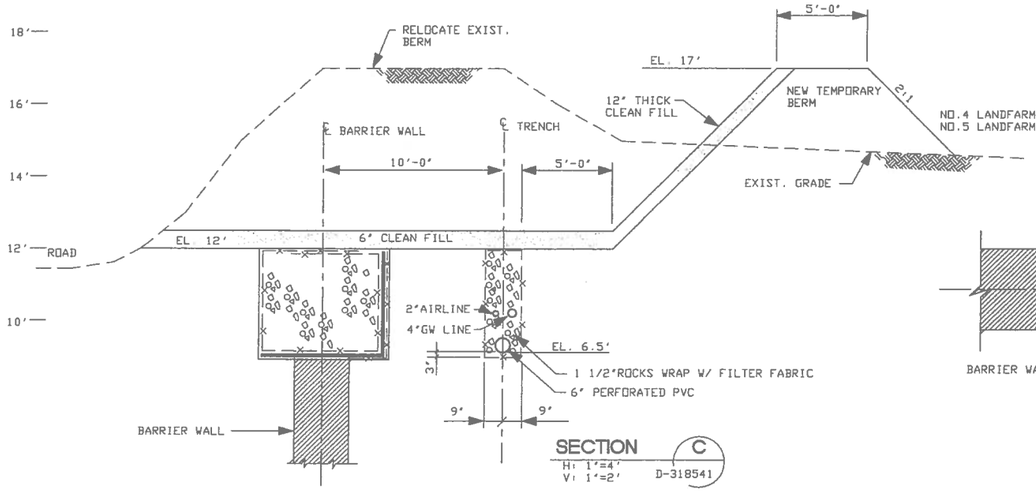


TRAFFIC AREA

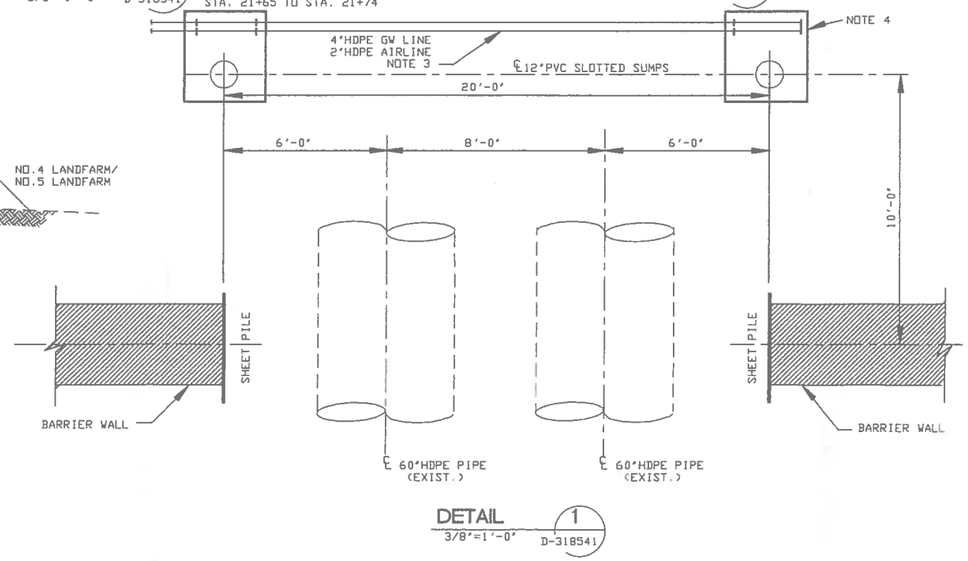
SECTION D
3/8"=1'-0" D-318541

STA. 07+40 TO STA. 12+63
STA. 15+20 TO STA. 17+95
STA. 18+50 TO STA. 21+30
STA. 21+65 TO STA. 21+74

STA. 21+74 TO 22+34



SECTION C
H: 1"=4'
V: 1"=2' D-318541



DETAIL 1
3/8"=1'-0" D-318541

LIST OF MATERIALS (PHASE I)

ITEM NO.	QUANTITY	DESCRIPTION	FURNISHED BY
1	210 TON	BENTONITE MATERIAL (NOTE 2)	CONTRACTOR
2	2,600TON	IMPORTED SELECT FILL (FOR SOIL-BENTONITE MIX) 900 CY OF EXCAVATED BAY MUD INCLUDED	COMPANY
3	25,200SF	40 MIL HDPET(TEXTURED) GEOMEMBRANE	CONTRACTOR
4	32,000SF	WOVEN GEOTEXTILE MIRAFI 800X OR EQ.	CONTRACTOR
5	1,300TON	3/4" UNIFORMLY GRADED CLEAN ROCKS (VIRGIN)	COMPANY
6	1,600TON	IMPORTED FILL FINE BANK RUN (FOR CAP MATERIAL)	COMPANY
7	20 TON	3/8" ASPHALTIC CONCRETE	COMPANY
8	45 CY	CONCRETE,4000 PSI @ 28 DAYS	CONTRACTOR
9	1-LOT	REINFORCING BARS	CONTRACTOR
10	16,000SF	MIRAFI 140N OR EQUAL	CONTRACTOR

LIST OF MATERIALS (PHASE I & II)

ITEM NO.	QUANTITY	DESCRIPTION	FURNISHED BY
1	300 TON	BENTONITE MATERIAL (NOTE 2)	CONTRACTOR
2	3,700TON	IMPORTED SELECT FILL (FOR SOIL-BENTONITE MIX) 1,250 CY OF EXCAVATED BAY MUD INCLUDED	COMPANY
3	36,000SF	40 MIL HDPET(TEXTURED) GEOMEMBRANE	CONTRACTOR
4	40,000SF	WOVEN GEOTEXTILE MIRAFI 800X OR EQ.	CONTRACTOR
5	2,200TON	3/4" UNIFORMLY GRADED CLEAN ROCKS (VIRGIN)	COMPANY
6	2,000TON	IMPORTED FILL FINE BANK RUN (FOR CAP MATERIAL)	COMPANY
7	20 TON	3/8" ASPHALTIC CONCRETE	COMPANY
8	45 CY	CONCRETE,4000 PSI @ 28 DAYS	CONTRACTOR
9	1-LOT	REINFORCING BARS	CONTRACTOR
10	22,000SF	MIRAFI 140N OR EQUAL	CONTRACTOR

NOTES

1. FOR GENERAL NOTES SEE DRAWING D-318541
2. COMPANY WILL PROVIDE 48 TONS OF BENTONITE MATERIAL WHICH ARE LOCATED ON LANDFILL 15 AREA. CONTRACTOR SHALL PROVIDE TRANSPORTATION TO THE JOB SITE.
3. HAND EXCAVATE GPS PIPING ACROSS 60" DWDP PIPES.
4. FOR SUMPS AND PIPING INSTALLATION SEE DRAWING D-318544.

Waste Discharge Order Project

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

REFERENCE DRAWINGS			
LOCATION PLAN	D-318541		
PROFILE	D-318542		

REVISIONS		
0 ISSUED FOR CONSTRUCTION	9/3/96	RLS MJW
1 REVISED SECTION C & DET. 1 FOR TRENCH CONSTRUCTION	9/19/96	RLS MJW

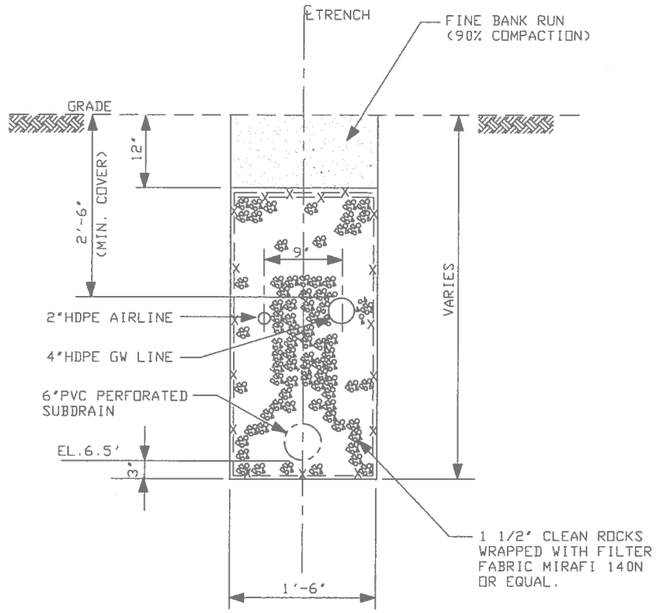
Chevron
Richmond Refinery

SCALE AS SHOWN DR. RLS DR. APP. DATE 8/12/96 APPROVED
ENGR. ENGR. DEPT. GEM 9/3/96 PJD 9/3/96
DPR'G. DEPT. ASH III 9/6/96

BARRIER WALL SECTIONS
SECTOR 83 - LANDFARMS 2-5
GROUNDWATER PROTECTION SYSTEM
UTILITIES/ENVIRONMENTAL ABU

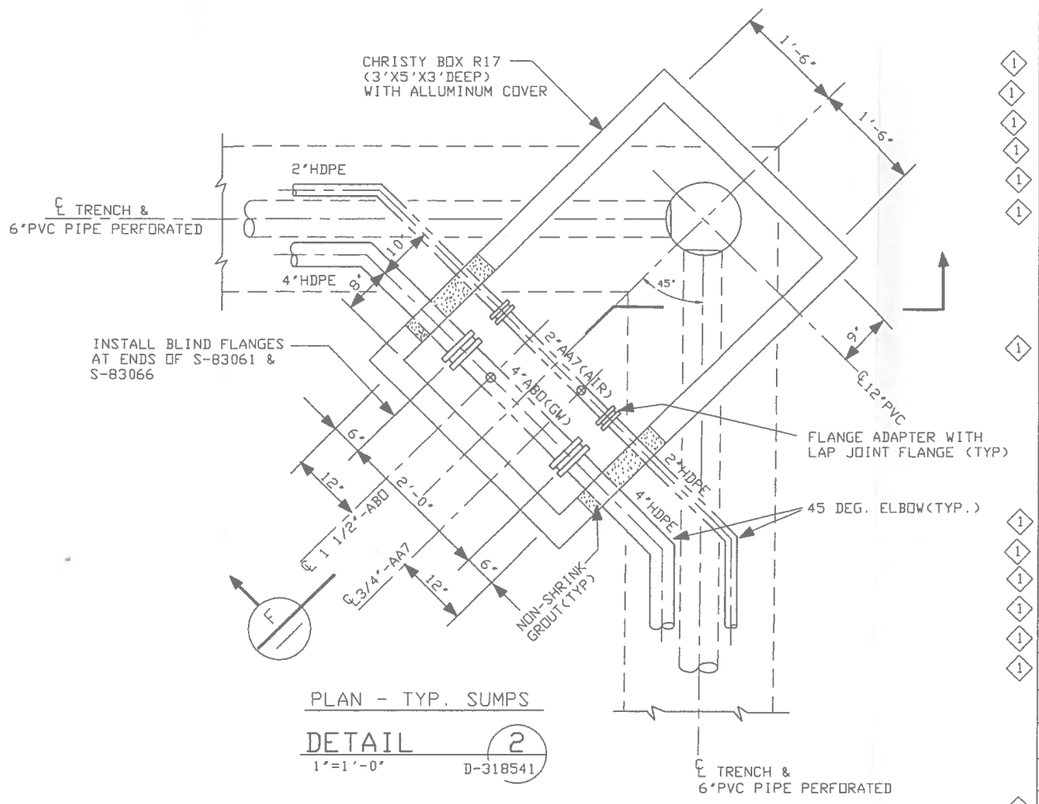
S W.O. _____ S.O. _____

D-318543-1



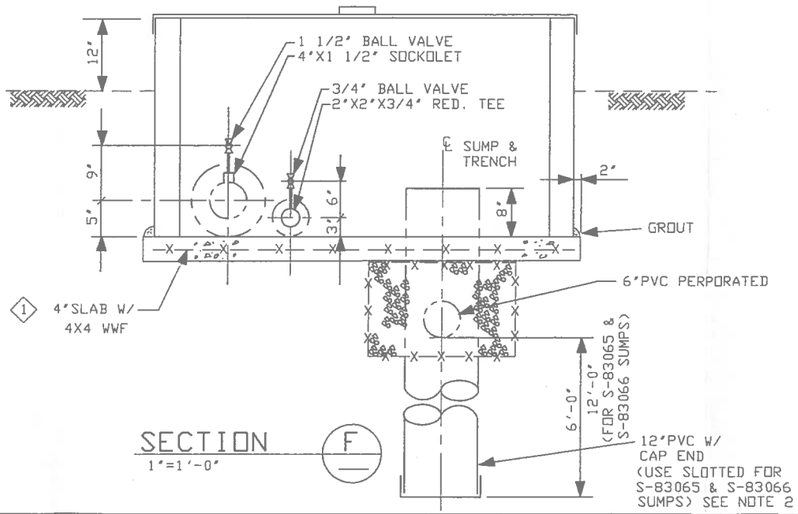
TYPICAL TRENCH

SECTION E
1"=1'-0" D-318541



PLAN - TYP. SUMPS

DETAIL 2
1"=1'-0" D-318541



SECTION F
1"=1'-0"

LIST OF MATERIALS (PHASE 1)

ITEM NO.	QUANT.	DESCRIPTION	FURNISHED BY
1	170 CY	1 1/2" CLEAN ROCKS(VIRGIN)	COMPANY
2	12,000 SF	NON-WOVEN GEOTEXTILE FABRIC MIRAFI 140N OR EQUAL	COMPANY
3	60 CY	FINE BANK RUN	COMPANY
4	700 LF	6"PVC SCH.80 PERFORATED SUB-DRAIN	COMPANY
5	700 LF	4"HDPE SDR 11 PIPE	COMPANY
6	700 LF	2"HDPE SDR 11 PIPE	COMPANY
7	2 EA.	4"X2"LG CARBON STL PIPE(ABO) SPOOL, VALVE & FITTINGS	CONTRACTOR
8	2 EA.	2"X2"LG CS PIPE GALV.(AA7) SPOOL, VALVES & FITTINGS	CONTRACTOR
9	2 EA.	12"X10"LG PVC SUMPS W/ CAP	CONTRACTOR
10	2 EA.	CHRISTY BOX R17(3'X5'X3'D) OR EQUAL	COMPANY
11	2 EA.	ALLUMINUM COVER	COMPANY

LIST OF MATERIALS (PHASE 1 & 2)

ITEM NO.	QUANT.	DESCRIPTION	FURNISHED BY
1	370 CY	1 1/2" CLEAN ROCKS(VIRGIN)	COMPANY
2	25,000 SF	NON-WOVEN GEOTEXTILE FABRIC MIRAFI 140N OR EQUAL	COMPANY
3	130 CY	FINE BANK RUN	COMPANY
4	1,500 LF	6"PVC SCH.80 PERFORATED SUB-DRAIN	COMPANY
5	1,500 LF	4"HDPE SDR 11 PIPE	COMPANY
6	1,500 LF	2"HDPE SDR 11 PIPE	COMPANY
7	6 EA.	4"X2"LG CARBON STL PIPE(ABO) SPOOL, VALVE & FITTINGS	CONTRACTOR
8	6 EA.	2"X2"LG CS PIPE GALV.(AA7) SPOOL, VALVES & FITTINGS	CONTRACTOR
9	4 EA.	12"X10"LG PVC SUMPS W/ CAP	CONTRACTOR
10	2 EA.	12"X15"LG PVC SUMPS W/ CAP SLOTTED	CONTRACTOR
11	6 EA.	CHRISTY BOX R17(3'X5'X3'D) OR EQUAL	COMPANY
12	6 EA.	ALLUMINUM COVER	COMPANY

NOTES

1. FOR LOCATION AND GENERAL NOTES SEE DRAWING D-318541.
2. WRAP SLOTTED PIPE SUMPS WITH MIRAFI 140N OR EQUAL. WHEN EXCAVATING FOR S-83065 AND S-83066 SUMPS USE SHORING IN ORDER TO PRESERVED THE INTEGRITY OF BACKFILL AROUND THE DWOP PIPES. USE CRUSHED ROCKS FOR BACKFILL ABOVE THE BAY MUD. PUSHING DOWN THE SUMPS INTO BAY MUD IS ACCEPTABLE IN LIEU OF EXCAVATION.

Waste Discharge Order Project

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

REFERENCE DRAWINGS		
LOCATION PLAN	D-318541	

REVISIONS				
0 ISSUED FOR CONSTRUCTION 9/19/96	RLS	MJW	PJD	
	GEM	ASH		
1 REVISED LIST OF MATERIALS 10/14/96	RLS			
	GEM			

Chevron
Richmond Refinery

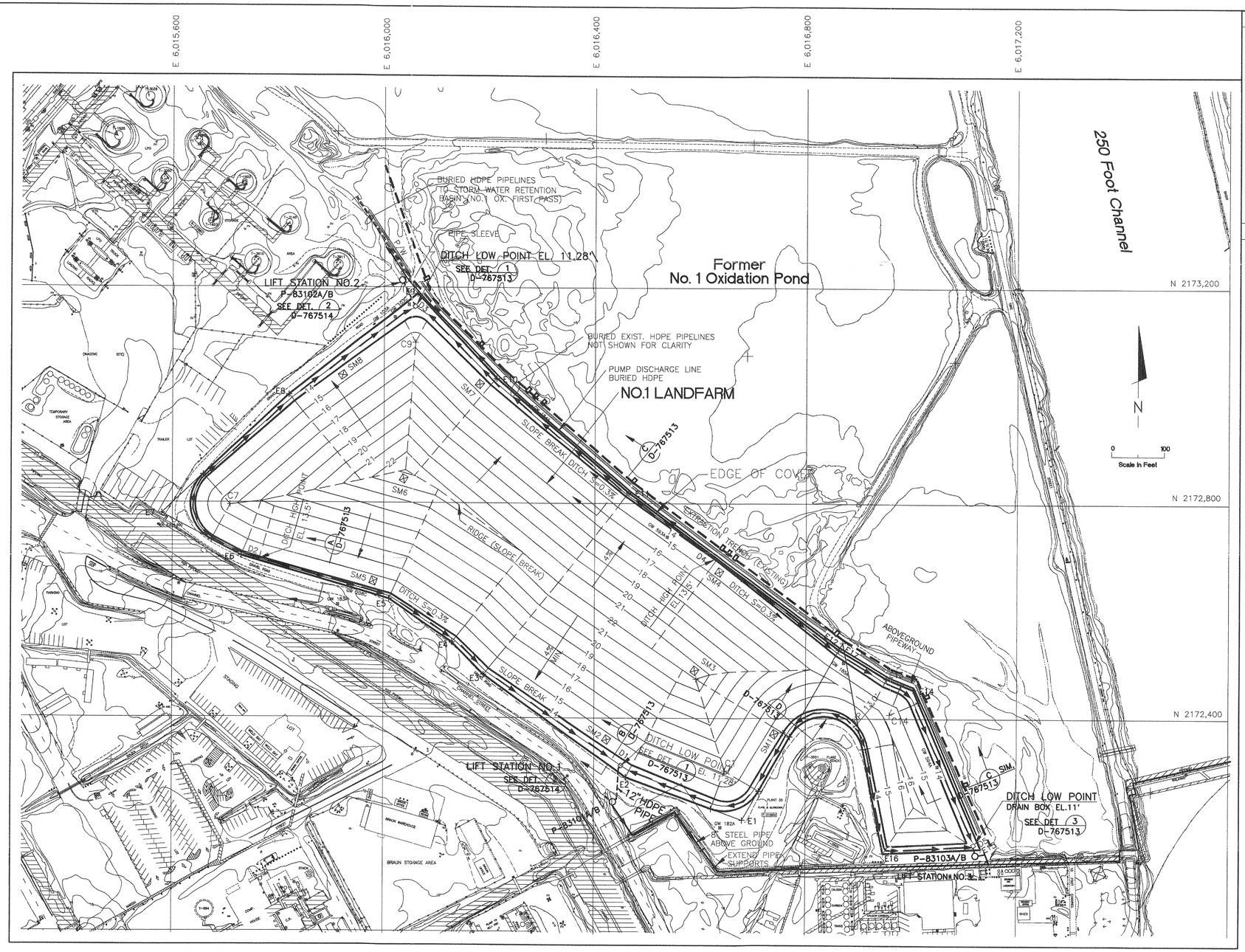
SCALE AS SHOWN DR. RLS DR. APP. DATE 9/6/96
ENGR. ENGR. DEPT.
OPR'G. DEPT. ASH III

APPROVED PJD 9/23/96

EXTRACTION TRENCH SECTIONS AND DETAILS
SECTOR 83: LANDFARMS NO. 2-5
GROUNDWATER PROTECTION SYSTEM
UTILITIES/ENVIRONMENTAL ABU

S W.O. _____ S.O. _____

D-318544-1



NOTES:

1. COORDINATES SHOWN ARE BASED ON 1983 NORTH AMERICAN DATUM (N.A.D.) COORDINATE SYSTEM.
2. ELEVATIONS SHOWN ARE BASED ON RICHMOND REFINERY DATUM ELEVATION 0.00' EQUALS ELEVATION −2.17' NATIONAL GEODETIC VERTICAL DATUM (NGVD)
3. CONTOUR LINES ARE AT 1 FOOT INTERVALS BASED ON AERIAL PHOTOGRAPHS DATED AUGUST 1990.
4. LINES AND GRADES SHOWN ARE FINAL GRADES.
5. COMPANY WILL REMOVE SPRINKLER SYSTEM PRIOR TO START OF WORK.

LEGEND

- DITCH
- GPS EXTRACTION TRENCH
- +E17 GEOMETRY POINTS
- ⊠ SM1 SETTLEMENT MARKER

CONTROLLING GEOMETRY POINTS

ID	NORTHING	EASTING
E1	2172210.00	6016680.00
E2	2172290.00	6016460.00
E3	2172480.00	6016190.00
E4	2172540.00	6016130.00
E5	2172620.00	6016010.00
E6	2172700.00	6015730.00
E7	2172780.00	6015580.00
E8	2173000.00	6015820.00
E9	2173188.00	6016063.00
E10	2173031.00	6016214.00
E11	2172820.00	6016464.00
E12	2172528.00	6016863.00
E13	2172474.00	6016953.00
E14	2172453.00	6017004.00
E15	2172158.00	6017133.00
E16	2172149.00	6016947.00
E17	2172540.00	6016870.00

SETTLEMENT MARKER LOCATION

ID	NORTHING	EASTING
SM1	2172370.00	6016740.00
SM2	2172360.00	6016423.00
SM3	2172488.00	6016590.00
SM4	2172672.00	6016636.00
SM5	2172653.00	6015982.00
SM6	2172844.00	6016038.00
SM7	2173022.00	6016183.00
SM8	2173036.00	6015920.00

DRAINAGE CONTROL POINTS

ID	NORTHING	EASTING	FLOW LINE EL.
D1	2172312.00	6016450.00	11.28
D2	2172694.00	6015766.00	13.50
D3	2173165.00	6016069.00	11.28
D4	2172697.00	6016629.00	13.50
D5	2172165.00	6017120.00	11.00

REVISION LIST:

1. REVISED DITCH SLOPE TO MINIMUM. (.3%)
2. ADDED PUMPS P−83101A/B, P−83102A/B, AND P−83103A/B.
3. ADDED MONITORING WELLS LOCATION.
4. ADDED NOTE 5.

Waste Discharge Order Project

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

REFERENCE DRAWINGS

NO.1 LANDFARM SECTIONS	D-767513	
PIPING SECTIONS AND DETAILS	D-767514	

REVISIONS

A	ISSUED FOR AGENCY REVIEW 6/21/95		
B	REVISED & RE-ISSUED FOR REVIEW 5/2/96	RLS	
C	SEE REVISION LIST 12/5/96	RLS	

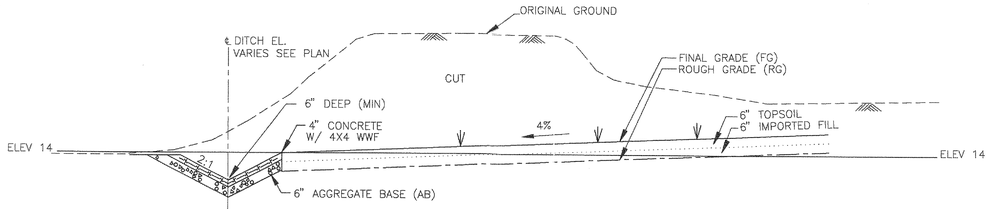
Chevron
Richmond Refinery

SCALE 1"=100' DR. RLS DR. APP. DATE 5/25/95 APPROVED
ENGR. ENGR. DEPT.
DPR'G. DEPT.

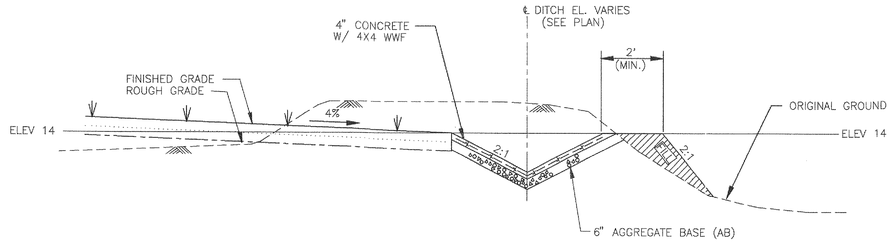
FINISHED GRADING PLAN − NO.1 LANDFARM
SECTOR 83 − LANDFARMS
LANDFARMS CLOSURE PLAN
UTILITIES/ENVIRONMENTAL ABU

S W.O. S.O.

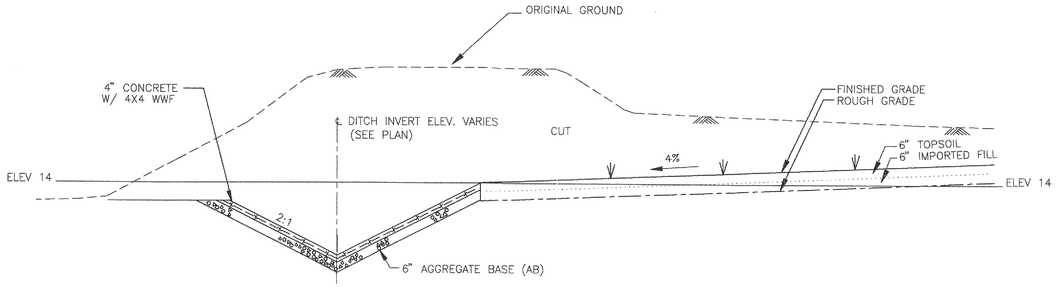
D-767512-C



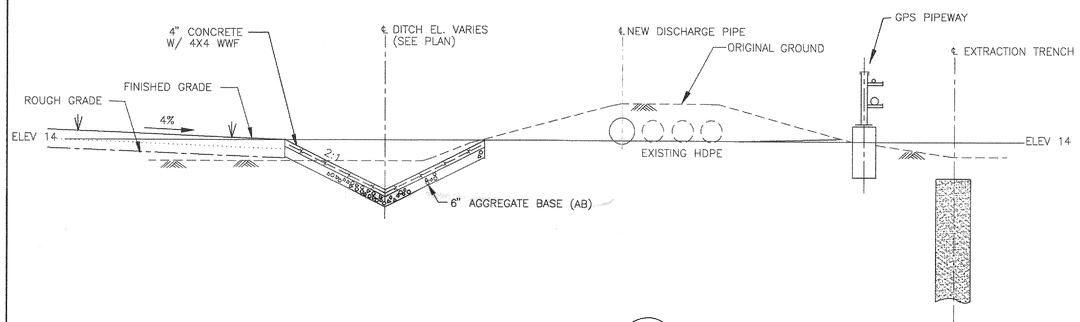
SECTION A
1/4"=1-0" D-767512



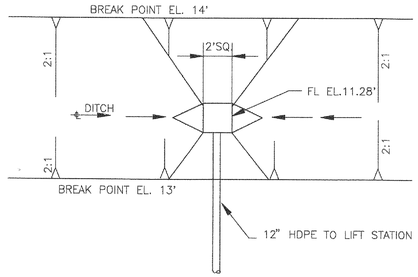
SECTION D
1/4"=1-0" D-767512



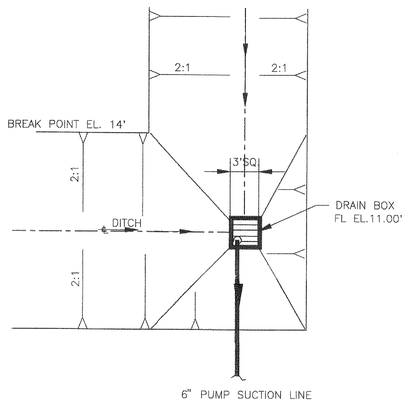
SECTION B
1/4"=1-0" D-767512



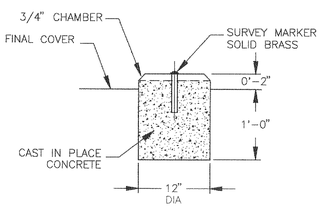
SECTION C
1/4"=1-0" D-767512



DETAIL 1
1/8"=1-0" D-767512



DETAIL 3
1/8"=1-0" D-767512



SETTLEMENT MARKER
DETAIL 4
NTS D-767512

NOTES

1. FOR LOCATION SEE DRAWING D-767512.

Waste Discharge Order Project

B E D M
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

REFERENCE DRAWINGS			
FINISHED GRADING PLAN	D-767512		

REVISIONS								
A	ISSUED FOR AGENCY REVIEW 6/21/95			C	REVISED DITCH FROM A.C. LINED TO CONCRETE LINED; ADDED DETAIL 3, DELETED DETAIL 2. 12/5/96	RLS		
B	REVISED AND RE-ISSUED FOR REVIEW 5/2/96	RLS						

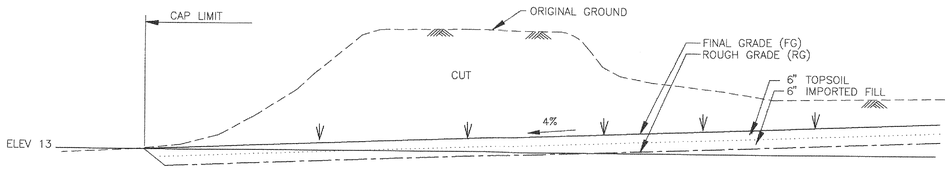
Chevron
Richmond Refinery

SCALE AS SHOWN DR. RLS DR. APP. DATE 6/25/95 APPROVED
ENGR. ENGR. DEPT.
OPR'G. DEPT.

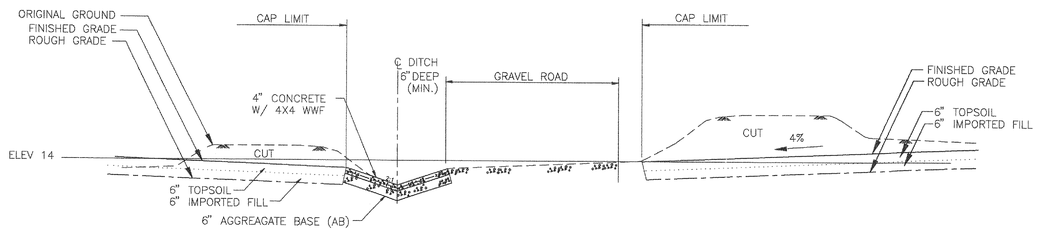
NO.1 LANDFARM SECTIONS
SECTOR 83 - LANDFARMS
LANDFARMS CLOSURE PLAN
UTILITIES/ENVIRONMENTAL ABU

S W.O. S.O.

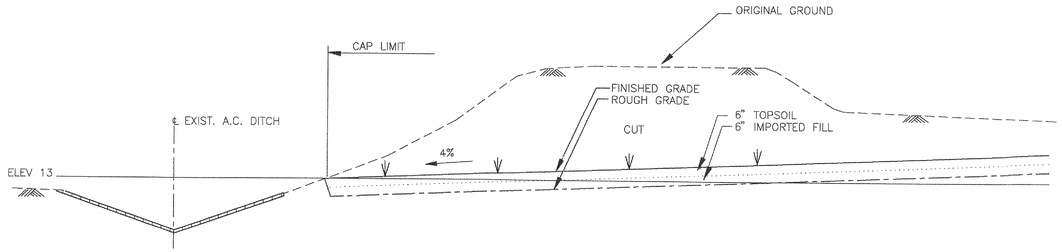
D-767513-C



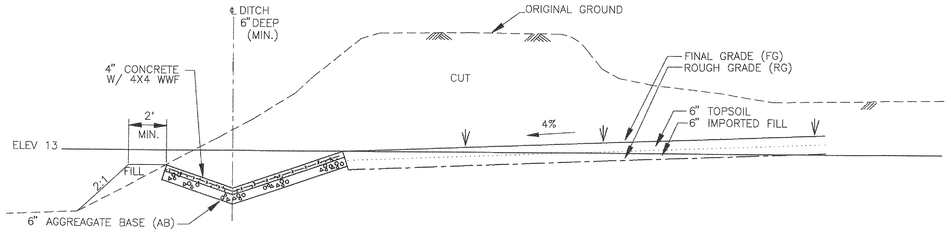
SECTION A
1/4"=1-0" D-767515



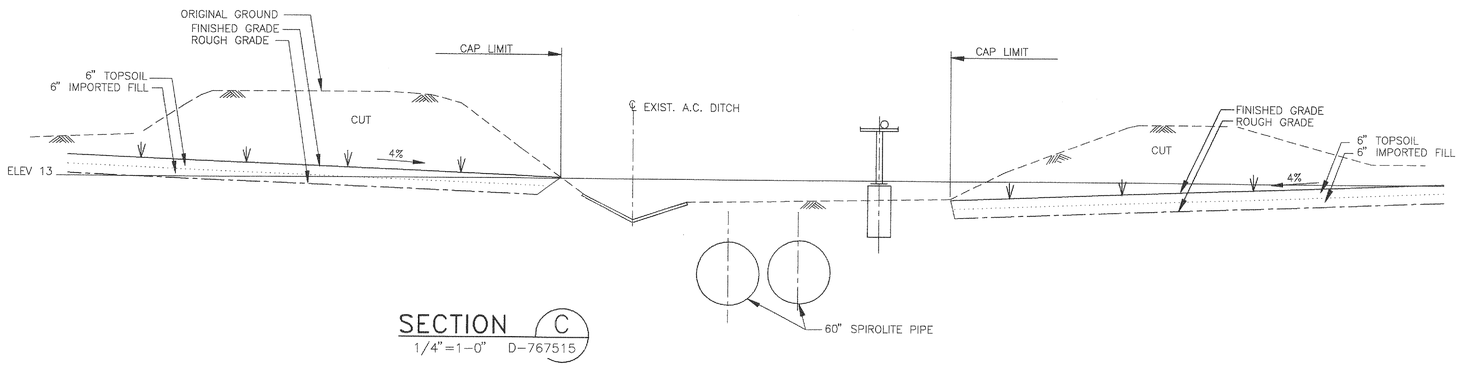
SECTION D
1/8"=1-0" D-767515



SECTION B
1/4"=1-0" D-767515



SECTION E
1/4"=1-0" D-767515



SECTION C
1/4"=1-0" D-767515

NOTES

1. FOR LOCATION SEE DRAWING D-767515.

Waste Discharge Order Project

BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20061 D & M Project No. 19000

REFERENCE DRAWINGS

FINISHED GRADING PLAN	D-767515	

REVISIONS

A	ISSUED FOR AGENCY REVIEW 6/21/95		C	REVISED DITCH FROM ASPHALT TO CONCRETE LINED. 12/5/96	RLS
B	REVISED AND RE-ISSUED FOR REVIEW 5/2/96	RLS			

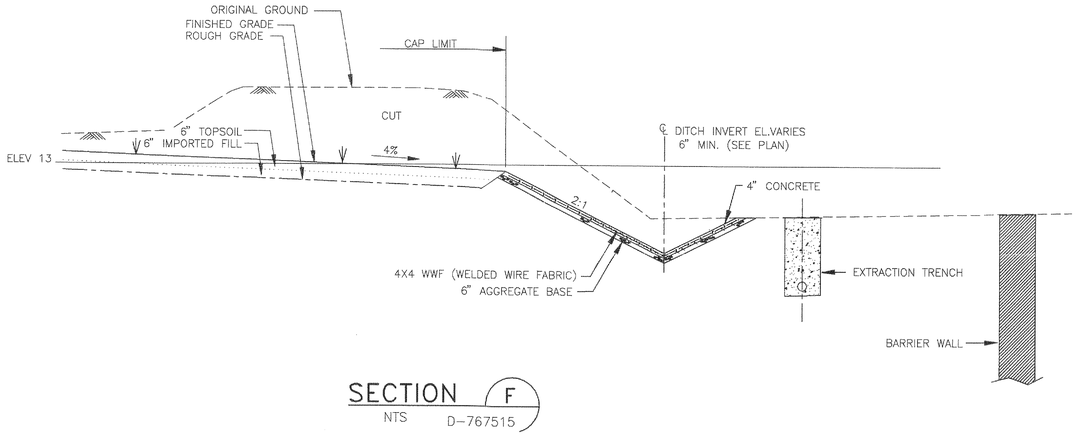
Chevron
Richmond Refinery

SCALE AS SHOWN DR. RLS DR. APP. DATE 10/4/96 APPROVED
ENGR. ENGR. DEPT.
DPR'G. DEPT.

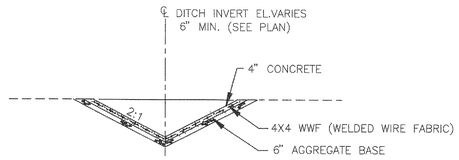
NOS. 2 THROUGH 5 LANDFARM - SECTIONS
SECTOR 83 - LANDFARMS
LANDFARMS CLOSURE PLAN
UTILITIES/ENVIRONMENTAL ABU

S W.O. S.O.

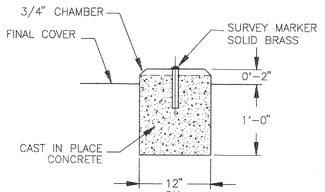
D-767516-C



SECTION F
NTS D-767515



TYPICAL DITCH SECTION
DETAIL 1
NTS D-767515



SETTLEMENT MARKER
DETAIL 2
NTS D-767515

NOTES

1. FOR LOCATION SEE DRAWING D-767515.

Waste Discharge Order Project

BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

REFERENCE DRAWINGS

FINISHED GRADING PLAN	D-767515		

REVISIONS

A	ISSUED FOR AGENCY REVIEW 6/21/95			C	REVISED DITCH FROM ASPHALT TO CONCRETE LINED. ADDED DETAIL 1. 12/5/96	RLS	
B	REVISED AND RE-ISSUED FOR REVIEW 5/2/96	RLS					

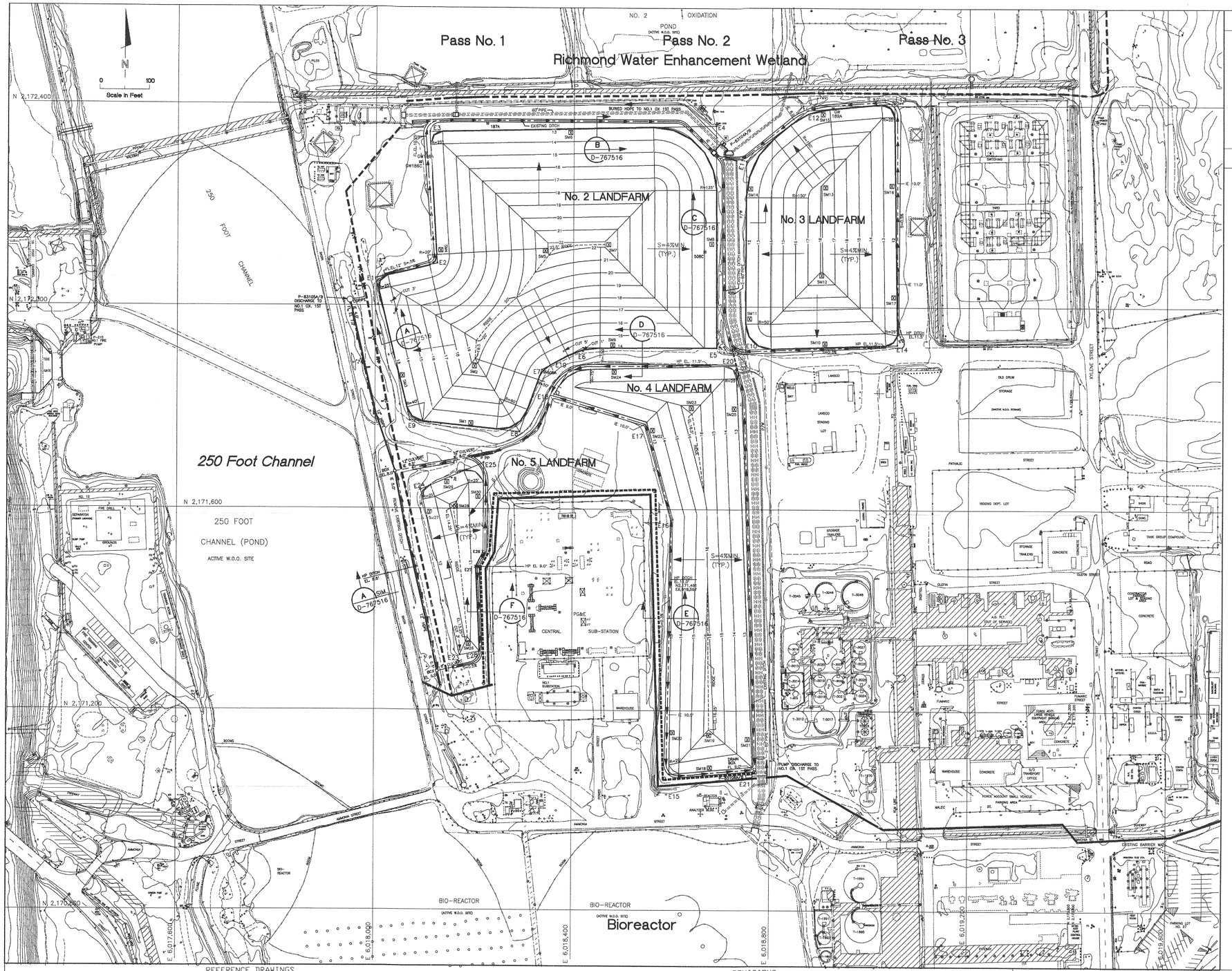
Chevron
Richmond Refinery

SCALE AS SHOWN DR. RLS DR. APP. DATE 10/4/96 APPROVED
ENGR. ENGR. DEPT.
DPR'G. DEPT.

NOS. 2 THROUGH 5 LANDFARM - SECTIONS
SECTOR 83 - LANDFARMS
LANDFARMS CLOSURE PLAN
UTILITIES/ENVIRONMENTAL ABU

S W.O. S.O.

D-767517-C



GENERAL NOTES

1. COORDINATES SHOWN ARE BASED ON 1983 NORTH AMERICAN DATUM (N.A.D.) COORDINATE SYSTEM.
2. ELEVATIONS SHOWN ARE BASED ON RICHMOND REFINERY DATUM ELAVATION 0.00' EQUALS ELEVATION −2.17' NATIONAL GEODETIC VERTICAL DATUM (NGVD).
3. CONTOUR LNES ARE AT 1.0' INTERVALS.
4. LINES, GRADES, AND ELEVATIONS SHOWN ARE FINAL GRADES.
5. COMPANY WILL REMOVE ALL SPRINKLER SYSTEM PRIOR TO START OF WORK.

LEGEND

- DITCH
- EXISTING OR PLANNED GPS EXTRACTION TRENCH
- EXISTING OR PLANNED GPS BARRIER WALL
- X E20 GEOMETRIC POINTS
- [X] SM10 SETTLEMENT MARKERS
- ⊠ 506C GROUNDWATER MONITORING WELL

GEOMETRIC POINTS				SETTLEMENT MARKERS		
ID	NORTHING	EASTING	AREA LOCATION	ID	NORTHING	EASTING
E1	2,172,055	6,018,000	NO.2 LANDFARM	SM1	2,171,768	6,018,194
E2	2,172,084	6,018,125		SM2	2,171,880	6,018,200
E3	2,172,346	6,018,108		SM3	2,171,862	6,018,055
E4	2,172,360	6,018,587		SM4	2,172,111	6,018,131
E5	2,171,918	6,018,690		SM5	2,172,111	6,018,343
E6	2,171,918	6,018,420		SM6	2,172,345	6,018,393
E7	2,171,875	6,018,337		SM7	2,172,124	6,018,470
E8	2,171,752	6,018,292		SM8	2,172,125	6,018,678
E9	2,171,774	6,018,070		SM9	2,171,923	6,018,480
E10	2,171,915	6,018,748	NO.3 LANDFARM	SM10	2,171,927	6,018,908
E11	2,172,290	6,018,748		SM11	2,171,977	6,018,756
E12	2,172,390	6,018,872		SM12	2,172,064	6,018,900
E13	2,172,405	6,019,048		SM13	2,172,239	6,018,908
E14	2,171,925	6,019,055		SM14	2,172,235	6,018,756
				SM15	2,172,382	6,018,903
				SM16	2,172,242	6,019,043
				SM17	2,172,020	6,019,047
E15	2,171,074	6,018,598	NO.4 LANDFARM	SM18	2,171,084	6,018,678
E16	2,171,580	6,018,602		SM19	2,171,160	6,018,677
E17	2,171,772	6,018,549		SM20	2,171,156	6,018,599
E18	2,171,826	6,018,361		SM21	2,171,144	6,018,760
E19	2,171,874	6,018,392		SM22	2,171,756	6,018,556
E20	2,171,884	6,018,730		SM23	2,171,800	6,018,639
E21	2,171,089	6,018,765		SM24	2,171,875	6,018,482
				SM25	2,171,799	6,018,729
E23	2,171,308	6,018,173	NO.5 LANDFARM	SM26	2,171,333	6,018,197
E24	2,171,638	6,018,092		SM27	2,171,592	6,018,111
E25	2,171,691	6,018,220		SM28	2,171,604	6,018,164
E26	2,171,514	6,018,220		SM29	2,171,654	6,018,146
E27	2,171,484	6,018,204		SM30	2,717,623	6,018,209
E28	2,171,316	6,018,212				

REVSION LIST:

1. ADDED BARIER WALL AND EXTRACTION TRENCH ALIGNMENT, GROUNDWATER MONITORING LOCATIONS, AND NOTE 5.
2. ADDED PUMPS P-83104A/B, P-83105A/B, AND P-83106A/B.

Waste Discharge Order Project

BEDM
BECHTEL ENVIRONMENTAL/DAMES & MOORE

BEI Job 20081 D & M Project No. 19000

REFERENCE DRAWINGS

CLOSURE CAP SECTIONS	D-767516
CLOSURE CAP SECTIONS	D-767517

REVISIONS

A	ISSUED FOR AGENCY REVIEW 6/21/95		
B	REVISED AND RE-ISSUED FOR REVIEW 5/22/96	RLS	
C	SEE REVISION LIST 12/5/96	RLS	

Chevron
Richmond Refinery

SCALE 1"=100' DR. RLS DR. APP. ____ DATE 5/25/95 APPROVED
ENGR. ____ ENGR. DEPT. ____
DPR'G. DEPT. ____

FINISHED GRADING PLAN – NOS. 2 THROUGH 5 LANDFARMS
SECTOR: 83 – LANDFARMS
LANDFARMS CLOSURE PLAN
UTILITIES/ENVIRONMENTAL ABU

S W.O. ____ S.O. ____

D-767515-C

APPENDIX K

Appendix K
Order of Magnitude Cost Estimate

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K.1.0 PROJECT SCOPE

K.1.1 No. 1 Landfarm Closure

This estimate includes:

- Remove existing/reinstall new sprinkler system and piping.
- Grade and compact approximately 13.5 acres of berm & LFM materials.
- Installation of 12,500 cy of imported fine soil & 12,500 cy of topsoil.
- Installation of approximately 4,000 LF of concrete perimeter ditch.
- Installation of 12,500 cy of imported fine soil and 12,500 cy of topsoil.
- Installation of (1) drain box and 12" culverts.
- Installation of 3,550 LF of 18" HDPE pipe and riprap.
- Installation of approximately 800 LF of 6" pump discharge lines over existing pipe supports.
- Installation of (8) settlement markers.
- Relocation of (1) fiberglass lift station with 2 pumps, piping and associated electrical controls and connections from LF-15.
- Installation of two (2) drainage systems with two (2) pumps each and associated electrical controls and connections.
- Installation of electrical power system.
- Relocate deeper existing HDPE pipes along east side of No. 1 Landfarm (if required); and
- Closure of No. 1 Landfarm with a 13.5-acre vegetation cover.

K.1.2 Nos. 2 through 5 Landfarms Closure

This estimate includes:

- Remove existing/reinstall new sprinkler system and piping.
- Grade and compact approximately 15.5 acres of berm and LFM materials.
- Installation of approximately 10,500 cy of imported fill.
- Installation of approximately 4,000 LF of concrete perimeter ditches.
- Installation of 12,750 cy of imported fine soil and 12,750 cy of topsoil.
- Installation of approximately (30) settlement markers.
- Install three (3) sets of electric pumps (2 pumps each) and associated electrical controls & connections.

- Installation of electrical power system.
- Installation of approximately 1,700 LF of 8" to 14" c.s. pipe.
- Installation of approximately 600 LF of 100 HDPE pipe.
- Modify existing pipe supports.
- Relocate (3) electrical guy wire anchor.
- Closure of Nos. 2 through 5 Landfarms with a 16-acre vegetation cover.

K.2.0 ESTIMATE BASIS

K.2.1 Pricing Level

The estimate pricing is based on previous capping costs at Landfill 15 in 1994. Future escalation is excluded. A cost summary for No. 1 Landfarm closure cover is presented in Table K-1, and Table K-2 provides further cost estimate detail. Tables K-3 and K-4 provide this information for Nos. 2 through 5 Landfarms.

K.2.2 Quantity

The quantities included in this estimate were developed based on the design drawings and sketches prepared for the Landfarms Closure Plan (Appendix J).

K.2.3 All-in Unit Cost

All-in unit cost including cost of material, installation labor, construction equipment, contractors profit and overhead, and Engineering, Procurement and Construction Management (EPCM) support is based on WDO previous project costs, such as those for Landfill 15.

K.2.4 BEDM/Chevron

BEDM's cost for EPCM is included at 3 percent of total field cost, including QA/QC. Chevron management support is excluded.

K.2.5 Contingency

Contingency is included in this estimate at 10 percent.

K.3.0 EXCLUSIONS AND QUALIFICATIONS

K.3.1 Exclusions

- Investigation and chemical analysis.
- Electrical work other than 2 electrical pumps at No. 1 Landfarm; may have to reroute existing poles and distribution system, specifically Landfarms 2 and 5.

- Permit costs (Federal, State, and local).
- Long-term inspection and maintenance.
- Final construction report.

K.3.2 Qualifications

- No odor control required.
- No consolidation required.
- No soil treatment and stabilization required.
- No off-site disposal required.
- Import fill and topsoil is from DUTRA (former AR&A) Quarry.

Table K-1: No. 1 Landfarm Closure Cover Summary
Landfarms Closure Plan
Appendix K
Chevron Richmond Refinery

ITEM	DESCRIPTION	QTY	UNIT	UNIT COST MAT'L	UNIT COST S/C	$ TOTAL COST MAT'L	$ TOTAL COST LABOR	$ TOTAL COST S/C	TOTAL
1.0	CIVIL STRUCTURAL								
1.1	MOBILIZATION/DEMOBILIZATION								5,000
1.2	DEMOLITION								0
1.3	EARTH WORK								18,800
1.4	CAPPING								395,200
1.5	DRAINAGE SYSTEM								279,200
1.6	MISCELLANEOUS								53,880
1.7	DISPOSAL								0
	TOTAL CIVIL/STRUCTURAL								752,100
2.0	ELECTRICAL								
	TOTAL ELECTRICAL								68,400
	TOTAL FIELD COST								**820,500**
	EPCM @ 3%								24,600
	TOTAL ESTIMATED COST								**845,100**
	Contingency @ 10%								84,500
	Total capital cost incl. contingency (3rd qtr. 1994 pricing)								929,600
	Rounded Total								**930,000**

Table K-2: No. 1 Landfarm Closure Cover Estimate
Landfarms Closure Plan
Appendix K
Chevron Richmond Refinery

ITEM	DESCRIPTION	QTY	UNIT	UNIT COST MAT'L	UNIT COST S/C	$ TOTAL COST MAT'L	$ TOTAL COST LABOR	$ TOTAL COST S/C	$ TOTAL COST TOTAL
1.0	**CIVIL STRUCTURAL**								
1.1	**MOBILIZATION/DEMOBILIZATION**	1	lot	5000.00				5,000	5,000
	S/T MOB/DEMOB							5,000	5,000
1.2	**DEMOLITION**	--	--	--		--	--	--	0
	S/T DEMOLITION							0	0
1.3	**EARTH WORK**								
	Pipe Road Crossing (Simple)	7	ea	2000.00				14,000	14,000
	Rough Grading - Blade	60	hr	80.00				4,800	4,800
	S/T EARTH WORK							18,800	18,800
1.4	**CAPPING**								
	Furnish & Place Imported Fill	18,750	ton	9.63				180,560	180,560
	Furnish & Place Top Soil	18,750	ton	11.00				206,250	206,250
	Hydroseeding	11.60	acre	725.00				8,410	8,410
	S/T CAPPING							395,220	395,220
1.5	**DRAINAGE SYSTEM**								
	Stormwater Pumps								
	-Submersible pumps (500gpm /set of 2)	3	ea	6000.00				18,000	18,000
	-Pipe supports	40	ea	300.00				12,000	12,000
	-Hydrotest	1	lot	1000.00				1,000	1,000
	-6" dia. c.s. pipe & fittings	800	lf	11.00				8,800	8,800
	-Laborer (3 @ $45/hr)	120	hrs	45.00				5,400	5,400
	-Welds	60	ea	75.00				4,500	4,500
	HDPE Pipe								
	-14" dia. HDPE & fittings	3,600	lf	16.00				57,600	57,600
	-Labor (3 @ $45/hr)	500	hrs	45.00				22,500	22,500
	-Fuse Welds	100	ea	80.00				8,000	8,000
	-Backfill & Compact	160	hrs	75.00				12,000	12,000
	-Rip Rap Rocks	50	tons	100.00				5,000	5,000
	Drainage Swale								
	-Concrete Ditch	4,000	lf	20.00				80,000	80,000
	-Stormwater sumps	3	ea	3000.00				9,000	9,000
	-Labor pipe/sumps (2@ $45/hr)	120	hr	45.00				5,400	5,400
	Basin St. Drain								
	-Remove Existing Drain	1	lot	3000.00				3,000	3,000
	-Install 12" HDPE Drain	750	lf	16.00				12,000	12,000
	-Install New Surface Drain	1	lot	15000.00				15,000	15,000
	S/T DRAINAGE SYS							279,200	279,200
1.6	**MISCELLANEOUS**								
	Relocate HDPE Piping (1-6", 3-14", 1500 lf)								
	-Unearth Pipe								
	D-3	20	hr	70.00				1,400	1,400
	Backhoe	20	hr	60.00				1,200	1,200
	End Dump	20	hr	65.00				1,300	1,300
	Labor (4@ $90/hr)	20	hr	90.00				1,800	1,800
	-Cut HDPE Pipe - Labor (4@ $90/hr)	16	hr	90.00				1,440	1,440
	-Relocate HDPE Pipe								
	Labor	16	hr	90.00				1,440	1,440
	D-3	16	hr	70.00				1,120	1,120
	Backhoe	16	hr	65.00				1,040	1,040
	-Fusion Weld HDPE Pipe								
	Labor (2@ $45/hr)	32	hr	45.00				1,440	1,440
	Weld Machine	32	hr	35.00				1,120	1,120
	Backhoe	32	hr	65.00				2,080	2,080
	-Decon Pipe - Labor	1	lot	500.00				500	500
	-Backfill Pipe								
	Re-use Fill	0	--	0.00				0	0
	Transport/Place/Compact	3,000	ton	4.00				12,000	12,000
	-Hydrotest Pipe	1	lot	1000.00				1,000	1,000
	Remove/reinstall sprinkler system	1	lot	25,000.00				25,000	25,000
	S/T MISC.							53,880	53,880
1.7	**DISPOSAL**								
	S/T DISPOSAL							0	0
	TOTAL CIVIL/STRUCTURAL							**752,100**	**752,100**
2.0	**ELECTRICAL**								
	1 1/2" Conduit	3,600	lf	3.50				12,600	12,600
	Conduit Supports	1,000	lf	35.00				35,000	35,000
	Main Disconnect	2	ea	1600.00				3,200	3,200
	#4 600V THW Wire	10,000	lf	0.92				9,200	9,200
	Conduit Seals	12	ea	80.00				960	960
	Motor Starter w/ Level Controls	3	ea	1400.00				4,200	4,200
	3/4" Conduit	90	lf	2.63				240	240
	Control Rack	3	ea	1000.00				3,000	3,000
	S/T ELECTRICAL							68,400	68,400
	TOTAL							**820,500**	**820,500**

Table K-3: Nos. 2 through 5 Landfarms Closure Cover Summary
Landfarms Closure Plan
Appendix K
Chevron Richmond Refinery

ITEM	DESCRIPTION	QTY	UNIT	UNIT COST MAT'L	UNIT COST S/C	$ TOTAL COST MAT'L	$ TOTAL COST LABOR	$ TOTAL COST S/C	TOTAL
1.0	**CIVIL/STRUCTURAL**								
1.1	MOBILIZATION/DEMOBILIZATION								10,000
1.2	DEMOLITION								0
1.3	EARTH WORK								150,300
1.4	CAPPING								439,600
1.5	DRAINAGE SYSTEM								190,000
1.6	MISCELLANEOUS								51,000
1.7	DISPOSAL								0
	TOTAL CIVIL/STRUCTURAL								840,900
2.0	**ELECTRICAL**								
	TOTAL ELECTRICAL								40,000
	TOTAL FIELD COST								**880,900**
	EPCM @ 3%								26,400
	TOTAL ESTIMATED COST								**907,300**
	Contingency @ 10%								90,700
	Total estimated capital cost incl. contigency (3rd qtr. 1994 pricing)								998,000
	Rounded Total								**1,000,000**

Table K-4: Nos. 2 through 5 Landfarms Closure Cover Estimate
Landfarms Closure Plan
Appendix K
Chevron Richmond Refinery

ITEM	DESCRIPTION	QTY	UNIT	UNIT COST MAT'L	UNIT COST S/C	TOTAL COST MAT'L	TOTAL COST LABOR	TOTAL COST S/C	TOTAL
1.0	CIVIL/STRUCTURAL								
1.1	MOBILIZATION/DEMOBILIZATION								
		1	lot		10000.00			10,000	10,000
	S/T MOB/DEMOB							10,000	10,000
1.3	EARTH WORK								
	Furnish & Place Import Fill	10,500	ton		9.63			101,120	101,120
	Rough Grading - Blade	240	hr		80.00			19,200	19,200
	Pipe Road Crossing (complex)	5	ea		6000.00			30,000	30,000
	S/T EARTH WORK							150,320	150,320
1.4	CAPPING								
	Survey	1	lot		2000.00			2,000	2,000
	Labor (2@ $45/hr)	20	hr		45.00			900	900
	-Imported Fill (Purchase/Import/Place/Compact)	1,000	ton		9.63			9,630	9,630
	-Furnish & Place Imported Fill	20,000	ton		9.63			192,600	192,600
	-Furnish & Place Top Soil	20,000	ton		11.00			220,000	220,000
	-Hydroseeding	20	acre		725.00			14,500	14,500
	S/T CAPPING							439,630	439,630
1.5	DRAINAGE SYSTEM								
	Drainage Swale								
	-Concrete Ditch	4,000	lf		20.00			80,000	80,000
	-Pumps (500 gpm/set of 2)	3	ea		6000.00			18,000	18,000
	-Labor Pipe/Sumps (2@$45/hr)	100	hr		45.00			4,500	4,500
	-8" c.s. Pipe & Fittings	300	lf		12.00			3,600	3,600
	-10" c.s. Pipe & Fittings	400	lf		14.00			5,600	5,600
	-14" c.s. Pipe & Fittings	1,000	lf		18.00			18,000	18,000
	Labor (3 @ $45/hr)	300	hr		45.00			13,500	13,500
	-Welds	100	ea		90.00			9,000	9,000
	-Support Modifications	1	lot		15000.00			15,000	15,000
	-10" HDPE Pipe	600	lf		12.50			7,500	7,500
	-Labor (3 @ $45/hr)	120	hr		45.00			5,400	5,400
	-Fuse Welds	30	ea		80.00			2,400	2,400
	-Backfill & Compact	100	hr		75.00			7,500	7,500
	S/T DRAINAGE SYS							190,000	190,000
1.6	MISCELLANEOUS								
	Relocate guy wire anchor	3	ea		7000.00			21,000	21,000
	Remove/reinstall new sprinkler sytems	1	lot		30000.00			30,000	30,000
	S/T MISC.							51,000	51,000
1.7	DISPOSAL								
	S/T DISPOSAL							0	0
	TOTAL CIVIL/STRUCTURAL							**840,950**	**840,950**
2.0	ELECTRICAL								
	Structural							0	0
	-1 1/2" Conduit	2000	lf		3.50			7,000	7,000
	-Conduit Supports	500	ea		35.00			17,500	17,500
	-Main Disconnect (2-5)	1	ea		1600.00			1,600	1,600
	-#4 600V THW Wire	6000	ea		0.92			5,520	5,520
	-Conduit Seals	12	ea		80.00			960	960
	-Motor Starter	3	ea		1400.00			4,200	4,200
	-3/4" Conduit	90	lf		2.63			240	240
	-Control Rack	3	ea		1000.00			3,000	3,000
	S/T ELECTRICAL							40,020	40,020
	TOTAL							**880,970**	**880,970**

Table K-5: Nos. 1 through 5 Landfarms Post-Closure Cost Estimate
Landfarms Closure Plan
Appendix K
Chevron Richmond Refinery

ACTIVITY	ANNUAL COST (X $1,000)
Groundwater Protection System Inspection & Maintenance	70.0
Settlement Monitoring	2.5
Cover Inspection & Maintenance	6.4
Drainage System Maintenance	1.1
Subtotal	80.0
Plan Administration (3%)	2.4
Contingency (10%)	8.0
Total Annual Inspection & Maintenance	90.4
30 year Inspection & Maintenance Cost	2,712.0
Worst Case Scenario - Inspection & Repair	70.0
30 Year Post-Closure Period Total Costs	2,782.0

APPENDIX L

Appendix L
Financial Assurance Documentation

UHL

Chevron

March 24, 1995

Chevron Corporation
555 Market Street
San Francisco, California
P.O. Box 7141
San Francisco, CA 94120-7141

J. Jeffrey Mojcher
Senior Counsel
Environmental Division
Corporation Law
Phone 415 894 6856
Fax 415 894 3284
Telex 176967

Branch Chief
Department of Toxic
Substances Control
Attention: Marvel Bradshaw
Region 2
Surveillance & Enforcement Branch
Financial Responsibility
700 Heinz Avenue
Berkeley, CA 94710

Hazardous Waste Sites - California
Financial Assurance for Closure
and Post-Closure Care
and Liability Coverage

Dear Ms. Bradshaw:

Attached as required by California regulations are the following Chevron Corporation items on behalf of our subsidiaries, Chevron Chemical Company and Chevron U.S.A. Inc.:

1. Financial Test Letters dated March 24, 1995
2. Corporate Guarantees for Closure and Post-Closure Care and Liability Coverage
3. 1994 Annual Report containing our Accountant's Report
4. Accountant's Special Report dated March 24, 1995

The following facilities are covered by these documents:

CAD 00833691
Chevron U.S.A. Inc.
El Segundo Refinery
P.O. Box 97
El Segundo, CA 90245

CAD 009114919
Chevron U.S.A. Inc.
Richmond Refinery
P.O. Box 1272
Richmond, CA 94802

CAD 043237486
Chevron Chemical Company
940 Hensley Street
Richmond, CA 94804

CAT 080011976
Chevron U.S.A. Inc.
LTF 3C H.W.M.F.
Sec. 3, T32S, R23E MDB&M
Taft, CA

CAD 981454283
Chevron U.S.A. Inc.
LTF 5K H.W.M.F.
Sec. 5, T11N, R23W SBB&M
Taft, CA

CAD 981454226
Chevron U.S.A. Inc.
LTF 23D H.W.M.F.
Sec. 23, T20S, R14E MDB&M
Coalinga, CA

CAT 080011950
Chevron U.S.A. Inc.
LTF 35Q H.W.M.F.
Sec. 35, T22S, R18E MDB&M
Kettleman Dome, CA

Chevron Corporation no longer has any TTUs or FTUs in California.

Please feel free to call me if you have any questions.

Sincerely,

J. Jeffrey Mojcher

JJM:jlm

Attachments

Hazardous Waste Sites - California
Financial Assurance for Closure
and Post-Closure Care
and Liability Coverage

March 24, 1995

bcc: W. A. Brommelsiek
J. R. Cornwell
M. D. Hannan
M. J. Holmes
R. J. Hunt
M. D. Keller
D. H. Lipnick
R. J. Moran
R. J. Muller
D. A. Newell
J. J. Rodgers
D. T. Sherman
T. R. Street
D. E. Tormey
D. Vickery (2), Price Waterhouse, 1194/225
P. A. Wagner
P. A. Wai
J. M. Waldron
K. F. Wiseman

Chevron Corporation
225 Bush Street, San Francisco, California 94104-4289

M. R. Klitten
Vice President, Finance

March 24, 1995

Financial Assurance

Branch Chief
Department of Toxic Substances Control
Region 2
Surveillance & Enforcement Branch
Financial Responsibility
700 Heinz Avenue
Berkeley, CA 94710

Dear Sir or Madam:

I am the chief financial officer of Chevron Corporation, 225 Bush Street, San Francisco, California.

This letter is in support of the use of the Financial Test to demonstrate financial responsibility for liability coverage as specified in Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations.

This firm is the owner/operator of the following facility(ies)/TTU(s) for which liability coverage for both sudden and nonsudden accidental occurrences is being demonstrated through the financial test specified in Sections 66264.147 and 66265.147, Title 22, California Code of Regulations: None.

This firm guarantees through the guarantee specified in Sections 66264.147 and 66265.147, Title 22, California Code of Regulations, liability coverage for both sudden and nonsudden accidental occurrences at the following facility(ies)/TTU(s) owned and operated by the following:

Facility	Liability Coverage (Per Occur./Annual Aggregate)
CAD 0833691 Chevron U.S.A. Inc. El Segundo Refinery P.O. Box 97 El Segundo, CA 90245	Sudden Occurrences - $1 million/$2 million Non-sudden Occurrences - $3 million/$6 million

Facility	Liability Coverage (Per Occur./Annual Aggregate)
CAD 009114919 Chevron U.S.A. Inc. Richmond Refinery P.O. Box 1272 Richmond, CA 94802	Sudden Occurrences - $1 million/$2 million Non-sudden Occurrences - $3 million/$6 million
CAD 043237486 Chevron Chemical Company 940 Hensley Street Richmond, CA 94804	Sudden Occurrences - $1 million/$2 million Non-sudden occurrences - $3 million/$6 million
CAD 981454226 Chevron U.S.A. Inc.* LTF 23D H.W.M.F. Sec. 23, T20S, R14E MDB&M Coalinga, CA	Sudden Occurrences - $1 million/$2 million Non-sudden Occurrences - $3 million/$6 million
CAT 080011950 Chevron U.S.A. Inc.* LTF 35Q H.W.M.F. Sec. 35, T22S, R18E MDB&M Kettleman Dome, CA	Sudden Occurrences - $1 million/$2 million Non-sudden Occurrences - $3 million/$6 million
CAT 080011976 Chevron U.S.A. Inc.* LTF 3C H.W.M.F. Sec. 3, T32S, R23E MDB&M Taft, CA	Sudden Occurrences - $1 million/$2 million Non-sudden Occurrences - $3 million/$6 million
CAD 981454283 Chevron U.S.A. Inc.* LTF 5K H.W.M.F. Sec. 5, T11N, R23W SBB&M Taft, CA	Sudden Occurrences - $1 million/$2 million Non-sudden Occurrences - $3 million/$6 million

*The address of the Chevron U.S.A. Inc. office managing these Hazardous Waste Management Facilities ("HWMF"s) is: P.O. Box 1392, Bakersfield, CA.

This firm is the direct or higher tier parent corporation of the owner/operator.

This corporation owns or operates the following facility(ies)/TTU(s) for which financial assurance for liability coverage is not demonstrated either to EPA or a state through this financial test and guarantee or through any other financial assurance mechanism as specified in Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations or substantially equivalent state

mechanisms. The current liability coverage not covered by such financial assurance is shown for each facility: None.

In states where EPA is not administering the financial requirements of Subpart H of 40 CFR Parts 264 and 265, this owner or operator is demonstrating financial assurance for liability coverage of the following facility(ies)/TTU(s) through the use of a test equivalent or substantially equivalent to the financial test specified in Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations. The current liability coverage by such a test is shown for each facility/TTU: None.

This firm is the owner or operator of the following UIC facility(ies) for which financial assurance for plugging and abandonment is required under Part 144. The current closure cost estimates as required by 40 CFR 144.62 are shown for each facility: None.

This corporation guarantees the plugging and abandonment costs for the following UIC facilities owned or operated by its subsidiaries for which financial assurance for plugging and abandonment is required under 40 CFR part 144. The current closure cost estimates as required by 40 CFR 144.62 are shown for each UIC facility:

Chevron U.S.A. Inc. Injection Well(s)/Address	Plugging and Abandonment Cost Estimate
Wells: Nos. Costas Federal 1-20-4B, 3-21-1D, and 2-20-3B; Gypsum Hills SRU 8-I and 10 Gypsum Hills Secondary Recovery Unit Uintah—Ouray Reservation Uintah County, UT	$ 153,000
Wells: Nos. 2, 6, 7, 11, 14, 16, 23, 25, 34, 48, 56, 59, 60, 61, 68(41-13B), 88(23-18B), 91, 93, 97, 100A, 102, 134, 139, 148, 150, 156, 161, 170, 173, 174, 182, 183, 185, 199, 202, 213, 215, 216, 263, 264, 265, 266, 269, 271, 275, 279 and 281 Red Wash Unit Uintah—Ouray Reservation Uintah County, UT	$ 1,440,000
Wells: Nos. WVU 9, 10, 13, 16, 21, 28-2, 29, 30, 31, 36, 40-2, 41, 50, 52, 59, 60, 61, 66, 67, 68, 71-2, 72, 73, 78, 126, 140, 143, and Stagecoach 12-33 Wonsits Valley State/Federal Unit Uintah—Ouray Reservation, Uintah County, UT	$ 858,000
Wells: Nos. Brinkerhoff 4, Brinkerhoff 6, C-1, C-27, C-30x, C-31, CI-15, CI-22, CI-23, CI-24, E-14, E-26, E-30, and S-1 Steamboat Butte Field Wind River Reservation Fremont County, WY	$ 645,000

The current plugging and abandonment cost for these units is $3,096,000.00.

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, 1994, using Alternative II.

ALTERNATIVE II

1.	Amount of annual aggregate liability coverage to be demonstrated	$ 68,000,000**
2.	Current bond rating of most recent issuance and name of rating service	AA Standard & Poors
3.	Date of issuance of bond	August 15, 1994
4.	Date of maturity of bond	August 15, 2004
* 5.	Tangible net worth	$ 14,504,000,000
* 6.	Total assets in the U.S.	In excess of $ 20,175,000,000

		Yes	No
7.	Is line 5 at least $10 million?	X	
8.	Is line 5 at least 6 times line 1?	X	
* 9.	Are at least 90 percent of assets located in the U.S.?		X
10.	Is line 6 at least 6 times line 1?	X	

**Includes $4,000,000 annual aggregate for underground storage tanks per 40 CFR part 280: $2,000,000 for our Chevron U.S.A. Inc. subsidiary, $1,000,000 for our Pittsburg & Midway Coal Mining Company subsidiary, and $1,000,000 for our Chevron Land & Development Company subsidiary.

I hereby certify that this letter is worded as specified by the Department of Health Services and is being executed in accordance with the requirements of Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations, except for the ninth paragraph above, which was modified to reveal that this firm is a guarantor, but not owner/operator, of plugging and abandonment costs of various UIC wells.

March 24, 1995

M. R. Klitten
Vice President, Finance

Corporate Seal

March 24, 1995

Branch Chief
Department of Toxic Substances Control
Region 2
Surveillance & Enforcement Branch
Financial Responsibility
700 Heinz Avenue
Berkeley, CA 94710

CORPORATE GUARANTEE FOR LIABILITY COVERAGE

GUARANTEE made this 24th day of March, 1995 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 our subsidiary CHEVRON U.S.A. INC., of 575 Market Street, San Francisco, California to any and all third parties who have sustained or may sustain bodily injury or property damage caused by sudden and/or non-sudden accidental occurrences arising from operation of the facility(ies)/TTU(s) 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 Sections 66264.147 and 66265.147 of Title 22, California Code of Regulations (CCR).

2. Chevron U.S.A. Inc. owns or operates the following hazardous waste management facility(ies)/TTU(s) covered by this guarantee:

CAD 00833691
Chevron U.S.A. Inc.
El Segundo Refinery
P.O. Box 97
El Segundo, CA 90245

CAD 009114919
Chevron U.S.A. Inc.
Richmond Refinery
P.O. Box 1272
Richmond, CA 94802

CAD 981454226
Chevron U.S.A. Inc.*
LTF 23D H.W.M.F.
Sec. 23, T20S, R14E MDB&M
Coalinga, CA

CAT 080011950
Chevron U.S.A. Inc.*
LTF 35Q H.W.M.F.
Sec. 35, T22S, R18E MDB&M
Kettleman Dome, CA

CAT 080011976
Chevron U.S.A. Inc.*
LTF 3C H.W.M.F.
Sec. 3, T32S, R23E MDB&M
Taft, CA

CAD 981454283
Chevron U.S.A. Inc.*
LTF 5K H.W.M.F.
Sec. 5, T11N, R23W SBB&M
Taft, CA

*The address of the Chevron U.S.A. Inc. office managing these Hazardous Waste Management Facilities ("HWMF"s) is: P.O. Box 1392, Bakersfield, CA.

This corporate guarantee satisfies State third-party liability requirements for both sudden and non-sudden accidental occurrences in the above-named owner or operator facility(ies)/TTU(s) for coverage in the amount of $4,000,000 per facility/TTU for each occurrence and $8,000,000 per facility/TTU per annual aggregate.

3. For value received from Chevron U.S.A. Inc. guarantor guarantees to any and all third parties who have sustained or may sustain bodily injury or property damage caused by sudden and/or non-sudden accidental occurrences arising from operations of the facility(ies)/TTU(s) covered by this guarantee that in the event that Chevron U.S.A. Inc. 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 non-sudden accidental occurrences, arising from the operation of the above-named facility(ies)/TTU(s), 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. This guarantee does not apply to:

(i) Bodily injury or property damage for which Chevron U.S.A. Inc. 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 Chevron U.S.A. Inc. would be obligated to pay in the absence of the contract or agreement.

(ii) Any obligation of Chevron U.S.A. Inc. under a workers' compensation, disability benefits, or unemployment compensation law or any similar laws.

(iii) Bodily injury to:

(A) An employee of Chevron U.S.A. Inc. arising from, and in the course of, employment by Chevron U.S.A. Inc.; or

(B) The spouse, child, parent, brother or sister of that employee as a consequence of, or arising from, and in the course of employment by Chevron U.S.A. Inc.

This exclusion applies:

(1) Whether Chevron U.S.A. Inc. may be liable as an employer or in any other capacity; and

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

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

(v) Property damage to:

(A) Any property owned, rented, or occupied by Chevron U.S.A., Inc.;

(B) Premises that are sold, given away or abandoned by Chevron U.S.A. Inc. if the property damage arises out of any part of those premises;

(C) Property loaned to Chevron U.S.A. Inc.;

(D) Personal property in the care, custody or control of Chevron U.S.A. Inc.;

(E) That particular part of real property on which Chevron U.S.A. Inc. or any contractor or subcontractors working directly or indirectly on behalf of Chevron U.S.A. Inc. are performing operations, if the property damage arises out of these operations.

5. Guarantor agrees that if at any time during or 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 ninety (90) days, by certified mail, notice to the Department of Health Services (Department) and to Chevron U.S.A. Inc. that he or she intends to provide alternate liability coverage as specified in Sections 66264.147 and 66265.147 of Title 22, CCR in the name of Chevron U.S.A. Inc. Within 120 days after the end of such fiscal year, the guarantor shall establish such liability coverage unless Chevron U.S.A. Inc. has done so.

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

7. Guarantor agrees that within thirty (30) days after being notified by the Department of a determination that guarantor no longer meets the financial test criteria or that he or she is disallowed from continuing as a guarantor, that alternate liability coverage shall be established as specified in Sections 66264.147 and 66265.147 of Title 22, CCR in the name of Chevron U.S.A. Inc.

8. Guarantor reserves the right to modify this agreement to take into account amendment or modification of the liability requirements set by Sections 66264.147 and 66265.147 of Title 22, CCR, provided that such modification shall become effective only if the Department does not disapprove the modification within thirty (30) days of receipt of notification of the modification.

9. Guarantor agrees to remain bound under this guarantee for so long as Chevron U.S.A. Inc. must comply with the applicable requirements of Sections 66264.147 and 66265.147 of Title 22, CCR for the above-listed facility(ies)/TTU(s), except as provided in paragraph 10 of this agreement.

10. Guarantor may terminate this guarantee by sending notice by certified mail to the Department, and to Chevron U.S.A. Inc. provided that this guarantee may be terminated unless and until Chevron U.S.A. Inc. obtains, and the Department approves, alternative liability coverage complying with Sections 66264.147 and 66265.147 of Title 22, CCR.

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 facility(ies)/TTU(s).

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 liability claimant(s) that the liability claim should be paid. The certification must 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 and/or nonsudden] accidental occurrence arising from operating [Principal's] hazardous waste treatment, storage, or disposal facility/TTU 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/TTU or group of facility(ies)/TTU(s).

14. In the event of combination of this guarantee with another mechanism to meet liability requirements, this guarantee will be considered primary coverage.

I hereby certify this guarantee is worded as specified by the Department of Health Services to the wording specified in 40 CFR and is being executed in accordance with the requirements of Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations.

Effective date: March 24, 1995

CHEVRON CORPORATION

By _____
M. R. Klitten
Vice President, Finance

By _____
Assistant Secretary

March 24, 1995

Branch Chief
Department of Toxic Substances Control
Region 2
Surveillance & Enforcement Branch
Financial Responsibility
700 Heinz Avenue
Berkeley, CA 94710

CORPORATE GUARANTEE FOR LIABILITY COVERAGE

GUARANTEE made this 24th day of March, 1995 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 our subsidiary CHEVRON CHEMICAL COMPANY, 6001 Bollinger Canyon Road, San Ramon, California to any and all third parties who have sustained or may sustain bodily injury or property damage caused by sudden and non-sudden accidental occurrences arising from operation of the facility(ies)/TTU(s) 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 Sections 66264.147 and 66265.147 of Title 22, California Code of Regulations (CCR).

2. Chevron Chemical Company owns or operates the following hazardous waste management facility(ies)/TTU(s) covered by this guarantee:

CAD 043237486
Chevron Chemical Company
940 Hensley Street
Richmond, CA 94804

This corporate guarantee satisfies State third-party liability requirements for both sudden and non-sudden accidental occurrences in the above-named owner or operator facility(ies)/TTU(s) for coverage in the amount of $4,000,000 per facility for each occurrence and $8,000,000 per facility/TTU per annual aggregate.

3. For value received from Chevron Chemical Company guarantor guarantees to any and all third parties who have sustained or may sustain bodily injury or property damage caused by sudden and/or

non-sudden accidental occurrences arising from operations of the facility(ies)/TTU(s) covered by this guarantee that in the event that Chevron Chemical Company 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 non-sudden accidental occurrences arising from the operation of the above-named facility(ies)/TTU(s), 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. This guarantee does not apply to:

(i) Bodily injury or property damage for which Chevron Chemical Company 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 Chevron Chemical Company would be obligated to pay in the absence of the contract or agreement.

(ii) Any obligation of Chevron Chemical Company under a workers' compensation, disability benefits, or unemployment compensation law or any similar laws.

(iii) Bodily injury to:

(A) An employee of Chevron Chemical Company arising from, and in the course of, employment by Chevron Chemical Company; or

(B) The spouse, child, parent, brother or sister of that employee as a consequence of, or arising from, and in the course of employment by Chevron Chemical Company.

This exclusion applies:

(1) Whether Chevron Chemical Company may be liable as an employer or in any other capacity; and

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

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

(v) Property damage to:

(A) Any property owned, rented, or occupied by Chevron Chemical Company;

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

(C) Property loaned to Chevron Chemical Company;

(D) Personal property in the care, custody or control of Chevron Chemical Company;

(E) That particular part of real property on which Chevron Chemical Company or any contractors or subcontractors working directly or indirectly on behalf of Chevron Chemical Company are performing operations, if the property damage arises out of these operations.

5. Guarantor agrees that if at any time during or 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 ninety (90) days, by certified mail, notice to the Department of Health Services (Department) and to Chevron Chemical Company that he or she intends to provide alternate liability coverage as specified in Sections 66264.147 and 66265.147 of Title 22, CCR in the name of Chevron Chemical Company. Within 120 days after the end of such fiscal year, the guarantor shall establish such liability coverage unless Chevron Chemical Company has done so.

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

7. Guarantor agrees that within thirty (30) days after being notified by the Department of a determination that guarantor no longer meets the financial test criteria or that he or she is disallowed from continuing as a guarantor, that alternate liability coverage shall be established as specified in Sections 66264.147 and 66265.147 and Title 22, CCR in the name of Chevron Chemical Company.

8. Guarantor reserves the right to modify this agreement to take into account amendment or modification of the liability requirements set by Sections 66264.147 and 66265.147 of Title 22, CCR provided that such modification shall become effective only if the Department does not disapprove the modification within thirty (30) days of receipt of notification of the modification.

9. Guarantor agrees to remain bound under this guarantee for so long as Chevron Chemical Company must comply with the applicable requirements of Sections 66264.147 and 66265.147 of Title 22, CCR for the above-listed facility(ies)/TTU(s), except as provided in paragraph 10 of this agreement.

10. Guarantor may terminate this guarantee by sending notice by certified mail to the Department, and to Chevron Chemical Company provided that this guarantee may be terminated unless and until Chevron Chemical Company obtains, and the Department approves, alternative liability coverage complying with Sections 66264.147 and 66265.147 of Title 22, CCR.

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 facility(ies/TTU(s).

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 liability claimant(s) that the liability claim should be paid. The certification must 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 and/or nonsudden] accidental occurrence arising from operating [Principal's] hazardous waste treatment, storage, or disposal facility/TTU 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/TTU or group of facility(ies)/TTU(s).

14. In the event of combination of this guarantee with another mechanism to meet liability requirements, this guarantee will be considered primary coverage.

I hereby certify this guarantee is worded as specified by the Department of Health Services to the wording specified in 40 CFR and is being executed in accordance with the requirements of Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations.

Effective date: March 24, 1995

CHEVRON CORPORATION

By _____
M. R. Klitten
Vice President, Finance

By _____
Assistant Secretary

Chevron Corporation
225 Bush Street, San Francisco, California 94104-4289

M. R. Klitten
Vice President, Finance

March 24, 1995

Financial Assurance

Branch Chief
Department of Toxic Substances Control
Region 2
Surveillance & Enforcement Branch
Financial Responsibility
700 Heinz Avenue
Berkeley, CA 94710

Dear Sir or Madam:

I am the chief financial officer of Chevron Corporation, 225 Bush Street, San Francisco, California.

This letter is in support of this firm's use of the Financial Test to demonstrate financial assurance, as specified in Division 4.5, Title 22, California Code of Regulations.

This firm is the owner or operator of the following facilities/TTUs for which financial assurance for closure or postclosure is demonstrated through the Financial Test as specified in Sections 66264.143(f) and 66264.145(f) of Title 22, California Code of Regulations. The current closure and/or postclosure cost estimates covered by the test are shown for each facility/TTU: None.

This firm guarantees through the corporate guarantee specified in Sections 66264.143(f) and 66264.145(f) of Title 22, California Code of Regulations, the closure and postclosure care of the following facilities/TTUs owned or operated by subsidiaries of this firm. The current cost estimates for the closure or postclosure care so guaranteed are shown for each facility/TTU.

AKD 009266149 Chevron U.S.A. Inc. Alaskan Refinery P.O. Drawer F Kenai, AK 99611	Closure Cost Post-Closure Cost	$	46,000 -0-
OHD 00425413 Chevron U.S.A. Inc. Cincinnati Refinery P.O. Box 96 North Bend, OH 45052	Closure Cost Post-Closure Cost	$	670,500 290,000

TXD 054256391 Chevron U.S.A. Inc. El Paso Refinery P.O. Box 20002 El Paso, TX 79998	Closure Cost Post-Closure Cost	$ 3,500,000 5,704,500
CAD 008336901 Chevron U.S.A. Inc. El Segundo Refinery P.O. Box 97 El Segundo, CA 90245	Closure Cost Post-Closure Cost	$ 7,121,500 7,923,000
HIT 160010005 Chevron U.S.A. Inc. Hawaiian Refinery P.O. Box 29789 Honolulu, HI 96820	Closure Cost Post-Closure Cost	$ 628,000 2,884,500
MSD 054179403 Chevron U.S.A. Inc. Pascagoula Refinery P.O. Box 1300 Pascagoula, MS 39567	Closure Cost Post-Closure Cost	$ 2,503,000 2,388,000
PAD 049791098 Chevron U.S.A. Inc. Philadelphia Refinery P.O. Box 7408 Philadelphia, PA 19101	Closure Cost Post-Closure Cost	$ 11,849,000 -0-
TXD 008090409 Chevron U.S.A. Inc. Port Arthur Refinery P.O. Box 701 Port Arthur, TX 77640	Closure Cost Post-Closure Cost	$ 15,500,000 3,270,000
CAD 009114919 Chevron U.S.A. Inc. Richmond Refinery P.O. Box 1272 Richmond, CA 94802	Closure Cost Post-Closure Cost	$ 15,435,500 18,262,000
UTD 092029768 Chevron U.S.A. Inc. Salt Lake Refinery P.O. Box 25117 Salt Lake City, UT 84125	Closure Cost Post-Closure Cost	$ 2,246,500 1,781,000

LAD O34199802 Chevron Chemical Company P.O. Box 70 Belle Chasse, LA 70037	Closure Cost Post-Closure Cost	$ 6,150,500 3,182,500
CAD 043237486 Chevron Chemical Company 940 Hensley Street Richmond, CA 94804	Closure Cost Post-Closure Cost	$ 92,759,000 14,041,000
CAD 981454226 Chevron U.S.A. Inc.* LTF 23D H.W.M.F. Sec. 23, T20S, R14E MDB&M Coalinga, CA	Closure Cost Post-Closure Cost	$ 38,000 117,000
CAT 080011950 Chevron U.S.A. Inc.* LTF 35Q H.W.M.F. Sec. 35, T22S, R18E MDB&M Kettleman Dome, CA	Closure Cost Post-Closure	$ 50,000 202,000
CAT 080011976 Chevron U.S.A. Inc.* LTF 3C H.W.M.F. Sec. 3, T32S, R23E MDB&M Taft, CA	Closure Cost Post-Closure Cost	$ 44,000 166,000
CAD 981454283 Chevron U.S.A. Inc.* LTF 5K H.W.M.F. Sec. 5, T11N, R23W SBB&M Taft, CA	Closure Cost Post-Closure Cost	$ 48,000 202,000

*The address of the Chevron U.S.A. Inc. office managing these Hazardous Waste Management Facilities ("HWMF"s) is: P.O. Box 1392, Bakersfield, CA.

In states where EPA is not administering the financial requirements of Subpart H, Title 40 CFR, Parts 264 and 265, this firm as owner, operator or guarantor is demonstrating financial assurance for the closure or postclosure care of the following facilities/TTUs through the use of a test equivalent or substantially equivalent to the financial test specified in Sections 66264.143(f) and 66264.145(f) of Title 22, California Code of Regulations. The current closure and/or postclosure estimates covered by such a test are shown for each facility/TTU: None.

This firm is the direct or higher tier parent corporation of the owner or operator.

This firm is the owner or operator of the following facilities/TTUs for which financial assurance for closure or, if a disposal facility/TTU, postclosure care, is *not* demonstrated either to EPA or a state through the financial test or any other financial assurance mechanism as specified in Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations or equivalent or substantially equivalent state mechanisms. The current closure and/or postclosure cost estimates *not* covered by such financial assurance are shown for each facility/TTU: None.

This firm is the owner or operator of the following UIC facilities for which financial assurance for plugging and abandonment is required under 40 CFR part 144. The current closure cost estimates are shown for each facility: None.

This corporation guarantees the plugging and abandonment costs for the following UIC facilities owned or operated by its subsidiaries for which financial assurance for plugging and abandonment is required under 40 CFR, part 144. The current closure cost estimates as required by 40 CFR, 144.62 are shown for each UIC facility:

Chevron U.S.A. Inc. Injection Well(s)/Address	Plugging and Abandonment Cost Estimate
Wells: Nos. Costas Federal 1-20-4B, 3-21-1D, and 2-20-3B; Gypsum Hills SRU 8-I and 10 Gypsum Hills Secondary Recovery Unit Uintah—Ouray Reservation Uintah County, UT	$ 153,000
Wells: Nos. 2, 6, 7, 11, 14, 16, 23, 25, 34, 48, 56, 59, 60, 61, 68(41-13B), 88(23-18B), 91, 93, 97, 100A, 102, 134, 139, 148, 150, 156, 161, 170, 173, 174, 182, 183, 185, 199, 202, 213, 215, 216, 263, 264, 265, 266, 269, 271, 275, 279 and 281 Red Wash Unit Uintah—Ouray Reservation Uintah County, UT	$ 1,440,000
Wells: Nos. WVU 9, 10, 13, 16, 21, 28-2, 29, 30, 31, 36, 40-2, 41, 50, 52, 59, 60, 61, 66, 67, 68, 71-2, 72, 73, 78, 126, 140, 143, and Stagecoach 12-33 Wonsits Valley State/Federal Unit Uintah—Ouray Reservation, Uintah County, UT	$ 858,000
Wells: Nos. Brinkerhoff 4, Brinkerhoff 6, C-1, C-27, C-30x, C-31, CI-15, CI-22, CI-23, CI-24, E-14, E-26, E-30, and S-1 Steamboat Butte Field Wind River Reservation Fremont County, WY	$ 645,000

The current plugging and abandonment cost for these units is $3,096,000.00.

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 corporation's independently audited, year-end financial statements for the latest completed fiscal year, ended December 31, 1994, using Alternative II.

ALTERNATIVE II

		Yes	No
1.	Sum of current closure and postclosure cost estimates	$ 222,099,000	
2.	Current bond rating of most recent issuance of this firm and name of rating service	AA Standard & Poors	
3.	Date of issuance of bond	August 15, 1994	
4.	Date of maturity of bond	August 15, 2004	
* 5.	Tangible net worth	$14,504,000,000	
* 6.	Total assets in the U.S.	In excess of $20,175,000,000	
7.	Is line 5 at least $10 million?	X	
* 8.	Is line 5 at least 6 times line 1?	X	
* 9.	Are at least 90 percent of the firms's assets located in the U.S.?		X
10.	Is line 6 at least 6 times line 1?	X	

I hereby certify that this letter is worded as specified by the Department of Health Services and is being executed in accordance with the requirements of Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations, except for the ninth paragraph above, which was modified to reveal that this firm is a guarantor, but not owner or operator, of plugging and abandonment costs of various UIC wells.

March 24, 1995

M. R. Klitten

M. R. Klitten
Vice President, Finance

Corporate Seal

March 24, 1995

Branch Chief
Department of Toxic Substances Control
Region 2
Surveillance & Enforcement Branch
Financial Responsibility
700 Heinz Avenue
Berkeley, CA 94710

CORPORATE GUARANTEE FOR CLOSURE AND POST-CLOSURE

GUARANTEE made this 24th day of March, 1995, by CHEVRON CORPORATION, a business corporation organized under the laws of the State of Delaware, herein referred to as guarantor, to the Department of Health Services (DHS), obligee on behalf of our subsidiary, CHEVRON U.S.A. INC. of 575 Market Street, San Francisco, California.

Recitals

1. Guarantor meets or exceeds the financial test criteria and agrees to comply with the reporting requirements for guarantors as specified in Sections 66264.143(f) and 66264.145(f), Title 22, California Code of Regulations.

2. Chevron U.S.A. Inc. owns at least 50 percent of the voting stock of and/or operates the following hazardous waste management facility(ies)/TTUs covered by this guarantee:

CAD 00833691 Chevron U.S.A. Inc. El Segundo Refinery P.O. Box 97 El Segundo, CA 90245	Closure and Post-Closure Care Closure Cost Post-Closure Cost	 $ 7,121,500 7,923,000
CAD 009114919 Chevron U.S.A. Inc. Richmond Refinery P.O. Box 1272 Richmond, CA 94802	Closure and Post-Closure Care Closure Cost Post-Closure Cost	 $ 15,435,500 18,262,000

CAD 981454226 Chevron U.S.A. Inc.* LTF 23D H.W.M.F. Sec. 23, T20S, R14E MDB&M Coalinga, CA	Closure and Post-Closure Care Closure Cost Post-Closure Cost	$	38,000 117,000
CAT 080011950 Chevron U.S.A. Inc.* LTF 35Q H.W.M.F. Sec. 35, T22S, R18E MDB&M Kettleman Dome, CA	Closure and Post-Closure Care Closure Cost Post-Closure	$	50,000 202,000
CAT 080011976 Chevron U.S.A. Inc.* LTF 3C H.W.M.F. Sec. 3, T32S, R23E MDB&M Taft, CA	Closure and Post-Closure Care Closure Cost Post-Closure Cost	$	44,000 166,000
CAD 981454283 Chevron U.S.A. Inc.* LTF 5K H.W.M.F. Sec. 5, T11N, R23W SBB&M Taft, CA	Closure and Post-Closure Care Closure Cost Post-Closure Cost	$	48,000 202,000

*The address of the Chevron U.S.A. Inc. office managing these Hazardous Waste Management Facilities ("HWMF"s) is: P.O. Box 1392, Bakersfield, CA.

3. "Closure plans" and "post-closure plans" as used below refer to the plans maintained as required by Division 4.5, Title 22, California Code of Regulations, for the closure and postclosure care of facility(ies)/TTUs as identified above.

4. For value received from Chevron U.S.A. Inc., guarantor guarantees to DHS that in the event that Chevron U.S.A. Inc. fails to perform closure or post-closure care of the above facility(ies)/TTUs 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 Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations, as applicable, in the name of Chevron U.S.A. Inc. in the amount of the current closure or post-closure cost estimates.

5. Guarantor agrees that if, at any time during or 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 either registered or certified mail, notice to DHS and to Chevron U.S.A. Inc. that he or she intends to provide alternate financial assurance as specified in Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations, as applicable, in the name of Chevron U.S.A. Inc. Within 90 days after the end of such fiscal year or other occurrence, the guarantor shall establish such alternate financial assurance unless Chevron U.S.A. Inc. has done so.

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

7. Guarantor agrees that within 30 days after being notified by the DHS of a determination that guarantor no longer meets the financial test criteria or that he or she is disallowed from continuing as a guarantor of closure or post-closure care, he or she shall establish alternate financial assurance, as applicable, in the name of Chevron U.S.A. Inc. unless Chevron U.S.A. Inc. 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 Division 4.5 of Title 22, California Code of Regulations.

9. Guarantor agrees to remain bound under this guarantee for so long as Chevron U.S.A. Inc. must comply with the applicable financial assurance requirements for the above-listed facilities/TTUs, except that guarantor may cancel this guarantee by sending notice by registered or certified mail to DHS and to Chevron U.S.A. Inc., such cancellation to become effective no earlier than 120 days after receipt of such notice by both DHS and Chevron U.S.A. Inc. as evidenced by the return receipts.

10. Guarantor agrees that if Chevron U.S.A. Inc. fails to provide alternate financial assurance as specified in Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations, as applicable, and obtain written approval of such assurance from the DHS within 90 days after a notice of cancellation by the guarantor is received by DHS from guarantor, guarantor shall provide such alternate financial assurance in the name of Chevron U.S.A. Inc.

11. Guarantor expressly waives notice of acceptance of this guarantee by DHS or by Chevron U.S.A. Inc. 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/TTU permit(s).

The parties below certify that this document is being executed in accordance with the requirements of Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations.

Effective Date: March 24, 1995

CHEVRON CORPORATION

By M. R. Klitten
M. R. Klitten
Vice President, Finance

By T. L. Walker
Assistant Secretary

March 24, 1995

Branch Chief
Department of Toxic Substances Control
Region 2
Surveillance & Enforcement Branch
Financial Responsibility
700 Heinz Avenue
Berkeley, CA 94710

CORPORATE GUARANTEE FOR CLOSURE AND POST-CLOSURE

GUARANTEE made this 24th day of March, 1995, by CHEVRON CORPORATION, a business corporation organized under the laws of the State of Delaware, herein referred to as guarantor, to the Department of Health Services (DHS), obligee on behalf of our subsidiary, CHEVRON CHEMICAL COMPANY, 6001 Bollinger Canyon Road, San Ramon, California.

Recitals

1. Guarantor meets or exceeds the financial test criteria and agrees to comply with the reporting requirements for guarantors as specified in Sections 66264.143(f) and 66264.145(f), Title 22, California Code of Regulations.

2. Chevron Chemical Company owns at least 50 percent of the voting stock of and/or operates the following hazardous waste management facility(ies)/TTUs covered by this guarantee:

CAD 043237486	Closure and Post-Closure Care	
Chevron Chemical Company	Closure Care	$ 92,759,000
940 Hensley Street	Post-Closure Care	14,041,000
Richmond, CA 94804		

3. "Closure plans" and "post-closure plan" as used below refer to the plans maintained as required by Division 4.5, Title 22, California Code of Regulations, for the closure and post-closure care of facility(ies)/TTU(s) as identified above.

4. For value received from Chevron Chemical Company, guarantor guarantees to DHS that in the event that Chevron Chemical Company fails to perform closure and post-closure care of the above facility(ies)/TTUs 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 Article 8 of Chapters 14 and 15, Title 22, California Code of

Regulations, as applicable, in the name of Chevron Chemical Company in the amount of the current closure or post-closure cost estimates.

5. Guarantor agrees that if, at any time during or 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 either registered or certified mail, notice to DHS and to Chevron Chemical Company that he or she intends to provide alternate financial assurance as specified in Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations, as applicable, in the name of Chevron Chemical Company. Within 90 days after the end of such fiscal year or other occurrence, the guarantor shall establish such alternate financial assurance unless Chevron Chemical Company has done so.

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

7. Guarantor agrees that within 30 days after being notified by the DHS of a determination that guarantor no longer meets the financial test criteria or that he or she is disallowed from continuing as a guarantor of closure or post-closure care, he or she shall establish alternate financial assurance as applicable, in the name of Chevron Chemical Company unless Chevron Chemical Company 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 postclosure or any other modification or alteration of an obligation of the owner or operator pursuant to Division 4.5 of Title 22, California Code of Regulations.

9. Guarantor agrees to remain bound under this guarantee for so long as Chevron Chemical Company must comply with the applicable financial assurance requirements for the above-listed facilities/TTUs, except that guarantor may cancel this guarantee by sending notice by registered or certified mail to DHS and to Chevron Chemical Company, such cancellation to become effective no earlier than 120 days after receipt of such notice by both DHS and Chevron Chemical Company as evidenced by the return receipts.

10. Guarantor agrees that if Chevron Chemical Company fails to provide alternate financial assurance as specified in Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations, as applicable, and obtain written approval of such assurance from DHS within 90 days after a notice of cancellation by the guarantor is received by DHS from guarantor, guarantor shall provide such alternate financial assurance in the name of Chevron Chemical Company.

11. Guarantor expressly waives notice of acceptance of this guarantee by DHS or by Chevron Chemical Company. 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/TTU permit(s).

The parties below certify that this document is being executed in accordance with the requirements of Article 8 of Chapters 14 and 15, Title 22, California Code of Regulations.

Effective Date: March 24, 1995

CHEVRON CORPORATION

By _____
M. R. Klitten
Vice President, Finance

By _____
Assistant Secretary

ENV7961

555 Californi[illegible]eet
San Francisc[illegible]A 94104
Telephone 415 393 8500
FAX Number 415 393 8644

Price Waterhouse LLP

March 24, 1995

To the Board of Directors of
Chevron Corporation

We have applied certain agreed-upon procedures, as discussed below, with respect to certain financial information included in the letter dated March 24, 1995, from the Vice President, Finance of Chevron Corporation to the California Department of Toxic Substances Control. The procedures we performed are summarized as follows:

a. i. We compared the Net Worth of Chevron Corporation (the Company) at December 31, 1994, as stated in the enclosed Schedule A, to the amount set forth as *Total Stockholders' Equity* in the consolidated financial statements included in the Company's 1994 Annual Report.

ii. We compared the Intangible Investments of the Company at December 31, 1994, as stated in the enclosed Schedule A, to a supporting schedule prepared by the Company from its accounting records. We also recalculated the mathematical accuracy of the supporting schedule.

iii. We compared the Tangible Net Worth of the Company, as stated in the attached Schedule A, to the corresponding amount as stated in the above letter.

b. i. We compared U.S. portion of Total Identifiable Assets of the Company at December 31, 1994, as stated in the enclosed Schedule B, to the amount set forth as *Identifiable Assets, Total United States* in Note 9 to the consolidated financial statements included in the Company's 1994 Annual Report.

ii. We compared the U.S. portion of Corporate and Other Assets of the Company at December 31, 1994, as stated in the enclosed Schedule B, to a supporting schedule prepared by the Company from its accounting records. We also recalculated the mathematical accuracy of the supporting schedule.

iii. We compared the Total Assets in the U.S., as stated in the enclosed Schedule B, to the corresponding amount in the above letter.

c. i. We compared Total Assets in the U.S., as stated in the enclosed Schedule B, to the amount set forth as *Total Assets* in Note 9 to the consolidated financial statements included in the Company's 1994 Annual Report in support of the Company's response to the question, **"Are at least 90% of the firm's assets located in the U.S.?"**

Because these procedures are not sufficient to constitute an audit made in accordance with generally accepted auditing standards, we do not express an opinion on any of the items referred to above. Had we performed additional procedures or had we made an examination in accordance with generally accepted auditing standards, matters might have come to our attention that would have been reported to you. This report relates only to the items specified above and does not extend to any other items or financial statements of the Company, taken as a whole. It is understood that this report is provided solely in support of the above letter and is not to be referred to for any other purpose.

Price Waterhouse LLP

SCHEDULE A

Tangible Net Worth of Chevron Corporation at December 31, 1994.

Net Worth	$ 14,596,000,000
Intangible Investments	(92,000,000)
Tangible Net Worth of Chevron Corporation	$ 14,504,000,000

SCHEDULE B

Total Assets in the U.S. of Chevron Corporation at December 31, 1994.

U.S. portion of Total Identifiable Assets	$ 18,124,000,000
U.S. portion of Corporate and Other Assets	2,051,000,000
Total Assets in the U.S. of Chevron Corporation	$ 20,175,000,000

APPENDIX M

Appendix M
Chemical Laboratory Results
Landfarms GPS Effluent Water Sampling

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE, RICHMOND, CA., 94802

REPORT DATE:
08-Aug-1996 12:52 pm

CLIENT :
CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
841 CHEVRON WAY
RICHMOND, CA. 94802

REQUESTOR :
PETE DUDA

PROJECT NAME: RR MISCELLANEOUS
PROJECT DESCRIPTION: LANDFARM EFFLUENT

REPORT ID: 100009320 CHARGE CODE : E83IC-3128-27-440

PROJECT ID : RAM LANDFARM EFFLUENT WATER
ANALYSIS : CONTRACT SEQUOIA LAB ; EPA 1020 (FLASH,A) ;
EPA 6010 (13+,METALS) ; EPA 7470 (MERCURY) ; EPA 7742 (SELENIUM) ;
EPA 9040 (PH AQUEOUS) ; REACTIVITY (CYANIDE) ; REACTIVITY (SULFIDE) ;
STLC CAM WET (PREP) ; TCLP 6010 (7-12,METALS) ; TCLP 7470 (MERCURY) ;
TCLP 7742 (SELENIUM) ; TCLP 8240 (VOLATILES) ; TCLP 8270 (SEMI-VOLATILE;
TCLP CONVENTIONAL (PREP); TCLP ZHE (PREP) ;

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION	SAMPLE DATE	DATE IN LAB	STATUS
200024283	961107-1	EFFLUENT WATER	07/11/96	07/11/96	APPROVED
200024284	961107-2	EFFLUENT WATER	07/11/96	07/11/96	APPROVED
200024285	961107-3	EFFLUENT WATER	07/11/96	07/11/96	APPROVED
200024286	961107-4	EFFLUENT WATER	07/11/96	07/11/96	APPROVED

PROJECT ID : RTM TCLP BIAS SPIKE REFINERY
ANALYSIS : TCLP 6010 (3-6,METALS) ; TCLP 7470 (MERCURY) ;
TCLP 7742 (SELENIUM) ; TCLP 8240 (VOLATILES) ; TCLP 8270 (SEMI-VOLATILE;

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION	SAMPLE DATE	DATE IN LAB	STATUS
200024288	961107-1 BIAS S				APPROVED

This report is "PROPRIETARY AND CONFIDENTIAL" and delivered to, and intended for the exclusive use of the above named client only. Chevron Environmental Laboratory assumes no responsibility of liability for the reliance hereon by anyone other than the above named client.

Chevron Environmental Laboratory

DUPINDER JOHL
Laboratory Advisor

08/12/96
Date

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024283	961107-1	EFFLUENT WATER

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	07/22/96	EPA 8240	07/22/96	DALEO	8392
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	07/29/96	EPA 8270	08/06/96	CMFER	10816
TCLP MISCELLANEOUS					
TCLP ZHE PREP. (A)	07/19/96	EPA 1311	N/A	DALEO	500000267
TCLP CONV. PREP. (A)	07/23/96	EPA 1311	N/A	PADEA	500000268
TCLP METALS					
METALS III (ICAP,A)	07/25/96	EPA 6010	07/25/96	BRWAL	11304
MERCURY (CV/AA)	07/25/96	EPA 7470	07/25/96	JJMAS	11394
SELENIUM (GH/AA)	07/26/96	EPA 7742	07/26/96	BRWAL	11161
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	07/12/96	EPA 9040	07/12/96	JMKEL	11210
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	07/18/96	EPA 6010	07/19/96	BRWAL	11300
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	07/16/96	EPA 7470	07/16/96	JJMAS	11297
SELENIUM (GH/AA)	07/17/96	EPA 7742	07/17/96	BRWAL	11157
INORGANIC PARAMETERS					
SULFIDE, REACTIVE (A)	07/16/96	APHA 427C	07/17/96	JMKEL	11322
CYANIDE, REACTIVE (A)	07/16/96	EPA 9010A	07/18/96	JMKEL	11323
CONVENTIONALS					
STLC PREP (A)	07/23/96	CCR STLC		PADEA	500000271
FLASH (A)	07/12/96	EPA 1020	07/12/96	JMKEL	11207

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024284	961107-2	EFFLUENT WATER

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	07/22/96	EPA 8240	07/22/96	DALEO	8392
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	07/29/96	EPA 8270	08/06/96	CMFER	10816

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

08-Aug-1996 12:52 pm
REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024284	961107-2	EFFLUENT WATER

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP MISCELLANEOUS					
TCLP ZHE PREP. (A)	07/19/96	EPA 1311	N/A	DALEO	500000267
TCLP CONV. PREP. (A)	07/23/96	EPA 1311	N/A	PADEA	500000268
TCLP METALS					
MERCURY (CV/AA)	07/25/96	EPA 7470	07/25/96	JJMAS	11394
SELENIUM (GH/AA)	07/26/96	EPA 7742	07/26/96	BRWAL	11161
METALS III (ICAP,A)	07/25/96	EPA 6010	07/25/96	BRWAL	11304
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	07/12/96	EPA 9040	07/12/96	JMKEL	11210
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	07/18/96	EPA 6010	07/19/96	BRWAL	11300
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	07/16/96	EPA 7470	07/16/96	JJMAS	11297
SELENIUM (GH/AA)	07/17/96	EPA 7742	07/17/96	BRWAL	11157
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	07/16/96	EPA 9010A	07/18/96	JMKEL	11323
SULFIDE, REACTIVE (A)	07/16/96	APHA 427C	07/17/96	JMKEL	11322
CONVENTIONALS					
FLASH (A)	07/12/96	EPA 1020	07/12/96	JMKEL	11207
STLC PREP (A)	07/23/96	CCR STLC		PADEA	500000271

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024285	961107-3	EFFLUENT WATER

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	07/23/96	EPA 8240	07/23/96	DALEO	8393
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	07/29/96	EPA 8270	08/07/96	CMFER	10816
TCLP MISCELLANEOUS					
TCLP ZHE PREP. (A)	07/19/96	EPA 1311	N/A	DALEO	500000267
TCLP CONV. PREP. (A)	07/23/96	EPA 1311	N/A	PADEA	500000268

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

08-Aug-1996 12:52 pm
REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024285	961107-3	EFFLUENT WATER

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP METALS					
METALS III (ICAP,A)	07/25/96	EPA 6010	07/25/96	BRWAL	11304
MERCURY (CV/AA)	07/25/96	EPA 7470	07/25/96	JJMAS	11394
SELENIUM (GH/AA)	07/26/96	EPA 7742	07/26/96	BRWAL	11161
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	07/12/96	EPA 9040	07/12/96	JMKEL	11210
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	07/18/96	EPA 6010	07/19/96	BRWAL	11300
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	07/16/96	EPA 7470	07/16/96	JJMAS	11297
SELENIUM (GH/AA)	07/17/96	EPA 7742	07/17/96	BRWAL	11157
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	07/16/96	EPA 9010A	07/18/96	JMKEL	11323
SULFIDE, REACTIVE (A)	07/16/96	APHA 427C	07/17/96	JMKEL	11322
CONVENTIONALS					
FLASH (A)	07/12/96	EPA 1020	07/12/96	JMKEL	11207
STLC PREP (A)	07/23/96	CCR STLC		PADEA	500000271

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024286	961107-4	EFFLUENT WATER

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	07/22/96	EPA 8240	07/22/96	DALEO	8392
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	07/29/96	EPA 8270	08/07/96	CMFER	10816
TCLP MISCELLANEOUS					
TCLP ZHE PREP. (A)	07/19/96	EPA 1311	N/A	DALEO	500000267
TCLP CONV. PREP. (A)	07/23/96	EPA 1311	N/A	PADEA	500000268
TCLP METALS					
METALS III (ICAP,A)	07/25/96	EPA 6010	07/25/96	BRWAL	11304
MERCURY (CV/AA)	07/25/96	EPA 7470	07/25/96	JJMAS	11394

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024286	961107-4	EFFLUENT WATER

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP METALS					
SELENIUM (GH/AA)	07/26/96	EPA 7742	07/26/96	BRWAL	11161
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	07/12/96	EPA 9040	07/12/96	JMKEL	11210
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	07/18/96	EPA 6010	07/19/96	BRWAL	11300
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	07/16/96	EPA 7470	07/16/96	JJMAS	11297
SELENIUM (GH/AA)	07/17/96	EPA 7742	07/17/96	BRWAL	11157
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	07/16/96	EPA 9010A	07/18/96	JMKEL	11323
SULFIDE, REACTIVE (A)	07/16/96	APHA 427C	07/17/96	JMKEL	11322
CONVENTIONALS					
STLC PREP (A)	07/23/96	CCR STLC		PADEA	500000271
FLASH (A)	07/12/96	EPA 1020	07/12/96	JMKEL	11207

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024288	961107-1 BIAS S	

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES BIAS SPIKE PERCENT REC.					
PURGEABLES PARTIAL (GC/MS,A)	07/24/96	EPA 8240	07/24/96	DALEO	8394
TCLP SEMI-VOL. BIAS SPIKE PERCENT REC.					
SEMIS TCLP (GC/MS,A)	07/29/96	EPA 8270	08/07/96	CMFER	10816
TCLP METALS BIAS SPIKE RECOVERY					
METALS II (ICAP,A)	07/25/96	EPA 6010	07/25/96	BRWAL	11304
MERCURY (CV/AA)	07/25/96	EPA 7470	07/25/96	JJMAS	11394
SELENIUM (GH/AA)	07/26/96	EPA 7742	07/26/96	BRWAL	11161

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024283	961107-1	EFFLUENT WATER

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	8392
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	8392
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	8392
BENZENE	ND	UG/L	50	EPA 8240	8392
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	8392
CHLOROBENZENE	ND	UG/L	50	EPA 8240	8392
CHLOROFORM	ND	UG/L	100	EPA 8240	8392
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	8392
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	8392
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	8392
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	8392
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10816
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10816
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10816
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10816
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10816
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10816
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10816
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10816
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10816
NITROBENZENE	ND	UG/L	25	EPA 8270	10816
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10816
PYRIDINE	ND	UG/L	50	EPA 8270	10816
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11304
BARIUM	.339	MG/L	.007	EPA 6010	11304
CADMIUM	ND	MG/L	.007	EPA 6010	11304
CHROMIUM	ND	MG/L	.04	EPA 6010	11304
LEAD	ND	MG/L	.084	EPA 6010	11304
MERCURY	ND	MG/L	.001	EPA 7470	11394
SELENIUM	ND	MG/L	.002	EPA 7742	11161
SILVER	ND	MG/L	.02	EPA 6010	11304
PHYSICAL PARAMETERS					
PH	7.45	pH	.5	EPA 9040	11210
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11300
ARSENIC	ND	MG/L	.092	EPA 6010	11300
BARIUM	.36	MG/L	.007	EPA 6010	11300
BERYLLIUM	ND	MG/L	.005	EPA 6010	11300
CADMIUM	ND	MG/L	.007	EPA 6010	11300
CHROMIUM	ND	MG/L	.04	EPA 6010	11300
COBALT	ND	MG/L	.015	EPA 6010	11300
COPPER	ND	MG/L	.02	EPA 6010	11300
LEAD	ND	MG/L	.084	EPA 6010	11300
MOLYBDENUM	.058	MG/L	.022	EPA 6010	11300

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024283	961107-1	EFFLUENT WATER

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11300
SILVER	ND	MG/L	.02	EPA 6010	11300
THALLIUM	ND	MG/L	.16	EPA 6010	11300
VANADIUM	ND	MG/L	.01	EPA 6010	11300
ZINC	.712	MG/L	.025	EPA 6010	11300
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11297
SELENIUM	ND	MG/L	.002	EPA 7742	11157
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.8	EPA 9010A	11323
SULFIDE, REACTIVE	ND	MG/L	7	APHA 427C	11322
CONVENTIONALS					
FLASH	ND	DEG F	170	EPA 1020	11207

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
08-Aug-1996 12:52 pm
REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024284	961107-2	EFFLUENT WATER

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	8392
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	8392
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	8392
BENZENE	ND	UG/L	50	EPA 8240	8392
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	8392
CHLOROBENZENE	ND	UG/L	50	EPA 8240	8392
CHLOROFORM	ND	UG/L	60	EPA 8240	8392
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	8392
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	8392
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	8392
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	8392
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10816
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10816
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10816
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10816
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10816
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10816
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10816
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10816
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10816
NITROBENZENE	ND	UG/L	25	EPA 8270	10816
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10816
PYRIDINE	ND	UG/L	50	EPA 8270	10816
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11304
BARIUM	.07	MG/L	.007	EPA 6010	11304
CADMIUM	ND	MG/L	.007	EPA 6010	11304
CHROMIUM	ND	MG/L	.04	EPA 6010	11304
LEAD	ND	MG/L	.084	EPA 6010	11304
MERCURY	ND	MG/L	.001	EPA 7470	11394
SELENIUM	ND	MG/L	.002	EPA 7742	11161
SILVER	ND	MG/L	.02	EPA 6010	11304
PHYSICAL PARAMETERS					
PH	7.51	pH	.5	EPA 9040	11210
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11300
ARSENIC	ND	MG/L	.092	EPA 6010	11300
BARIUM	.078	MG/L	.007	EPA 6010	11300
BERYLLIUM	ND	MG/L	.005	EPA 6010	11300
CADMIUM	ND	MG/L	.007	EPA 6010	11300
CHROMIUM	ND	MG/L	.04	EPA 6010	11300
COBALT	ND	MG/L	.015	EPA 6010	11300
COPPER	.048	MG/L	.02	EPA 6010	11300
LEAD	ND	MG/L	.084	EPA 6010	11300
MOLYBDENUM	ND	MG/L	.022	EPA 6010	11300

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024284	961107-2	EFFLUENT WATER

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11300
SILVER	ND	MG/L	.02	EPA 6010	11300
THALLIUM	ND	MG/L	.16	EPA 6010	11300
VANADIUM	.014	MG/L	.01	EPA 6010	11300
ZINC	.301	MG/L	.025	EPA 6010	11300
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11297
SELENIUM	ND	MG/L	.002	EPA 7742	11157
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.8	EPA 9010A	11323
SULFIDE, REACTIVE	ND	MG/L	7	APHA 427C	11322
CONVENTIONALS					
FLASH	ND	DEG F	170	EPA 1020	11207

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024285	961107-3	EFFLUENT WATER

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	8393
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	8393
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	8393
BENZENE	ND	UG/L	50	EPA 8240	8393
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	8393
CHLOROBENZENE	ND	UG/L	50	EPA 8240	8393
CHLOROFORM	ND	UG/L	60	EPA 8240	8393
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	8393
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	8393
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	8393
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	8393
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10816
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10816
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10816
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10816
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10816
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10816
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10816
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10816
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10816
NITROBENZENE	ND	UG/L	25	EPA 8270	10816
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10816
PYRIDINE	ND	UG/L	50	EPA 8270	10816
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11304
BARIUM	.092	MG/L	.007	EPA 6010	11304
CADMIUM	ND	MG/L	.007	EPA 6010	11304
CHROMIUM	ND	MG/L	.04	EPA 6010	11304
LEAD	ND	MG/L	.084	EPA 6010	11304
MERCURY	ND	MG/L	.001	EPA 7470	11394
SELENIUM	ND	MG/L	.002	EPA 7742	11161
SILVER	ND	MG/L	.02	EPA 6010	11304
PHYSICAL PARAMETERS					
PH	7.06	pH	.5	EPA 9040	11210
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11300
ARSENIC	ND	MG/L	.092	EPA 6010	11300
BARIUM	.054	MG/L	.007	EPA 6010	11300
BERYLLIUM	ND	MG/L	.005	EPA 6010	11300
CADMIUM	ND	MG/L	.007	EPA 6010	11300
CHROMIUM	ND	MG/L	.04	EPA 6010	11300
COBALT	ND	MG/L	.015	EPA 6010	11300
COPPER	ND	MG/L	.02	EPA 6010	11300
LEAD	ND	MG/L	.084	EPA 6010	11300
MOLYBDENUM	.247	MG/L	.022	EPA 6010	11300

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

08-Aug-1996 12:52 pm
REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024285	961107-3	EFFLUENT WATER

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	.069	MG/L	.056	EPA 6010	11300
SILVER	ND	MG/L	.02	EPA 6010	11300
THALLIUM	ND	MG/L	.16	EPA 6010	11300
VANADIUM	ND	MG/L	.01	EPA 6010	11300
ZINC	.659	MG/L	.025	EPA 6010	11300
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11297
SELENIUM	ND	MG/L	.002	EPA 7742	11157
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.8	EPA 9010A	11323
SULFIDE, REACTIVE	ND	MG/L	7	APHA 427C	11322
CONVENTIONALS					
FLASH	ND	DEG F	170	EPA 1020	11207

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024286	961107-4	EFFLUENT WATER

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	8392
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	8392
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	8392
BENZENE	ND	UG/L	50	EPA 8240	8392
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	8392
CHLOROBENZENE	ND	UG/L	50	EPA 8240	8392
CHLOROFORM	ND	UG/L	60	EPA 8240	8392
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	8392
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	8392
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	8392
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	8392
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10816
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10816
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10816
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10816
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10816
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10816
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10816
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10816
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10816
NITROBENZENE	ND	UG/L	25	EPA 8270	10816
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10816
PYRIDINE	ND	UG/L	50	EPA 8270	10816
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11304
BARIUM	.222	MG/L	.007	EPA 6010	11304
CADMIUM	ND	MG/L	.007	EPA 6010	11304
CHROMIUM	ND	MG/L	.04	EPA 6010	11304
LEAD	ND	MG/L	.084	EPA 6010	11304
MERCURY	ND	MG/L	.001	EPA 7470	11394
SELENIUM	.007	MG/L	.002	EPA 7742	11161
SILVER	ND	MG/L	.02	EPA 6010	11304
PHYSICAL PARAMETERS					
PH	7.46	pH	.5	EPA 9040	11210
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11300
ARSENIC	ND	MG/L	.092	EPA 6010	11300
BARIUM	.225	MG/L	.007	EPA 6010	11300
BERYLLIUM	ND	MG/L	.005	EPA 6010	11300
CADMIUM	ND	MG/L	.007	EPA 6010	11300
CHROMIUM	ND	MG/L	.04	EPA 6010	11300
COBALT	ND	MG/L	.015	EPA 6010	11300
COPPER	ND	MG/L	.02	EPA 6010	11300
LEAD	ND	MG/L	.084	EPA 6010	11300
MOLYBDENUM	.025	MG/L	.022	EPA 6010	11300

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024286	961107-4	EFFLUENT WATER

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11300
SILVER	ND	MG/L	.02	EPA 6010	11300
THALLIUM	ND	MG/L	.16	EPA 6010	11300
VANADIUM	ND	MG/L	.01	EPA 6010	11300
ZINC	1.01	MG/L	.025	EPA 6010	11300
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11297
SELENIUM	ND	MG/L	.002	EPA 7742	11157
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.8	EPA 9010A	11323
SULFIDE, REACTIVE	ND	MG/L	7	APHA 427C	11322
CONVENTIONALS					
FLASH	ND	DEG F	170	EPA 1020	11207

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 08-Aug-1996 12:52 pm
WASTE DISCHARGE ORDER REPORT ID: 100009320

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200024288	961107-1	BIAS S

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES BIAS SPIKE PERCENT REC.					
1,1-DICHLOROETHENE	82.593	PERCENT		EPA 8240	8394
1,2-DICHLOROETHANE	104.922	PERCENT		EPA 8240	8394
1,4-DICHLOROBENZENE	99.52	PERCENT		EPA 8240	8394
BENZENE	91.477	PERCENT		EPA 8240	8394
CARBON TETRACHLORIDE	97.719	PERCENT		EPA 8240	8394
CHLOROBENZENE	93.637	PERCENT		EPA 8240	8394
CHLOROFORM	87.635	PERCENT		EPA 8240	8394
METHYL ETHYL KETONE	91.657	PERCENT		EPA 8240	8394
TETRACHLOROETHENE	94.478	PERCENT		EPA 8240	8394
TRICHLOROETHENE	90.276	PERCENT		EPA 8240	8394
VINYL CHLORIDE	88.235	PERCENT		EPA 8240	8394
TCLP SEMI-VOL. BIAS SPIKE PERCENT REC.					
1,4-DICHLOROBENZENE	68.56	PERCENT		EPA 8270	10816
2,4,5-TRICHLOROPHENOL	81.88	PERCENT		EPA 8270	10816
2,4,6-TRICHLOROPHENOL	83.57	PERCENT		EPA 8270	10816
2,4-DINITROTOLUENE	94.49	PERCENT		EPA 8270	10816
2-METHYLPHENOL	105.99	PERCENT		EPA 8270	10816
3/4-METHYLPHENOL	97.2	PERCENT		EPA 8270	10816
HEXACHLOROBENZENE	56.78	PERCENT		EPA 8270	10816
HEXACHLOROBUTADIENE	53.52	PERCENT		EPA 8270	10816
HEXACHLOROETHANE	68.71	PERCENT		EPA 8270	10816
NITROBENZENE	110.45	PERCENT		EPA 8270	10816
PENTACHLOROPHENOL	111.54	PERCENT		EPA 8270	10816
PYRIDINE	77.3	PERCENT		EPA 8270	10816
TCLP METALS BIAS SPIKE RECOVERY					
ARSENIC	80.6	PERCENT		EPA 6010	11304
BARIUM	74.1	PERCENT		EPA 6010	11304
CADMIUM	82	PERCENT		EPA 6010	11304
CHROMIUM	83.2	PERCENT		EPA 6010	11304
LEAD	69.4	PERCENT		EPA 6010	11304
MERCURY	53.8	PERCENT		EPA 7470	11394
SELENIUM	63.15	PERCENT		EPA 7742	11161
SILVER	80.8	PERCENT		EPA 6010	11304

Sequoia Analytical

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Chevron Environmental Laboratory
940 Hensley St.
Richmond, CA 94804
Attention: C. Arcia

Client Project ID: Chevron GPS - Sub 100009320
Sample Descript: Liquid, 961107-1
Analysis Method: See below
Lab Number: 607-0751

Sampled: Jul 11, 1996
Received: Jul 12, 1996
Reported: Jul 23, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 28 mm
Min. length: 23 mm
Max. length: 33 mm
Mean weight: 0.32 g
Min. weight: 0.17 g
Max. weight: 0.49 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	32	46	49
750 ppm	31	35	49	50
Duplicate 750 ppm	31	34	49	50

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	7/12/96	7/13/96	7/14/96	7/15/96	7/16/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.1	18	7.6	8.0	17	7.6	0	5.9	19	7.2	0	6.3	18	7.3	0	6.3	18	7.3	0	0
750 ppm	9.2	18	7.5	7.8	17	7.5	0	5.9	18	7.2	0	6.0	18	7.2	0	6.0	18	7.1	0	0
250 ppm	9.1	17	7.6	7.6	17	7.5	0	6.3	18	7.1	0	5.9	18	7.1	1	5.4	18	7.1	3	3
Duplicate																				
750 ppm	9.3	17	7.5	7.6	17	7.6	0	5.5	18	7.1	1	6.0	18	7.2	2	6.1	18	7.1	2	2
250 ppm	9.4	17	7.6	8.0	17	7.5	0	6.3	18	7.1	0	6.3	18	7.1	0	5.5	17	7.1	0	0

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ D. Newcomb

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Kenneth L. Witmer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Laboratory
940 Hensley St.
Richmond, CA 94804
Attention: C. Arcia

Client Project ID: Chevron GPS - Sub 100009320
Sample Descript: Liquid, 961107-2
Analysis Method: See below
Lab Number: 607-0752

Sampled: Jul 11, 1996
Received: Jul 12, 1996
Reported: Jul 23, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 28 mm
Min. length: 23 mm
Max. length: 33 mm
Min. weight: 0.17 g
Mean weight: 0.32 g
Max. weight: 0.49 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	32	46	49
750 ppm	31	33	48	50
Duplicate 750 ppm	30	33	49	49

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	7/12/96	7/13/96	7/14/96	7/15/96	7/16/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.1	18	7.6	8.0	17	7.6	0	5.9	19	7.2	0	6.3	18	7.3	0	6.3	18	7.3	0	0
750 ppm	9.4	17	7.7	7.5	17	7.5	0	6.6	19	7.1	0	6.5	18	7.2	0	5.9	18	7.2	0	0
250 ppm	9.5	17	7.7	7.7	17	7.5	0	5.9	19	7.1	0	6.5	18	7.2	3	5.8	17	7.2	6	6
Duplicate																				
750 ppm	9.5	17	7.7	7.2	17	7.5	0	6.4	19	7.1	0	6.4	18	7.1	0	5.6	18	7.1	1	1
250 ppm	9*.3	18	7.7	7.4	17	7.5	0	5.4	19	7.1	0	5.7	18	7.2	0	5.9	17	7.2	0	0

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ D. Newcomb

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Kenneth L. Wimer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Laboratory
940 Hensley St.
Richmond, CA 94804
Attention: C. Arcia

Client Project ID: Chevron GPS - Sub 100009320
Sample Descript: Liquid, 961107-3
Analysis Method: See below
Lab Number: 607-0753

Sampled: Jul 11, 1996
Received: Jul 12, 1996
Reported: Jul 23, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 28 mm
Min. length: 23 mm
Max. length: 33 mm
Mean weight: 0.32 g
Min. weight: 0.17 g
Max. weight: 0.49 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	32	46	49
750 ppm	30	39	47	50
Duplicate 750 ppm	30	33	48	50

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	7/12/96	7/13/96	7/14/96	7/15/96	7/16/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.1	18	7.6	8.0	17	7.6	0	5.9	19	7.2	0	6.3	18	7.3	0	6.3	18	7.3	0	0
750 ppm	9.5	17	7.6	7.2	17	7.5	0	5.6	18	7.0	1	6.0	18	7.2	1	5.6	18	7.1	1	1
250 ppm	9.5	17	7.6	7.5	17	7.4	0	5.6	18	7.1	0	6.2	18	7.1	0	5.9	18	7.1	0	0
Duplicate																				
750 ppm	9.5	17	7.6	7.6	17	7.5	0	5.8	18	7.0	0	5.9	18	7.1	0	5.9	18	7.1	0	0
250 ppm	9.5	17	7.6	7.8	17	7.4	0	7.0	18	7.1	0	6.3	18	7.1	0	6.1	17	7.1	0	0

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ D. Newcomb

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Kenneth L. Wimer
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Laboratory	Client Project ID: Chevron GPS - Sub 100009320	Sampled: Jul 11, 1996
940 Hensley St.	Sample Descript: Liquid, 961107-4	Received: Jul 12, 1996
Richmond, CA 94804	Analysis Method: See below	
Attention: C. Arcia	Lab Number: 607-0754	Reported: Jul 23, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 28 mm
Min. length: 23 mm
Max. length: 33 mm
Mean weight: 0.32 g
Min. weight: 0.17 g
Max. weight: 0.49 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	32	46	49
750 ppm	30	34	48	49
Duplicate 750 ppm	29	34	48	48

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	7/12/96	7/13/96	7/14/96	7/15/96	7/16/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.1	18	7.6	8.0	17	7.6	0	5.9	19	7.2	0	6.3	18	7.3	0	6.3	18	7.3	0	0
750 ppm	9.5	17	7.6	8.0	17	7.4	0	5.6	18	7.1	0	5.8	17	7.1	0	5.5	18	7.0	0	0
250 ppm	9.4	17	7.7	6.7	17	7.5	0	6.1	18	7.1	0	5.9	18	7.1	0	5.9	17	7.1	0	0
Duplicate																				
750 ppm	9.5	17	7.6	8.1	17	7.4	0	6.5	18	7.1	0	6.2	17	7.1	0	6.1	18	7.0	0	0
250 ppm	9.4	17	7.7	7.7	17	7.5	0	5.0	18	7.1	1	6.0	18	7.1	2	6.0	17	7.1	2	2

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ D. Newcomb

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Kenneth L. Wimer
Project Manager

SEQUOIA ANALYTICAL
CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENVIRONMENTAL LABORATORY	Project Name: CHEVRON GPS – SUBMISSION 100009320
Address: 940 HENSLEY ST	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: (510) 231-8113 FAX #: (510) 231-8262	P.O. #:
Report To: C. ARCIA Sampler: M. MARIN	QC Data: ☐ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested

	Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	BIOASSAY (*)	Comments
1	961107-1	07/11/96; 11:30	AQ	2	L-AG	6070751		(*) DEFINITIVE IF REQUIRED
2	961107-2	07/11/96; 13:00	AQ	2	L-AG	6070752	X	
3	961107-3	07/11/96; 14:00	AQ	2	L-AG	6070753	X	
4	961107-4	07/11/96; 11:30	AQ	2	L-AG	6070754	X	
5								
6								
7								
8								
9								
10								

FR 11 56

Pink - Client
Yellow - Sequoia
White - Sequoia

Relinquished By: C. Arcia	Date: 07/12/96	Time: 0943	Received By: ATC 980	Date: 7-12-96	Time: 0943
Relinquished By: ATC 980	Date: 7/12/96	Time: 1040	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab:	Date: 7/12	Time: 1040

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment

SEQUOIA ANALYTICAL CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENVIRONMENTAL LABORATORY	Project Name: CHEVRON GPS - SUBMISSION 100009320
Address: 940 HENSLEY ST	Billing Address (if different):
City: RICHMOND State: CA. Zip Code: 94804	
Telephone: (510) 231-8113 FAX #: (510) 231-8262	P.O. #:
Report To: C. ARCIA Sampler: M. MARIN	QC Data: ☐ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	BIOASSAY (*)									Comments
1. 961107-1	07/11/96; 11:30	AQ	2	L-AG		X								(*)	DEFINITIVE IF REQUIRED
2. 961107-2	07/11/96; 13:00	AQ	2	L-AG		X									
3. 961107-3	07/11/96; 14:00	AQ	2	L-AG		X									
4. 961107-4	07/11/96; 10:30	AQ	2	L-AG		X									
5.															
6.															
7.															
8.															
9.															
10.															

Relinquished By: [signature]	Date: 07/11/96	Time: 0943	Received By: [signature] 480	Date: 7-12-96	Time: 0943
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab:	Date:	Time:

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment

Page of

Pink - Client
Yellow - Sequoia
White - Sequoia

CHEVRON ENVIRONMENTAL LABORATORY
SAMPLE CONDITIONS

3MISSION ID: 10000320 DATE RECEIVED: 07/11/96

1PERATURE: Cold X ;Ambient ___ ;Warm ___ SEALED: (Y/N) N

Sample ID:		200024283			200024284			200024285			200024286			2000		
Customer ID:		961107-1			961107-2			961107-3			961107-4					
Notes: Preserved(Y/N) HS=Headspace(Y/N)																
LYSIS REQUIRED	Preservative	Pr	pH	HS	Pr	pH	HS	Pr	pH	HS	Pr	pH	HS	Pr	pH	HS
ll 1-L AG	NONE	rec'd. ok →														
metals	HNO_3		<2			<2			<2			<2				

Conditions checked by: [signature]

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE.,RICHMOND,CA.,94804

CLIENT REP : CHARMAINE ARCIA
PHONE : (510) 231-8113
FAX : (510) 231-8262

CHAIN OF CUSTODY / ANALYSIS REQUEST

LANDFARM EFFLUENT
RR MISCELLANEOUS

REPORT ID : 100009320

CHARGE CODE: 999

REQUESTOR : PETE DUDA
DIVISION : WASTE DISCHARGE ORDER

CONTACT : PETE DUDA
PHONE :

SAMPLE TYPE: RAM LANDFARM EFFLUENT WATER

SUBMITTER : MARC MARIN

ANALYSIS REQUESTED:

CONTRACT SEQUOIA LAB	EPA 1020 (FLASH,A)	EPA 6010 (13+,METALS)
EPA 7470 (MERCURY)	EPA 7742 (SELENIUM)	EPA 9040 (PH AQUEOUS)
REACTIVITY (CYANIDE)	REACTIVITY (SULFIDE)	STLC CAM WET (PREP)
TCLP 6010 (7-12,METALS)	TCLP 7470 (MERCURY)	TCLP 7742 (SELENIUM)
TCLP 8240 (VOLATILES)	TCLP 8270 (SEMI-VOLATILE	TCLP CONVENTIONAL (PREP)
TCLP ZHE (PREP)		

COMMENTS: corrected w/o (Flash/Ignit. added) CMO

	LAB NUMBER	CLIENT ID	SAMPLE INFORMATION	SAMPLE DATE	TIME	SAMPLE CONTAINER(S)
1.	200024283	961107-1	EFFLUENT WATER	07/11/96	1130	8 1L-G/2 1L-P/1
2.	200024284	961107-2	EFFLUENT WATER	07/11/96	1300	8 1L-G/2 1L-P/1
3.	200024285	961107-3	EFFLUENT WATER	07/11/96	1400	8 1L-G/2 1L-P/1
4.	200024286	961107-4	EFFLUENT WATER	07/11/96	1030	8 1L-G/2 1L-P/1
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						

CHAIN OF POSSESSION:

A.	Signature	Title	Date/Time
	[signature]	[signature]	07/12/96

B

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE.,RICHMOND,CA.,94804

CLIENT REP : CHARMAINE ARCIA
PHONE : (510) 231-8113
FAX : (510) 231-8262

CHAIN OF CUSTODY / ANALYSIS REQUEST

LANDFARM EFFLUENT
RR MISCELLANEOUS

REPORT ID : 100009320

CHARGE CODE: 999

REQUESTOR : PETE DUDA
DIVISION : WASTE DISCHARGE ORDER

CONTACT : PETE DUDA
PHONE :

SAMPLE TYPE: RAM LANDFARM EFFLUENT WATER

SUBMITTER : MARC MARIN

ANALYSIS REQUESTED:

CONTRACT SEQUOIA LAB	EPA 6010 (13+,METALS)	EPA 7470 (MERCURY)
EPA 7742 (SELENIUM)	EPA 9040 (PH AQUEOUS)	REACTIVITY (CYANIDE)
REACTIVITY (SULFIDE)	STLC CAM WET (PREP)	TCLP 6010 (7-12,METALS)
TCLP 7470 (MERCURY)	TCLP 7742 (SELENIUM)	TCLP 8240 (VOLATILES)
TCLP 8270 (SEMI-VOLATILE	TCLP CONVENTIONAL (PREP)	TCLP ZHE (PREP)

COMMENTS:

	LAB NUMBER	CLIENT ID	SAMPLE INFORMATION	SAMPLE DATE	TIME	SAMPLE CONTAINER(S)
1.	200024283	961107-1	EFFLUENT WATER	07/11/96	1130	8 1L-G/2 1L-P/1
2.	200024284	961107-2	EFFLUENT WATER	07/11/96	1300	8 1L-G/2 1L-P/1
3.	200024285	961107-3	EFFLUENT WATER	07/11/96	1400	8 1L-G/2 1L-P/1
4.	200024286	961107-4	EFFLUENT WATER	07/11/96	1030	8 1L-G/2 1L-P/1
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						

CHAIN OF POSSESSION:

	Signature	Title	Date/Time
A.			07/11/96
B.			

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE.,RICHMOND,CA.,94804

CLIENT REP : CHARMAINE ARCIA
PHONE : (510) 231-8113
FAX : (510) 231-8262

CHAIN OF CUSTODY / ANALYSIS REQUEST

LANDFARM EFFLUENT
RR MISCELLANEOUS

REPORT ID : 100009320

CHARGE CODE: 999

REQUESTOR : PETE DUDA
DIVISION : WASTE DISCHARGE ORDER

CONTACT : PETE DUDA
PHONE :

SAMPLE TYPE: RTM TCLP BIAS SPIKE REFINERY

SUBMITTER : MARC MARIN

ANALYSIS REQUESTED:
TCLP 6010 (3-6,METALS) ; TCLP 7470 (MERCURY) ; TCLP 7742 (SELENIUM) ;
TCLP 8240 (VOLATILES) ; TCLP 8270 (SEMI-VOLATILE ;

COMMENTS: _____

	LAB NUMBER	CLIENT ID	SAMPLE INFORMATION	SAMPLE DATE	TIME	SAMPLE CONTAINER(S)
1.	200024288	961107-1 Bias Spk				
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						

CHAIN OF POSSESSION:

	Signature	Title	Date/Time
A.	Marc Arcia	Tech	07/11/96
B.			

CHAIN-OF-CUSTODY RECORD

WHITE COPY - Original (Accompanies Samples) YELLOW COPY - Collector PINK COPY - Project Manager

Sample Number	Depth	Time	Sample Type	Container Type	ANALYSES: VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	PEST/PCB 8080	PNA 610/8310	DIESEL 8015M	TPHIDQ 8015M	GAS/BTEX	Ignitability	Corrosivity	TPH 418.1	PH	RCRA METALS (8)	PP METALS (13)	TTLC METALS (17)	Asbestos	Reactivity	TCLP	CWET	FIELD NOTES:	Total Number Of Containers	Laboratory Note Number
961107-1		1130	WAT	8LA/2LP 1-250P										X	X							X	X	X		11	
961107-2		1300	WAT	"										X	X							X	X	X			
961107-3		1400	WAT	"										X	X							X	X	X			
961107-4		1030	WAT	"										X	X							X	X	X			

RELINQUISHED BY: (Signature) DATE/TIME 1600 RECEIVED BY: (Signature)
[signature] 7/11/96 [signature]

RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

Clients Name: Dames & Moore
Address: 2001 Gateway Pl
City, State, Zip: SAN JOSE, CA 95110
Phone: (408) 451-1125 Fax: (408) 451-7137
Laboratory Contact: Charmaine A.

D&M LABORATORIES
ENVIRONMENTAL AND INDUSTRIAL HYGIENE SERVICES
3700 Lakeville Highway, Petaluma CA 94954
Telephone: (707) 763-8245
FAX: (707) 763-4065

LABORATORY NOTES:
Was unable to fully fill both 1000ml P; Only provided one 250ml P - okayed by Charmaine.

JOB NO.: 19000-800 SHEET 1 OF 1
PROJECT Chevron GPS
LOCATION Richmond, CA
COLLECTOR Marin DATE OF COLLECTION 7-11-96

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE, RICHMOND, CA., 94802

REPORT DATE:
17-Sep-1996 09:13 am

CLIENT :
CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
841 CHEVRON WAY
RICHMOND, CA. 94802

REQUESTOR :
PETE DUDA

PROJECT NAME: WDO REFINERY GROUNDWATER PROGRAM
PROJECT DESCRIPTION: CHEVRON GPS - COMPOSITE STUDY

REPORT ID: 100009675 CHARGE CODE : E83IC-3128-27-440

PROJECT ID : RGG GPS COMPOSITE STUDY
ANALYSIS : CONTRACT SEQUOIA LAB ; EPA 6010 (13+,METALS) ;
EPA 7470 (MERCURY) ; EPA 7742 (SELENIUM) ; EPA 9040 (PH AQUEOUS) ;
REACTIVITY (CYANIDE) ; REACTIVITY (SULFIDE) ; TCLP 6010 (3-6,METALS) ;
TCLP 7470 (MERCURY) ; TCLP 7742 (SELENIUM) ; TCLP 8240 (VOLATILES) ;
TCLP 8270 (SEMI-VOLATILE; TCLP CONVENTIONAL (PREP); TCLP ZHE (PREP) ;

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION	SAMPLE DATE	DATE IN LAB	STATUS
200025026	960823-1	GPS EFFLUENT	08/23/96	08/23/96	APPROVED
200025027	960823-1 BIAS S	GPS EFFLUENT BIAS SP	08/23/96	08/23/96	APPROVED

This report is "PROPRIETARY AND CONFIDENTIAL" and delivered to, and intended for the exclusive use of the above named client only. Chevron Environmental Laboratory assumes no responsibility of liability for the reliance hereon by anyone other than the above named client.

Chevron Environmental Laboratory

DUPINDER JOHL
Laboratory Advisor

09/17/96
Date

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

17-Sep-1996 09:13 am
REPORT ID: 100009675

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025026	960823-1	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/03/96	EPA 8240	09/03/96	DALEO	11438
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/05/96	EPA 8270	09/10/96	NEDHO	10818
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/04/96	EPA 1311	N/A	PADEA	500000284
TCLP ZHE PREP. (A)	08/27/96	EPA 1311	08/27/96	GAMAR	500000283
TCLP METALS					
METALS II (ICAP,A)	09/05/96	EPA 6010	09/06/96	BRWAL	11756
MERCURY (CV/AA)	09/05/96	EPA 7470	09/05/96	MATIR	11807
SELENIUM (GH/AA)	09/06/96	EPA 7742	09/06/96	KAYIP	11379
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	08/23/96	EPA 9040	08/23/96	JMKEL	11655
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	08/27/96	EPA 6010	08/28/96	BRWAL	11319
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	08/28/96	EPA 7470	08/28/96	MATIR	11688
SELENIUM (GH/AA)	09/05/96	EPA 7742	09/05/96	KAYIP	11378
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/04/96	EPA 9010A	09/04/96	JMKEL	11824
SULFIDE, REACTIVE (A)	09/09/96	EPA 9010A	09/09/96	JMKEL	11816

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025027	960823-1 BIAS	SGPS EFFLUENT BIAS SP

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/03/96	EPA 8240	09/03/96	DALEO	11438
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/05/96	EPA 8270	09/10/96	NEDHO	10818
TCLP METALS					
METALS II (ICAP,A)	09/05/96	EPA 6010	09/06/96	BRWAL	11756
MERCURY (CV/AA)	09/05/96	EPA 7470	09/05/96	MATIR	11807
SELENIUM (GH/AA)	09/06/96	EPA 7742	09/06/96	KAYIP	11379

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

17-Sep-1996 09:13 am
REPORT ID: 100009675

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025026	960823-1	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11438
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11438
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11438
BENZENE	ND	UG/L	50	EPA 8240	11438
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11438
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11438
CHLOROFORM	ND	UG/L	100	EPA 8240	11438
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11438
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11438
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11438
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11438
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10818
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10818
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10818
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10818
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10818
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10818
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10818
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10818
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10818
NITROBENZENE	ND	UG/L	25	EPA 8270	10818
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10818
PYRIDINE	ND	UG/L	50	EPA 8270	10818
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11756
BARIUM	.81	MG/L	.007	EPA 6010	11756
CADMIUM	ND	MG/L	.007	EPA 6010	11756
CHROMIUM	ND	MG/L	.04	EPA 6010	11756
LEAD	ND	MG/L	.084	EPA 6010	11756
MERCURY	ND	MG/L	.001	EPA 7470	11807
SELENIUM	ND	MG/L	.002	EPA 7742	11379
SILVER	ND	MG/L	.02	EPA 6010	11756
PHYSICAL PARAMETERS					
PH	7.52	pH	.5	EPA 9040	11655
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11319
ARSENIC	ND	MG/L	.092	EPA 6010	11319
BARIUM	.932	MG/L	.007	EPA 6010	11319
BERYLLIUM	ND	MG/L	.005	EPA 6010	11319
CADMIUM	ND	MG/L	.007	EPA 6010	11319
CHROMIUM	ND	MG/L	.04	EPA 6010	11319
COBALT	ND	MG/L	.015	EPA 6010	11319
COPPER	ND	MG/L	.02	EPA 6010	11319
LEAD	ND	MG/L	.084	EPA 6010	11319
MOLYBDENUM	.079	MG/L	.022	EPA 6010	11319

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

17-Sep-1996 09:13 am
REPORT ID: 100009675

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025026	960823-1	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11319
SILVER	ND	MG/L	.02	EPA 6010	11319
THALLIUM	ND	MG/L	.16	EPA 6010	11319
VANADIUM	.012	MG/L	.01	EPA 6010	11319
ZINC	ND	MG/L	.025	EPA 6010	11319
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11688
SELENIUM	ND	MG/L	.002	EPA 7742	11378
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.2	EPA 9010A	11824
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11816

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

17-Sep-1996 09:13 am
REPORT ID: 100009675

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025027	960823-1 BIAS	SGPS EFFLUENT BIAS SP

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	100.72	PERCENT		EPA 8240	11438
1,2-DICHLOROETHANE	108.283	PERCENT		EPA 8240	11438
1,4-DICHLOROBENZENE	86.315	PERCENT		EPA 8240	11438
BENZENE	90.756	PERCENT		EPA 8240	11438
CARBON TETRACHLORIDE	106.002	PERCENT		EPA 8240	11438
CHLOROBENZENE	92.917	PERCENT		EPA 8240	11438
CHLOROFORM	97.239	PERCENT		EPA 8240	11438
METHYL ETHYL KETONE	92.077	PERCENT		EPA 8240	11438
TETRACHLOROETHENE	97.119	PERCENT		EPA 8240	11438
TRICHLOROETHENE	94.958	PERCENT		EPA 8240	11438
VINYL CHLORIDE	53.661	PERCENT		EPA 8240	11438
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	60.87	PERCENT		EPA 8270	10818
2,4,5-TRICHLOROPHENOL	105.47	PERCENT		EPA 8270	10818
2,4,6-TRICHLOROPHENOL	108.06	PERCENT		EPA 8270	10818
2,4-DINITROTOLUENE	115.06	PERCENT		EPA 8270	10818
2-METHYLPHENOL	95.51	PERCENT		EPA 8270	10818
3/4-METHYLPHENOL	97.5	PERCENT		EPA 8270	10818
HEXACHLOROBENZENE	79.13	PERCENT		EPA 8270	10818
HEXACHLOROBUTADIENE	60.2	PERCENT		EPA 8270	10818
HEXACHLOROETHANE	57.89	PERCENT		EPA 8270	10818
NITROBENZENE	104.03	PERCENT		EPA 8270	10818
PENTACHLOROPHENOL	124.69	PERCENT		EPA 8270	10818
PYRIDINE	107.17	PERCENT		EPA 8270	10818
TCLP METALS					
ARSENIC	81.2	PERCENT		EPA 6010	11756
BARIUM	90	PERCENT		EPA 6010	11756
CADMIUM	89	PERCENT		EPA 6010	11756
CHROMIUM	81.6	PERCENT		EPA 6010	11756
LEAD	81.4	PERCENT		EPA 6010	11756
MERCURY	68.2	MG/L		EPA 7470	11807
SELENIUM	103	MG/L	.01	EPA 7742	11379
SILVER	84.2	PERCENT		EPA 6010	11756

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab	Client Project ID: Chevron EVPS-Sub #100009675	Sampled: Aug 23, 1996
940 Hensley St.	Sample Descript: Water, 960823-1	Received: Aug 26, 1996
Richmond, CA 94804	Analysis Method: See below	
Attention: Charmaine Arcia	Lab Number: 608-1886	Reported: Sep 5, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 24 mm
Min. length: 22 mm
Max. length: 27 mm
Mean weight: 0.20 g
Min. weight: 0.14 g
Max. weight: 0.29 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	31	31	41	42
750 ppm	30	31	45	48
Duplicate 750 ppm	31	32	46	48

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	8/29/96	8/30/96	8/31/96	9/1/96	9/2/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.3	19	7.6	7.6	18	7.5	0	7.7	18	7.3	0	7.6	18	7.4	0	6.5	18	7.3	0	0
750 ppm	9.4	19	7.8	7.1	18	7.3	0	6.6	18	7.2	0	6.7	18	7.3	0	6.0	18	7.2	0	0
250 ppm	9.3	19	7.8	7.8	18	7.3	0	7.0	18	7.2	0	7.1	18	7.3	0	6.3	18	7.2	0	0
Duplicate																				
750 ppm	9.5	19	7.8	7.6	18	7.3	0	7.0	18	7.2	0	6.7	18	7.3	0	6.0	18	7.2	1	1
250 ppm	9.4	19	7.7	7.8	18	7.4	0	7.4	18	7.2	0	7.4	18	7.3	1	6.2	18	7.3	1	1

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Client Services Representative

SEQUOIA ANALYTICAL
CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENVIRONMENTAL LABORATORY	Project Name: CHEVRON EPS - SUBMISSION 10000675
Address: 9240 HENSLEY ST.	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: 231-8113 FAX #: 231-8262	P.O. #:
Report To: C. ARCIA Sampler: N. MaCullough	QC Data: ☒ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	BIOASSAY *	Comments
1. 960823-1	08/23/96:1200	AQ	2	L-AG.	6081886	X	* DEFINITIVE IF REQUIRED
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

Pink - Client
Yellow - Sequoia
White - Sequoia

Relinquished By:	Date: 08/23/96	Time: 10:53	Received By:	Date: 8/26/96	Time: 10:55
Relinquished By:	Date: 8/26/96	Time: 1310	Received By:	Date: 8-26	Time: 1340
Relinquished By:	Date: 8-26	Time:	Received By Lab:	Date: 8/26/96	Time: 15.00

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment_____ Page __ of __

9608600 WC

Sub-Chain of Custody

Sequoia Analytical
819 Striker Avenue, Suite 8
Sacramento, CA 95834
(916) 921-9600
(916) 921-0100 (Fax)

Attn: [X] Linda Schneider
Janet Harlan

Project subbed to :

[ ] Redwood City
[X] Walnut Creek
[ ] Other:

Turnaround Time:

ASAP	2 - 8hr	24 hr X	48hr
72hr	5d	7d	10d

Date Due: ~~9/2/96~~ 9/3/96 as per sandie 8/30/96

Project: Della/Exxon

Sample ID	matrix	# containers	container type	sampling date	8270	[illegible]								
608-1211	S	1	300	8/29/96	X									

Remarks:
6082268

FR 1 21

Relinquished by: [signature] Date: 8/30/96 Time: 1130 Received by:
Relinquished by: [signature] Date: 8-30 Time: 1250 Received by: [signature] R Smith
Relinquished by: Date: Time: Received by:

SEQUOIA ANALYTICAL CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENVIRONMENTAL LABORATORY	Project Name: CHEVRON GPS - SUBMISSION 100009675
Address: 940 HENSLEY ST.	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: 231-8113 FAX #: 231-8262	P.O. #:
Report To: C. ARCIA Sampler: N. McCullough	QC Data: ☒ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	Gasoline *									Comments
1. 960823-1	08/23/96:1200	AQ	2	L-Ah.		X									* DEFINITIVE IF REQUIRED
2.															
3.															
4.															
5.															
6.															
7.															
8.															
9.															
10.															

Relinquished By: [signature]	Date: 08/23/96	Time: 10:55	Received By: [signature]	Date: 8/26/96	Time: 10:55
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab:	Date:	Time:

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment_____ Page __ of __

Pink - Client
Yellow - Sequoia
White - Sequoia

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE.,RICHMOND,CA.,94804

CLIENT REP : CHARMAINE ARCIA
PHONE : (510) 231-8113
FAX : (510) 231-8262

CHAIN OF CUSTODY / ANALYSIS REQUEST

CHEVRON GPS - COMPOSITE STUDY
WDO REFINERY GROUNDWATER PROGRAM

REPORT ID : 100009675

CHARGE CODE: E83IC-3128-27-440

REQUESTOR : PETE DUDA
DIVISION : WASTE DISCHARGE ORDER

CONTACT : RANDY BRANDT
PHONE : 242-5735

SAMPLE TYPE: RGG GPS COMPOSITE STUDY

SUBMITTER : N.MC CULLOUGH

ANALYSIS REQUESTED:

CONTRACT SEQUOIA LAB	EPA 6010 (13+,METALS)	EPA 7470 (MERCURY)
EPA 7742 (SELENIUM)	EPA 9040 (PH AQUEOUS)	REACTIVITY (CYANIDE)
REACTIVITY (SULFIDE)	TCLP 6010 (3-6,METALS)	TCLP 7470 (MERCURY)
TCLP 7742 (SELENIUM)	TCLP 8240 (VOLATILES)	TCLP 8270 (SEMI-VOLATILE
TCLP CONVENTIONAL (PREP)	TCLP ZHE (PREP)	

COMMENTS:

	LAB NUMBER	CLIENT ID	SAMPLE INFORMATION	SAMPLE DATE	TIME	SAMPLE CONTAINER(S)
1.	200025026	960823-1	GPS EFFLUENT	08/23/96	12:00	6-L AG;1-500ML
2.	200025027	960823-1 BIAS S #	GPS EFFLUENT BIAS SP	08/23/96		1
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						

CHAIN OF POSSESSION:

	Signature	Title	Date/Time
A.	[signature]	[illegible]	08/23/96
B.			

CHAIN-OF-CUSTODY RECORD

WHITE COPY - Original (Accompanies Samples) YELLOW COPY - Collector PINK COPY - Project Manager

Boring or Well Number	Sample Number	Depth	Time	Sample Type	Container Type	VOA 601/8010	VOA 602/8020	VOA 624/8240	Semi Vol 625/8270	TPH 418.1	TPH 8015 (M)	TITLE 22 METALS	WET Test	PNA 610/8100	PEST/PCBs 8080	HEX CHROME	ORGANIC LEAD	TCLP	pH	ASBESTOS	Ignitability	Corrosivity	Reactivity	Bioassay	FIELD NOTES:	Total Number Of Containers	Laboratory Note Number
960823-1	—	12:00	Water	6 Lamber/							X					X				X	X	X	X			8	
				1500 mL's 1																							
				250 mL																							

RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

N. McCullough 08/23/96 12:55 [signature]

RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature) DATE/TIME RECEIVED BY: (Signature)

ANALYTICAL LABORATORY: Chevron

LABORATORY CONTACT: Charmain A.

D&M CONTACT: Natalie McCullough PHONE: (415) 243-3732

LABORATORY NOTES:

JOB NO.: 19000-800 SHEET 1 OF 1

PROJECT Chevron GPS

LOCATION Richmond, CA.

COLLECTOR N. McCullough DATE OF COLLECTION 8/23/96

DAMES & MOORE
221 MAIN STREET, SUITE 600
SAN FRANCISCO, CALIFORNIA 94105-1907
(415) 896-5858 FAX (415) 882-9261

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE, RICHMOND, CA., 94802

REPORT DATE:
10-Oct-1996 05:13 pm

CLIENT :
CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
841 CHEVRON WAY
RICHMOND, CA. 94802

REQUESTOR :
RANDY BRANDT

PROJECT NAME: WDO REFINERY MISC.GW PROGRAMS
PROJECT DESCRIPTION: CHEVRON GPS - COMPOSITE STUDY

REPORT ID: 100009712 CHARGE CODE : DWRRI-00236-352cmp ~~E83IC-3128-27-440~~ 10/10/96

PROJECT ID : RGG GPS COMPOSITE STUDY
ANALYSIS : CONTRACT SEQUOIA LAB ; EPA 6010 (13+,METALS) ;
EPA 7470 (MERCURY) ; EPA 7742 (SELENIUM) ; EPA 9040 (PH AQUEOUS) ;
REACTIVITY (CYANIDE) ; REACTIVITY (SULFIDE) ; TCLP 6010 (3-6,METALS) ;
TCLP 7470 (MERCURY) ; TCLP 7742 (SELENIUM) ; TCLP 8240 (VOLATILES) ;
TCLP 8270 (SEMI-VOLATILE; TCLP CONVENTIONAL (PREP); TCLP ZHE (PREP) ;

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION	SAMPLE DATE	DATE IN LAB	STATUS
200025099	962908-1	GPS EFFLUENT	08/29/96	08/29/96	APPROVED
200025100	962908-2	GPS EFFLUENT	08/29/96	08/29/96	APPROVED
200025101	962908-3	GPS EFFLUENT	08/29/96	08/29/96	APPROVED
200025102	962908-4	GPS EFFLUENT	08/29/96	08/29/96	APPROVED
200025103	962908-1 BIAS S	BIAS SPIKE	08/29/96	08/29/96	APPROVED

This report is "PROPRIETARY AND CONFIDENTIAL" and delivered to, and intended for the exclusive use of the above named client only. Chevron Environmental Laboratory assumes no responsibility of liability for the reliance hereon by anyone other than the above named client.

Chevron Environmental Laboratory

DUPINDER JOHL
Laboratory Advisor

10/10/96
Date

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025099	962908-1	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/05/96	EPA 8240	09/05/96	DALEO	11440
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/12/96	EPA 8270	09/13/96	NEDHO	10819
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/06/96	EPA 1311	N/A	PADEA	500000284
TCLP ZHE PREP. (A)	09/03/96	EPA 1311	N/A	GAMAR	500000283
TCLP METALS					
METALS II (ICAP,A)	09/10/96	EPA 6010	09/10/96	BRWAL	11757
MERCURY (CV/AA)	09/10/96	EPA 7470	09/10/96	MATIR	11807
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	08/30/96	EPA 9040	08/30/96	JMKEL	11655
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	09/04/96	EPA 6010	09/05/96	BRWAL	11755
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	09/03/96	EPA 7470	09/03/96	MATIR	11751
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/17/96	EPA 9010A	09/17/96	JMKEL	11824
SULFIDE, REACTIVE (A)	09/12/96	EPA 9010A	09/12/96	JMKEL	11816

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025100	962908-2	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/05/96	EPA 8240	09/05/96	DALEO	11440
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/12/96	EPA 8270	09/13/96	NEDHO	10819
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/06/96	EPA 1311	N/A	PADEA	500000284
TCLP ZHE PREP. (A)	09/03/96	EPA 1311	N/A	GAMAR	500000283
TCLP METALS					
METALS II (ICAP,A)	09/10/96	EPA 6010	09/10/96	BRWAL	11757

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025100	962908-2	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP METALS					
MERCURY (CV/AA)	09/10/96	EPA 7470	09/10/96	MATIR	11807
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	08/30/96	EPA 9040	08/30/96	JMKEL	11655
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	09/04/96	EPA 6010	09/05/96	BRWAL	11755
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	09/03/96	EPA 7470	09/03/96	MATIR	11751
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/17/96	EPA 9010A	09/17/96	JMKEL	11824
SULFIDE, REACTIVE (A)	09/12/96	EPA 9010A	09/12/96	JMKEL	11816

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025101	962908-3	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/05/96	EPA 8240	09/05/96	DALEO	11440
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/12/96	EPA 8270	09/13/96	NEDHO	10819
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/06/96	EPA 1311	N/A	PADEA	500000284
TCLP ZHE PREP. (A)	09/03/96	EPA 1311	N/A	GAMAR	500000283
TCLP METALS					
METALS II (ICAP,A)	09/10/96	EPA 6010	09/10/96	BRWAL	11757
MERCURY (CV/AA)	09/10/96	EPA 7470	09/10/96	MATIR	11807
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	08/30/96	EPA 9040	08/30/96	JMKEL	11655
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	09/04/96	EPA 6010	09/05/96	BRWAL	11755
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	09/03/96	EPA 7470	09/03/96	MATIR	11751

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

10-Oct-1996 05:13 pm
REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025101	962908-3	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
METALS (TOTAL,BY AA)					
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/17/96	EPA 9010A	09/17/96	JMKEL	11824
SULFIDE, REACTIVE (A)	09/12/96	EPA 9010A	09/12/96	JMKEL	11816

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025102	962908-4	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/05/96	EPA 8240	09/05/96	DALEO	11440
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/12/96	EPA 8270	09/13/96	NEDHO	10819
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/06/96	EPA 1311	N/A	PADEA	500000284
TCLP ZHE PREP. (A)	09/03/96	EPA 1311	N/A	GAMAR	500000283
TCLP METALS					
METALS II (ICAP,A)	09/10/96	EPA 6010	09/10/96	BRWAL	11757
MERCURY (CV/AA)	09/10/96	EPA 7470	09/10/96	MATIR	11807
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	08/30/96	EPA 9040	08/30/96	JMKEL	11655
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	09/04/96	EPA 6010	09/05/96	BRWAL	11755
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	09/03/96	EPA 7470	09/03/96	MATIR	11751
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/17/96	EPA 9010A	09/17/96	JMKEL	11824
SULFIDE, REACTIVE (A)	09/12/96	EPA 9010A	09/12/96	JMKEL	11816

----- SAMPLE SUMMARY -----

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025103	962908-1 BIAS	SBIAS SPIKE

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/05/96	EPA 8240	09/05/96	DALEO	11440
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/12/96	EPA 8270	09/13/96	NEDHO	10819
TCLP METALS					
METALS II (ICAP,A)	09/10/96	EPA 6010	09/10/96	BRWAL	11757
MERCURY (CV/AA)	09/10/96	EPA 7470	09/10/96	MATIR	11807
SELENIUM (GH/AA)	09/11/96	EPA 7742	09/11/96	KAYIP	11380

----- RESULTS SUMMARY -----

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WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025099	962908-1	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11440
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11440
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11440
BENZENE	ND	UG/L	50	EPA 8240	11440
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11440
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11440
CHLOROFORM	ND	UG/L	100	EPA 8240	11440
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11440
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11440
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11440
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11440
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10819
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10819
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10819
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10819
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10819
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10819
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10819
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10819
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10819
NITROBENZENE	ND	UG/L	25	EPA 8270	10819
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10819
PYRIDINE	ND	UG/L	50	EPA 8270	10819
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11757
BARIUM	.573	MG/L	.007	EPA 6010	11757
CADMIUM	ND	MG/L	.007	EPA 6010	11757
CHROMIUM	ND	MG/L	.04	EPA 6010	11757
LEAD	ND	MG/L	.084	EPA 6010	11757
MERCURY	ND	MG/L	.001	EPA 7470	11807
SELENIUM	.002	MG/L	.002	EPA 7742	11380
SILVER	ND	MG/L	.02	EPA 6010	11757
PHYSICAL PARAMETERS					
PH	7.79	pH	.5	EPA 9040	11655
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11755
ARSENIC	ND	MG/L	.092	EPA 6010	11755
BARIUM	.986	MG/L	.007	EPA 6010	11755
BERYLLIUM	ND	MG/L	.005	EPA 6010	11755
CADMIUM	ND	MG/L	.007	EPA 6010	11755
CHROMIUM	ND	MG/L	.04	EPA 6010	11755
COBALT	ND	MG/L	.015	EPA 6010	11755
COPPER	.066	MG/L	.02	EPA 6010	11755
LEAD	ND	MG/L	.084	EPA 6010	11755
MOLYBDENUM	.103	MG/L	.022	EPA 6010	11755

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025099	962908-1	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11755
SILVER	ND	MG/L	.02	EPA 6010	11755
THALLIUM	ND	MG/L	.16	EPA 6010	11755
VANADIUM	.027	MG/L	.01	EPA 6010	11755
ZINC	.05	MG/L	.025	EPA 6010	11755
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11751
SELENIUM	.003	MG/L	.002	EPA 7742	11380
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.025	EPA 9010A	11824
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11816

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

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REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025100	962908-2	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11440
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11440
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11440
BENZENE	ND	UG/L	50	EPA 8240	11440
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11440
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11440
CHLOROFORM	ND	UG/L	100	EPA 8240	11440
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11440
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11440
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11440
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11440
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10819
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10819
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10819
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10819
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10819
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10819
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10819
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10819
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10819
NITROBENZENE	ND	UG/L	25	EPA 8270	10819
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10819
PYRIDINE	ND	UG/L	50	EPA 8270	10819
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11757
BARIUM	.092	MG/L	.007	EPA 6010	11757
CADMIUM	ND	MG/L	.007	EPA 6010	11757
CHROMIUM	ND	MG/L	.04	EPA 6010	11757
LEAD	ND	MG/L	.084	EPA 6010	11757
MERCURY	ND	MG/L	.001	EPA 7470	11807
SELENIUM	ND	MG/L	.002	EPA 7742	11380
SILVER	ND	MG/L	.02	EPA 6010	11757
PHYSICAL PARAMETERS					
PH	7.47	pH	.5	EPA 9040	11655
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11755
ARSENIC	ND	MG/L	.092	EPA 6010	11755
BARIUM	.06	MG/L	.007	EPA 6010	11755
BERYLLIUM	ND	MG/L	.005	EPA 6010	11755
CADMIUM	ND	MG/L	.007	EPA 6010	11755
CHROMIUM	ND	MG/L	.04	EPA 6010	11755
COBALT	ND	MG/L	.015	EPA 6010	11755
COPPER	.054	MG/L	.02	EPA 6010	11755
LEAD	ND	MG/L	.084	EPA 6010	11755
MOLYBDENUM	ND	MG/L	.022	EPA 6010	11755

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025100	962908-2	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11755
SILVER	ND	MG/L	.02	EPA 6010	11755
THALLIUM	ND	MG/L	.16	EPA 6010	11755
VANADIUM	ND	MG/L	.01	EPA 6010	11755
ZINC	.036	MG/L	.025	EPA 6010	11755
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11751
SELENIUM	ND	MG/L	.002	EPA 7742	11380
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.025	EPA 9010A	11824
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11816

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025101	962908-3	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11440
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11440
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11440
BENZENE	ND	UG/L	50	EPA 8240	11440
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11440
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11440
CHLOROFORM	ND	UG/L	100	EPA 8240	11440
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11440
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11440
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11440
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11440
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10819
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10819
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10819
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10819
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10819
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10819
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10819
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10819
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10819
NITROBENZENE	ND	UG/L	25	EPA 8270	10819
PENTACHLOROPHENOL	27.7	UG/L	10	EPA 8270	10819
PYRIDINE	ND	UG/L	50	EPA 8270	10819
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11757
BARIUM	.136	MG/L	.007	EPA 6010	11757
CADMIUM	ND	MG/L	.007	EPA 6010	11757
CHROMIUM	ND	MG/L	.04	EPA 6010	11757
LEAD	ND	MG/L	.084	EPA 6010	11757
MERCURY	ND	MG/L	.001	EPA 7470	11807
SELENIUM	ND	MG/L	.002	EPA 7742	11380
SILVER	ND	MG/L	.02	EPA 6010	11757
PHYSICAL PARAMETERS					
PH	7.54	pH	.5	EPA 9040	11655
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11755
ARSENIC	ND	MG/L	.092	EPA 6010	11755
BARIUM	.282	MG/L	.007	EPA 6010	11755
BERYLLIUM	ND	MG/L	.005	EPA 6010	11755
CADMIUM	ND	MG/L	.007	EPA 6010	11755
CHROMIUM	ND	MG/L	.04	EPA 6010	11755
COBALT	ND	MG/L	.015	EPA 6010	11755
COPPER	.154	MG/L	.02	EPA 6010	11755
LEAD	ND	MG/L	.084	EPA 6010	11755
MOLYBDENUM	ND	MG/L	.022	EPA 6010	11755

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025101	962908-3	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11755
SILVER	ND	MG/L	.02	EPA 6010	11755
THALLIUM	ND	MG/L	.16	EPA 6010	11755
VANADIUM	.018	MG/L	.01	EPA 6010	11755
ZINC	.192	MG/L	.025	EPA 6010	11755
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11751
SELENIUM	.002	MG/L	.002	EPA 7742	11380
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.025	EPA 9010A	11824
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11816

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025102	962908-4	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11440
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11440
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11440
BENZENE	ND	UG/L	50	EPA 8240	11440
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11440
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11440
CHLOROFORM	ND	UG/L	60	EPA 8240	11440
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11440
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11440
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11440
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11440
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10819
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10819
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10819
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10819
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10819
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10819
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10819
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10819
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10819
NITROBENZENE	ND	UG/L	25	EPA 8270	10819
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10819
PYRIDINE	ND	UG/L	50	EPA 8270	10819
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11757
BARIUM	.247	MG/L	.007	EPA 6010	11757
CADMIUM	ND	MG/L	.007	EPA 6010	11757
CHROMIUM	ND	MG/L	.04	EPA 6010	11757
LEAD	ND	MG/L	.084	EPA 6010	11757
MERCURY	ND	MG/L	.001	EPA 7470	11807
SELENIUM	ND	MG/L	.002	EPA 7742	11380
SILVER	ND	MG/L	.02	EPA 6010	11757
PHYSICAL PARAMETERS					
PH	7.75	pH	.5	EPA 9040	11655
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11755
ARSENIC	ND	MG/L	.092	EPA 6010	11755
BARIUM	.363	MG/L	.007	EPA 6010	11755
BERYLLIUM	ND	MG/L	.005	EPA 6010	11755
CADMIUM	ND	MG/L	.007	EPA 6010	11755
CHROMIUM	.044	MG/L	.04	EPA 6010	11755
COBALT	ND	MG/L	.015	EPA 6010	11755
COPPER	.592	MG/L	.02	EPA 6010	11755
LEAD	.103	MG/L	.084	EPA 6010	11755
MOLYBDENUM	.032	MG/L	.022	EPA 6010	11755

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025102	962908-4	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11755
SILVER	ND	MG/L	.02	EPA 6010	11755
THALLIUM	ND	MG/L	.16	EPA 6010	11755
VANADIUM	.027	MG/L	.01	EPA 6010	11755
ZINC	.24	MG/L	.025	EPA 6010	11755
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11751
SELENIUM	ND	MG/L	.002	EPA 7742	11380
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.025	EPA 9010A	11824
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11816

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 10-Oct-1996 05:13 pm
WASTE DISCHARGE ORDER REPORT ID: 100009712

LAB NUMBER: 200025103
CLIENT ID: 962908-1 BIAS SBIAS SPIKE
SAMPLE DESCRIPTION:

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	95.438	PERCENT		EPA 8240	11440
1,2-DICHLOROETHANE	97.839	PERCENT		EPA 8240	11440
1,4-DICHLOROBENZENE	86.315	PERCENT		EPA 8240	11440
BENZENE	90.396	PERCENT		EPA 8240	11440
CARBON TETRACHLORIDE	99.16	PERCENT		EPA 8240	11440
CHLOROBENZENE	87.755	PERCENT		EPA 8240	11440
CHLOROFORM	92.557	PERCENT		EPA 8240	11440
METHYL ETHYL KETONE	55.402	PERCENT		EPA 8240	11440
TETRACHLOROETHENE	92.077	PERCENT		EPA 8240	11440
TRICHLOROETHENE	90.156	PERCENT		EPA 8240	11440
VINYL CHLORIDE	41.537	PERCENT		EPA 8240	11440
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	44.73	PERCENT		EPA 8270	10819
2,4,5-TRICHLOROPHENOL	88.16	PERCENT		EPA 8270	10819
2,4,6-TRICHLOROPHENOL	81.94	PERCENT		EPA 8270	10819
2,4-DINITROTOLUENE	87.64	PERCENT		EPA 8270	10819
2-METHYLPHENOL	71.07	PERCENT		EPA 8270	10819
3/4-METHYLPHENOL	83.4	PERCENT		EPA 8270	10819
HEXACHLOROBENZENE	61.71	PERCENT		EPA 8270	10819
HEXACHLOROBUTADIENE	40.84	PERCENT		EPA 8270	10819
HEXACHLOROETHANE	39.71	PERCENT		EPA 8270	10819
NITROBENZENE	72.5	PERCENT		EPA 8270	10819
PENTACHLOROPHENOL	125.56	PERCENT		EPA 8270	10819
PYRIDINE	37.98	PERCENT		EPA 8270	10819
TCLP METALS					
ARSENIC	111	PERCENT		EPA 6010	11757
BARIUM	61.2	PERCENT		EPA 6010	11757
CADMIUM	90	PERCENT		EPA 6010	11757
CHROMIUM	89.4	PERCENT		EPA 6010	11757
LEAD	79.8	PERCENT		EPA 6010	11757
MERCURY	56.3	MG/L		EPA 7470	11807
SELENIUM	90	PERCENT		EPA 7742	11380
SILVER	86.2	PERCENT		EPA 6010	11757

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab
940 Hensley St.
Richmond, CA 94804
Attention: Charmaine Arcia

Client Project ID: Chevron GPS-Sub 100009712
Sample Descript: Water, 962908-1
Analysis Method: See below
Lab Number: 609-0003

Sampled: Aug 29, 1996
Received: Aug 30, 1996
Reported: Sep 13, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 25 mm
Min. length: 21 mm
Max. length: 27 mm
Mean weight: 0.18 g
Min. weight: 0.16 g
Max. weight: 0.24 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	29	41	43
750 ppm	28	31	43	46
Duplicate 750 ppm	27	31	42	46

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	9/3/96	9/4/96	9/5/96	9/6/96	9/7/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.1	19	7.6	8.0	18	7.5	1	7.7	18	7.4	1	7.7	19	7.4	1	7.7	18	7.4	1	1
750 ppm	9.1	19	7.6	8.0	18	7.6	0	7.7	18	7.4	0	7.7	19	7.4	1	7.6	18	7.4	2	2
250 ppm	9.0	19	7.6	8.2	18	7.5	0	7.8	18	7.5	0	7.7	19	7.4	1	7.7	18	7.4	1	1
Duplicate																				
750 ppm	9.1	19	7.6	7.8	18	7.5	1	7.2	18	7.4	1	7.2	19	7.3	1	7.4	18	7.4	1	1
250 ppm	9.1	19	7.6	7.7	18	7.5	0	7.8	18	7.4	0	7.7	19	7.4	0	7.6	18	7.4	0	0

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Client Services Representative

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab
940 Hensley St.
Richmond, CA 94804
Attention: Charmaine Arcia

Client Project ID: Chevron GPS-Sub 100009712
Sample Descript: Water, 962908-2
Analysis Method: See below
Lab Number: 609-0004

Sampled: Aug 29, 1996
Received: Aug 30, 1996
Reported: Sep 13, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 25 mm
Min. length: 21 mm
Max. length: 27 mm
Mean weight: 0.18 g
Min. weight: 0.16 g
Max. weight: 0.24 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	29	41	43
750 ppm	29	30	43	44
Duplicate 750 ppm	29	30	43	44

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	9/3/96	9/4/96	9/5/96	9/6/96	9/7/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.1	19	7.6	8.0	18	7.5	1	7.7	18	7.4	1	7.7	19	7.4	1	7.7	18	7.4	1	1
750 ppm	9.0	18	7.6	7.9	18	7.4	0	7.6	18	7.5	0	7.7	18	7.4	0	7.4	18	7.4	0	0
250 ppm	9.1	18	7.6	7.9	18	7.4	0	7.6	18	7.4	0	7.8	18	7.4	0	7.7	18	7.4	0	0
Duplicate																				
750 ppm	9.0	18	7.6	8.1	18	7.4	0	7.6	18	7.5	0	8.0	18	7.5	0	7.8	18	7.4	0	0
250 ppm	9.1	18	7.6	8.0	18	7.4	0	7.9	18	7.4	1	7.8	18	7.4	1	7.7	18	7.4	1	1

Pass X **Fail** ___

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Client Services Representative

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab
940 Hensley St.
Richmond, CA 94804
Attention: Charmaine Arcia

Client Project ID: Chevron GPS-Sub 100009712
Sample Descript: Water, 962908-3
Analysis Method: See below
Lab Number: 609-0005

Sampled: Aug 29, 1996
Received: Aug 30, 1996
Reported: Sep 13, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 24 mm
Min. length: 22 mm
Max. length: 26 mm
Mean weight: 0.20 g
Min. weight: 0.15 g
Max. weight: 0.24 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	41	42
750 ppm	30	31	42	43
Duplicate 750 ppm	30	31	42	43

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	9/4/96	9/5/96	9/6/96	9/7/96	9/8/96

	Initial			24 Hr				48 Hr				72 Hr				96 Hr				Total Dead
	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	
Control	8.9	18	7.6	8.1	18	7.6	0	7.8	18	7.4	0	7.5	17	7.5	0	7.0	21	7.4	0	0
750 ppm	8.9	18	7.6	7.8	18	7.5	0	7.5	18	7.4	0	7.3	17	7.5	0	6.7	21	7.4	1	1
250 ppm	8.9	18	7.6	7.8	18	7.4	0	7.5	18	7.4	0	7.4	18	7.4	0	7.0	20	7.4	0	0
Duplicate																				
750 ppm	8.9	18	7.6	7.6	18	7.5	0	7.2	18	7.4	0	6.8	18	7.4	1	6.4	21	7.4	1	1
250 ppm	8.9	18	7.6	7.9	18	7.4	0	7.4	18	7.3	0	7.4	18	7.4	0	6.9	20	7.4	1	1

Pass X **Fail** ___

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Client Services Representative

609-0003.CHE <3>

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab
940 Hensley St.
Richmond, CA 94804
Attention: Charmaine Arcia

Client Project ID: Chevron GPS-Sub 100009712
Sample Descript: Water, 962908-4
Analysis Method: See below
Lab Number: 609-0006

Sampled: Aug 29, 1996
Received: Aug 30, 1996
Reported: Sep 13, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 24 mm
Min. length: 22 mm
Max. length: 26 mm
Mean weight: 0.20 g
Min. weight: 0.15 g
Max. weight: 0.24 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	41	42
750 ppm	29	30	43	44
Duplicate 750 ppm	29	30	42	43

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	9/4/96	9/5/96	9/6/96	9/7/96	9/8/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	8.9	18	7.6	8.1	18	7.6	0	7.8	18	7.4	0	7.5	17	7.5	0	7.0	21	7.4	0	0
750 ppm	9.0	18	7.6	7.7	18	7.4	0	6.9	18	7.3	0	7.0	18	7.4	1	6.2	20	7.4	1	1
250 ppm	9.0	18	7.6	7.6	18	7.4	0	7.5	18	7.3	0	7.5	18	7.4	0	7.0	19	7.3	1	1
Duplicate																				
750 ppm	9.0	18	7.6	7.8	18	7.4	1	7.4	18	7.3	2	7.4	18	7.4	3	6.8	19	7.3	3	3
250 ppm	9.1	18	7.6	7.9	18	7.4	0	6.9	18	7.3	0	6.9	18	7.4	1	6.2	19	7.3	1	1

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Client Services Representative

SEQUOIA ANALYTICAL
CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

6090003 6090004 6090005 6090006

Company Name: CHEVRON ENV. LAB	Project Name: CHEVRON GPS - SUBMISSION 10000971 2
Address: 940 HENSLEY ST.	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: FAX #:	P.O. #:
Report To: Sampler:	QC Data: ☒ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	BIOASSAY *									Comments
1. 962908-1	08/29/96; 12:15	AQ	1	L-AG		X						6090003			*STATIC - DEFINITIVE IF
2. 962908-2	08/29/96; 13:00	AQ	1	L-AG		X						6090004			REQUIRED
3. 962908-3	08/29/96; 12:45	AQ	1	L-AG		X						6090005			
4. 962908-4	08/29/96; 11:45	AQ	1	L-AG		X						6090006			
5.															
6.															
7.															
8.															
9.															
10.															

Relinquished By:	Date: 08/29/96	Time: 12:05	Received By:	Date: 8/30/96	Time: 1205
Relinquished By:	Date: 8/30	Time: 1730	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab:	Date: 8/30/96	Time: 1736

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment_____ Page __ of __

Pink - Client
Yellow - Sequoia
White - Sequoia

SEQUOIA ANALYTICAL
CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENV. LAB	Project Name: CHEVRON GPS - SUBMISSION 100097712
Address: 940 HENSLEY ST.	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: FAX #:	P.O. #:
Report To: Sampler:	QC Data: ☒ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 7 Working Days ☐ 5 Working Days ☐ 3 Working Days ☐ 2 Working Days ☐ 24 Hours ☐ 2 - 8 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	BIOASSAY *	Comments
1. 962908-1	08/29/96; 12:15	AQ	1	L-AG		X	*STATIC - DEFINITIVE IF
2. 962908-2	08/29/96; 12:30	AQ	1	L-AG		X	REQUIRED
3. 962908-3	08/29/96; 12:45	AQ	1	L-AG		X	
4. 962908-4	08/29/96; 11:45	AQ	1	L-AG		X	
5.							
6.							
7.							
8.							
9.							
10.							

Relinquished By:	Date: 08/29/96	Time: 12:05	Received By:	Date: 8/30/96	Time: 1205
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab:	Date:	Time:

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment_____ Page __ of __

Pink - Client
Yellow - Sequoia
White - Sequoia

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE.,RICHMOND,CA.,94804

CLIENT REP : CHARMAINE ARCIA
PHONE : (510) 231-8113
FAX : (510) 231-8262

CHAIN OF CUSTODY / ANALYSIS REQUEST

CHEVRON GPS - COMPOSITE STUDY
WDO REFINERY GROUNDWATER PROGRAM

REPORT ID : 100009712

CHARGE CODE: E83IC-3128-27-440

REQUESTOR : JOHN MACLEOD
DIVISION : WASTE DISCHARGE ORDER

CONTACT : JOHN MACLEOD
PHONE : 242-2295

SAMPLE TYPE: RGG GPS COMPOSITE STUDY

SUBMITTER : B.STUART

ANALYSIS REQUESTED:

CONTRACT SEQUOIA LAB	EPA 6010 (13+,METALS)	EPA 7470 (MERCURY)
EPA 7742 (SELENIUM)	EPA 9040 (PH AQUEOUS)	REACTIVITY (CYANIDE)
REACTIVITY (SULFIDE)	TCLP 6010 (3-6,METALS)	TCLP 7470 (MERCURY)
TCLP 7742 (SELENIUM)	TCLP 8240 (VOLATILES)	TCLP 8270 (SEMI-VOLATILE
TCLP CONVENTIONAL (PREP)	TCLP ZHE (PREP)	

COMMENTS: Sequoia - Bioassay /add STLC prep, analysis if required.

	LAB NUMBER	CLIENT ID	SAMPLE INFORMATION	SAMPLE DATE	TIME	SAMPLE CONTAINER(S)
1.	200025099	962908-1	GPS EFFLUENT	08/29/96	12:15	5-L AG;1-500ML
2.	200025100	962908-2	GPS EFFLUENT	08/29/96	13:00	6-L AG;1-500ML
3.	200025101	962908-3	GPS EFFLUENT	08/29/96	12:45	3-L AG;1-500ML
4.	200025102	962908-4	GPS EFFLUENT	08/29/96	11:45	5-L AG;1-500ML
5.	200025103	962908-1 BIAS S #	BIAS SPIKE	08/29/96		1
6.						
7.						
8.						
9.						
10.						
11.						
12.						

CHAIN OF POSSESSION:

A. _____ (Signature) _____ (Title) 08/29/96 (Date/Time)

Project Name: CHEVRON GIPS

Contact: RANDY BRANDT
Phone 242-5735

Chevron

Chevron Environmental Lab
Chevron Chemical Company
940 Hensley Street
Richmond, CA 94804

CHAIN-OF-CUSTODY RECORD
SAMPLE ANALYSIS REQUEST

Return form with analysis to Randy Brandt
Charge Number: EB3IC-3138.27-440

Sample Collector's Name: Brodie Stuart

Analysis Requested:

TCLP
CCR metals
pH (corrosivity)
Ignitability
Reactivity

Bioassay

(STLC prep only if required)

Special Handling/Storage: Store at 4°C

Chevron's Sample No.	Date/Time Sampled	Sample Information
962908-1	8/29 1215	
962908-2	8/29 1300	
962908-3	8/29 1245	
962908-4	8/29 1145	

Sample destination: Chevron Environmental Lab, 940 Hensley St., Bldg 120, Room 15, Richmond, CA 94804

Chain of Possession:

	Signature	Title	Inclusive Dates
1.	Brodie A Stuart		
2.	[signature]	Tech	08/29/96
3.			
4.			

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE, RICHMOND, CA., 94802

REPORT DATE:
09-Oct-1996 03:10 pm

CLIENT :
CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
841 CHEVRON WAY
RICHMOND, CA. 94802

REQUESTOR :
RANDY BRANDT

PROJECT NAME: WDO REFINERY MISC.GW PROGRAMS
PROJECT DESCRIPTION: CHEVRON GPS-COMPOSITE STUDY

REPORT ID: 100009819 CHARGE CODE : E83IC-3128-27-440

PROJECT ID : RGG GPS COMPOSITE STUDY
ANALYSIS : CONTRACT SEQUOIA LAB ; EPA 6010 (13+,METALS) ;
EPA 7470 (MERCURY) ; EPA 7742 (SELENIUM) ; EPA 9040 (PH AQUEOUS) ;
REACTIVITY (CYANIDE) ; REACTIVITY (SULFIDE) ; TCLP 6010 (3-6,METALS) ;
TCLP 7470 (MERCURY) ; TCLP 7742 (SELENIUM) ; TCLP 8240 (VOLATILES) ;
TCLP 8270 (SEMI-VOLATILE; TCLP CONVENTIONAL (PREP); TCLP ZHE (PREP) ;

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION	SAMPLE DATE	DATE IN LAB	STATUS
200025362	961209-1	GPS EFFLUENT	09/12/96	09/12/96	APPROVED
200025363	961209-2	GPS EFFLUENT	09/12/96	09/12/96	APPROVED
200025364	961209-3	GPS EFFLUENT	09/12/96	09/12/96	APPROVED
200025365	961209-4	GPS EFFLUENT	09/12/96	09/12/96	APPROVED
200025366	961209-1 BIAS S	TCLP BIAS SPIKE	09/12/96	09/12/96	APPROVED

Remarks:
ANOMALY REPORT:
Not all analysis run for sample 961209-3 due to limited amount of sample received.

This report is "PROPRIETARY AND CONFIDENTIAL" and delivered to, and intended for the exclusive use of the above named client only. Chevron Environmental Laboratory assumes no responsibility of liability for the reliance hereon by anyone other than the above named client.

Chevron Environmental Laboratory

DUPINDER JOHL
Laboratory Advisor

10/09/96
Date

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

09-Oct-1996 03:10 pm
REPORT ID: 100009819

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025362	961209-1	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/19/96	EPA 8240	09/19/96	DALEO	11445
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/24/96	EPA 8270	09/25/96	NEDHO	10820
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/19/96	EPA 1311	N/A	PADEA	500000287
TCLP ZHE PREP. (A)	09/17/96	EPA 1311	N/A	GAMAR	500000286
TCLP METALS					
METALS II (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761
MERCURY (CV/AA)	09/23/96	EPA 7470	09/23/96	MATIR	11830
SELENIUM (GH/AA)	09/24/96	EPA 7742	09/24/96	MATIR	11383
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	09/13/96	EPA 9040	09/13/96	JMKEL	11831
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	09/16/96	EPA 7470	09/16/96	MATIR	11828
SELENIUM (GH/AA)	09/17/96	EPA 7742	09/17/96	KAYIP-	11382
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/27/96	EPA 9010A	09/27/96	JMKEL	11852
SULFIDE, REACTIVE (A)	09/23/96	EPA 9010A	09/23/96	EAU_I	

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025363	961209-2	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/19/96	EPA 8240	09/19/96	DALEO	11445
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/24/96	EPA 8270	09/25/96	NEDHO	10820
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/19/96	EPA 1311	N/A	PADEA	500000287

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY
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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025363	961209-2	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP MISCELLANEOUS					
TCLP ZHE PREP. (A)	09/17/96	EPA 1311	N/A	GAMAR	500000286
TCLP METALS					
MERCURY (CV/AA)	09/23/96	EPA 7470	09/23/96	MATIR	11830
SELENIUM (GH/AA)	09/24/96	EPA 7742	09/24/96	MATIR	11383
METALS II (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	09/13/96	EPA 9040	09/13/96	JMKEL	11831
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	09/16/96	EPA 7470	09/16/96	MATIR	11828
SELENIUM (GH/AA)	09/17/96	EPA 7742	09/17/96	KAYIP	11382
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/27/96	EPA 9010A	09/27/96	JMKEL	11852
SULFIDE, REACTIVE (A)	09/23/96	EPA 9010A	09/23/96	EAU_I	

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025364	961209-3	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/24/96	EPA 8270	09/25/96	NEDHO	10820
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/19/96	EPA 1311	N/A	PADEA	500000287
TCLP METALS					
METALS II (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761
MERCURY (CV/AA)	09/23/96	EPA 7470	09/23/96	MATIR	11830
SELENIUM (GH/AA)	09/24/96	EPA 7742	09/24/96	MATIR	11383
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	09/13/96	EPA 9040	09/13/96	JMKEL	11831
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025364	961209-3	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
METALS (TOTAL,BY AA)					
SELENIUM (GH/AA)	09/17/96	EPA 7742	09/17/96	KAYIP	11382
MERCURY (CV/AA)	09/16/96	EPA 7470	09/16/96	MATIR	11828
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/25/96	EPA 9010A	09/25/96	JMKEL	11852
SULFIDE, REACTIVE (A)	09/25/96	EPA 9010A	09/25/96	JMKEL	11911

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025365	961209-4	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/19/96	EPA 8240	09/19/96	DALEO	11445
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/24/96	EPA 8270	09/25/96	NEDHO	10820
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	09/19/96	EPA 1311	N/A	PADEA	500000287
TCLP ZHE PREP. (A)	09/17/96	EPA 1311	N/A	GAMAR	500000286
TCLP METALS					
METALS II (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761
MERCURY (CV/AA)	09/23/96	EPA 7470	09/23/96	MATIR	11830
SELENIUM (GH/AA)	09/24/96	EPA 7742	09/24/96	KAYIP	11383
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	09/13/96	EPA 9040	09/13/96	JMKEL	11831
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	09/16/96	EPA 7470	09/16/96	MATIR	11828
SELENIUM (GH/AA)	09/17/96	EPA 7742	09/17/96	KAYIP	11382
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/25/96	EPA 9010A	09/25/96	JMKEL	11852
SULFIDE, REACTIVE (A)	09/25/96	EPA 9010A	09/25/96	JMKEL	11911

----- SAMPLE SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025365	961209-4	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025366	961209-1 BIAS	STCLP BIAS SPIKE

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	09/19/96	EPA 8240	09/19/96	DALEO	11445
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	09/24/96	EPA 8270	09/25/96	NEDHO	10820
TCLP METALS					
MERCURY (CV/AA)	09/23/96	EPA 7470	09/23/96	MATIR	11830
SELENIUM (GH/AA)	09/24/96	EPA 7742	09/24/96	MATIR	11383
METALS II (ICAP,A)	09/20/96	EPA 6010	09/20/96	BRWAL	11761

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
LAB

09-Oct-1996 03:10 pm
REPORT ID: 100009819

NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025362	961209-1	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11445
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11445
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11445
BENZENE	ND	UG/L	50	EPA 8240	11445
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11445
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11445
CHLOROFORM	ND	UG/L	60	EPA 8240	11445
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11445
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11445
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11445
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11445
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10820
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10820
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10820
NITROBENZENE	ND	UG/L	25	EPA 8270	10820
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
PYRIDINE	ND	UG/L	50	EPA 8270	10820
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11761
BARIUM	.631	MG/L	.007	EPA 6010	11761
CADMIUM	ND	MG/L	.007	EPA 6010	11761
CHROMIUM	ND	MG/L	.04	EPA 6010	11761
LEAD	ND	MG/L	.084	EPA 6010	11761
MERCURY	ND	MG/L	.001	EPA 7470	11830
SELENIUM	ND	MG/L	.002	EPA 7742	11383
SILVER	ND	MG/L	.02	EPA 6010	11761
PHYSICAL PARAMETERS					
PH	7.42	pH	.5	EPA 9040	11831
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11761
ARSENIC	ND	MG/L	.092	EPA 6010	11761
BARIUM	.69	MG/L	.007	EPA 6010	11761
BERYLLIUM	ND	MG/L	.005	EPA 6010	11761
CADMIUM	ND	MG/L	.007	EPA 6010	11761
CHROMIUM	ND	MG/L	.04	EPA 6010	11761
COBALT	ND	MG/L	.015	EPA 6010	11761
COPPER	ND	MG/L	.02	EPA 6010	11761
LEAD	ND	MG/L	.084	EPA 6010	11761
MOLYBDENUM	.082	MG/L	.022	EPA 6010	11761

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

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REPORT ID: 100009819

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025362	961209-1	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11761
SILVER	ND	MG/L	.02	EPA 6010	11761
THALLIUM	ND	MG/L	.16	EPA 6010	11761
VANADIUM	ND	MG/L	.01	EPA 6010	11761
ZINC	ND	MG/L	.025	EPA 6010	11761
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11828
SELENIUM	.002	MG/L	.002	EPA 7742	11382
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.1	EPA 9010A	11852
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
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09-Oct-1996 03:10 pm
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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025363	961209-2	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11445
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11445
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11445
BENZENE	ND	UG/L	50	EPA 8240	11445
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11445
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11445
CHLOROFORM	ND	UG/L	100	EPA 8240	11445
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11445
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11445
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11445
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11445
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10820
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10820
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10820
NITROBENZENE	ND	UG/L	25	EPA 8270	10820
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
PYRIDINE	ND	UG/L	50	EPA 8270	10820
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11761
BARIUM	.068	MG/L	.007	EPA 6010	11761
CADMIUM	ND	MG/L	.007	EPA 6010	11761
CHROMIUM	ND	MG/L	.04	EPA 6010	11761
LEAD	ND	MG/L	.084	EPA 6010	11761
MERCURY	ND	MG/L	.001	EPA 7470	11830
SELENIUM	ND	MG/L	.002	EPA 7742	11383
SILVER	ND	MG/L	.02	EPA 6010	11761
PHYSICAL PARAMETERS					
PH	8.17	pH	.5	EPA 9040	11831
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11761
ARSENIC	ND	MG/L	.092	EPA 6010	11761
BARIUM	1.08	MG/L	.007	EPA 6010	11761
BERYLLIUM	ND	MG/L	.005	EPA 6010	11761
CADMIUM	ND	MG/L	.007	EPA 6010	11761
CHROMIUM	.047	MG/L	.04	EPA 6010	11761
COBALT	.02	MG/L	.015	EPA 6010	11761
COPPER	.045	MG/L	.02	EPA 6010	11761
LEAD	ND	MG/L	.084	EPA 6010	11761
MOLYBDENUM	.033	MG/L	.022	EPA 6010	11761

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025363	961209-2	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11761
SILVER	ND	MG/L	.02	EPA 6010	11761
THALLIUM	ND	MG/L	.16	EPA 6010	11761
VANADIUM	.086	MG/L	.01	EPA 6010	11761
ZINC	1.73	MG/L	.025	EPA 6010	11761
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11828
SELENIUM	.005	MG/L	.002	EPA 7742	11382
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.1	EPA 9010A	11852
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
09-Oct-1996 03:10 pm
REPORT ID: 100009819

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025364	961209-3	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10820
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10820
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10820
NITROBENZENE	ND	UG/L	25	EPA 8270	10820
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
PYRIDINE	ND	UG/L	50	EPA 8270	10820
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11761
BARIUM	.104	MG/L	.007	EPA 6010	11761
CADMIUM	ND	MG/L	.007	EPA 6010	11761
CHROMIUM	ND	MG/L	.04	EPA 6010	11761
LEAD	ND	MG/L	.084	EPA 6010	11761
MERCURY	ND	MG/L	.001	EPA 7470	11830
SELENIUM	ND	MG/L	.002	EPA 7742	11383
SILVER	ND	MG/L	.02	EPA 6010	11761
PHYSICAL PARAMETERS					
PH	7.56	pH	.5	EPA 9040	11831
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11761
ARSENIC	.384	MG/L	.092	EPA 6010	11761
BARIUM	1.35	MG/L	.007	EPA 6010	11761
BERYLLIUM	ND	MG/L	.005	EPA 6010	11761
CADMIUM	ND	MG/L	.007	EPA 6010	11761
CHROMIUM	.084	MG/L	.04	EPA 6010	11761
COBALT	.028	MG/L	.015	EPA 6010	11761
COPPER	.084	MG/L	.02	EPA 6010	11761
LEAD	ND	MG/L	.084	EPA 6010	11761
MOLYBDENUM	.304	MG/L	.022	EPA 6010	11761
NICKEL	.144	MG/L	.056	EPA 6010	11761
SILVER	ND	MG/L	.02	EPA 6010	11761
THALLIUM	ND	MG/L	.16	EPA 6010	11761
VANADIUM	.122	MG/L	.01	EPA 6010	11761
ZINC	3.9	MG/L	.025	EPA 6010	11761
METALS (TOTAL,BY AA)					
MERCURY	.459	UG/L	.12	EPA 7470	11828
SELENIUM	ND	MG/L	.002	EPA 7742	11382
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.1	EPA 9010A	11852
SULFIDE, REACTIVE	1.14	MG/L	1	EPA 9010A	11911

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

09-Oct-1996 03:10 pm
REPORT ID: 100009819

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025364	961209-3	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
INORGANIC PARAMETERS					

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
09-Oct-1996 03:10 pm
REPORT ID: 100009819

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025365	961209-4	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11445
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11445
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11445
BENZENE	ND	UG/L	50	EPA 8240	11445
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11445
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11445
CHLOROFORM	ND	UG/L	100	EPA 8240	11445
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11445
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11445
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11445
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11445
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10820
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10820
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10820
NITROBENZENE	ND	UG/L	25	EPA 8270	10820
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
PYRIDINE	ND	UG/L	50	EPA 8270	10820
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11761
BARIUM	.152	MG/L	.007	EPA 6010	11761
CADMIUM	ND	MG/L	.007	EPA 6010	11761
CHROMIUM	ND	MG/L	.04	EPA 6010	11761
LEAD	ND	MG/L	.084	EPA 6010	11761
MERCURY	ND	MG/L	.001	EPA 7470	11830
SELENIUM	.014	MG/L	.002	EPA 7742	11383
SILVER	ND	MG/L	.02	EPA 6010	11761
PHYSICAL PARAMETERS					
PH	7.3	pH	.5	EPA 9040	11831
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11761
ARSENIC	ND	MG/L	.092	EPA 6010	11761
BARIUM	.183	MG/L	.007	EPA 6010	11761
BERYLLIUM	ND	MG/L	.005	EPA 6010	11761
CADMIUM	ND	MG/L	.007	EPA 6010	11761
CHROMIUM	ND	MG/L	.04	EPA 6010	11761
COBALT	ND	MG/L	.015	EPA 6010	11761
COPPER	ND	MG/L	.02	EPA 6010	11761
LEAD	ND	MG/L	.084	EPA 6010	11761
MOLYBDENUM	ND	MG/L	.022	EPA 6010	11761

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY 09-Oct-1996 03:10 pm
WASTE DISCHARGE ORDER REPORT ID: 100009819

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025365	961209-4	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11761
SILVER	ND	MG/L	.02	EPA 6010	11761
THALLIUM	ND	MG/L	.16	EPA 6010	11761
VANADIUM	ND	MG/L	.01	EPA 6010	11761
ZINC	.053	MG/L	.025	EPA 6010	11761
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11828
SELENIUM	ND	MG/L	.002	EPA 7742	11382
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.1	EPA 9010A	11852
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11911

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
09-Oct-1996 03:10 pm
REPORT ID: 100009819

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025366	961209-1 BIAS	STCLP BIAS SPIKE

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	119.088	PERCENT		EPA 8240	11445
1,2-DICHLOROETHANE	102.401	PERCENT		EPA 8240	11445
1,4-DICHLOROBENZENE	99.76	PERCENT		EPA 8240	11445
BENZENE	100.6	PERCENT		EPA 8240	11445
CARBON TETRACHLORIDE	103.721	PERCENT		EPA 8240	11445
CHLOROBENZENE	91.957	PERCENT		EPA 8240	11445
CHLOROFORM	99.16	PERCENT		EPA 8240	11445
METHYL ETHYL KETONE	79.232	PERCENT		EPA 8240	11445
TETRACHLOROETHENE	109.964	PERCENT		EPA 8240	11445
TRICHLOROETHENE	96.038	PERCENT		EPA 8240	11445
VINYL CHLORIDE	87.875	PERCENT		EPA 8240	11445
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	68.4	PERCENT		EPA 8270	10820
2,4,5-TRICHLOROPHENOL	91.78	PERCENT		EPA 8270	10820
2,4,6-TRICHLOROPHENOL	87.31	PERCENT		EPA 8270	10820
2,4-DINITROTOLUENE	81.77	PERCENT		EPA 8270	10820
2-METHYLPHENOL	88.49	PERCENT		EPA 8270	10820
3/4-METHYLPHENOL	94.8	PERCENT		EPA 8270	10820
HEXACHLOROBENZENE	41.78	PERCENT		EPA 8270	10820
HEXACHLOROBUTADIENE	53.43	PERCENT		EPA 8270	10820
HEXACHLOROETHANE	56.65	PERCENT		EPA 8270	10820
NITROBENZENE	91.66	PERCENT		EPA 8270	10820
PENTACHLOROPHENOL	107.74	PERCENT		EPA 8270	10820
PYRIDINE	38	PERCENT		EPA 8270	10820
TCLP METALS					
ARSENIC	93.4	PERCENT		EPA 6010	11761
BARIUM	73.2	PERCENT		EPA 6010	11761
CADMIUM	89	PERCENT		EPA 6010	11761
CHROMIUM	79.4	PERCENT		EPA 6010	11761
LEAD	82.2	PERCENT		EPA 6010	11761
MERCURY	98.3	MG/L		EPA 7470	11830
SELENIUM	69.4	MG/L		EPA 7742	11383
SILVER	79.2	PERCENT		EPA 6010	11761

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 9406. (415) 364-9600 FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598 (510) 988-9600 FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834 (916) 921-9600 FAX (916) 921-0100

Chevron Environmental Lab
940 Hensley St.
Richmond, CA 94804
Attention: Charmaine Arcia

Client Project ID: Chevron GPS: Sub 100009819
Sample Descript: Water, 961209-1
Analysis Method: See below
Lab Number: 609-0841

Sampled: Sep 12, 1996
Received: Sep 13, 1996
Reported: Sep 26, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 27 mm
Min. length: 25 mm
Max. length: 29 mm
Min. weight: 0.24 g
Mean weight: 0.30 g
Max. weight: 0.37 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	42	42
750 ppm	30	30	45	47
Duplicate 750 ppm	30	31	45	46

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	9/17/96	9/18/96	9/19/96	9/20/96	9/21/96

	Initial			24 Hr				48 Hr				72 Hr				96 Hr				Total
	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Dead
Control	9.0	18	7.6	7.7	20	7.4	0	7.4	19	7.3	0	7.5	19	7.3	0	7.2	19	7.3	0	0
750 ppm	9.1	18	7.6	8.0	20	7.4	0	7.8	18	7.4	0	7.6	19	7.2	1	6.8	19	7.3	1	1
250 ppm	9.2	18	7.6	7.8	20	7.5	0	7.7	18	7.5	0	7.7	19	7.3	0	7.0	18	7.4	0	0
Duplicate																				
750 ppm	9.2	18	7.6	7.9	20	7.5	0	7.7	18	7.4	0	7.8	19	7.3	0	6.9	18	7.3	0	0
250 ppm	9.3	18	7.6	7.8	20	7.4	0	7.8	18	7.5	1	7.7	19	7.3	1	7.0	18	7.4	1	1

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Client Services Representative

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab
940 Hensley St.
Richmond, CA 94804
Attention: Charmaine Arcia

Client Project ID: Chevron GPS: Sub 100009819
Sample Descript: Water, 961209-2
Analysis Method: See below
Lab Number: 609-0842

Sampled: Sep 12, 1996
Received: Sep 13, 1996
Reported: Sep 26, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 27 mm
Min. length: 25 mm
Max. length: 29 mm
Mean weight: 0.30 g
Min. weight: 0.24 g
Max. weight: 0.37 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	42	42
750 ppm	30	31	43	45
Duplicate 750 ppm	31	32	43	45

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	9/17/96	9/18/96	9/19/96	9/20/96	9/21/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.0	18	7.6	7.7	20	7.4	0	7.4	19	7.3	0	7.5	19	7.3	0	7.2	19	7.3	0	0
750 ppm	9.3	17	7.7	7.6	20	7.4	0	7.6	18	7.4	0	7.8	18	7.4	0	6.8	18	7.4	1	1
250 ppm	9.3	18	7.6	8.0	20	7.5	0	7.9	18	7.4	0	8.0	18	7.4	0	7.3	18	7.4	0	0
Duplicate																				
750 ppm	9.3	17	7.6	7.8	20	7.5	0	7.7	18	7.4	0	7.9	18	7.4	0	7.0	18	7.4	1	1
250 ppm	9.3	18	7.6	7.8	20	7.5	0	7.6	18	7.4	0	7.7	18	7.4	0	7.0	18	7.4	0	0

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Client Services Representative

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834 (916) 921-9600 FAX (916) 921-0100

Chevron Environmental Lab
940 Hensley St.
Richmond, CA 94804
Attention: Charmaine Arcia

Client Project ID: Chevron GPS: Sub 100009819
Sample Descript: Water, 961209-4
Analysis Method: See below
Lab Number: 609-0843

Sampled: Sep 12, 1996
Received: Sep 13, 1996
Reported: Sep 26, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 27 mm
Min. length: 25 mm
Max. length: 29 mm
Mean weight: 0.30 g
Min. weight: 0.24 g
Max. weight: 0.37 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	42	42
750 ppm	31	32	42	44
Duplicate 750 ppm	30	32	42	43

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	9/17/96	9/18/96	9/19/96	9/20/96	9/21/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	9.0	18	7.6	7.7	20	7.4	0	7.4	19	7.3	0	7.5	19	7.3	0	7.2	19	7.3	0	0
750 ppm	9.3	18	7.7	7.9	20	7.4	0	7.7	18	7.3	0	7.8	19	7.4	0	7.1	18	7.4	0	0
250 ppm	9.3	18	7.7	7.9	19	7.5	0	7.8	18	7.3	0	8.0	18	7.4	0	7.3	18	7.4	0	0
Duplicate																				
750 ppm	9.3	18	7.6	7.8	19	7.5	0	7.8	18	7.3	0	7.8	19	7.4	0	7.2	18	7.4	0	0
250 ppm	9.3	18	7.7	7.7	19	7.5	0	7.8	18	7.3	0	7.8	18	7.4	0	7.3	18	7.4	0	0

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Client Services Representative

609-0841.CHE <3>

SEQUOIA ANALYTICAL CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENVIRONMENTAL LABORATORY	Project Name: Chevron GPS Submission #1000098 19
Address: 940 HENSLEY ST.	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: 231-8113 FAX #: 231-8262	P.O. #:
Report To: C. ARCIA Sampler: B. STUART	QC Data: ☐ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	BIOASSAY ⊛								Comments
1. 961209-1	09/12/96	AQ	1	L-AG		X					6090841			⊛ DEFINITIVE IF REQUIRED
2. 961209-2	09/12/96	AQ	1	L-AG		X					6090842			
3. 961209-4	09/12/96	AQ	1	L-AG		X					6090843			
4.														
5.														
6.														
7.														
8.														
9.														
10.														

Relinquished By: C. Arcia	Date: 09/12/96	Time: 12:15	Received By: [signature]	Date: 9/13/96	Time: 12:15
Relinquished By: [signature]	Date: 9/13/96	Time: 17:45	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab: [signature]	Date: 9/13/96	Time: 17:45

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment_____ Page __ of __

Pink - Client
Yellow - Sequoia
White - Sequoia

SEQUOIA ANALYTICAL
CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENVIRONMENTAL LABORATORY	Project Name: CHEVRON GPS - SUBMISSION 10000 9819
Address: 940 HENSLEY ST.	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: 231-6113 FAX #: 231-5262	P.O. #:
Report To: C. ARCIA Sampler: B. STUART	QC Data: ☐ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	BIOASSAY ⊛								Comments
1. 961209-1	9/12/96	AQ	1	L-AG		X								⊛ DEFINITIVE IF REQUIRED
2. 961209-2	09/12/96	AQ	1	L-AG		X								
3. 961209-4	09/12/96	AQ	1	L-AG		X								
4.														
5.														
6.														
7.														
8.														
9.														
10.														

Relinquished By: C. Arcia	Date: 09/12/96	Time: 12:15	Received By:	Date: 9/13/96	Time: 12:15
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab:	Date:	Time:

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment_____ Page __ of __

Pink - Client
Yellow - Sequoia
White - Sequoia

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE.,RICHMOND,CA.,94804

CLIENT REP : CHARMAINE ARCIA
PHONE : (510) 231-8113
FAX : (510) 231-8262

CHAIN OF CUSTODY / ANALYSIS REQUEST

CHEVRON GPS-COMPOSITE STUDY
WDO REFINERY GROUNDWATER PROGRAM

REPORT ID : 100009819

CHARGE CODE: E83IC-3128-27-440

REQUESTOR : JOHN MACLEOD
DIVISION : WASTE DISCHARGE ORDER

CONTACT : JOHN MACLEOD
PHONE : 242-5735

SAMPLE TYPE: RGG GPS COMPOSITE STUDY

SUBMITTER : B.STUART

ANALYSIS REQUESTED:

CONTRACT SEQUOIA LAB	EPA 6010 (13+,METALS)	EPA 7470 (MERCURY)
EPA 7742 (SELENIUM)	EPA 9040 (PH AQUEOUS)	REACTIVITY (CYANIDE)
REACTIVITY (SULFIDE)	TCLP 6010 (3-6,METALS)	TCLP 7470 (MERCURY)
TCLP 7742 (SELENIUM)	TCLP 8240 (VOLATILES)	TCLP 8270 (SEMI-VOLATILE
TCLP CONVENTIONAL (PREP)	TCLP ZHE (PREP)	

COMMENTS: Not enough Sample 225364 for all analysis + Bioassay: ZHE Prep; TCLP 8240

	LAB NUMBER	CLIENT ID	SAMPLE INFORMATION	SAMPLE DATE	TIME	SAMPLE CONTAINER(S)
1.	200025362	961209-1	GPS EFFLUENT	09/12/96	08:45	6-L AG;2-250ML
2.	200025363	961209-2	GPS EFFLUENT	09/12/96	09:00	6-L AG;1-500ML
3.	200025364	961209-3	GPS EFFLUENT	09/12/96	09:20	1-L AG;2-250ML
4.	200025365	961209-4	GPS EFFLUENT	09/12/96	08:20	5-L AG;2-250ML
5.	200025366	961209-1 BIAS S #	TCLP BIAS SPIKE	09/12/96		1
6.						
7.						
8.						
9.						
10.						
11.						
12.						

CHAIN OF POSSESSION:

A.	[signature]	Truck	09/12/96
	Signature	Title	Date/Time

Project Name: CHEVRON GPS -COMPOSITE STUDY Contact: RANDY BRANDT
Phone 242-5735

Chevron

Chevron Environmental Lab
Chevron Chemical Company
940 Hensley Street
Richmond, CA 94804

CHAIN-OF-CUSTODY RECORD
SAMPLE ANALYSIS REQUEST

Return form with analysis to RANDY BRANDT - WDO
Charge Number: E831C-3128-27440

Sample Collector's Name: Brodie Stuart - WDO

Analysis Requested: [RGG GPS COMPOSITE STUDY]

TCLP
CCR metals (*)
pH (corrosivity)
Ignitability
Reactivity

Bioassay

(*) STLC prep only if required

Special Handling/Storage: Store at 4°C

Chevron's Sample No.	Date/Time Sampled	Sample Information
961209-1	9/12/96 845	
961209-2	9/12/96 900	
961209-3	9/12/96 920	~~not enough sample for all analyses~~ TPH 9/12/96
961209-4	9/12/96 820	

Sample destination: Chevron Environmental Lab, 940 Hensley St., Bldg 120, Room 15, Richmond, CA 94804

Chain of Possession:

	Signature	Title	Inclusive Dates
1.	Brodie Stuart		9/12/96
2.	[signature]	Tech	09/12/96
3.			
4.			

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE, RICHMOND, CA., 94802

REPORT DATE:
31-Oct-1996 04:13 pm

CLIENT :
CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER
841 CHEVRON WAY
RICHMOND, CA. 94802

REQUESTOR :
RANDY BRANDT

PROJECT NAME: WDO REFINERY MISC.GW PROGRAMS
PROJECT DESCRIPTION: CHEVRON GPS - COMPOSITE STUDY

REPORT ID: 100009945 CHARGE CODE : E83IC-3128-27-440

PROJECT ID : RGG GPS COMPOSITE STUDY
ANALYSIS : CONTRACT SEQUOIA LAB ; EPA 1020 (FLASH,A) ;
EPA 6010 (13+,METALS) ; EPA 7470 (MERCURY) ; EPA 7742 (SELENIUM) ;
EPA 9040 (PH AQUEOUS) ; REACTIVITY (CYANIDE) ; REACTIVITY (SULFIDE) ;
TCLP 6010 (3-6,METALS) ; TCLP 7470 (MERCURY) ; TCLP 7742 (SELENIUM) ;
TCLP 8240 (VOLATILES) ; TCLP 8270 (SEMI-VOLATILE; TCLP CONVENTIONAL (PREP);
TCLP ZHE (PREP) ;

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION	SAMPLE DATE	DATE IN LAB	STATUS
200025623	962609-1	GPS EFFLUENT	09/26/96	09/26/96	APPROVED
200025624	962609-2	GPS EFFLUENT	09/26/96	09/26/96	APPROVED
200025625	962609-3	GPS EFFLUENT	09/26/96	09/26/96	APPROVED
200025626	962609-4	GPS EFFLUENT	09/26/96	09/26/96	APPROVED
200025627	962609-2 BIAS S	GPS EFF BIAS SPIKE	09/26/96	09/26/96	APPROVED

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Chevron Environmental Laboratory

DUPINDER JOHL
Laboratory Advisor

11/14/96
Date

----- SAMPLE SUMMARY -----

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025623	962609-1	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	10/05/96	EPA 8240	10/05/96	DALEO	11448
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	10/02/96	EPA 8270	10/03/96	NEDHO	10820
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	10/01/96	EPA 1311	N/A	PADEA	500000290
TCLP ZHE PREP. (A)	09/27/96	EPA 1311	N/A	GAMAR	500000289
TCLP METALS					
METALS II (ICAP,A)	10/03/96	EPA 6010	10/03/96	BRWAL	11765
MERCURY (CV/AA)	10/07/96	EPA 7470	10/07/96	MATIR	11913
SELENIUM (GH/AA)	10/07/96	EPA 7742	10/07/96	MATIR	11971
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	09/26/96	EPA 9040	09/26/96	JMKEL	11915
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	10/01/96	EPA 6010	10/03/96	BRWAL	11764
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	10/03/96	EPA 7470	10/03/96	MATIR	11981
SELENIUM (GH/AA)	10/03/96	EPA 7742	10/03/96	MATIR	11971
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	09/27/96	EPA 9010A	09/27/96	JMKEL	11852
SULFIDE, REACTIVE (A)	09/27/96	EPA 9010A	09/27/96	JMKEL	11911
CONVENTIONALS					
FLASH (A)	10/25/96	EPA 1020	10/25/96	JMKEL	12084

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025624	962609-2	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	10/05/96	EPA 8240	10/05/96	DALEO	11448
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	10/02/96	EPA 8270	10/03/96	NEDHO	10820
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	10/01/96	EPA 1311	N/A	PADEA	500000290

----- SAMPLE SUMMARY -----

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025624	962609-2	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP MISCELLANEOUS					
TCLP ZHE PREP. (A)	09/27/96	EPA 1311	N/A	GAMAR	500000289
TCLP METALS					
METALS II (ICAP,A)	10/03/96	EPA 6010	10/03/96	BRWAL	11765
MERCURY (CV/AA)	10/07/96	EPA 7470	10/07/96	MATIR	11913
SELENIUM (GH/AA)	10/07/96	EPA 7742	10/07/96	MATIR	11971
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	09/26/96	EPA 9040	09/26/96	JMKEL	11915
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	10/03/96	EPA 6010	10/03/96	BRWAL	11764
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	10/03/96	EPA 7470	10/03/96	MATIR	11981
SELENIUM (GH/AA)	10/03/96	EPA 7742	10/03/96	MATIR	11971
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	10/04/96	EPA 9010A	10/04/96	JMKEL	11956
SULFIDE, REACTIVE (A)	10/02/96	EPA 9010A	10/02/96	JMKEL	11955
CONVENTIONALS					
FLASH (A)	10/25/96	EPA 1020	10/25/96	JMKEL	12084

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025625	962609-3	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	10/05/96	EPA 8240	10/05/96	DALEO	11448
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	10/02/96	EPA 8270	10/03/96	NEDHO	10820
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	10/01/96	EPA 1311	N/A	PADEA	500000290
TCLP ZHE PREP. (A)	09/27/96	EPA 1311	N/A	GAMAR	500000289
TCLP METALS					
METALS II (ICAP,A)	10/03/96	EPA 6010	10/03/96	BRWAL	11765
MERCURY (CV/AA)	10/07/96	EPA 7470	10/07/96	MATIR	11913
SELENIUM (GH/AA)	10/07/96	EPA 7742	10/07/96	MATIR	11971
PHYSICAL PARAMETERS					

----- SAMPLE SUMMARY -----

PH (ELECTROMETRIC,A)	09/26/96 EPA 9040	09/26/96 JMKEL	11915

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025625	962609-3	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	10/03/96	EPA 6010	10/03/96	BRWAL	11764
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	10/03/96	EPA 7470	10/03/96	MATIR	11981
SELENIUM (GH/AA)	10/03/96	EPA 7742	10/03/96	MATIR	11971
INORGANIC PARAMETERS					
SULFIDE, REACTIVE (A)	10/02/96	EPA 9010A	10/02/96	JMKEL	11955
CYANIDE, REACTIVE (A)	10/04/96	EPA 9010A	10/04/96	JMKEL	11956
CONVENTIONALS					
FLASH (A)	10/25/96	EPA 1020	10/25/96	JMKEL	12084

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025626	962609-4	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	10/05/96	EPA 8240	10/05/96	DALEO	11448
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	10/02/96	EPA 8270	10/03/96	NEDHO	10820
TCLP MISCELLANEOUS					
TCLP CONV. PREP. (A)	10/01/96	EPA 1311	N/A	PADEA	500000290
TCLP ZHE PREP. (A)	09/27/96	EPA 1311	N/A	GAMAR	500000289
TCLP METALS					
METALS II (ICAP,A)	10/03/96	EPA 6010	10/03/96	BRWAL	11765
MERCURY (CV/AA)	10/07/96	EPA 7470	10/07/96	MATIR	11913
SELENIUM (GH/AA)	10/07/96	EPA 7742	10/07/96	MATIR	11971
PHYSICAL PARAMETERS					
PH (ELECTROMETRIC,A)	09/26/96	EPA 9040	09/26/96	JMKEL	11915
METALS (TOTAL,BY ICAP)					
METALS IV (ICAP,A)	10/03/96	EPA 6010	10/03/96	BRWAL	11764
METALS (TOTAL,BY AA)					
MERCURY (CV/AA)	10/03/96	EPA 7470	10/03/96	MATIR	11981
SELENIUM (GH/AA)	10/03/96	EPA 7742	10/03/96	MATIR	11971
INORGANIC PARAMETERS					
CYANIDE, REACTIVE (A)	10/04/96	EPA 9010A	10/04/96	JMKEL	11956

----- SAMPLE SUMMARY -----

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025626	962609-4	GPS EFFLUENT

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
INORGANIC PARAMETERS					
SULFIDE, REACTIVE (A)	10/04/96	EPA 9010A	10/04/96	JMKEL	11955
CONVENTIONALS					
FLASH (A)	10/25/96	EPA 1020	10/25/96	JMKEL	12084

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025627	962609-2 BIAS	SGPS EFF BIAS SPIKE

ANALYTICAL OPERATION	PREP DATE	EPA METHOD	ANALYSIS DATE	LAB ANALYST	QC BATCH NUMBER
TCLP VOLATILES					
PURGEABLES TCLP (GC/MS,A)	10/06/96	EPA 8240	10/06/96	DALEO	11448
TCLP SEMI-VOLATILES					
SEMIS TCLP (GC/MS,A)	10/02/96	EPA 8270	10/03/96	NEDHO	10820
TCLP METALS					
METALS II (ICAP,A)	10/03/96	EPA 6010	10/03/96	BRWAL	11765
MERCURY (CV/AA)	10/07/96	EPA 7470	10/07/96	MATIR	11913
SELENIUM (GH/AA)	10/07/96	EPA 7742	10/07/96	MATIR	11971

----- RESULTS SUMMARY -----

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025623	962609-1	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11448
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11448
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11448
BENZENE	ND	UG/L	50	EPA 8240	11448
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11448
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11448
CHLOROFORM	ND	UG/L	100	EPA 8240	11448
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11448
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11448
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11448
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11448
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10820
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10820
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10820
NITROBENZENE	ND	UG/L	25	EPA 8270	10820
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
PYRIDINE	ND	UG/L	50	EPA 8270	10820
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11765
BARIUM	.233	MG/L	.007	EPA 6010	11765
CADMIUM	ND	MG/L	.007	EPA 6010	11765
CHROMIUM	ND	MG/L	.04	EPA 6010	11765
LEAD	ND	MG/L	.084	EPA 6010	11765
MERCURY	ND	MG/L	.001	EPA 7470	11913
SELENIUM	.0021	MG/L	.002	EPA 7742	11971
SILVER	ND	MG/L	.02	EPA 6010	11765
PHYSICAL PARAMETERS					
PH	7.56	pH	.5	EPA 9040	11915
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11764
ARSENIC	ND	MG/L	.092	EPA 6010	11764
BARIUM	.592	MG/L	.007	EPA 6010	11764
BERYLLIUM	ND	MG/L	.005	EPA 6010	11764
CADMIUM	ND	MG/L	.007	EPA 6010	11764
CHROMIUM	ND	MG/L	.04	EPA 6010	11764
COBALT	ND	MG/L	.015	EPA 6010	11764
COPPER	.073	MG/L	.02	EPA 6010	11764
LEAD	ND	MG/L	.084	EPA 6010	11764
MOLYBDENUM	.095	MG/L	.022	EPA 6010	11764

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025623	962609-1	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11764
SILVER	ND	MG/L	.02	EPA 6010	11764
THALLIUM	ND	MG/L	.16	EPA 6010	11764
VANADIUM	.031	MG/L	.01	EPA 6010	11764
ZINC	.058	MG/L	.025	EPA 6010	11764
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11981
SELENIUM	.0048	MG/L	.002	EPA 7742	11971
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.1	EPA 9010A	11852
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11911
CONVENTIONALS					
FLASH	ND	DEG F	170	EPA 1020	12084

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025624	962609-2	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11448
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11448
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11448
BENZENE	ND	UG/L	50	EPA 8240	11448
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11448
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11448
CHLOROFORM	ND	UG/L	100	EPA 8240	11448
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11448
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11448
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11448
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11448
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10820
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10820
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10820
NITROBENZENE	ND	UG/L	25	EPA 8270	10820
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
PYRIDINE	ND	UG/L	50	EPA 8270	10820
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11765
BARIUM	.073	MG/L	.007	EPA 6010	11765
CADMIUM	ND	MG/L	.007	EPA 6010	11765
CHROMIUM	ND	MG/L	.04	EPA 6010	11765
LEAD	ND	MG/L	.084	EPA 6010	11765
MERCURY	ND	MG/L	.001	EPA 7470	11913
SELENIUM	ND	MG/L	.002	EPA 7742	11971
SILVER	ND	MG/L	.02	EPA 6010	11765
PHYSICAL PARAMETERS					
PH	7.35	pH	.5	EPA 9040	11915
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11764
ARSENIC	ND	MG/L	.092	EPA 6010	11764
BARIUM	.28	MG/L	.007	EPA 6010	11764
BERYLLIUM	ND	MG/L	.005	EPA 6010	11764
CADMIUM	ND	MG/L	.007	EPA 6010	11764
CHROMIUM	ND	MG/L	.04	EPA 6010	11764
COBALT	ND	MG/L	.015	EPA 6010	11764
COPPER	ND	MG/L	.02	EPA 6010	11764
LEAD	ND	MG/L	.084	EPA 6010	11764
MOLYBDENUM	ND	MG/L	.022	EPA 6010	11764

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200025624	962609-2	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11764
SILVER	ND	MG/L	.02	EPA 6010	11764
THALLIUM	ND	MG/L	.16	EPA 6010	11764
VANADIUM	.011	MG/L	.01	EPA 6010	11764
ZINC	.28	MG/L	.025	EPA 6010	11764
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11981
SELENIUM	ND	MG/L	.002	EPA 7742	11971
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.1	EPA 9010A	11956
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11955
CONVENTIONALS					
FLASH	ND	DEG F	170	EPA 1020	12084

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LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025625	962609-3	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11448
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11448
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11448
BENZENE	ND	UG/L	50	EPA 8240	11448
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11448
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11448
CHLOROFORM	ND	UG/L	60	EPA 8240	11448
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11448
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11448
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11448
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11448
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10820
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10820
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10820
NITROBENZENE	ND	UG/L	25	EPA 8270	10820
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
PYRIDINE	ND	UG/L	50	EPA 8270	10820
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11765
BARIUM	.084	MG/L	.007	EPA 6010	11765
CADMIUM	ND	MG/L	.007	EPA 6010	11765
CHROMIUM	ND	MG/L	.04	EPA 6010	11765
LEAD	ND	MG/L	.084	EPA 6010	11765
MERCURY	ND	MG/L	.001	EPA 7470	11913
SELENIUM	ND	MG/L	.002	EPA 7742	11971
SILVER	ND	MG/L	.02	EPA 6010	11765
PHYSICAL PARAMETERS					
PH	7.12	pH	.5	EPA 9040	11915
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11764
ARSENIC	ND	MG/L	.092	EPA 6010	11764
BARIUM	.113	MG/L	.007	EPA 6010	11764
BERYLLIUM	ND	MG/L	.005	EPA 6010	11764
CADMIUM	ND	MG/L	.007	EPA 6010	11764
CHROMIUM	ND	MG/L	.04	EPA 6010	11764
COBALT	ND	MG/L	.015	EPA 6010	11764
COPPER	.023	MG/L	.02	EPA 6010	11764
LEAD	ND	MG/L	.084	EPA 6010	11764
MOLYBDENUM	.261	MG/L	.022	EPA 6010	11764

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

31-Oct-1996 04:13 pm
REPORT ID: 100009945

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025625	962609-3	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	.067	MG/L	.056	EPA 6010	11764
SILVER	ND	MG/L	.02	EPA 6010	11764
THALLIUM	ND	MG/L	.16	EPA 6010	11764
VANADIUM	.01	MG/L	.01	EPA 6010	11764
ZINC	.089	MG/L	.025	EPA 6010	11764
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11981
SELENIUM	ND	MG/L	.002	EPA 7742	11971
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	ND	MG/L	.1	EPA 9010A	11956
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11955
CONVENTIONALS					
FLASH	ND	DEG F	170	EPA 1020	12084

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

31-Oct-1996 04:13 pm
REPORT ID: 100009945

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025626	962609-4	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	ND	UG/L	70	EPA 8240	11448
1,2-DICHLOROETHANE	ND	UG/L	50	EPA 8240	11448
1,4-DICHLOROBENZENE	ND	UG/L	50	EPA 8240	11448
BENZENE	ND	UG/L	50	EPA 8240	11448
CARBON TETRACHLORIDE	ND	UG/L	60	EPA 8240	11448
CHLOROBENZENE	ND	UG/L	50	EPA 8240	11448
CHLOROFORM	ND	UG/L	60	EPA 8240	11448
METHYL ETHYL KETONE	ND	UG/L	750	EPA 8240	11448
TETRACHLOROETHENE	ND	UG/L	50	EPA 8240	11448
TRICHLOROETHENE	ND	UG/L	50	EPA 8240	11448
VINYL CHLORIDE	ND	UG/L	100	EPA 8240	11448
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
2,4,5-TRICHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
2,4,6-TRICHLOROPHENOL	ND	UG/L	25	EPA 8270	10820
2,4-DINITROTOLUENE	ND	UG/L	10	EPA 8270	10820
2-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
3/4-METHYLPHENOL	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBENZENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROBUTADIENE	ND	UG/L	25	EPA 8270	10820
HEXACHLOROETHANE	ND	UG/L	25	EPA 8270	10820
NITROBENZENE	ND	UG/L	25	EPA 8270	10820
PENTACHLOROPHENOL	ND	UG/L	10	EPA 8270	10820
PYRIDINE	ND	UG/L	50	EPA 8270	10820
TCLP METALS					
ARSENIC	ND	MG/L	.092	EPA 6010	11765
BARIUM	.199	MG/L	.007	EPA 6010	11765
CADMIUM	ND	MG/L	.007	EPA 6010	11765
CHROMIUM	ND	MG/L	.04	EPA 6010	11765
LEAD	ND	MG/L	.084	EPA 6010	11765
MERCURY	ND	MG/L	.001	EPA 7470	11913
SELENIUM	ND	MG/L	.002	EPA 7742	11971
SILVER	ND	MG/L	.02	EPA 6010	11765
PHYSICAL PARAMETERS					
PH	7.13	pH	.5	EPA 9040	11915
METALS (TOTAL,BY ICAP)					
ANTIMONY	ND	MG/L	.091	EPA 6010	11764
ARSENIC	ND	MG/L	.092	EPA 6010	11764
BARIUM	.184	MG/L	.007	EPA 6010	11764
BERYLLIUM	ND	MG/L	.005	EPA 6010	11764
CADMIUM	ND	MG/L	.007	EPA 6010	11764
CHROMIUM	ND	MG/L	.04	EPA 6010	11764
COBALT	ND	MG/L	.015	EPA 6010	11764
COPPER	ND	MG/L	.02	EPA 6010	11764
LEAD	ND	MG/L	.084	EPA 6010	11764
MOLYBDENUM	ND	MG/L	.022	EPA 6010	11764

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

31-Oct-1996 04:13 pm
REPORT ID: 100009945

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025626	962609-4	GPS EFFLUENT

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
METALS (TOTAL,BY ICAP)					
NICKEL	ND	MG/L	.056	EPA 6010	11764
SILVER	ND	MG/L	.02	EPA 6010	11764
THALLIUM	ND	MG/L	.16	EPA 6010	11764
VANADIUM	ND	MG/L	.01	EPA 6010	11764
ZINC	.035	MG/L	.025	EPA 6010	11764
METALS (TOTAL,BY AA)					
MERCURY	ND	UG/L	.12	EPA 7470	11981
SELENIUM	ND	MG/L	.002	EPA 7742	11971
INORGANIC PARAMETERS					
CYANIDE, REACTIVE	.107	MG/L	.1	EPA 9010A	11956
SULFIDE, REACTIVE	ND	MG/L	1	EPA 9010A	11955
CONVENTIONALS					
FLASH	ND	DEG F	170	EPA 1020	12084

----- RESULTS SUMMARY -----

CHEVRON PRODUCTS COMPANY
WASTE DISCHARGE ORDER

31-Oct-1996 04:13 pm
REPORT ID: 100009945

LAB NUMBER	CLIENT ID	SAMPLE DESCRIPTION
200025627	962609-2	BIAS SGPS EFF BIAS SPIKE

COMPONENT	SAMPLE RESULT	UNITS	REPORT LIMIT	EPA METHOD	QC BATCH NUMBER
TCLP VOLATILES					
1,1-DICHLOROETHENE	134.334	PERCENT		EPA 8240	11448
1,2-DICHLOROETHANE	96.759	PERCENT		EPA 8240	11448
1,4-DICHLOROBENZENE	105.882	PERCENT		EPA 8240	11448
BENZENE	112.125	PERCENT		EPA 8240	11448
CARBON TETRACHLORIDE	99.04	PERCENT		EPA 8240	11448
CHLOROBENZENE	105.402	PERCENT		EPA 8240	11448
CHLOROFORM	105.642	PERCENT		EPA 8240	11448
METHYL ETHYL KETONE	101.921	PERCENT		EPA 8240	11448
TETRACHLOROETHENE	98.559	PERCENT		EPA 8240	11448
TRICHLOROETHENE	102.761	PERCENT		EPA 8240	11448
VINYL CHLORIDE	198.199	PERCENT		EPA 8240	11448
TCLP SEMI-VOLATILES					
1,4-DICHLOROBENZENE	62.53	PERCENT		EPA 8270	10820
2,4,5-TRICHLOROPHENOL	79	PERCENT		EPA 8270	10820
2,4,6-TRICHLOROPHENOL	75.95	PERCENT		EPA 8270	10820
2,4-DINITROTOLUENE	68.39	PERCENT		EPA 8270	10820
2-METHYLPHENOL	79.53	PERCENT		EPA 8270	10820
3/4-METHYLPHENOL	82.75	PERCENT		EPA 8270	10820
HEXACHLOROBENZENE	30.13	PERCENT		EPA 8270	10820
HEXACHLOROBUTADIENE	48.48	PERCENT		EPA 8270	10820
HEXACHLOROETHANE	54.12	PERCENT		EPA 8270	10820
NITROBENZENE	89.29	PERCENT		EPA 8270	10820
PENTACHLOROPHENOL	96.87	PERCENT		EPA 8270	10820
PYRIDINE	60.85	PERCENT		EPA 8270	10820
TCLP METALS					
ARSENIC	91.8	PERCENT		EPA 6010	11765
BARIUM	33.07	PERCENT		EPA 6010	11765
CADMIUM	90	PERCENT		EPA 6010	11765
CHROMIUM	84.2	PERCENT		EPA 6010	11765
LEAD	52.6	PERCENT		EPA 6010	11765
MERCURY	68.7	MG/L		EPA 7470	11913
SELENIUM	88.4	MG/L		EPA 7742	11971
SILVER	77	PERCENT		EPA 6010	11765

CHEVRON CHEMICAL ENVIRONMENTAL

LABORATORY QUALITY CONTROL / QUALITY ASSURANCE SUMMARY

BATCH INFORMATION

ANALYST	DALEO
PREP. DATE	09/19/96
ANALYSIS DATE	09/19/96
PREP. METHOD	5030
ANALYSIS METHOD	8240

BATCH # 11448

THIS BATCH IS ASSOCIATED WITH THE FOLLOWING SUBMISSIONS:

100009884
100010003
100009945
100009949

LABORATORY CONTROLS**

COMPONENT LIST	SPIKE LEVEL	BLANK RESULTS	LCS1 RESULTS	LCS2 RESULTS	AVRG %RCVRY	%RECVRY LIMITS L	%RECVRY LIMITS H	RPD	RPD LIMIT
VINYL CHLORIDE	50.00	0.00	57.00	64.00	121	43	135	12	25
1,1-DICHLOROETHENE	50.00	0.00	49.00	53.00	102	70	136	8	25
METHYL ETHYL KETONE	400.00	0.00	391.00	443.00	104	71	139	12	25
CHLOROFORM	50.00	0.00	44.00	47.00	91	76	124	7	25
CARBON TETRACHLORIDE	50.00	0.00	44.00	48.00	92	77	131	9	25
BENZENE	50.00	0.00	48.00	57.00	105	88	118	17	25
1,2-DICHLOROETHANE	50.00	0.00	47.00	50.00	97	70	132	6	25
TRICHLOROETHENE	50.00	0.00	48.00	52.00	100	88	114	8	25
TOLUENE	50.00	0.00	54.00	61.00	115	82	118	12	25
TETRACHLOROETHENE	50.00	0.00	44.00	50.00	94	72	132	13	25
CHLOROBENZENE	50.00	0.00	45.00	51.00	96	86	116	13	25
1,4-DICHLOROBENZENE	50.00	0.00	44.00	52.00	96	70	148	17	25
(SS)D4-1,2-DICHLOROETHANE	50.00	49.70	47.90	46.10	94	76	114	4	15
(SS)D8-TOLUENE	50.00	57.40	51.20	52.60	104	88	110	3	15
(SS)BROMOFLUOROBENZENE	50.00	48.20	52.30	55.00	107	86	115	5	15

Matrix Controls**

COMPONENT LIST	SPIKE LEVEL	SAMPLE 25746 RESULTS	MS RESULTS	MSD RESULTS	AVRG %RCVRY	%RECVRY LIMITS L	%RECVRY LIMITS H	RPD	RPD LIMIT
VINYL CHLORIDE	50.00	0.00	58.00	53.00	111	43	135	9	25
1,1-DICHLOROETHENE	50.00	0.00	50.00	47.00	97	70	136	6	25
METHYL ETHYL KETONE	400.00	0.00	387.00	440.00	103	71	139	13	25
CHLOROFORM	50.00	0.00	47.00	45.00	92	76	124	4	25
CARBON TETRACHLORIDE	50.00	0.00	50.00	47.00	97	77	131	6	25
BENZENE	50.00	0.00	54.00	54.00	108	88	118	0	25
1,2-DICHLOROETHANE	50.00	0.00	53.00	52.00	105	70	132	2	25
TRICHLOROETHENE	50.00	0.00	52.00	48.00	100	88	114	8	25
TOLUENE	50.00	0.00	58.00	57.00	115	82	118	2	25
TETRACHLOROETHENE	50.00	0.00	49.00	44.00	93	72	132	11	25
CHLOROBENZENE	50.00	0.00	49.00	49.00	98	86	116	0	25
1,4-DICHLOROBENZENE	50.00	0.00	46.00	46.00	92	70	148	0	25
(SS)D4-1,2-DICHLOROETHANE	50.00	45.30	48.90	48.30	97	76	114	1	15
(SS)D8-TOLUENE	50.00	52.30	52.10	51.30	103	88	110	2	15
(SS)BROMOFLUOROBENZENE	50.00	54.80	53.20	54.00	107	86	115	1	15

* VALUE FAILS TO FALL WITHIN THE ESTABLISHED LIMITS ** VALUES IN TABLE ARE IN UNITS OF UG/L UNLESS OTHERWISE SPECIFIED

CHEVRON ENVIRONMENTAL LABORATORY

QUALITY ASSURANCE / QUALITY CONTROL SUMMARY

BATCH INFORMATION

ANALYST	NEDHO	BATCH # 10820				MATRIX
PREP. DATE	09/18/96	THIS BATCH IS ASSOCIATED WITH				AQUEOUS
ANALYSIS DATE	09/25/96	THE FOLLOWING SUBMISSIONS:				
PREP. METHOD	3520	100009863	100009949	10000	10000	
ANALYSIS METHOD	8270	100009895	100009945	10000	10000	
		100009819	10000	10000	10000	
		100009884	10000	10000	10000	

LABORATORY CONTROLS**

COMPONENT LIST	SPIKE LEVEL	BLANK RESULTS	LCS1 %RCVRY RESULTS	LCS2 %RCVRY RESULTS	AVG %RECOVERY	%RECOVERY LIMITS L	H	RPD	RPD LIMIT
PHENOL	100	0	59	83	71	44	97	35	44
2-CHLOROPHENOL	100	0	62	89	76	57	108	36	46
1,4-DICHLOROBENZENE	100	0	38	57	48	39	91	39	50
N-NITROSODI-N-PROPYLAMINE	100	0	89	81	85	55	103	9	31
1,2,4-TRICHLOROBENZENE	100	0	39	56	48	40	98	37	42
4-CHLORO-3-METHYLPHENOL	100	0	86	85	86	59	108	1	34
ACENAPHTHENE	100	0	69	71	70	49	100	2	31
4-NITROPHENOL	100	0	83	75	79	30	104	10	40
2,4-DINITROTOLUENE	100	0	91	83	87	52	95	9	34
PENTACHLOROPHENOL	100	0	90	91	91	51	125	2	33
DI-N-BUTYL PHTHALATE	100	0	89	94	92	59	110	5	35
PYRENE	100	0	79	88	83	56	110	12	38
2-Fluorophenol	100	64	52	80	66	42	108	41	51
Phenol-d5	100	64	57	79	68	46	106	32	42
Nitrobenzene-d5	50	59	61	79	70	48	121	26	39
2-Fluorobiphenyl	50	46	63	67	65	43	112	5	30
2,4,6-Tribromophenol	100	68	80	89	85	51	119	10	28
Terphenyl-d14	50	68	60	66	63	27	96	10	34

Matrix Controls**

COMPONENT LIST	SPIKE LEVEL	SAMPLE 200025949 RESULTS	MS %RCVRY RESULTS	MSD %RCVRY RESULTS	AVG %RECOVERY	%RECOVERY LIMITS L	H	RPD	RPD LIMIT
PHENOL	100	0	44	88	66	42	104	67 *	61
2-CHLOROPHENOL	100	0	43	94	69	35	109	74 *	69
1,4-DICHLOROBENZENE	100	0	37	84	61	21	82	77	79
N-NITROSODI-N-PROPYLAMINE	100	0	71	89	80	45	91	23	53
1,2,4-TRICHLOROBENZENE	100	0	47	88	68	22	84	62	69
4-CHLORO-3-METHYLPHENOL	100	0	80	87	84	50	108	9	42
ACENAPHTHENE	100	0	68	72	70	38	85	6	46
4-NITROPHENOL	100	0	83	79	81	43	113	4	51
2,4-DINITROTOLUENE	100	0	74	75	75	39	98	2	44
PENTACHLOROPHENOL	100	0	94	83	88	48	128	12	42
DI-N-BUTYL PHTHALATE	100	0	84	91	87	47	105	7	42
PYRENE	100	0	98	108	103 *	39	74	10	31
2-Fluorophenol	100	44	42	93	67	21	100	76	80
Phenol-d5	100	53	51	99	75	10	94	64	64
Nitrobenzene-d5	50	69	67	114	90	35	114	53	65
2-Fluorobiphenyl	50	76	72	81	77	43	116	12	50
2,4,6-Tribromophenol	100	90	86	81	84	10	123	6	36
Terphenyl-d14	50	82	71	94	82	33	141	27	70

QC BATCH NOTES:

* VALUE FAILS TO FALL WITHIN ESTABLISHED LIMITS

** VALUES IN TABLE ARE IN UNITS OF (ug/l) UNLESS OTHERWISE SPECIFIED

CHEVRON CHEMICAL ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH INFORMATION

ANALYST	BRWAL
PREP. DATE	10/03/96
ANALYSIS DATE	10/03/96
PREP. METHOD	3005
ANALYSIS METHOD	6010

BATCH # 11765

THIS BATCH IS ASSOCIATED WITH THE FOLLOWING SUBMISSIONS:

9989	9999
9936	9984
9997	9985
9945	9986

MATRIX: AQUEOUS 200025730

LABORATORY CONTROLS**

COMPONENT LIST	SPIKE LEVEL	BLANK RESULTS	LCS1 RESULTS	LCS2 RESULTS	AVRG %RCVRY	%RECVRY LIMITS	RPD	RPD LIMIT
SILVER	2.0	0.0	2.04	2.03	101.8	80 - 120	0	25
ARSENIC	1.0	0.0	0.96	0.99	93.1	80 - 120	3	25
BARIUM	1.0	0.0	0.82	0.84	83.0	80 - 120	2	25
BERYLLIUM	1.0					80 - 120		25
CADMIUM	1.0	0.0	0.78	0.81	79.5 *	80 - 120	4	25
COBALT	1.0					80 - 120		25
CHROMIUM	1.0	0.0	0.84	0.89	86.4	80 - 120	5	25
COPPER	1.0					80 - 120		25
MANGANESE	1.0					80 - 120		25
MOLYBDENUM	1.0					80 - 120		25
NICKEL	1.0	0.0	0.78	0.78	77.6 *	80 - 120	1	25
LEAD	1.0	0.0	0.80	0.83	80.6	80 - 120	4	25
ANTIMONY	1.0					80 - 120		25
SELENIUM	1.0					80 - 120		25
THALLIUM	1.0					80 - 120		25
VANADIUM	2.0					80 - 120		25
ZINC	1.0	0.0	0.80	0.81	79.4 *	80 - 120	2	25
ALUMINUM						80 - 120		25
CALCIUM	1.0					80 - 120		25
IRON	1.0					80 - 120		25
POTASSIUM	1.0					80 - 120		25
MAGNESIUM	1.0					80 - 120		25
SODIUM	1.0					80 - 120		25
TITANIUM						80 - 120		25
STRONTIUM						80 - 120		25
BORON						80 - 120		25

Matrix Controls**

COMPONENT LIST	SPIKE LEVEL	SAMPLE 200025730 RESULTS	MS RESULTS	MSD RESULTS	AVRG %RCVRY	%RECVRY LIMITS	RPD	RPD LIMIT
SILVER	2.0	0.00	2.02	2.01	101	80 - 120	0	25
ARSENIC	1.00	0.05	1.00	0.92	91	80 - 120	8	25
BARIUM	1.00	0.01	0.83	0.86	84	80 - 120	5	25
BERYLLIUM	1.00					80 - 120		25
CADMIUM	1.00	0.00	0.77	0.81	79 *	80 - 120	4	25
COBALT	1.00					80 - 120		25
CHROMIUM	1.00	0.00	0.84	0.73	79 *	80 - 120	14	25
COPPER	1.00					80 - 120		25
MANGANESE	1.00					80 - 120		25
MOLYBDENUM	1.00					80 - 120		25
NICKEL	1.00	0.03	0.79	0.79	76 *	80 - 120	0	25
LEAD	1.00	0.01	0.79	0.84	81	80 - 120	6	25
ANTIMONY	1.00					80 - 120		25
SELENIUM	1.00					80 - 120		25
THALLIUM	1.00					80 - 120		25
VANADIUM	2.00					80 - 120		25
ZINC	1.00	0.01	0.79	0.82	79 *	80 - 120	4	25
ALUMINUM						80 - 120		25
CALCIUM	1.00					80 - 120		25
IRON	1.00					80 - 120		25
POTASSIUM	1.00					80 - 120		25
MAGNESIUM	1.00					80 - 120		25
SODIUM	1.00					80 - 120		25
TITANIUM						80 - 120		25
STRONTIUM						80 - 120		25

BORON						80 - 120		25

* VALUE FAILS TO FALL WITHIN THE ESTABLISHED LIMITS * * VALUES IN TABLE ARE IN UNITS OF (MG/L) UNLESS OTHERWISE SPECIFIED
^ RESULTS USED IN CALCULATION ARE NOT CORRECTED FOR DILUTION/CONC., HENCE ACTUAL RESULTS IN SAMPLE REPORT MAY DIFFER.

CHEVRON CHEMICAL ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH INFORMATION

ANALYST	BRWAL
PREP. DATE	10/03/96
ANALYSIS DATE	10/03/96
PREP. METHOD	3005
ANALYSIS METHOD	6010

BATCH # 11765

THIS BATCH IS ASSOCIATED WITH THE FOLLOWING SUBMISSIONS:

9989	9999
9936	9984
9997	9985
9945	9986

MATRIX

AQUEOUS
200025730

PQL & BLANK DATA

COMPONENT LIST	PQL (mg/L)	BLANK RESULTS (mg/L)
SILVER	0.020	ND
ARSENIC	0.092	ND
BARIUM	0.007	ND
BERYLLIUM	0.005	ND
CADMIUM	0.007	ND
COBALT	0.015	ND
CHROMIUM	0.040	ND
COPPER	0.020	ND
MANGANESE	0.008	ND
MOLYBDENUM	0.022	ND
NICKEL	0.056	ND
LEAD	0.084	ND
ANTIMONY	0.091	ND
SELENIUM	0.167	ND
THALLIUM	0.163	ND
VANADIUM	0.010	ND
ZINC	0.025	ND
ALUMINUM	0.26	
CALCIUM	0.33	ND
IRON	0.57	ND
POTASSIUM	2.55	ND
MAGNESIUM	0.12	ND
SODIUM	0.30	ND
TITANIUM		
STRONTIUM	0.01	
BORON	0.19	

ND = NON DETECTED

CONTROL LIMITS FOR LCS AND MS ARE ARBITARY

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 11913

REPORT DATE: 13-Nov-96

ANALYST: MATIR
PREP DATE: 25-Sep-1996
ANALYSIS DATE: 25-Sep-1996

PREP METHOD: EPA 1311
ANALYSIS METHOD,
MATRIX: 7470A, TCLP Mercury

CALIBRATION CHECKS

COMPONENT		BLANK	CHECK LEVEL	RESULT	% REC	RECOVERY LIMIT (%) UPPER	LOWER	
Mercury	ug/L	0	10	9.54	95	125	70	ug/L

LABORATORY CONTROLS

COMPONENT	SPIKE LEVEL (ug/L)	BLANK (ug/L)	LCS1 (ug/L)	LCS2 (ug/L)	AVG (%) RECVRY	RECOVERY LIMIT (%) UPPER	LOWER	RPD (%)	RPD LIMIT
Mercury	10	0	9.46	9.57	95.2	125	70	1.2	25

MATRIX CONTROLS

SAMPLE No: 200025488 MS No: MSD No:

COMPONENT	SPIKE LEVEL (ug/L)	SAMPLE RESULT (ug/L)	MS1 (ug/L)	MS2 (ug/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD(%)	RPD LIMIT
Mercury	10	0	8.92	8.89	89.1	*	0	0	0.3	21

* INDICATES OUT OF CONTROL

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 11971

REPORT DATE: 13-Nov-96

ANALYST: MATIR
PREP DATE: 03-Oct-1996
ANALYSIS DATE: 03-Oct-1996

PREP METHOD: 7741A
ANALYSIS METHOD,
MATRIX: 3114B, Selenium Aqueous

CALIBRATION CHECKS

COMPONENT		BLANK	CHECK LEVEL	RESULT	% REC	RECOVERY LIMIT (%) UPPER	LOWER	
Selenium	ug/L	0	10	10.6	106	120	80	ug/L

LABORATORY CONTROLS

COMPONENT	SPIKE LEVEL (ug/L)	BLANK (ug/L)	LCS1 (ug/L)	LCS2 (ug/L)	AVG (%) RECVRY	RECOVERY LIMIT (%) UPPER	LOWER	RPD (%)	RPD LIMIT
Selenium	10	0	9.46	9.52	94.9	123	74	0.6	25

MATRIX CONTROLS

SAMPLE No: 200025626 MS No: MSD No:

COMPONENT	SPIKE LEVEL (ug/L)	SAMPLE RESULT (ug/L)	MS1 (ug/L)	MS2 (ug/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD(%)	RPD LIMIT
Selenium	10	0.55	9.29	10.1	91.4	*	0	0	8.4	25

* INDICATES OUT OF CONTROL

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 11915

REPORT DATE: 13-Nov-96

ANALYST: JMKEL
PREP DATE: 26-Sep-1996
ANALYSIS DATE: 26-Sep-1996

PREP METHOD:
ANALYSIS METHOD,
MATRIX: 150.1/9040, pH AQUEOUS

MATRIX CONTROLS

SAMPLE No: 200025615 MS No: MSD No:

COMPONENT	SPIKE LEVEL (pH)	SAMPLE RESULT (pH)	MS1 (pH)	MS2 (pH)	AVG (%) RECVRY	RECOVERY LIMIT (%) UPPER	LOWER	RPD(%)	RPD LIMIT
pH			9.44	9.45		0	0	0.1	15

* INDICATES OUT OF CONTROL

CHEVRON CHEMICAL ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH INFORMATION

ANALYST	BRWAL
PREP. DATE	10/01/96
ANALYSIS DATE	10/03/96
PREP. METHOD	3005
ANALYSIS METHOD	6010

BATCH # 11764

THIS BATCH IS ASSOCIATED WITH THE FOLLOWING SUBMISSIONS:

9945	9947	9884
9984	9870	
9985	9871	
9986	9885	

MATRIX: AQUEOUS 200025488

LABORATORY CONTROLS**

COMPONENT LIST	SPIKE LEVEL	BLANK RESULTS	LCS1 RESULTS	LCS2 RESULTS	AVRG %RCVRY	%RECVRY LIMITS	RPD	RPD LIMIT
SILVER	2.0	0.0	1.99	1.96	98.8	80 - 120	2	25
ARSENIC	1.0	0.0	1.03	1.01	102.0	80 - 120	2	25
BARIUM	1.0	0.0	0.87	0.88	87.0	80 - 120	1	25
BERYLLIUM	1.0	0.0	0.91	0.90	90.5	80 - 120	2	25
CADMIUM	1.0	0.0	0.83	0.84	83.4	80 - 120	1	25
COBALT	1.0	0.0	0.85	0.86	85.4	80 - 120	1	25
CHROMIUM	1.0	0.0	0.94	0.93	93.5	80 - 120	0	25
COPPER	1.0	0.0	0.85	0.86	85.4	80 - 120	0	25
MANGANESE	1.0	0.0	0.87	0.88	87.4	80 - 120	1	25
MOLYBDENUM	1.0	0.0	0.93	0.91	91.7	80 - 120	2	25
NICKEL	1.0	0.0	0.90	0.88	88.8	80 - 120	1	25
LEAD	1.0	0.0	0.83	0.86	84.4	80 - 120	3	25
ANTIMONY	1.0	0.0	0.94	0.88	91.1	80 - 120	6	25
SELENIUM	1.0					80 - 120		25
THALLIUM	1.0	0.0	0.98	0.92	91.1	80 - 120	7	25
VANADIUM	2.0	0.0	1.77	1.76	88.3	80 - 120	1	25
ZINC	1.0	0.0	0.86	0.86	85.1	80 - 120	0	25
ALUMINUM						80 - 120		25
CALCIUM	1.0	0.3	1.21	1.15	88.1	80 - 120	5	25
IRON	1.0	0.1	1.32	0.95	101.7	80 - 120	33 *	25
POTASSIUM	1.0	0.1	1.1	1.1	100.8	80 - 120	6	25
MAGNESIUM	1.0	0.1	0.9	0.86	82.4	80 - 120	4	25
SODIUM	1.0	0.2	1.3	1.4	117.7	80 - 120	12	25
TITANIUM						80 - 120		25
STRONTIUM						80 - 120		25
BORON						80 - 120		25

Matrix Controls**

COMPONENT LIST	SPIKE LEVEL	SAMPLE 200025488 RESULTS	MS RESULTS	MSD RESULTS	AVRG %RCVRY	%RECVRY LIMITS	RPD	RPD LIMIT
SILVER	2.0	0.00	0.00	0.00		80 - 120		25
ARSENIC	1.00	18.90		19.80	90	80 - 120	200 *	25
BARIUM	1.00	3.74	4.54	4.63	85	80 - 120	2	25
BERYLLIUM	1.00	0.23	1.11	1.14	90	80 - 120	3	25
CADMIUM	1.00	0.24	1.05	1.07	82	80 - 120	2	25
COBALT	1.00	1.49	2.27	2.31	80	80 - 120	2	25
CHROMIUM	1.00	4.27	4.99	5.07	76 *	80 - 120	2	25
COPPER	1.00	0.00	0.69	0.70	70 *	80 - 120	2	25
MANGANESE	1.00	170.00	165.00	167.00	-400 *	80 - 120	1	25
MOLYBDENUM	1.00	5.02		5.95	93	80 - 120	200 *	25
NICKEL	1.00	51.40	50.70	51.70	-20 *	80 - 120	2	25
LEAD	1.00	2.29	3.07	3.15	82	80 - 120	3	25
ANTIMONY	1.00	0.24		1.22	98	80 - 120	200 *	25
SELENIUM	1.00					80 - 120		25
THALLIUM	1.00	0.00	0.00	0.06	3 *	80 - 120	200 *	25
VANADIUM	1.00	65.50		66.20	70 *	80 - 120	200 *	25
ZINC	1.00	90.80	88.80	90.20	-130 *	80 - 120	2	25
ALUMINUM						80 - 120		25
CALCIUM	1.00	601.00	586.00	596.00	-1000 *	80 - 120	2	25
IRON	1.00	1309.00		1310.00	100	80 - 120	200 *	25
POTASSIUM	1.00	40.80		41.10	30 *	80 - 120	200 *	25
MAGNESIUM	1.00	94.30	92.30	93.80	-125 *	80 - 120	2	25
SODIUM	1.00					80 - 120		25
TITANIUM						80 - 120		25
STRONTIUM						80 - 120		25
BORON						80 - 120		25

* VALUE FAILS TO FALL WITHIN THE ESTABLISHED LIMITS ** VALUES IN TABLE ARE IN UNITS OF (MG/L) UNLESS OTHERWISE SPECIFIED

^ RESULTS USED IN CALCULATION ARE NOT CORRECTED FOR DILUTION/CONC., HENCE ACTUAL RESULTS IN SAMPLE REPORT MAY DIFFER.

CHEVRON CHEMICAL ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH INFORMATION

ANALYST	BRWAL
PREP. DATE	10/01/96
ANALYSIS DATE	10/03/96
PREP. METHOD	3005
ANALYSIS METHOD	6010

BATCH # 11764

THIS BATCH IS ASSOCIATED WITH THE FOLLOWING SUBMISSIONS:

9945	9947	9884
9984	9870	
9985	9871	
9986	9885	

MATRIX
AQUEOUS
200025488

PQL & BLANK DATA

COMPONENT LIST	PQL (mg/L)	BLANK RESULTS (mg/L)
SILVER	0.020	ND
ARSENIC	0.092	ND
BARIUM	0.007	ND
BERYLLIUM	0.005	ND
CADMIUM	0.007	ND
COBALT	0.015	ND
CHROMIUM	0.040	ND
COPPER	0.020	ND
MANGANESE	0.008	ND
MOLYBDENUM	0.022	ND
NICKEL	0.056	ND
LEAD	0.084	ND
ANTIMONY	0.091	ND
SELENIUM	0.167	ND
THALLIUM	0.163	ND
VANADIUM	0.010	ND
ZINC	0.025	ND
ALUMINUM	0.26	
CALCIUM	0.33	ND
IRON	0.57	ND
POTASSIUM	2.55	ND
MAGNESIUM	0.12	ND
SODIUM	0.30	ND
TITANIUM		
STRONTIUM	0.01	
BORON	0.19	

ND = NON DETECTED

CONTROL LIMITS FOR LCS AND MS ARE ARBITARY

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 11981

REPORT DATE: 13-Nov-96

ANALYST: MATIR
PREP DATE: 03-Oct-1996
ANALYSIS DATE: 03-Oct-1996

PREP METHOD: EPA 1311
ANALYSIS METHOD, MATRIX: 7470, Mercury Aqueous Waste

CALIBRATION CHECKS

COMPONENT		BLANK	CHECK LEVEL	RESULT	% REC	RECOVERY LIMIT (%) UPPER	LOWER	
Mercury	ug/L	0	1	1.14	114	120	80	ug/L

LABORATORY CONTROLS

COMPONENT	SPIKE LEVEL (ug/L)	BLANK (ug/L)	LCS1 (ug/L)	LCS2 (ug/L)	AVG (%) RECVRY	RECOVERY LIMIT (%) UPPER	LOWER	RPD (%)	RPD LIMIT
Mercury	1	0	1.12	1.05	108.5	120	80	6.5	25

MATRIX CONTROLS

SAMPLE No: 200025753 MS No: MSD No:

COMPONENT	SPIKE LEVEL (ug/L)	SAMPLE RESULT (ug/L)	MS1 (ug/L)	MS2 (ug/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD(%)	RPD LIMIT
Mercury	1	0.1155	1.05	1.06	94.0	*	0	0	0.9	25

* INDICATES OUT OF CONTROL

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 11852

REPORT DATE: 12-Nov-96

ANALYST: JMKEL
PREP DATE: 18-Sep-1996
ANALYSIS DATE: 18-Sep-1996

PREP METHOD:
ANALYSIS METHOD, MATRIX: 9010A, CYANIDE (REACTIVITY)

LABORATORY CONTROLS

COMPONENT	SPIKE LEVEL (mg/L)	BLANK (mg/L)	LCS1 (mg/L)	LCS2 (mg/L)	AVG (%) RECVRY	RECOVERY LIMIT (%) UPPER	LOWER	RPD (%)	RPD LIMIT
CYANIDE, REACTIVITY	100	0	8.75	7.61	8.2	30	0	13.9	15

* INDICATES OUT OF CONTROL

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 11911

REPORT DATE: 14-Nov-96

ANALYST: JMKEL
PREP DATE: 24-Sep-1996
ANALYSIS DATE: 24-Sep-1996

PREP METHOD:
ANALYSIS METHOD, MATRIX: REACTIVITY,SULFIDE.,AQEOUS

LABORATORY CONTROLS

COMPONENT	SPIKE LEVEL (mg/L)	BLANK (mg/L)	LCS1 (mg/L)	LCS2 (mg/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD (%)	RPD LIMIT
REACTIVITY,SULFIDE,AQEOUS	1000	0	768	706	73.7	*	120	80	8.4	

MATRIX CONTROLS

SAMPLE No: 200026363 MS No: MSD No:

COMPONENT	SPIKE LEVEL (mg/L)	SAMPLE RESULT (mg/L)	MS1 (mg/L)	MS2 (mg/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD(%)	RPD LIMIT
REACTIVITY,SULFIDE,AQEOUS	1000	0	454	454	45.4	*	0	0	0.0	

* INDICATES OUT OF CONTROL

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 12084

REPORT DATE: 13-Nov-96

ANALYST: JMKEL
PREP DATE: 28-Oct-1996
ANALYSIS DATE: 25-Oct-1996

PREP METHOD:
ANALYSIS METHOD, MATRIX: EPA 1020 (FLASH,A)

MATRIX CONTROLS

SAMPLE No: 200028905 MS No: MSD No:

COMPONENT	SPIKE LEVEL (F)	SAMPLE RESULT (F)	MS1 (F)	MS2 (F)	AVG (%) RECVRY	RECOVERY LIMIT (%) UPPER	LOWER	RPD(%)	RPD LIMIT
FLASH POINT			110	110		0	0	0.0	15

* INDICATES OUT OF CONTROL

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 11955

REPORT DATE: 13-Nov-96

ANALYST: JMKEL
PREP DATE: 03-Oct-1996
ANALYSIS DATE: 03-Oct-1996

PREP METHOD:
ANALYSIS METHOD, MATRIX: REACTIVITY,SULFIDE.,AQEOUS(SM733)

LABORATORY CONTROLS

COMPONENT	SPIKE LEVEL (mg/L)	BLANK (mg/L)	LCS1 (mg/L)	LCS2 (mg/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD (%)	RPD LIMIT
REACTIVITY,SULFIDE,AQUEOUS(SM733)	1000	0	508	458	48.3	*	120	80	10.4	

MATRIX CONTROLS

SAMPLE No: 200025626 MS No: MSD No:

COMPONENT	SPIKE LEVEL (mg/L)	SAMPLE RESULT (mg/L)	MS1 (mg/L)	MS2 (mg/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD(%)	RPD LIMIT
REACTIVITY,SULFIDE,AQUEOUS(SM733)	1000	0	480	440	46.0	*	0	0	8.7	

* INDICATES OUT OF CONTROL

CHEVRON ENVIRONMENTAL LABORATORY
QUALITY CONTROL SUMMARY

BATCH: 11956

REPORT DATE: 13-Nov-96

ANALYST: JMKEL
PREP DATE: 04-Oct-1996
ANALYSIS DATE: 04-Oct-1996

PREP METHOD:
ANALYSIS METHOD, MATRIX: RECTIVITY,CYANIDE,AQEOUS

LABORATORY CONTROLS

COMPONENT	SPIKE LEVEL (mg/L)	BLANK (mg/L)	LCS1 (mg/L)	LCS2 (mg/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD (%)	RPD LIMIT
REACTIVIY,CYANIDE,AQEOUS	1000	0	144	207	17.6	*	120	80	35.9	

MATRIX CONTROLS

SAMPLE No: 200025626 MS No: MSD No:

COMPONENT	SPIKE LEVEL (mg/L)	SAMPLE RESULT (mg/L)	MS1 (mg/L)	MS2 (mg/L)	AVG (%) RECVRY		RECOVERY LIMIT (%) UPPER	LOWER	RPD(%)	RPD LIMIT
REACTIVITY,CYANIDE,AQEOUS	1000	0.107	88.4	105	9.7	*	0	0	17.2	

* INDICATES OUT OF CONTROL

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab	Client Project ID: Chevron GPS-Sub 100009945	Sampled: Sep 26, 1996
940 Hensley St.	Sample Descript: Water, 962609-1	Received: Sep 27, 1996
Richmond, CA 94804	Analysis Method: See below	
Attention: Charmaine Arcia	Lab Number: 609-1951	Reported: Oct. 11, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 31 mm
Min. length: 26 mm
Max. length: 34 mm
Mean weight: 0.29 g
Min. weight: 0.26 g
Max. weight: 0.48 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	42	42
750 ppm	30	30	44	44
Duplicate 750 ppm	29	29	44	44

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	10/3/96	10/4/96	10/5/96	10/6/96	10/7/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	8.9	19	7.6	7.5	19	7.4	0	7.8	18	7.5	0	7.5	18	7.4	0	7.4	17	7.1	0	0
750 ppm	8.4	19	7.6	7.3	19	7.4	0	7.5	18	7.4	1	7.4	18	7.4	1	7.2	19	7.3	1	1
250 ppm	8.9	19	7.7	7.3	19	7.3	0	7.7	18	7.4	0	7.6	18	7.4	0	7.3	19	7.3	0	0
Duplicate																				
750 ppm	9.0	19	7.6	7.4	19	7.4	0	7.7	18	7.4	0	7.6	18	7.4	0	7.4	19	7.3	0	0
250 ppm	9.0	19	7.7	7.1	19	7.3	0	7.4	18	7.3	0	7.3	18	7.4	0	7.0	19	7.2	0	0

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Client Services Representative

Sequoia Analytical

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Chevron Environmental Lab	Client Project ID: Chevron GPS-Sub 100009945	Sampled: Sep 26, 1996
940 Hensley St.	Sample Descript: Water, 962609-2	Received: Sep 27, 1996
Richmond, CA 94804	Analysis Method: See below	
Attention: Charmaine Arcia	Lab Number: 609-1952	Reported: Oct. 11, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 31 mm
Min. length: 26 mm
Max. length: 34 mm
Mean weight: 0.29 g
Min. weight: 0.26 g
Max. weight: 0.48 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	42	42
750 ppm	29	29	44	44
Duplicate 750 ppm	28	29	44	44

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	10/3/96	10/4/96	10/5/96	10/6/96	10/7/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	8.9	19	7.6	7.5	19	7.4	0	7.8	18	7.5	0	7.5	18	7.4	0	7.4	17	7.1	0	0
750 ppm	9.0	19	7.7	7.2	19	7.3	0	7.6	18	7.4	0	7.4	18	7.4	0	7.0	18	7.3	1	1
250 ppm	9.0	19	7.7	7.4	19	7.4	2	7.8	18	7.4	2	7.6	18	7.4	3	7.2	19	7.4	5	5
Duplicate																				
750 ppm	9.0	19	7.8	7.9	19	7.4	0	7.7	18	7.4	1	7.6	18	7.4	1	7.2	18	7.4	2	2
250 ppm	9.0	19	7.8	7.6	19	7.4	1	8.0	18	7.4	1	7.6	18	7.4	1	7.5	19	7.4	1	1

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Client Services Representative

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab	Client Project ID: Chevron GPS-Sub 100009945	Sampled: Sep 26, 1996
940 Hensley St.	Sample Descript: Water, 962609-3	Received: Sep 27, 1996
Richmond, CA 94804	Analysis Method: See below	
Attention: Charmaine Arcia	Lab Number: 609-1953	Reported: Oct. 11, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 31 mm
Min. length: 26 mm
Max. length: 34 mm
Min. weight: 0.26 g
Mean weight: 0.29 g
Max. weight: 0.48 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	42	42
750 ppm	28	28	45	45
Duplicate 750 ppm	28	28	44	44

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	10/3/96	10/4/96	10/5/96	10/6/96	10/7/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	8.9	19	7.6	7.5	19	7.4	0	7.8	18	7.5	0	7.5	18	7.4	0	7.4	17	7.1	0	0
750 ppm	9.2	19	7.8	7.6	19	7.4	0	7.6	18	7.5	3	7.8	18	7.4	4	7.2	18	7.3	5	5
250 ppm	9.0	18	7.8	7.7	19	7.4	0	8.0	18	7.5	1	7.9	18	7.5	2	7.7	18	7.4	2	2
Duplicate																				
750 ppm	9.2	18	7.8	7.7	19	7.4	0	8.0	18	7.5	1	8.0	18	7.4	1	7.7	18	7.4	2	2
250 ppm	9.0	18	7.8	7.8	19	7.4	0	8.0	18	7.5	0	8.0	18	7.5	0	7.7	18	7.2	0	0

Pass X **Fail** ____

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer

Melissa A. Brewer
Client Services Representative

609-1951.CHE <3>

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Chevron Environmental Lab	Client Project ID: Chevron GPS-Sub 100009945	Sampled: Sep 26, 1996
940 Hensley St.	Sample Descript: Water, 962609-4	Received: Sep 27, 1996
Richmond, CA 94804	Analysis Method: See below	
Attention: Charmaine Arcia	Lab Number: 609-1954	Reported: Oct. 11, 1996

STATIC HAZARDOUS ABBREVIATED SCREEN BIOASSAY

Species: Pimephales promelas
Common Name: Fathead Minnow

Mean length: 31 mm
Min. length: 26 mm
Max. length: 34 mm
Mean weight: 0.29 g
Min. weight: 0.26 g
Max. weight: 0.48 g

Organisms/Tank: 10
Organisms/Conc.: 20
Tank Depth: 13 cm
Tank Volume: 10 L
Acclimation Temp.: 19 °C
Supplier: Sticklebacks Unlimited

Dilution Water: Synthetic Softwater
Hardness 40-48

	Alkalinity, mg/L		Hardness, mg/L	
	Initial	Final	Initial	Final
Control	30	30	42	42
750 ppm	27	27	43	43
Duplicate 750 ppm	28	28	43	43

	Initial	24 Hr	48 Hr	72 Hr	96 Hr
DATE	10/3/96	10/4/96	10/5/96	10/6/96	10/7/96

	DO mg/L	C Temp	pH Units	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	DO mg/L	C Temp	pH Units	# M Dead	Total Dead
Control	8.9	19	7.6	7.5	19	7.4	0	7.8	18	7.5	0	7.5	18	7.4	0	7.4	17	7.1	0	0
750 ppm	9.2	18	7.8	7.9	19	7.5	0	8.1	18	7.5	1	8.1	18	7.5	1	7.9	18	7.4	1	1
250 ppm	9.2	18	7.7	7.7	19	7.4	0	8.0	18	7.5	0	7.5	18	7.5	0	7.8	18	7.2	0	0
Duplicate																				
750 ppm	9.2	18	7.7	7.7	19	7.5	0	8.1	18	7.5	0	8.0	18	7.4	0	7.6	18	7.3	0	0
250 ppm	9.2	18	7.7	7.7	19	7.4	0	8.0	18	7.5	0	8.0	18	7.5	0	6.9	18	7.3	2	2

Pass X **Fail** ___

Remarks: The screen fails if > 40% of the fish die in the 750 ppm concentration.

Analyst: K. Anderson/ P. Kosovskaya

Method Reference: Static Acute Bioassay Procedures for Hazardous Waste Samples, November 1988, California Department of Fish and Game WPCL.

SEQUOIA ANALYTICAL, #1271

Melissa A. Brewer
Client Services Representative

SEQUOIA ANALYTICAL
CHAIN OF CUSTODY

❑ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
❑ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENV. LAB	Project Name: CHEVRON GRS – SUBMISSION 10000994S
Address: 940 HENSLEY ST.	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: 231-8113 FAX #: 231-8262	P.O. #:
Report To: C. ARCIA Sampler: B. STUART	QC Data: ☒ Level D (Standard) ❑ Level C ❑ Level B ❑ Level A

Turnaround Time: ☒ 10 Working Days ❑ 3 Working Days ❑ 2 - 8 Hours ❑ 7 Working Days ❑ 2 Working Days ❑ 5 Working Days ❑ 24 Hours

❑ Drinking Water ☒ Waste Water ❑ Other

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	BIOASSAY *									Comments
1. 962609-1	09/26/96; 07:50	AQ	1	L-AG		X					691951				* DEFINITIVE IF REQUIRED
2. 962609-2	09/26/96; 08:05	AQ	1	L-AG		X					691952				
3. 962609-3	09/26/96; 08:20	AQ	1	L-AG		X					691953				
4. 962609-4	09/26/96; 07:25	AQ	1	L-AG.		X					691954				
5.															
6.															
7.															
8.															
9.															
10.															

Relinquished By:	Date: 09/26/96	Time: 11:44	Received By:	Date: 9/27/96	Time: 11:44
Relinquished By:	Date: 9/27/96	Time: 17:00	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab:	Date: 9/27/96	Time: 1700

Were Samples Received in Good Condition? ❑ Yes ❑ No Samples on Ice? ❑ Yes ❑ No Method of Shipment_____

Pink - Client
Yellow - Sequoia
White - Sequoia

SEQUOIA ANALYTICAL
CHAIN OF CUSTODY

☐ 680 Chesapeake Drive • Redwood City, CA 94063 • (415) 364-9600 FAX (415) 364-9233
☐ 819 Striker Ave., Suite 8 • Sacramento, CA 95834 • (916) 921-9600 FAX (916) 921-0100
☒ 404 N. Wiget Lane • Walnut Creek, CA 94598 • (510) 988-9600 FAX (510) 988-9673

Company Name: CHEVRON ENV. LAB	Project Name: CHEVRON GRS - SUBMISSION 10000945
Address: 940 HENSLEY ST.	Billing Address (if different):
City: RICHMOND State: CA Zip Code: 94804	
Telephone: 231-8113 FAX #: 231 5262	P.O. #:
Report To: C. ARCIA Sampler: B. STUART	QC Data: ☒ Level D (Standard) ☐ Level C ☐ Level B ☐ Level A

Turnaround Time: ☒ 10 Working Days ☐ 3 Working Days ☐ 2 - 8 Hours ☐ 7 Working Days ☐ 2 Working Days ☐ 5 Working Days ☐ 24 Hours

☐ Drinking Water ☒ Waste Water ☐ Other

Analyses Requested: TPH(G) * / BTEX

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Sequoia's Sample #	TPH(G) *	BTEX	Comments
1. 962609 - 1	09/26/96; 07:50	AQ	1	L - AG		X		✓ DETECTIVE IF REQUIRED
2. 962609 - 2	09/26/96; 08:05	AQ	1	L - AG		X		
3. 962609 - 3	09/26/96; 08:20	AQ	1	L - AG		X		
4. 962609 - 4	09/26/96; 07:25	AQ	1	L - AG		X		
5.								
6.								
7.								
8.								
9.								
10.								

Pink - Client
Yellow - Sequoia
White - Sequoia

Relinquished By: [signature]	Date: 9/26/96	Time: 11:44	Received By: [signature]	Date: 9/27/96	Time: 11:44
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By Lab:	Date:	Time:

Were Samples Received in Good Condition? ☐ Yes ☐ No Samples on Ice? ☐ Yes ☐ No Method of Shipment: _____

CHEVRON CHEMICAL COMPANY
CHEVRON ENVIRONMENTAL LABORATORY
940 HENSLEY AVE.,RICHMOND,CA.,94804

CLIENT REP : CHARMAINE ARCIA
PHONE : (510) 231-8113
FAX : (510) 231-8262

CHAIN OF CUSTODY / ANALYSIS REQUEST

CHEVRON GPS - COMPOSITE STUDY
WDO REFINERY MISC.GW PROGRAMS

REPORT ID : 100009945

CHARGE CODE: E83IC-3128-27-440

REQUESTOR : RANDY BRANDT
DIVISION : WASTE DISCHARGE ORDER

CONTACT : RANDY BRANDT
PHONE : 242-5735

SAMPLE TYPE: RGG GPS COMPOSITE STUDY

SUBMITTER : BRODIE STUART

ANALYSIS REQUESTED:

CONTRACT SEQUOIA LAB	EPA 6010 (13+,METALS)	EPA 7470 (MERCURY)
EPA 7742 (SELENIUM)	EPA 9040 (PH AQUEOUS)	REACTIVITY (CYANIDE)
REACTIVITY (SULFIDE)	TCLP 6010 (3-6,METALS)	TCLP 7470 (MERCURY)
TCLP 7742 (SELENIUM)	TCLP 8240 (VOLATILES)	TCLP 8270 (SEMI-VOLATILE
TCLP CONVENTIONAL (PREP)	TCLP ZHE (PREP)	

COMMENTS: _____

	LAB NUMBER	CLIENT ID	SAMPLE INFORMATION	SAMPLE DATE	TIME	SAMPLE CONTAINER(S)
1.	200025623	962609-1	GPS EFFLUENT	09/26/96	07:50	6-L AG;1-500ML
2.	200025624	962609-2	GPS EFFLUENT	09/26/96	08:05	6-L AG;1-500ML
3.	200025625	962609-3	GPS EFFLUENT	09/26/96	08:20	3-L AG;1-500ML
4.	200025626	962609-4	GPS EFFLUENT	09/26/96	07:25	6-L AG;1-500ML
5.	200025627	962609-2 BIAS S #	GPS EFF BIAS SPIKE	09/26/96		1
6.						
7.						
8.						
9.						
10.						
11.						
12.						

CHAIN OF POSSESSION:

A.	Signature	Title	Date/Time
			09/26/96

Project Name: CHEVRON GPS -COMPOSITE STUDY Contact: RANDY BRANDT
Phone 242-5735

Chevron

Chevron Environmental Lab
Chevron Chemical Company
940 Hensley Street
Richmond, CA 94804

CHAIN-OF-CUSTODY RECORD
SAMPLE ANALYSIS REQUEST

Return form with analysis to RANDY BRANDT -WDO
Charge Number: E831c-3128-27-440

Sample Collector's Name: Brooke Shuart

Analysis Requested: [RE&G GPS COMPOSITE STUDY]

TCLP
CCR metals (*)
pH (corrosivity)
Ignitability
Reactivity

Bioassay

(*) STLC prep only if required

Special Handling/Storage: Store at 4°C

Chevron's Sample No.	Date/Time Sampled	Sample Information
960609-1	9/26 0750	6-L AG-; 1-PT P; 1-250ML P
960609-2	9/26 0805	6-L AG; 1-PT P; 1-250ML P
960609-3	9/26 0820	3-L AG; 1-PT P; 1-250ML P
960609-4	9/26 0745	6-L AG; 1PT P; 1-250ML P

Sample destination: Chevron Environmental Lab, 940 Hensley St., Bldg 120, Room 15, Richmond, CA 94804

Chain of Possession:

	Signature	Title	Inclusive Dates
1.	Brooke Shuart		9/26/96
2.	[signature]	Tech	9/26/96
3.			
4.			

Project Name: CHEVRON GPS -COMPOSITE STUDY Contact: RANDY BRANDT
Phone 242-5735

Chevron

Chevron Environmental Lab
Chevron Chemical Company
940 Hensley Street
Richmond, CA 94804

CHAIN-OF-CUSTODY RECORD
SAMPLE ANALYSIS REQUEST

Return form with analysis to RANDY BRANDT -WDO
Charge Number: EB3Ic-3128-27440

Sample Collector's Name: Brooke Stuart

Analysis Requested: [RGG GPS COMPOSITE STUDY]

TCLP
CCR metals (*)
pH (corrosivity)
Ignitability
Reactivity

Bioassay

(*) STLC prep only if required

Special Handling/Storage: Store at 4°C

Chevron's Sample No.	Date/Time Sampled	Sample Information
962609-1	9/26 0750	6-L AG-; 1-PT P; 1-250ml P
962609-2	9/26 0805	6-L AG; 1-PT P; 1-250ml P
962609-3	9/26 0820	3-L AG; 1-PT P; 1-250ml P
962609-4	9/26 0725	6-L AG; 1PT P; 1-250ml P

Sample destination: Chevron Environmental Lab, 940 Hensley St., Bldg 120, Room 15, Richmond, CA 94804

Chain of Possession:

	Signature	Title	Inclusive Dates
1.	Brooke Stuart		9/26/96
2.	Cynthia	Tech	09/26/96
3.			
4.			

Appendix N
Landfarms Post Earthquake Inspection and Corrective Action Plan

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Appendix A Construction Drawings (To be included after closure is completed)

N.1.0 INTRODUCTION

Bechtel Environmental, Inc and Dames & Moore (BEDM) have prepared this Landfarms Post Earthquake Inspection and Corrective Action Plan to comply with a request by the California Environmental Protection Agency Department of Toxic Substances Control (DTSC). The request was transmitted to Chevron in the DTSCs *Notice of Deficiency (NOD) for the Revised Closure / Post-Closure Plan, Richmond Refinery Landfarm Nos. 1 Through 5, Chevron U.S.A. Products Company, Richmond, California, 94801, EPA ID. No CAD 009 114 919,* dated August 15, 1995. This plan is currently presented as a part of the Landfarms Closure Plan and will be converted into a stand-alone document when the closure is completed. This document will necessarily reference the as-built configuration of the Landfarms. Hence, several of the drawing references will be modified in the future, and Appendix A, which will include copies of the as-built construction drawings, is not included at this time.

This plan is designed to be implemented by the Environmental Operations Section of the Refinery's Utilities/Environmental Area Business Unit (U/E) in the event of any earthquake that generates ground shaking of Modified Mercalli Intensity V or greater at or near the landfill. An event of this intensity is generally described as follows: "Felt by nearly everyone; many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop."

This plan discusses the containment facilities that may be impacted at the former waste disposal sites by static and seismic deformations of the Landfarms due to an earthquake. The plan also addresses the corrective actions to be taken in the event of damage due to an earthquake. On completion of site closure, this plan will be revised to include the new closure features.

This plan was prepared under the supervision of Mr. Mark J. Wahler, California Registered Engineer No. C-35633.

N.2.0 POTENTIALLY IMPACTED FACILITIES

The following sections discuss the major elements of the Landfarms containment systems that may be impacted by a major seismic event. Appendix A to this plan contains copies of the design and as-built drawings for the elements discussed in this plan (to be completed following closure of the landfarms). The nature of the facilities and contaminants at this site are such that fires or explosions are unlikely. Furthermore, there is little likelihood of release of hazardous wastes that would pose an immediate threat to human health or the environment. The only potential releases would occur if either the GPS discharge lines ruptured, resulting in a discharge of the extracted groundwater to the ground, or if heavy rains washed soils out of the closure unit through a rupture of the cover. In either case, the release would likely be contained within the Refinery and would not likely to release constituents at levels that would cause a short-term risk to either people or the environment.

N.2.1 Groundwater Extraction Trench

The extraction trench is a subsurface structure consisting of a geotextile-fabric-wrapped gravel drain. This feature is somewhat flexible and is only likely to be disrupted by a deep slope failure of the landfill. As discussed in the Landfarms Closure Plan, the maximum foreseeable displacement along a failure surface is approximately equal to the width of the trench, indicating that the trench may not be functional immediately after the event and may require repair. If the fabric is torn, fines from the adjacent soils may enter the trench and eventually clog it. This condition would become obvious during the routine monitoring of the trench piezometers and pumping rates and could be corrected at that time.

The extraction sumps are durable elements and, as with the trench, are only likely to be damaged by a general slope failure during a major event. Limited distortion of the sump or well casing would not significantly impair the operation of the trench or well. If the casing is crushed or severed completely, it may become impossible to operate a pump within the sump or well.

A failure of some or all of the extraction system may result in a slow rise in the groundwater level within the site. Since the normal operating level of the system is below the level of groundwater outside the site, BEDM anticipates a considerable time would pass before the groundwater level rose sufficiently to create an outward gradient from the site or over-top the wall. This time should be sufficient to repair the system.

N.2.2 Groundwater Monitoring Wells and Piezometers

The groundwater monitoring wells and piezometers at the Landfarms could be disrupted by a significant ground rupture. Since these features are only used to monitor water quality in the "A" and "C" Zones and the long-term effectiveness of the containment system, there would be no significant immediate consequences if they were to be damaged during an earthquake.

N.2.3 Groundwater Extraction Pumps and Controllers

The pumps are suspended in the sumps and extraction wells and would be immersed in water under normal operating conditions. The sturdy construction combined with the damping effect of the water in the sumps should prevent damage from any movement during an earthquake. The attached hoses will have sufficient slack to accommodate any movements.

The controllers are mounted above grade (see drawings D-318641, D-318643, D-318651, D-318652, D-782424, D-782425, D-782441 and D-782442 in Appendix A) and are connected to the pumps with stainless steel tubing. The system is flexible and is unlikely to be damaged. However, if damage does occur, it would most likely consist of a separated piping connection and should be readily visible.

The failure of some or all of the pumps would have the same consequences as the failure of the trench or wells themselves, which was discussed above in Section 2.2.

N.2.4 Compressed Air Supply Lines

The compressed air supply required to run the pumps and their controllers is supplied through an above-grade 2-inch galvanized steel pipe (see Appendix A). A shutoff valve for the No. 1 Landfarm system is at the air filters located just north of the end of the LPG loading tracks. (see drawings D-318640 and D-318641 in Appendix A). A shutoff valve for the Nos. 2 through 5 Landfarm systems is with the air filter located near the southwest corner of the Electrical Switchgear Station, which is just east of No. 3 Landfarm (see drawings D-782439 and D-782441 in Appendix A). The connections from the air line to the pump controllers include a shutoff valve. The line is flexible and the worst anticipated occurrence during a substantial earthquake would be the lines bouncing off their supports. If the lines were to break, the rupture should be readily apparent and easy to repair.

The air supply lines are carbon steel pipes that are connected to the existing Refinery compressed air system. It is likely that, during a major seismic event, the Refinery's compressed air system will go out of service, resulting in a loss of supply to the extraction sumps. If this were to occur, the pumps would simply cease operating.

N.2.5 Groundwater Transfer Lines

The discharge lines for the extraction pumps are carbon steel lines that parallel the compressed air supply lines within the Landfarms area and are equipped with similar sets of valves. As with the air lines, in the unlikely event that the line is ruptured during a major earthquake, the damage should be readily apparent and easily repaired. Most likely, an event strong enough to rupture the discharge lines would also disable the compressed air supply system, which would in turn stop the pumps. Hence, only the water contained within the discharge line at the time of the event would be available to drain from the line. Water draining from a broken line would flow into an existing swale from which it can be recovered.

The discharge line ultimately drains to the Refinery's No. 1A Separator. A major seismic event may put the separator out of service for awhile.

N.2.6 Stormwater Transfer System

The stormwater transfer system for No. 1 Landfarm consists of a several permanently installed submersible pumps connected to a 4-inch line that discharges to the No. 1 Oxidation Pond, First Pass. The transfer system for Nos. 2 through 5 Landfarm consists of gravity-feed culverts that discharge to either the Refinery effluent treatment system or the Richmond Refinery water-enhanced wetlands. Damage to this system due to an earthquake is unlikely, but would be readily detected and could easily be repaired. Damage to this system would only be of consequence if a significant rainfall were to occur before the system could be repaired.

N.2.7 Final Cover

The final cover over the Landfarms is vegetated layer intended to promote the biodegredation of hydrocarbons remaining in the old Landfarms soils and to reduce rainwater infiltration into the old Landfarms soils. The cover consists of a one-foot layer of vegetated fill, as shown on Drawing D-767519. If permanent displacements of the Landfarms cover occurs during the earthquake, the fill layer is likely to crack, creating an entry path for rainwater infiltration into the underlying materials. This is only of concern if it is raining. The nature of the underlying materials is such that they do not impose an immediate health hazard simply by being exposed.

N.3.0 POST EARTHQUAKE INSPECTION

Due to the relatively low immediate consequences of earthquake-induced damage to the Landfarms containment systems when compared to the balance of the Refinery, the inspection of the systems has been divided into two phases. The first phase would be performed as soon as an U/E operator could be spared from potentially more critical matters, and would consist of a quick inspection to ascertain if the systems had sustained major damage that might result in an immediate release of potentially contaminated groundwater to the ground surface. The second phase would consist of a more thorough inspection to ascertain if any less significant damage had occurred. If other post-earthquake demands on the operator are not urgent, the first phase can be skipped and only the more thorough inspection be performed.

N.3.1 Phase I Inspection

The intent of this initial inspection is to evaluate whether the extraction system should be shut off immediately and remain off until a more careful inspection can be performed or repairs completed. The system is to be shut down if any of the following conditions exist:

- Compressed air service to the Landfarms is discontinued.
- The No. 1A Separator is out of service.

- The discharge pipeline is ruptured, either at the Landfarms or at any point between the Landfarms and the No. 1A Separator.
- The compressed air header at the Landfarms is ruptured.

The locations for the system's shutoff valves were described in Section N.2.4. When shutting off the system, the compressed air valve should be closed first and then the water discharge line. When restarting the system, the discharge valve should be opened first, followed by the compressed air valve.

In addition, an individual pump is to be shut off if either its air supply line or discharge line is ruptured between the valve and the pump.

N.3.2 Phase I Inspection Procedure

The inspection of the the Landfarms containment systems shall be performed by an operator who is familiar with the system. During the course of the Phase I inspection, the operator shall keep a record of his observations and actions. The record should include observations of ground ruptures, damage to service roads, pipeway supports, etc. After an earthquake, inspect the system as follows:

- Ascertain, if possible, if either the No. 1A Separator is out of service or if compressed air service to either of the Landfarms areas has been discontinued. If either or both have occurred, proceed to the Landfarms system in question, shut off the extraction system, and discontinue Phase I of the inspection.

- By vehicle, visually inspect the above-ground air supply and groundwater discharge line piping at each Landfarm, starting at one end of the system and proceeding along the system. If any breaks in the main discharge line or main compressed air line are seen, shut off the extraction system and discontinue Phase I of the inspection. If any breaks in an individual pump's discharge line or compressed air line are seen, shut off that pump.

- Inspect the first sump to ascertain if compressed air is being supplied to this sump. If no compressed air is being supplied to the pump, shut off the extraction system and discontinue Phase I of the inspection.

- Proceed by vehicle to inspect the discharge lines. Observe where the line enters or exits any below-grade pipe sleeves to ascertain if the line is ruptured within the sleeve. If any breaks are detected, shut off the extraction system and discontinue Phase I of the inspection.

N.3.3 Phase II Inspection

The Phase II inspection is intended to be a more thorough inspection of the containment system. As with Phase I, the operator shall keep a written record of his observations during the inspection. After an earthquake, inspect the system as follows:

- Starting at one end of the groundwater extraction system, carefully inspect the full length of the system. Carefully look for any evidence of damage or leakage, with particular emphasis on the following items. Carefully check the system to ensure that:

- The air supply and groundwater discharge pipelines are leak-free.

- The pipelines are still properly located on all supports.

- The pumps and pump controllers are undamaged and remain functional.

- There is no evidence of a major slope failure that may have damaged any of the slurry walls, extraction trenches, extraction wells, monitoring wells, piezometers, or stormwater retention dikes.
- All sumps, wells, and piezometers appear to be intact.

- If a leak is discovered in the air supply line or discharge line for a specific pump, or if the pump or controller are not functioning properly, take the following actions:
  - Immediately shut off the air supply to the individual pump.
  - Shut off the discharge line from the individual pump.
  - Request maintenance to repair the problem in a expeditious manner and restart the pump.

- If a leak is discovered in the main air supply line or discharge lines, take the following actions:
  - Immediately shut off the air supply to the entire system.
  - Shut off the discharge line from the entire system.
  - Request maintenance to repair the problem in a expeditious manner and restart the system.

- If the lines have fallen off their supports or if other non-critical damage is noted, request maintenance to repair the problem.
- If there is evidence of a major slope failure that may have disrupted the slurry walls or extraction trenches, take the following actions:
  - Immediately shut off the air supply to the entire system.
  - Shut off the discharge line from the entire system.
  - Advise engineering(1) and the Environmental and Safety Division (ESD) of the problem.

- If there is evidence of a major slope failure that may have disrupted one or more extraction well, take the following actions:
  - Immediately shut off the air supply to the affected well.
  - Shut off the discharge line from the affected well.
  - Advise engineering(1) and ESD of the problem.

- If there is evidence that any of the monitoring wells or piezometers have been damaged beyond repair, advise engineering(1) and ESD of the problem.
- If the stormwater transfer system has been damaged, request maintenance to repair the problem.

- Carefully inspect the surfaces of the Landfarms for cracking of the vegetated fill. If any damage is observed, advise engineering(1) and ESD of the problem.

---

(1) Engineering refers to the Waste Discharge Order (WDO) Project engineering manager if the WDO project is still ongoing, or to the Refinery engineering manager if not.

- If there is evidence that the vegetated cover is damaged and rainfall is imminent, sandbags shall be placed such that any surface runoff will be diverted away from the damaged area.

N.3.4 Inspection Reporting

ESD will be prepared to provide the DTSC with a verbal report of the results of inspection of the system within 18 hours of the event. The report will contain a summary of any damage observed, any temporary steps taken to mitigate the damage, and will describe what plans have been made to effect permanent repairs. U/E will provide ESD the information necessary to prepare this report. The information is to be provided on weekdays to ESD's Environmental Supervisor for Hazardous Waste and Groundwater and to ESD's On-Call Public and Environmental Affairs Officer on weekends and holidays. If there is either a release of the extracted groundwater to the ground or a washout of soils from beneath the cover liner, several State agencies will need to be notified as follows:

Immediately notify the State Office of Emergency Services at 1-800-852-7552 and report the following information:

- the name and telephone number of the person reporting the incident;
- the name and address of the facility;
- the time and type of incident (e.g., release);
- name and quantity of material(s) involved, to the extent known;
- the extent of injuries (caused by the release), if any; and
- the possible hazards to human health, or the environment, outside of the facility.

Within 15 days of the incident, ESD shall submit a written report on the incident to the DTSC. The report shall include:

- the name, address, and telephone number of the owner or operator;
- the name, address, and telephone number of the facility;
- the date, time, and type of incident (e.g., release);
- name and quantity of material(s) involved;
- the extent of injuries (caused by the release), if any;
- an assessment of actual or potential hazards to human health, or the environment, where this is applicable; and
- the estimated quantity and disposition of recovered material that resulted from the incident.

A written summary of the damage is to be provided to ESD and the Waste Discharge Order Project (WDO) engineering manager (if the WDO project is still ongoing) within one week of the earthquake event.

N.4.0 CORRECTIVE ACTION PLAN

Most of the actions required to correct minor damage to the system are included in the inspection procedures described above. However, repair of below-grade structures, such as extraction trenches, low-permeability cover elements, and monitoring wells, is beyond the knowledge and experience of the Refinery's maintenance crews. These items are discussed in the following sections. This work will be performed under the direction of the WDO engineering manager if the WDO project is still ongoing, or the Refinery engineering manager if not.

N.4.1 Monitoring Wells or Piezometers

Any monitoring well or piezometer that is damaged beyond repair will be properly abandoned and replaced within four months of its destruction.

N.4.2 Extraction Trench

If the extraction trench has been disrupted by a slope failure, it will be necessary to repair the damaged section in order to avoid an excessive inflow of fines from the surrounding soils. Depending on the actual nature of the damage, two courses of action may be taken: 1) the damaged portion of the trench can be excavated and repaired, or 2) a sand-bentonite plug could be installed in the trench and, if needed, additional sumps could be installed to control the groundwater.

N.4.3 Extraction Sump

If an individual extraction sump becomes unusable due to excessive distortion and there is an adjacent, undamaged sump that is currently not being pumped, that sump can be substituted for the damaged sump. If no alternate sump is available, a new sump will be installed into the extraction trench. The old sump will be left in place as it will not interfere with the operation of the trench.

N.4.4 Final Cover

If there is evidence that the vegetated fill cover layer has cracked, it will be necessary repair the damage. If the surface has become sufficiently distorted such that it no longer drains freely, additional grading should be performed to restore proper surface drainage.

N.4.5 Corrective Action Reporting

On completion of any required work, ESD will advise the DTSC that all repairs have been completed. If the damage is such that the repaired containment system deviates significantly from the original design, engineering (WDO or Refinery) will prepare and submit to the DTSC an addendum to the Landfarms Closure Certification Report.

N.5.0 REFERENCES

Bechtel Environmental, Inc. and Dames & Moore (BEDM), 1996, *Landfarms Closure Plan*, September 15.

Appendix O
Phytoremediation References

Chevron

Chevron

Research and Technology

Memorandum

Date: June 12, 1996

To: Pete Duda

From: KT O'Reilly

Topic: Phytoremediation

The paper by Gatliff discusses the use of trees and deep rooted plants to control groundwater migration.

The paper by Davis et. al. demonstrates that degradation, not volatilization, is responsible for the loss of toluene. Chevron (CRTC and Marketing) have funded a similar project looking at the fate of benzene (Ferro et. al. 1996). The results were similar. There was no evidence that plants caused transfer of volatile compounds from the subsurface to the atmosphere. Additionally, benzene was not found in the plant tissue.

The paper by Aprill and Sims suggest that perennial prairie grasses may influence treatment at depth up to 10 feet. Although the exact treatment depth is unknown, Dr. Peter Kalakow from KSU expects California native grasses to have root structure and to be deep rooted. Dr. Ari Ferro of Phytokinetics told me that there is not good field data available on soil treatment at greater depth, but alfalfa is known to root down to 20' and tall fescue should root to 6-8'.

The "Summary of Phytoremediation Process" was written by Sheldon Nelson, a hydrogeologist at CRTC.

KTO 6/12/96

Vegetative Remediation Process Offers Advantages over Traditional Pump-and-Treat Technologies

Edward G. Gatliff

Edward G. Gatliff, Ph.D., is president of Applied Natural Sciences, Inc., in Hamilton, Ohio. He was formerly research director for agricultural studies at Servi-Tech, Inc., and has directed the analytical sciences division for Bowser-Morner, Inc. In addition to the development of the TreeMediation process, he has worked extensively with remote monitoring with computers and sensors. He continues to conduct research and consultation services for TreeMediation and other vegetative remediation projects.

The use of bioremediation technologies to clean up contaminated soil and groundwater is increasingly winning favor over more costly and often ineffective mechanical approaches. One new type of bioremediation process, known as TreeMediation™, uses trees and other vegetation to remediate soil by acting as a natural pump to extract and remediate contaminated groundwater in aquifers less than 30 feet deep. This article describes this innovative treatment method, shows its advantages over traditional pump and-treat techniques, and explains how TreeMediation is being used to extract nitrate and ammonium contamination from an aquifer in New Jersey.

Bioremediation methodologies have become increasingly important as a means of cleaning up environmental contaminants. These methods take advantage of natural biological processes to reduce or eliminate risks to health and the environment posed by toxic or hazardous substances.

Most bioremediation methods use microorganisms to metabolize or otherwise chemically transform hazardous or toxic substances. Another method enlists the aid of plant species to assimilate contaminants or to create environments conducive to the degradation of contaminants through natural biochemical processes (Erickson et al., 1994). These methods are often referred to as phytoremediation, agroremediation, or simply, vegetative remediation.

Plant species can be selected to extract and assimilate or extract and chemically decompose target contaminants. Many inorganic chemicals considered environmental contaminants are, in fact, vital plant nutrients that can be absorbed through the root system for use in growth and development. Heavy metals can be taken up and bioaccumulated in plant tissues. Organic chemicals, notably pesticides, can be absorbed and metabolized by plants, including trees.

TreeMediation™ takes vegetative remediation a step further by using trees as an alternative to groundwater "pump-and-treat" technology. The TreeMediation process takes advantage of the extensive root systems of

trees and other vegetation to extract water from aquifer systems shallower than 30 feet.

The uptake of water by trees can substantially influence the local hydraulics of a shallow aquifer, thus controlling the migration of a contaminant plume. This "pumping" effect flushes water upward through the soil column and can be much more effective at remediation than traditional pump-and-treat systems by limiting additional leaching of contaminants into the aquifer. The benefits of TreeMediation are:

- In-situ remediation
- Environmental compatibility
- Efficient low-tech alternative
- Low maintenance
- Low capital cost

SELECTION OF TREEMEDIATION FOR A CONTAMINATED AQUIFER

In 1990, we were confronted with the task of cleaning up a nitrogen-contaminated aquifer in New Jersey that could not be pumped efficiently. Soil conditions were such that the aquifer could be considered an aquiclude—groundwater that is held very tightly by the aquifer medium. Still, however tightly the groundwater was being held, it was also moving off-site and had to be contained. Various treatment alternatives were considered, including multiple pumping wells and a collection trench. These proposals were unsatisfactory due to the uncertainty of their effectiveness in this situation, as well as their cost. Interception and conventional treatment would have required significant long-term expenditures. TreeMediation was ultimately chosen as a cost-effective method of treatment.

Prior to this, our experience had been with the use of crops, such as alfalfa, corn, and other vegetation, to effect remediation of surficial soil conditions. Most crops effectively root in the top 3 to 4 feet of the soil. Many plants are capable of rooting substantially deeper but soil conditions, such as impermeable layers, often get in their way.

At this site, the soil conditions were very much a potential impediment for deep root penetration. In addition, the aquifer at this site was located at about 16 feet below the surface—a push for even a deep-rooted crop like alfalfa. Specifically, the problem was to obtain rooting activity to a depth of 16 feet in a "tight" soil. Trees became the focus of attention. That focus was further narrowed to phreatophytes—trees that are known for fast growth and high water usage rates—to ensure that the problem would be addressed within a relatively short time span. Common phreatophytes include cottonwood and willow trees.

Even with trees, however, there are no assurances that rooting activity will extend below the top 3 or 4 feet of soil. Rooting activity of phreatophytic trees has been demonstrated to readily occur at depths of 20 feet or more in semiarid or arid climates where rooting to the aquifer is a matter of survival. To expect this depth of rooting to occur naturally in a region where annual rainfall is moderate to heavy is quite another

matter. In a humid climate, trees are provided with more than enough water and nutrients in the surface few feet of soil not only to survive, but to thrive.

Plants will naturally conserve their resources and will typically expend only the energy necessary to maintain reasonable viability. At this site, this translates into rooting activity being contained in the surface few feet of soil where soil physical conditions are favorable and water and nutrients are adequate for reasonable growth. Thus, planting a tree and waiting for it possibly to develop rooting activity to the aquifer 16 feet below the surface was not an acceptable alternative.

TREEMEDIATION VERSUS PUMP-AND-TREAT

Experience is demonstrating that standard pump-and-treat technology is often falling short as a remedial option. Even where viable, pump-and-treat technology may be cost-prohibitive. Water in an aquifer preferentially follows the path of least resistance. If some or all of a contaminant occurs in a section of the aquifer where water is more tightly held (especially in capillary pores), this water will not become a significant part of the pumping stream. This problem undoubtedly demonstrates one of the primary fallacies of using standard pump-and-treat systems to address the cleanup of contaminated zones of an aquifer.

Properly designed, TreeMediation influences the root system to develop to the aquifer, drawing water and contaminants up through soil pores.

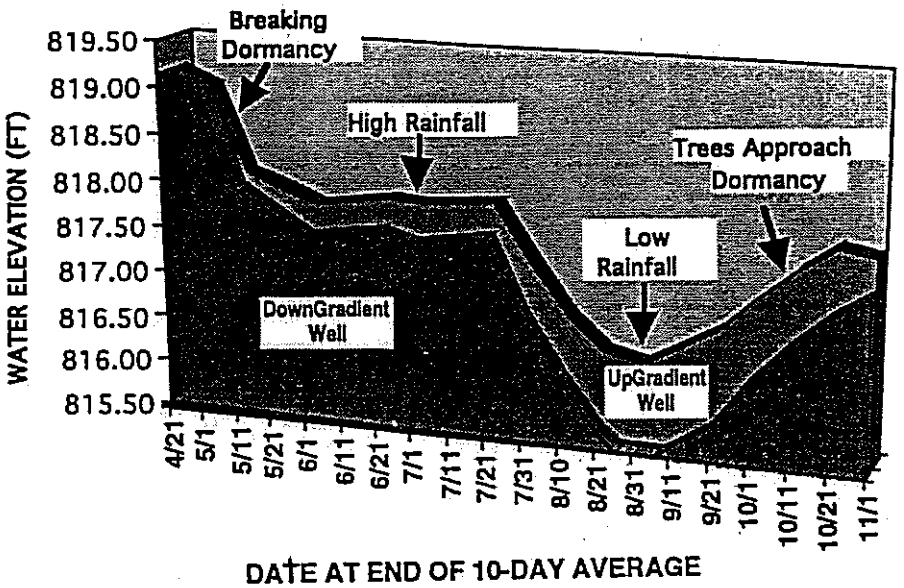
TreeMediation is a localized and steady process that is even capable of extracting capillary water. Properly designed, TreeMediation influences the root system to develop to the aquifer, drawing water and contaminants up through soil pores. Many contaminants will then be absorbed into the plant or affected by the microbial populations associated with the rhizosphere—the biologically active zone surrounding the root system. This process removes contaminants from the groundwater or limits contaminant migration to the groundwater.

Pump-and-Treat Capabilities of Phreatophytes

It has long been recognized that phreatophytic crops and trees are effective at rooting very deeply—to 100 feet and more. In fact, phreatophytes have been studied as a nuisance in the semiarid to arid regions of the western United States where water is scarce. These plants are known to affect water availability by significantly lowering groundwater levels. Diurnal fluctuations of wells were reported in the 1940s and attributed to a grove of nearby cottonwood trees (USDA, 1955). Aquifer levels at other locations were reported to have dropped 5 feet during the growing season due to water consumption by phreatophytes. It has been reported that a single willow tree "uses and loses over 5,000 gallons of water in one summer day" (Miami Conservancy District, 1991). This seemingly phenomenal figure is comparable to what 0.6 acres of the phreatophyte alfalfa can transpire in one day (Schwab et al., 1957) and is plausible when the leaf surface area of a fairly large willow tree is considered.

At a site in southwestern Ohio, cottonwood trees demonstrated considerable pumping capacity, even in a relatively humid environment. A fairly ideal situation was available where two 40-foot-tall cottonwood

Exhibit 1. Aquifer Drawdown by Cottonwood Trees.



trees could be isolated and evaluated. Monitoring wells were placed around the cottonwood trees and monitored for an entire season. **Exhibit 1** clearly denotes the onset of transpiration, the drawdown of the aquifer during the season, and the rise in the elevation of the aquifer as the trees approached dormancy. Additionally, there was a downgradient trough, as demonstrated by the difference between the upgradient and downgradient well elevations. Other well elevations are not presented for illustration effect; however, they did parallel and deviate only slightly but appropriately from the upgradient elevations. Calculations based on the rate of drawdown suggest the pumping rate for each cottonwood tree ranged between 50 and 350 gallons a day.

Tree Growth and Contaminant Removal Studies

A study to evaluate the effect of tree placement in relation to the aquifer was conducted at the New Jersey site. Fourteen-foot tall balled-and-burlapped hybrid poplar trees were cased and planted at depths progressively closer to the aquifer. **Exhibits 2** and **3** illustrate the positive effect of root ball placement on early growth and nitrogen accumulation by the trees. Basically, the closer the trees were planted to the groundwater, the greater their productivity in these first two years. It has been determined that surface-planted trees have now effectively rooted to the aquifer, which should translate into future productivity comparable with the deep-planted trees.

Nitrogen accumulation is expected to increase substantially as the trees mature. These rates of nitrogen removal should approach three or more

Exhibit 2. Method of Planting Trees to Affect Rooting Activity.

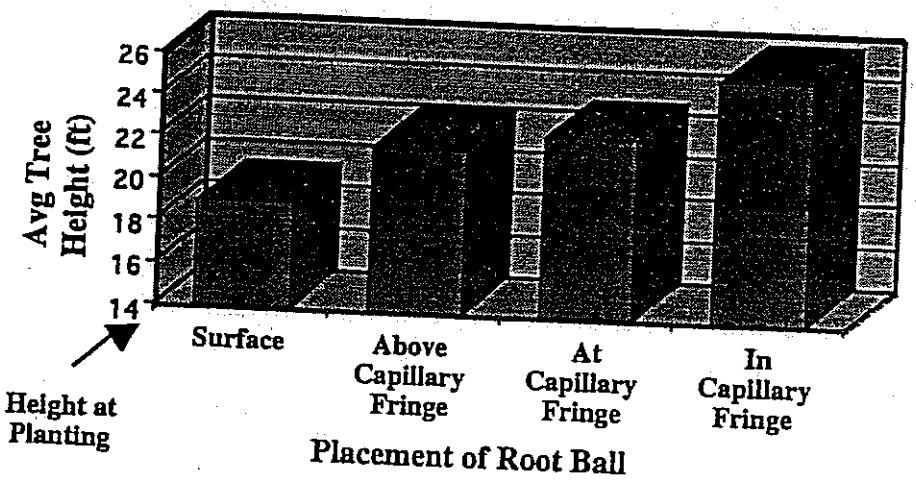
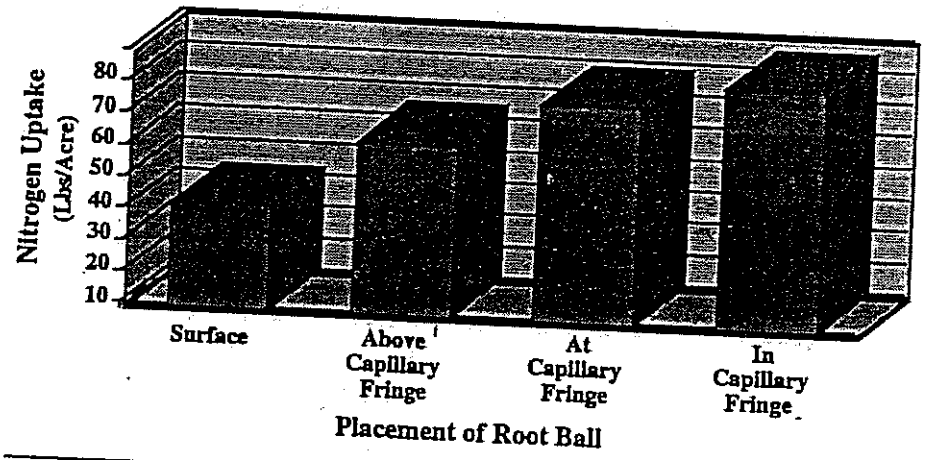


Exhibit 3. Method of Planting Trees to Affect Rooting Activity.

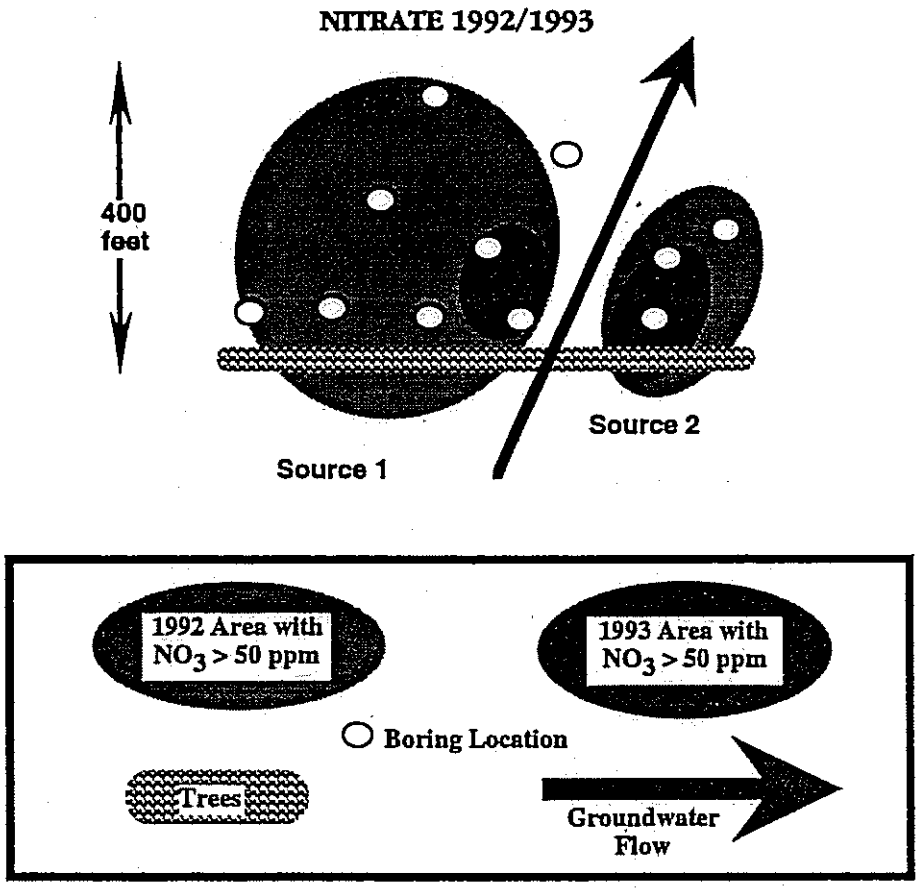


times the levels reflected in **Exhibit 3** (California Fertilizer Association, 1975). While nitrogen is used in plant production at relatively high rates, other target contaminants could accumulate at comparable rates but will depend on several factors, such as solubility, compatibility for plant absorption, and growing conditions.

Effects on Aquifer Contaminants

Downgradient groundwater samples were collected at the beginning of the 1992 growing season and after the 1993 growing season at the New

Exhibit 4. Changes in the Nitrate Contaminant Plume Two Years after Initiating the TreeMediation Process.

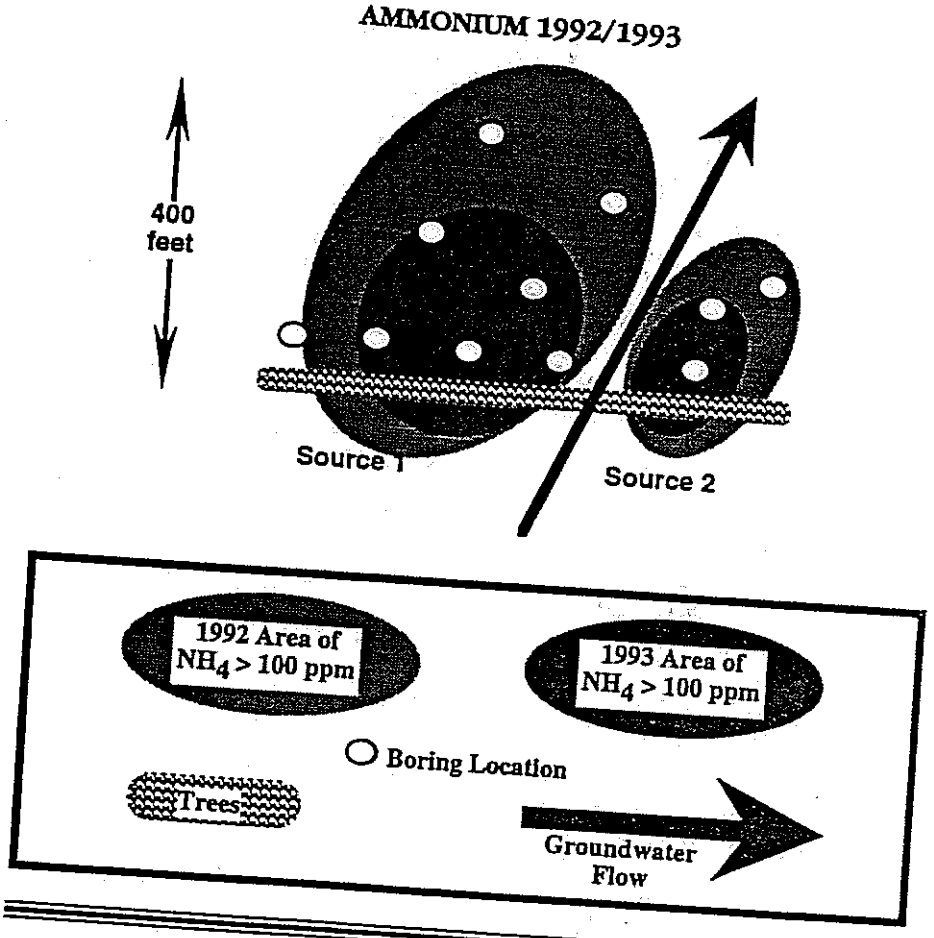


Jersey site, representing two seasons of remedial activity. Each boring location was surveyed to ensure replication of between-year samples. Though limited, these data permit a preliminary evaluation of the effects of TreeMediation on the nitrogen contamination in the downgradient aquifer. Two sources of contamination are suspected and are graphically distinguishable. **Exhibits 4** and **5** show an apparent contraction of both contaminant plumes and provide illustrations of the potential effectiveness of TreeMediation and the pumping capacity of the trees. Both nitrate and ammonium concentrations were reduced to less than 10 mg/l in 1993 at locations farthest from each source

COST COMPARISON

At a site in Illinois, TreeMediation was coupled with a pump-and-treat system to mitigate an immediate "at-risk" situation. In the initial phase of this remedial activity, TreeMediation will function primarily as the "treatment" phase of the pump-and-treat system. Eventually, TreeMediation will

Exhibit 5. Changes in the Ammonium Contaminant Plume Two Years after Initiating the TreeMediation Process.



assume both phases of the system. Fortunately, this situation provides a unique opportunity to compare the costs of the two systems. The estimated costs provided below were developed based on this experience and are intended for illustration purposes only.

Pump-and-treat and TreeMediation costs were estimated in round numbers for a 1-acre site with an aquifer 20 feet deep. Costs common to both approaches were not included, such as meetings with regulators and laboratory analysis. **Exhibit 6** gives the items and costs considered for the pump-and-treat system and the TreeMeditation system. It was assumed that the pump-and-treat system could function with three pumping wells and a reverse osmosis system for treatment. As Exhibit 6 shows, the estimated costs for the TreeMediation program are considerably lower than those for the pump-and-treat system.

Obviously, these costs can vary widely depending on specific circumstances. However, when the use of TreeMediation is a viable option, it should be a more cost-effective approach than pump-and-treat. There is

Exhibit 6. Estimated Costs—1-Acre Site with 20-Foot-Deep Aquifer.

Pump-and-Treat[a]	
Equipment	$100,00
Consulting	25,000
Installation/construction	100,000
5-year costs	
Maintenance	105,000
Operation	50,000
Waste disposal	180,000
Waste disposal liability	100,000
Total	**$660,000**

[a] Assuming off-the-shelf equipment, three pumping wells, and a reverse osmosis treatment system.

TreeMediation	
TreeMediation program design and implementation	$50,000
Monitoring equipment	
Hardware	10,000
Installation	10,000
Replacement	5,000
5-year monitoring	
Travel and meetings	50,000
Data collection	50,000
Annual reports	25,000
Effectiveness assessment—sample collection and analysis	50,000
Total	**$250,000**

another important consideration: additional disposal of pump-and-treat residues can result in additional regulatory problems. Usually, treatment with vegetation results in no disposable residue.

CONTAMINANT LIST GROWS

Vegetative remediation has proven to be effective at remediating pesticides and fertilizers in soil and groundwater (Nair et al., 1993 and Juergens-Gschwind, 1989). However, like pump-and-treat technologies, vegetative remediation methods, such as TreeMediation, will not treat all contaminants. As more is learned about the ability for vegetative remediation of specific contaminants, the more targeted the remediation effort can be.

Heavy Metals

TreeMediation has potential for removal or mitigation of heavy metals from contaminated soil and soil solutions, thereby preventing their

contamination of aquifers. Due to the low solubility of most heavy metals, they are nearly impossible to extract via standard pump-and-treat methodologies. Although it is true that plants generally do not uptake heavy metals to any great degree, this is somewhat dependent on their lack of availability to the plant (Jackson and Alloway, 1992).

Heavy metal availability may explain the following data. An evaluation of heavy metal uptake by several hybrid poplar trees revealed a ten-fold or more increase in the zinc content of affected trees. Zinc concentrations were as high as 2,900 mg/kg in dry leaf tissue of selected trees and as low as 170 mg/kg for other trees. Although these data are not the result of a controlled experiment, they illustrate the potential for heavy metal uptake and the potential fit that TreeMediation has in the remediation of heavy metals. This is especially true where it is acceptable to contain the problem and limit or eliminate migration of heavy metals to the groundwater.

Organics

Organic constituents can be adsorbed by vegetation and metabolized or otherwise degraded, or they can be affected by contact with the plant roots (Shimp et al., 1993). Plant roots are extremely valuable to a wide range of microbial populations that thrive, often in a symbiotic relationship, in the area immediately surrounding the roots (the rhizosphere). The rhizosphere provides much of the food, moisture, and oxygen needed by microbes to survive in regions of the soil where they would not normally be found (i.e., in the region of a deep aquifer) (Anderson et al., 1993). Once in contact with the plants' roots, many organic molecules can be subjected to microbial degradation or metabolism.

Once in contact with the plants' roots, many organic molecules can be subjected to microbial degradation or metabolism.

CONCLUSION

Since its inception in 1990, the TreeMediation process has been applied at six sites in Wisconsin, Illinois, North and South Carolina, and New Jersey. Application at the New Jersey site was the main focus of this discussion. In Illinois, TreeMediation was coupled with a standard pump-and-treat system to alleviate an immediate problem of off-site movement of a contaminant plume containing nitrogen and pesticides. Another site in Illinois is being treated for organic and inorganic agricultural chemicals; dramatic reductions have been realized for pesticide levels in the soil (from 1,000 mg/kg to less than 10 mg/kg thus far). In Wisconsin, nitrogen and pesticides are being remediated using TreeMediation and surface vegetation. An aquifer in sandy coastal soil in North Carolina is being treated with TreeMediation for several inorganic agricultural chemicals as a cost-effective alternative to a pump-and-treat system. Finally, TreeMediation is being applied to mitigate the migration of heavy metals to an aquifer in western South Carolina.

Each site posed different problems and, except for the New Jersey and South Carolina sites, standard pump-and-treat typically would have been the process of choice. TreeMediation, however, was chosen for these sites because of its superior capabilities and much lower costs than traditional pump-and-treat. ■

REFERENCES

Anderson, T.A., E.A. Guthrie, and B.T. Walton. 1993. "Bioremediation," in "In The Rhizosphere." *Environmental Science and Technology* 27(13):2630-36.

California Fertilizer Association (Soil Improvement Committee). 1975. *Western Fertilizer Handbook*, 5th ed. Interstate Printers and Publishers.

Erickson, L.E., et al. 1994. "Using Vegetation to Enhance In Situ Bioremediation," Center for Hazardous Substance Research, Ward Hall, Kansas State University, Manhattan, KS 66506. Unpublished draft copy.

Jackson, A.P. and B.J. Alloway. 1992. "The Transfer of Cadmium from Agricultural Soils to the Human Food Chain." In *Biogeochemistry of Trace Metals*, edited by Adriano. Washington, DC: Lewis Publishers.

Juergens-Gschwind, S. 1989. "Ground Water Nitrates in Other Developed Countries (Europe)—Relationships to Land Use Patterns." In *Nitrogen Management and Ground Water Protection*, edited by R.F. Follett. New York: Elsevier Science Publishers.

Miami Conservancy District. 1991. *Aquifer Update*, No. 1:1.

Nair, D.R., et al. 1993. "Mineralization and Uptake of Triazine Pesticide in Soil-Plant Systems." *Journal of Environmental Engineering* 119(5):842-54.

Schwab, G.O., et al. 1957. *Elementary Soil and Water Engineering*, 2d ed. New York: John Wiley & Sons.

Shimp, J.F., et al. 1993. "Beneficial Effects of Plants in the Remediation of Soil and Groundwater Contaminated with Organic Materials." *Critical Reviews in Environmental Science and Technology* 23(1):41-77.

U.S. Department of Agriculture. 1955. "Water," *The Yearbook of Agriculture 195*. Washington, DC: U.S. GPO.

REMEDIATION

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