AP - 001

STAGE 1 & 2 REPORTS

DATE:

Oct. 28, 1996

GCL
Environmental Science and Engineering
A BDM International Company

505 Marquette NW, Ste. 1100 • Albuquerque, NM 87102
(505) 842-0001 • FAX: (505) 842-0595

OIL CONSL
DIST. 3
96 OCT 30 AM 8 52

October 28, 1996

Mr. Bill Olsen
New Mexico Oil Conservation Division
2040 S. Pacheco
Santa Fe, NM 87505

RE: DRAFT RESPONSE TO NEW MEXICO OIL CONSERVATION DIVISION (NMOCD) COMMENTS ON BRICKLAND REFINERY SITE FINAL SITE INVESTIGATION REPORT

Dear Bill:

Pursuant to our telephone conversation last week, I am submitting a "draft" copy of the response to your comments on the Final Site Investigation Report for the Brickland Refinery site. The purpose for submitting this draft is to allow you to review our response to specific comments so we can discuss any further discrepancies prior to republishing the complete report. Since most of the NMOCD comments are straightforward and more for clarification than contention of conclusions, most of our responses are not likely to generate further comment. After you review the draft response, I will call you to discuss any questions or further concerns. Then, on behalf of Rexene, I can finalize the report for final submission.

I appreciate your willingness to discuss our draft response, and believe it will be the most efficient method to achieve approval of this rather voluminous report. As you requested, I will wait a week before calling you to schedule a time to discuss our response.

Sincerely,
Geoscience Consultants, Ltd. (GCL)

Linda Daley for
Michael W. Selke, RG
Senior Program Manager

3031/olsen004.ltr

cc: Roger Martin, Rexene
Todd Carver, Rexene

GCL
Environmental Science and Engineering
A BDM International Company

505 Marquette NW, Ste. 1100 • Albuquerque, NM 87102
(505) 842-0001 • FAX: (505) 842-0595

October 10, 1996

DRAFT

Roger Martin
Rexene Corporation
P.O. Box 3986
Odessa, TX 79760

RE: PROPOSED REVISIONS TO FINAL SITE INVESTIGATION REPORT FOR THE BRICKLAND REFINERY SITE

Dear Roger:

Submitted herein are proposed changes to the Final Site Investigation Report for the Brickland Refinery Site, Sunland Park, New Mexico in response to New Mexico Oil Conservation Division (NMOCD) comments in their letter dated August 21, 1996. I have attached certain tables and figures that have meaningful proposed revisions. Several maps are still under reconstruction and will be forwarded next week. I have not attached figure or map changes that are simple corrections or additions of data or data points, but address the proposed changes specifically in my comment by comment response. I'll call you next week to plan when we want to discuss the response.

NMOCD Comment No. 1. Section 3.2.1, Page 10

This section references Appendix E as containing the soil metals study conducted by the El Paso City-County Health Department and the Texas Air Control Board. However, Appendix E actually contains the International Boundary Water Commission Report.

Response to NMOCD Comment No. 1

The correct report, which presents studies conducted by the El Paso City-County Health Department and the Texas Air Control Board, has been inserted into Appendix E. The incorrect report has been removed.

NMOCD Comment No. 2. Section 3.2.2, Area B, Page 12

The elevated concentration of silver and mercury in Area B soil samples needs to be included in the discussion.

Response to NMOCD Comment No. 2

The following text has been inserted at the end of first partial sentence on page 13: "Mercury was 0.41 mg/kg in B-HA-4. B-HA-1, -2 and -4 contained 1.4, 1.8 and 4.9 mg/kg silver, respectively; B-HA-3 contained 177.0 mg/kg silver."

NMOCD Comment No. 3. Section 3.2.2, Area C, Page 13

The elevated concentrations of cadmium and silver in Area C soil samples needs to be included in the discussion.

Response to NMOCD Comment No. 3

The following text has been inserted at the end of the last paragraph of the Area C discussion on page 13: "Silver occurs in C-TP-8 at 2.9 mg/kg. Cadmium was identified at concentrations 16.5 and 19.0 mg/kg in C-TP-5 and C-TP-7, respectively. All other test pits contained cadmium near or below background levels."

NMOCD Comment No. 4. Section 3.2.2, Area D, Page 14

The elevated concentration of lead in Area D soil samples needs to be included in the discussion.

Response to NMOCD Comment No. 4

The following text has been inserted as a new paragraph preceding the last paragraph of the Area D discussion on pages 14 and 15: "Lead was identified in GCL trench TR-02 at a concentration of 55 mg/kg and in boring B-04 at concentrations of 46.0 and 9.0 mg/kg at depths of 2 to 4 and 6 to 8 feet, respectively. Eder soil sampling detected lead in borings B-1 through B-16 at concentrations ranging from 5.9 to 1,500 mg/kg."

NMOCD Comment No. 5. Section 3.2.2, Area E, Page 15

a. The elevated concentration of mercury in Area E soil samples needs to be included in the discussion.

b. The bottom paragraph on the page has a soil concentration of 139 mg/kg lead listed for boring E-TP-26. This appears to be a typographical error. Table 8c lists the concentration as 139,000 mg/kg.

c. What is the significance of comparing the soil lead concentration in boring E-TP-29 with that from trench TR-01? These sample locations are approximately 250 feet apart and therefore would not confirm that TR-01 samples represents accurate sample concentrations at E-TP-29's location.

Response to NMOCD Comment No. 5

a. The following text has been inserted as a new paragraph after the last paragraph of the Area E discussion on page 15: "Soil sampling by Eder detected mercury at concentrations of 0.15, 0.16 and 0.76 mg/kg in test pits E-TP-25, -26 and -27, respectively. Soil sampled from GCL trench TR-01 contained 0.14 mg/kg at a depth of 0 to 2 feet, while the 2 to 4 foot sample was below the detection limit."

b. "139 mg/kg" has been changed to "139,000 mg/kg"

c. The last sentence of the last paragraph of the Area E discussion on page 15 has been revised to: "Lead concentrations from samples obtained by GCL from TR-01 at zero to two feet (53.0 mg/kg) and two to four feet (9-10 mg/kg) were low. Eder results obtained from E-TP-29 (88.4 mg/kg), located in the southeast corner of Area E, were higher (Figure 11a)."

NMOCD Comment No. 6. Section 3.2.2, Area F, Page 16

The elevated concentrations of mercury, chromium, cadmium, and silver in Area F soil samples need to be included in the discussion.

Response to NMOCD Comment No. 6

The following text has been inserted as a new paragraph following the last paragraph of the Area F discussion on page 16: "Limited sampling for other metals also detected concentrations of mercury, cadmium, chromium, and silver between background concentration and approximately one order of magnitude above background concentrations."

NMOCD Comment No. 7. Section 3.2.2, Area G, Page 17

The elevated concentrations of mercury, chromium, cadmium, and silver in Area F soil samples need to be included in the discussion.

Response to NMOCD Comment No. 7

The following text has been inserted as a new paragraph following the last paragraph of the Area G discussion on page 17: "Other limited sampling detected concentrations of mercury, chromium, cadmium and silver. Eder sampling detected a mercury concentration of 0.06 mg/kg in test pit G-TP-77 and concentrations of 0.03, 0.15, and 0.09 in surface samples G-SS-7, -8 and -9, respectively. GCL borings contained no detectable mercury but trench TR-04 contained 0.14 and 0.19 mg/kg at depths of 0 to 2 and 2 to 4 feet, respectively. Eder test pit and surface samples contained chromium at concentrations ranging from 7.0 to 97.0 mg/kg. All GCL boring and trench samples were within background levels or nondetect for chromium and silver. One Eder sample from test pit G-TP-77 contained 2.5 mg/kg silver. Two samples collected from Eder test pits G-TP-66 and G-TP-75 contained cadmium above background levels, at 36.7 and 24.1 mg/kg, respectively." add GCL results

NMOCD Comment No. 8. Section 3.2.3, Pages 18-22 and Figure 11b

There appears to be some typographical errors on Figure 11b. Some of the comparative sampling results are reversed in the figure. Some Eder sample results are depicted as GCL sample results and some GCL samples results are depicted as Eder sample results. This figure needs to be corrected.

Response to NMOCD Comment No. 8

The reversed sampling results have been corrected. Figure 11b now presents correct results for GCL and Eder samples as explained in the legend. [Roger, a copy of the insert is attached, the map is currently being revised.]

NMOCD Comment No. 9. Section 3.2.3, Page 18

a. The analytical data sheets and associated quality assurance/quality control data for the April 1996 soil sampling is not included in the report. Since the information has not been previously supplied to the OCD, this data needs to be included in the report.

b. The text states that the soil sampling comparative studies include a discussion of Area D and boring B-1. While Figure 11b shows comparative sample results for boring B-1, there is not discussion of the results in the text.

Response to NMOCD Comment No. 9

a. The following sentence has been inserted before the last sentence of the second paragraph: "Laboratory reports and quality assurance/quality control reports are included in Appendix __." [The actual appendix designation will be made after proposed changes are final approved by Rexene.]

b. The following text has been added at the end of the Area B and before the Area E discussions:

"Area D

- Location: B-1
- Type of sample: shallow subsurface soil
- Sample depth: approximately 24 inches
- Sample method: hand auger
- Soil description: black to gray soil with hydrocarbon odor

Eder detected 44.4 and 169.0 mg/kg cadmium and arsenic while GCL samples were nondetect and 11.0 mg/kg, respectively

Eder detected 951.0 mg/kg copper and 887.0 mg/kg zinc; GCL did not analyze for these metals.

Eder detected 1,500 mg/kg lead while the GCL sample contained 154 mg/kg."

NMOCD Comment No. 10. Section 3.2.3, Page 20 and Figure 11b

a. The data for the E-SS-4 samples could not be found in the Eder data tables nor elsewhere in the report.

b. There appears to be a typographical error in the sample location on Figure 11b. Sample location F-SS-4 should be E-SS-4.

Response to NMOCD Comment No. 10

a. The missing data has been added to Table 8c.

b. The sample location indicator F-SS-4 on Figure 11b has been changed to E-SS-4.

NMOCD Comment No. 11. Section 3.2.3, Page 21 and Figure 11b

The data for the F-SS-6 samples could not be found in the Eder data tables nor elsewhere in the report. In addition, the F-SS-5 sample location on Figure 11b shows a sample result that is not included as data elsewhere in the report.

Response to NMOCD Comment No. 11

The missing data has been added to Table 9c.

NMOCD Comment No. 12. Section 3.3.2, Page 24

a. This section needs to contain the quarterly total benzene, toluene, ethylbenzene, and xylene (BTEX) maps showing their distribution in groundwater. These maps were to be submitted in quarterly reports as required in OCD's April 14, 1995 approval of the monitoring program. Since the OCD has no record of receiving these maps in the quarterly reports, they will need to be included in this report.

b. The text references GCL surface water and river sediment samples, but it was not clear where these samples were taken. The sample locations should be depicted on the site maps.

c. The analytical data sheets and associated quality assurance/quality control data for the surface water and river sediment sampling is not included in the report. Since the information has not been previously supplied to the OCD, this data needs to be included in the report.

Response to NMOCD Comment No. 12

a. Maps showing benzene in groundwater were submitted for the four most recent quarterly sampling events. Similar maps showing toluene, ethylbenzene and xylenes were not created because there were no exceedances of WQCC standards for these compounds in any monitor wells in the quarterly sampling events. Table __ presents quarterly BTEX analytical results. [The actual table number will be designated after Rexene approval of proposed changes.]

b. The location of the surface water and river sediment samples has been added to Figure 4. [The map is currently being revised and will be forwarded next week.]

c. The analytical data sheets and associated quality assurance/quality control data for the surface water and river sediment samples have been added to the report as Appendix __. The actual reports are separately attached from the document because the volume precludes inclusion. [The actual appendix designation will be finalized after Rexene approval of proposed changes.]

NMOCD Comment No. 13. Section 3.3.3, Page 25

a. This section needs to contain the quarterly total polycyclic aromatic hydrocarbon (PAH) maps showing their distribution in groundwater. These maps were to be submitted in quarterly reports as required in OCD's April 14, 1995 approval of the monitoring program. Since the OCD has no record of receiving these maps in the quarterly reports, they will need to be included in this report.

b. The first sentence of the PAH section references Appendix F. This appears to be a typographical error. It should reference Appendix G.

c. PAHs have been detected in prior off-site sampling, therefore the text should not categorically state that off-site migration of these constituents has not occurred. In addition, the OCD's June 21, 1996 sampling of surface water adjacent to MW-6 (sample results and sample location map enclosed) shows low-level PAHs appear to be entering the river at this location.

d. There is no reference to surface water quality sampling for PAHs that was required in OCD's April 14, 1995 approval of the monitoring program. Since the OCD has no record of receiving this information, the analytical data sheets and associated quality assurance/quality control data for these samples needs to be included in the report.

Response to NMOCD Comment No. 13

a. Quarterly PAH maps that correspond to the existing quarterly benzene maps have been added to the report as Figures 15b, 15c and 15d. Figure 15 has been renumbered to Figure 15a.

b. The reference to Appendix F has been changed to Appendix G.

c. The fifth sentence of the second paragraph of Section 3.3.3 on page 25 has been deleted: "Therefore, off-site migration of these heavier molecular weight compounds does not appear to have occurred."

d. PAHs were not included as analytes for the surface water sampling, but will be included in future sampling on an annual basis.

NMOCD Comment No. 14. Section 3.3.3, Page 27

The sample results show metals concentrations in groundwater have been detected in excess of New Mexico Water Quality Control Commission (WQCC) standards in petroleum-contaminated monitoring wells both on site and off site. At times when WQCC standards have not been exceeded, metals are fairly regularly found in the petroleum-contaminated wells at elevated levels. In addition, GCL's TCLP soil sampling demonstrated that leachable amounts of lead were present in soils in one area, well in excess of state standards and at a level that would classify them as a hazardous waste. Therefore, the summary needs to discuss these trends and should not categorically state that metals do not pose a threat to groundwater and are tightly bound within site soils.

Response to NMOCD Comment No. 14

The last sentence on page 26 and the first sentence on page 27 have been deleted and the following text inserted in place: "Elevated concentrations of selected metals occur in all monitor wells at various times. Of those elevated metals, cadmium, iron, manganese, and selenium do not appear to correlate with petroleum hydrocarbons in groundwater. One elevated mercury occurrence in MW-14 in December 1994 appears to be anomalous. Elevated concentrations of barium and arsenic may correlate with monitor wells that contain petroleum hydrocarbons. However, there are also elevated background concentrations of those two metals in the soil which may also account for their common occurrence at the site."

NMOCD Comment No. 15. Section 3.4.6, Pages 27-31 and Appendix K

The text in this section accurately reflects that the slug test early time data represents the hydraulic conductivity (K) of the gravel pack and not the aquifer formation materials. However, approximately half of the slug tests in Appendix K still use early time data to calculate the K of the formation. These slug tests need to be recalculated for the correct aquifer K using the late time data.

Response to NMOCD Comment No. 15

Page 28, second paragraph under 3.4.3: Please note MW-10 should be included in the first sentence, which states what wells were tested (a total of 10). Also, a typographic error in the second sentence states that MW-9D was tested, when in fact MW-10 was tested. MW-10 is completed in very fine sand and clay. The reference to "MW-9D" has been changed to "MW-10".

Page 29, section 3.4.5: The procedures described are for falling head tests. Note that GCL also performed rising head tests, as discussed in subsequent sections of the report.

Page 30, third full paragraph. The second sentence states "For the former materials..." when it should state "For the latter materials...". The text has been changed accordingly.

Regarding use of early- or late-time data for determination of conductivity:

The rationale for using early- or late-time data is stated in the third and fourth paragraphs on page 30; however, because of the typographic error described above ("former" instead of "latter") some confusion may have been created. To restate the point in question, it is common for wells completed across the water table in fine-grained, low-permeability materials to show two distinct responses during slug tests: an early-time steep curve, and a later-time shallow curve. The early-time steep curve is due to water draining from the sand-pack, which has a higher permeability than the surrounding formation. The later-time curve is due to the actual formation response. This phenomenon was called the "double straight line effect" by Bouwer in his 1989 paper titled "The Bouwer and Rice Slug Test -- An Update" (Groundwater, Vol. 27, No. 3, pages 306 and 307).

Examining the plots in Appendix J ("Slug Test Results") of GCL's May 15, 1996 report, the curves selected for determination of conductivity (K) are unique in wells MW-6S, MW-3S, MW-3D, MW-9S (rising head), and MW-10. These wells are generally completed in sandy and gravelly materials, which explains why no "double straight line effect" is observed.

The curves selected for wells MW-1, MW-6D, and MW-9S are for early-time data, and are steep curves which give relatively high values of conductivity. The use of early-time data is appropriate because wells MW-6D and MW-9S are completed in relatively coarse material; however, well MW-1 was completed in relatively fine material, so a better choice would have been early-time data. However, use of early-time data for well MW-1 is a conservative choice, since it results in higher values of K and since using higher K values in the model overestimates groundwater flux into the Rio Grande, and hence overestimates contaminant input.

The curves selected for wells MW-5, MW-8, and MW-11 are for late-time data, and are shallow curves which give relatively low values of conductivity (0.14, 0.12, and 0.5 feet per day, which are the lowest values reported). These wells are also completed in some of the finest formations encountered (silty clay to very fine sand, silty clay, and silty clay, respectively). Note, these wells are completed across the water table in fine-grained formations. The response of the slug tests in these wells represents the "double straight line effect" of Bouwer, so the later-time data in these wells (which yields lower K values) is the correct choice.

In summary, the early versus late curves selected for all wells were appropriate based on the grain sizes and relative slug test response, with the exception of MW-1 for which late-time data may have been more appropriate. However, the result of using the later-time curve for MW-1 would be to decrease the value of K used in the model, which would not be a conservative option since it would result in less loading of chemicals into the Rio Grande.

NMOCD Comment No. 16. Section 3.5, Pages 31-37 and Appendix K

The transport modeling calculations will need to be redone after the proper K values have been recalculated as discussed in comment 15 above.

Response to NMOCD Comment No. 16

Based on the response to NMOCD Comment No. 15, the model does not need to be rerun.

NMOCD Comment No. 17. Section 3.6, Page 37

The text references Figure 18. However, no Figure 18 could be found in the report.

Response to NMOCD Comment No. 17

The last sentence of the third paragraph of Section 3.6 on page 37 has been deleted and the reference to Figure 18 eliminated.

NMOCD Comment No. 18. Table 8a, Figure 4, and Figure 10

The benzene soil sample results for E-TP-4-2, E-TP-5-2, E-TP-6-2, and E-TP-8-2 are not plotted on Figure 10 nor could their sample locations be found on the Figure 4 site map.

Response to NMOCD Comment No. 18

The results for the sample locations cited in NMOCD Comment No. 18 are not shown on Figures 4 and 10 because they are resamples that correspond to existing test pits as follows:

E-TP-4-2 corresponds to E-TP-12
E-TP-5-2 corresponds to E-TP-17
E-TP-6-2 corresponds to E-TP-20
E-TP-8-2 corresponds to E-TP-32

An insert has been added to Figures 4 and 10 that explains the duplicate sampling locations.

NMOCD Comment No. 19. Table 9a, Figure 4, and Figure 10

The benzene soil sample results for F-TP-9-2, T-TP-10-2, and F-TP-91 are not plotted on Figure 10 nor could their sample locations be found on the Figure 4 site map.

Response to NMOCD Comment No. 19

The results for the sample locations cited in NMOCD Comment No. 19 are not shown on Figures 4 and 10 because they are resamples that correspond to existing test pits as follows:

F-TP-9-2 corresponds to F-TP-34
F-TP-10-2 corresponds to F-TP-61

An insert has been added to Figures 4 and 10 that explains the duplicate sampling locations. F-TP-91 is shown on Figures on 4 and 10 and is located along the southwestern property boundary.

NMOCD Comment No. 20. Table 10a, Figure 4, and Figure 10

The benzene soil sample results for G-TP-11-2, G-TP-12-2, G-TP-13-2, G-TP-14-2, G-TP-15-2, and G-TP-16-2 are not plotted on Figure 10 nor could their sample locations be found on the Figure 4 site map.

Response to NMOCD Comment No. 20

The results for the sample locations cited in NMOCD Comment No. 18 are not shown on Figures 4 and 10 because they are resamples that correspond to existing test pits as follows:

G-TP-11-2 corresponds to G-TP-68
G-TP-12-2 corresponds to G-TP-73
G-TP-13-2 corresponds to G-TP-76
G-TP-14-2 corresponds to G-TP-80
G-TP-15-2 corresponds to G-TP-82
G-TP-16-2 corresponds to G-TP-77

An insert has been added to Figures 4 and 10 that explains the duplicate sampling locations.

NMOCD Comment No. 21. Table 13

In order to make comparisons with WQCC standards, this table needs to contain a breakdown of the individual BTEX components for each sampling event.

Response to NMOCD Comment No. 21

Table __ presents individual BTEX and TPH analytical results compared to WQCC standards for each sampling event. [The actual table number will be designated after Rexene approves the proposed changes.]

NMOCD Comment No. 22. Figure 12

The PAH data from Eder reports needs to be included in this figure.

Response to NMOCD Comment No. 22

[Roger, we are still working on this - I'll call you next week on it.]

NMOCD Comment No. 23. Figure 14a, Figure 14b, Figure 14c, and Figure 14d

When compared with the free-phase hydrocarbon map (Figure 13), the contour lines drawn for these figures are misleading. The benzene maps show known free-phase product areas as having non-detectable concentrations of benzene. These maps need to be re-evaluated.

Response to NMOCD Comment No. 23

Figures 14a through 14d have been revised to assume that benzene is present in groundwater where floating product occurs. [These maps will be forwarded next week.]

NMOCD Comment No. 24. Appendix B

As stated in the OCD's February 13, 1996 correspondence, the monitor well logs need to include monitor well construction details, or the construction details need to be included as a separate appendix.

Response to NMOCD Comment No. 24

Well completion details have been incorporated into Appendix B and include specifications for both Eder and GCL monitor wells.

I did not make changes to the conclusions. I thought it would be best to agree on the changes within the text first, and then revise the conclusions, if necessary. When these proposed changes are revised and finalized I will publish the final report. However, I recommend I call Bill Olsen prior to that and go through the responses just to ensure he is thinking as we are on their stated issues. This should eliminate the need for any further NMOCD comment.

Sincerely,
Geoscience Consultants, Ltd. (GCL)

Michael W. Selke, RG
Senior Program Manager

JMC:MWS/3031/RESPONSE.MWS

cc: Todd Carver, Rexene
Reggie Baker, Rexene

OLD BRICKLAND REFINERY SITE
SUNLAND PARK, NEW MEXICO

Table 8c

SELECTED METALS ANALYSIS
FROM UNIQUE SOIL SAMPLES IN AREA "E"

Parameter	E-SS-4	E-SS-5
Mercury	<0.02	<0.02
Silver	NA	NA
Cadmium	NA	NA
Chromium	75	55
Copper	190	300
Nickel	22	18
Zinc	NA	NA
Arsenic	NA	NA
Lead	1000	1100

NOTES:

NA - Not analyzed
U - Undetected at <IDL
W - Analytical spike recovery out of range
B - Undetected, <CRQL but >IDL
E - Matrix interference
N - Matrix spike out of acceptable range
S - Performed by MSA
\+ - MSA correlation coefficient <.995
* - Digested duplicate out of 20% RPD
Units - (mg/kg) for all analytes

OLD BRICKLAND REFINERY SITE
SUNLAND PARK, NEW MEXICO

Table 9c

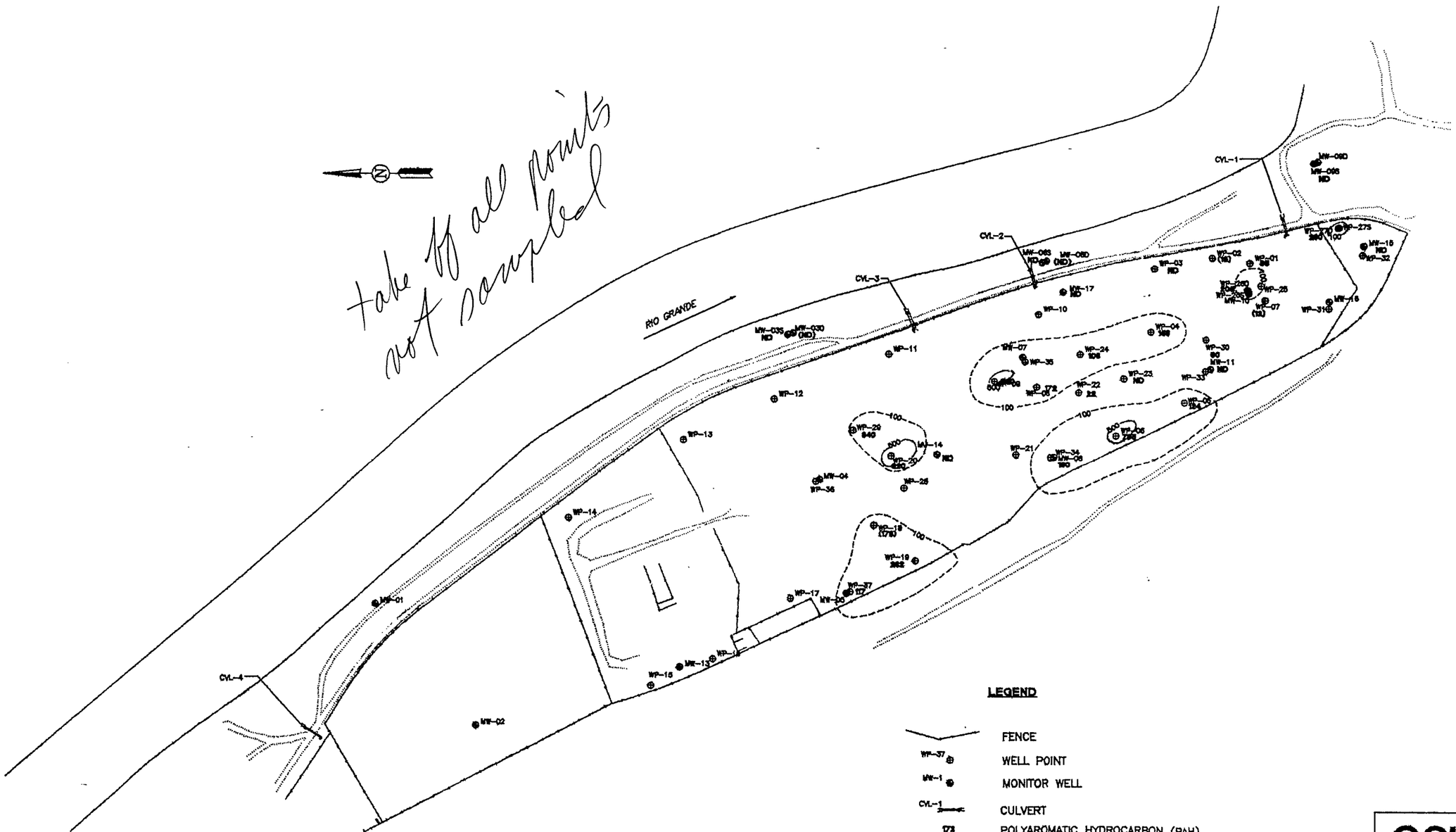
SELECTED METALS ANALYSIS
FROM UNIQUE SOIL SAMPLES IN AREA "F"

Parameter	F-TP-61	F-TP-62	B-27	B-28	F-SS-1	F-SS-2	F-SS-3	F-SS-6	F-TP-91
Mercury	0.06UN	0.26N	NA	NA	8.0	10	3.7	0.1	0.03
Silver	NA	NA	NA	NA	NA	NA	NA	NA	0.45
Cadmium	1.3	10.2	NA	NA	NA	NA	NA	NA	0.85
Chromium	NA	NA	NA	NA	18	28	8.0	8.0	4.7
Copper	52.9	349N	255	206	34000	2300	4700	120	6.5
Nickel	NA	NA	NA	NA	20	13	13	8.0	7.0
Zinc	72.9	358	454	103	NA	NA	NA	NA	23
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	ND
Lead	95.5	718	547	333	320	1100	300	260	17

NOTES:

ND - Not detected
NA - Not analyzed
U - Undetected at <IDL
W - Analytical spike recovery out of range
B - Undetected, <CRQL but >IDL
E - Matrix interference
N - Matrix spike out of acceptable range
S - Performed by MSA
\+ - MSA correlation coefficient <.995
* - Digested duplicate out of 20% RPD
Units - (mg/kg) for all analytes

take 11 all points not sampled



LEGEND

- FENCE
- WP-37 — WELL POINT
- MW-1 — MONITOR WELL
- CVL-1 — CULVERT
- 173 — POLYAROMATIC HYDROCARBON (PAH) CONCENTRATION (µg/L)
- ND — NOT DETECTED (<10 µg/L)
- (176) — CONCENTRATIONS IN PARENTHESIS WERE NOT USED IN CONTOURING BECAUSE SCREEN INTERVALS WERE AT A DEEPER DEPTH
- PAH CONCENTRATION CONTOUR (DASHED WHERE INFERRED)

GCL

FIGURE 15a
POLYAROMATIC HYDROCARBON (PAH) CONCENTRATION CONTOUR MAP IN GROUNDWATER
5TH QUARTER (MARCH 1995)
BRICKLAND REFINERY SITE

CLIENT: REXENE	
DATE: 9/13/95	
AUTHORED BY: RR	
DRAWN BY: MP	
CHECKED BY: TS/BAL	
DWG. NO.: \REXENE\1STQTR95.DWG	

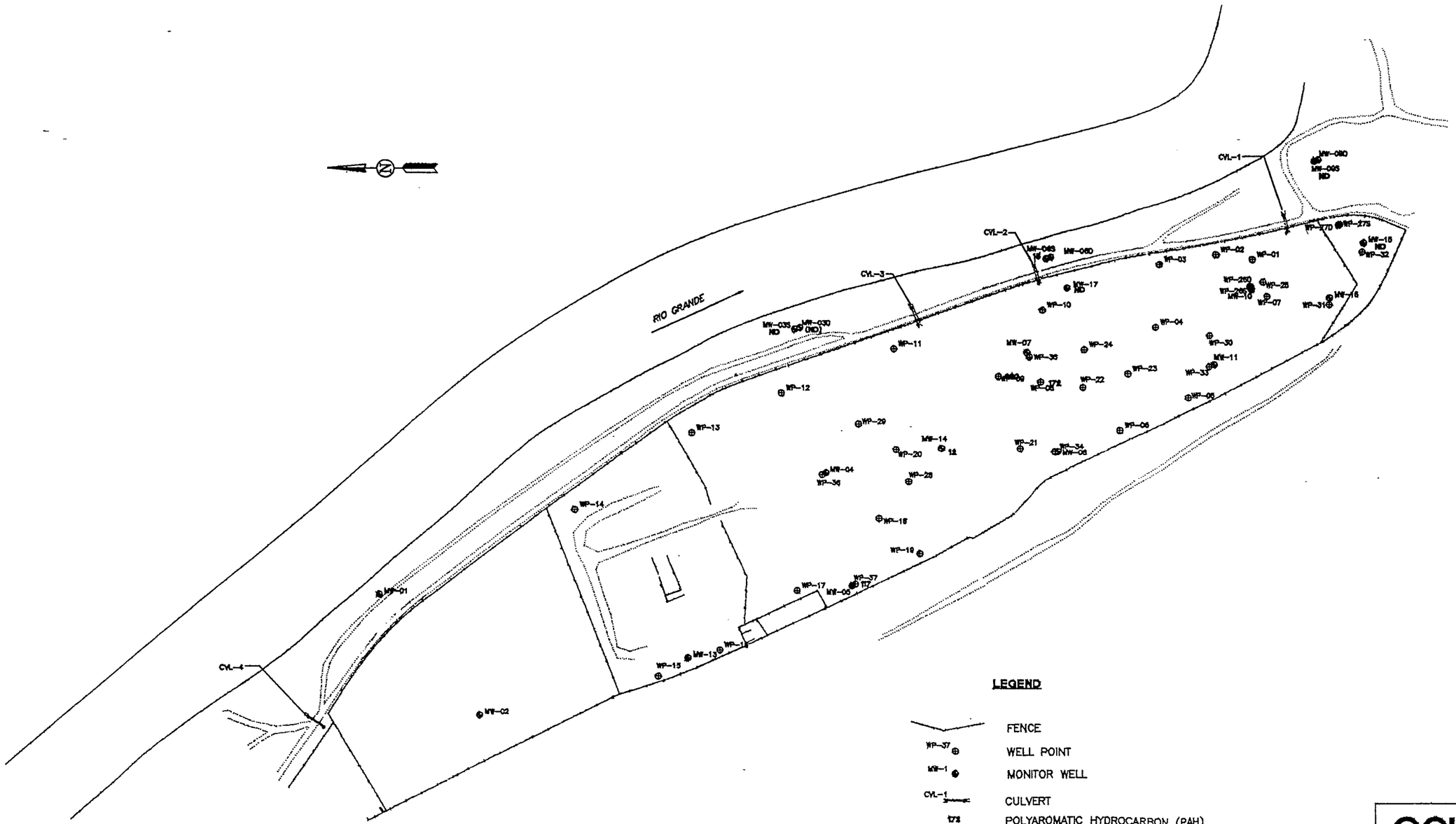


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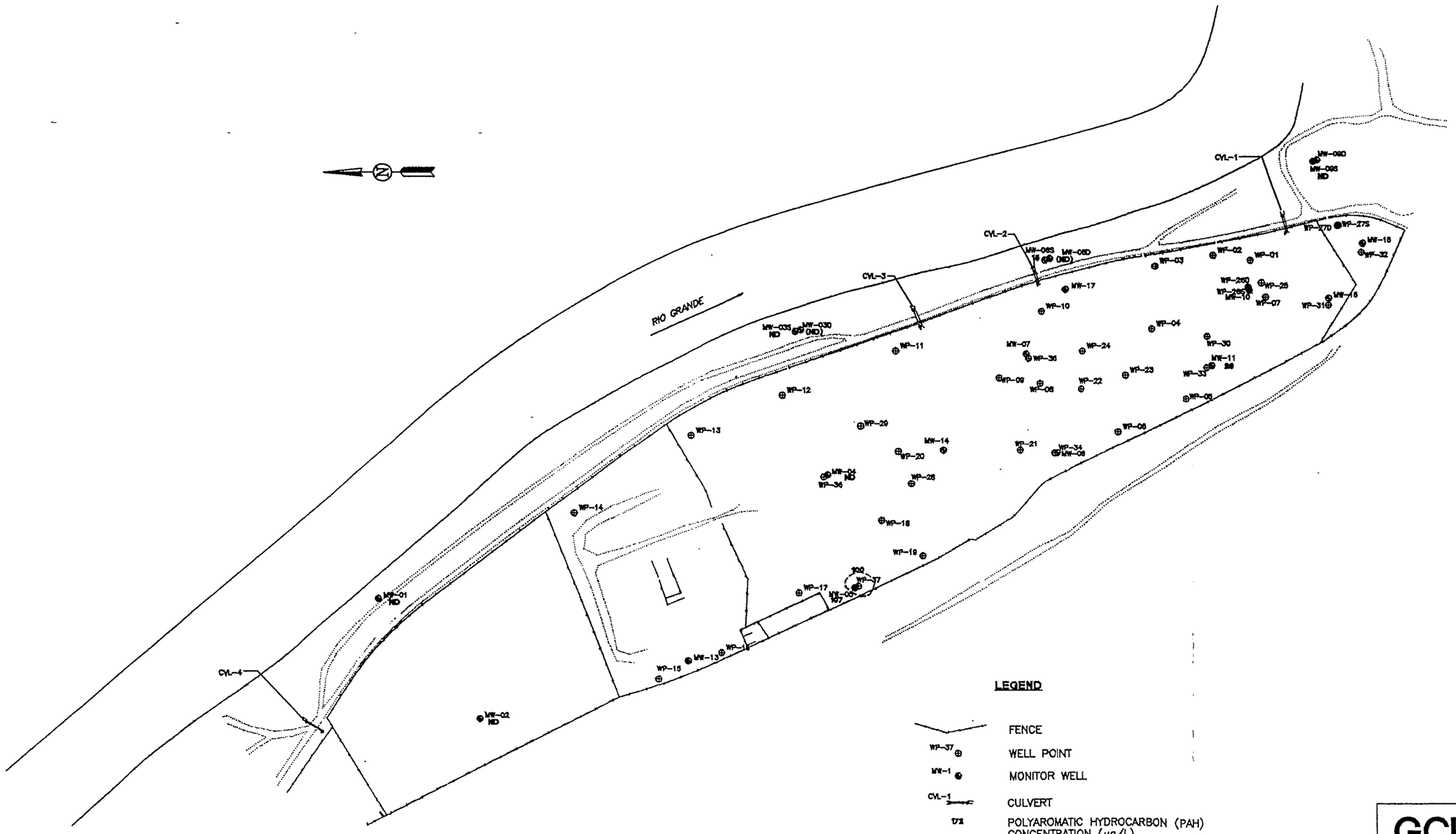
FIGURE 16b
POLYAROMATIC HYDROCARBON (PAH) CONCENTRATION CONTOUR MAP IN GROUNDWATER
5TH QUARTER (JUNE 1995)
BRICKLAND REFINERY SITE

CLIENT:	REXENE
DATE:	9/13/95
AUTHORED BY:	JH
DRAWN BY:	MP
CHECKED BY:	MWS
DWG. NO.:	\REXENE\10TR95B.DWG



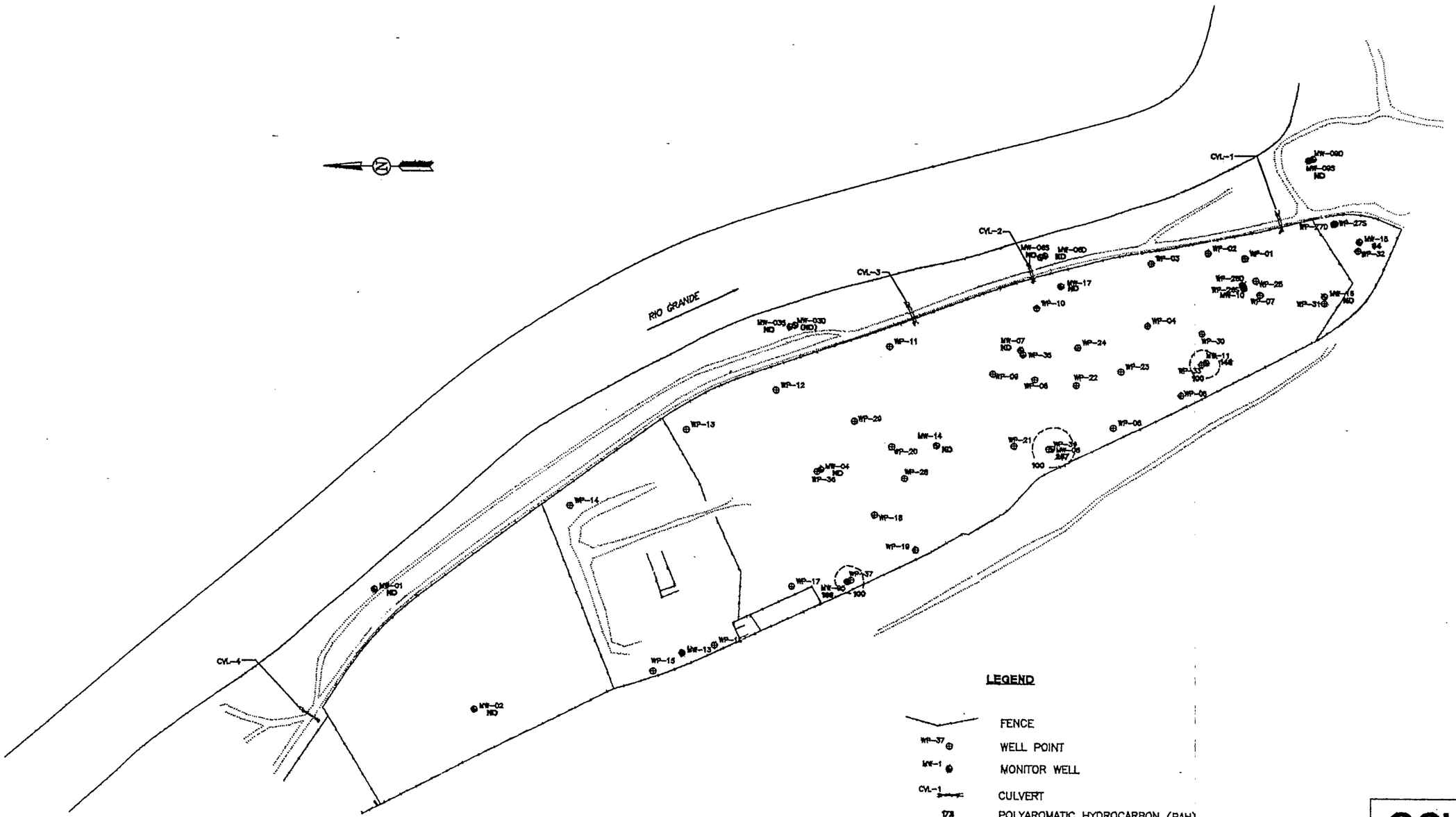
LEGEND

- FENCE
- WP-37 ⊕ WELL POINT
- MW-1 ● MONITOR WELL
- CVL-1 CULVERT
- 172 POLYAROMATIC HYDROCARBON (PAH) CONCENTRATION (μg/L)
- ND NOT DETECTED (<10 μg/L)
- (178) CONCENTRATIONS IN PARENTHESIS WERE NOT USED IN CONTOURING BECAUSE SCREEN INTERVALS WERE AT A DEEPER DEPTH
- PAH CONCENTRATION CONTOUR (DASHED WHERE INFERRED)

GCL

FIGURE 15c
POLYAROMATIC HYDROCARBON (PAH) CONCENTRATION CONTOUR MAP IN GROUNDWATER
6TH QUARTER (MARCH 1994)
BRICKLAND REFINERY SITE

CLIENT:	REXENE
DATE:	9/13/95
AUTHORED BY:	JH
DRAWN BY:	MP
CHECKED BY:	MWS
DWG. NO.:	\REXENE\1QTR95c.DWG



LEGEND

- FENCE
- WP-37 ⊕ WELL POINT
- MW-1 ⊕ MONITOR WELL
- CVL-1 CULVERT
- 173 POLYAROMATIC HYDROCARBON (PAH) CONCENTRATION (μg/L)
- ND NOT DETECTED (<10 μg/L)
- (179) CONCENTRATIONS IN PARENTHESIS WERE NOT USED IN CONTOURING BECAUSE SCREEN INTERVALS WERE AT A DEEPER DEPTH
- PAH CONCENTRATION CONTOUR (DASHED WHERE INFERRED)

GCL

FIGURE 15d
POLYAROMATIC HYDROCARBON (PAH) CONCENTRATION CONTOUR MAP IN GROUNDWATER (DECEMBER 1994)
BRICKLAND REFINERY SITE

CLIENT:	REXENE
DATE:	9/13/95
AUTHORED BY:	JH
DRAWN BY:	MP
CHECKED BY:	MWS
DWG. NO.:	\REXENE\10TR95d.DWG

Brickland Refinery Site
Quarterly Analytical Results
(All results in µg/L except TPH in mg/L)

MW-1

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	ND	ND	1.3	ND	ND	NS	NS	NS
Toluene	750	0.1 µg/L	ND	ND	ND	ND	ND	NS	NS	NS
Ethyl Benzene	750	0.5 µg/L	ND	ND	ND	ND	ND	NS	NS	NS
Xylenes	620	0.5 µg/L	ND	ND	ND	ND	ND	NS	NS	NS
TPH	None	0.1 mg/L	0.1	ND	NA	NA	NA	NS	NS	NS

MW-2

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	NS	ND	ND	ND	ND	NS	NS	NS
Toluene	750	0.1 µg/L	NS	18	ND	ND	ND	NS	NS	NS
Ethyl Benzene	750	0.5 µg/L	NS	3.2	ND	ND	ND	NS	NS	NS
Xylenes	620	0.5 µg/L	NS	49	ND	ND	ND	NS	NS	NS
TPH	None	0.1 mg/L	NS	0.5	NA	NA	NA	NS	NS	NS

MW-3S

Parameter	WQCC Std.	Detection Limit	12/08/93	03/25/94	07/12/94	09/28/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	ND	ND	0.8	ND	ND	ND	ND	NS
Toluene	750	0.1 µg/L	ND	4.9	ND	ND	ND	ND	ND	NS
Ethyl Benzene	750	0.5 µg/L	ND	ND	ND	ND	ND	ND	ND	NS
Xylenes	620	0.5 µg/L	ND	18	ND	ND	ND	ND	ND	NS
TPH	None	0.1 mg/L	0.1	ND	NA	NA	NA	NA	NA	NS

Brickland Refinery Site
Quarterly Analytical Results
(All results in µg/L except TPH in mg/L)

MW-3D

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	07/12/94	09/28/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	ND	ND	0.6	ND	ND	ND	ND	ND
Toluene	750	0.1 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	750	0.5 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	620	0.5 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
TPH	None	0.1 mg/L	0.1	ND	NA	NA	NA	NA	NA	NA

MW-4

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	NS	130,110	1800	2000	220	220	NS	NS
Toluene	750	0.1 µg/L	NS	ND,ND	12	ND	ND	ND	NS	NS
Ethyl Benzene	750	0.5 µg/L	NS	2.5,1.6	50	ND	ND	6	NS	NS
Xylenes	620	0.5 µg/L	NS	ND,ND	ND	ND	ND	ND	NS	NS
TPH	None	0.1 mg/L	NS	ND,ND	NA	NA	NA	NA	NS	NS

MW-5

Parameter	WQCC Std.	Detection Limit	12/08/93	03/24/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	NS	7100	5000,4200	5600	4600	4700	NS	NS
Toluene	750	0.1 µg/L	NS	160	ND,ND	ND	84	100	NS	NS
Ethyl Benzene	750	0.5 µg/L	NS	53	ND,ND	ND	ND	70	NS	NS
Xylenes	620	0.5 µg/L	NS	420	130,130	160	140	280	NS	NS
TPH	None	0.1 mg/L	NS	12	NA,NA	NA	NA	NA	NS	NS

Brickland Refinery Site
Quarterly Analytical Results
(All results in µg/L except TPH in mg/L)

MW-6S

Parameter	WQCC Std.	Detection Limit	12/08/93	03/25/94	07/12/94	09/28/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	71	74	110	4.8	59	110	NS	NS
Toluene	750	0.1 µg/L	ND	ND	ND	2.8	ND	7	NS	NS
Ethyl Benzene	750	0.5 µg/L	52	12	30	34	ND	32	NS	NS
Xylenes	620	0.5 µg/L	ND	7.6	88	16	ND	43	NS	NS
TPH	None	0.1 mg/L	2.9	1.8	NA	NA	NA	NA	NS	NS

MW-6D

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	07/12/94	09/28/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	ND	ND	ND	ND	ND	ND	ND	ND,ND
Toluene	750	0.1 µg/L	ND	ND	ND	ND	ND	ND	ND	ND,ND
Ethyl Benzene	750	0.5 µg/L	ND	ND	ND	ND	ND	ND	ND	ND,ND
Xylenes	620	0.5 µg/L	ND	1.6	ND	ND	ND	ND	ND	ND,ND
TPH	None	0.1 mg/L	0.1	ND	NA	NA	NA	NA	NA	NA

MW-7

Parameter	WQCC Std.	Detection Limit	12/08/93	03/24/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	NS	31	ND	ND	36	100	NS	NS
Toluene	750	0.1 µg/L	NS	ND	ND	ND	ND	ND	NS	NS
Ethyl Benzene	750	0.5 µg/L	NS	2.1	ND	3.6	ND	ND	NS	NS
Xylenes	620	0.5 µg/L	NS	0.6	3.2	1.3	ND	ND	NS	NS
TPH	None	0.1 mg/L	NS	ND	NA	NA	NA	NA	NS	NS

Brickland Refinery Site
Quarterly Analytical Results
(All results in µg/L except TPH in mg/L)

MW-8

Parameter	WQCC Std.	Detection Limit	12/08/93	03/24/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	NS	9600	2400	13000	5300	14000	NS	NS
Toluene	750	0.1 µg/L	NS	ND	ND	ND	ND	ND	NS	NS
Ethyl Benzene	750	0.5 µg/L	NS	ND	ND	ND	ND	ND	NS	NS
Xylenes	620	0.5 µg/L	NS	720	ND	ND	140	1100	NS	NS
TPH	None	0.1 mg/L	NS	ND	NA	NA	NA	NA	NS	NS

MW-9S

Parameter	WQCC Std.	Detection Limit	12/08/93	03/25/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	750	0.1 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	750	0.5 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	620	0.5 µg/L	ND	ND	0.6	ND	ND	0.6	ND	ND
TPH	None	0.1 mg/L	0.1	ND	NA	NA	NA	NA	NA	NA

MW-11

Parameter	WQCC Std.	Detection Limit	12/08/93	03/25/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	NS	120	ND	15	15	0.6	NS	NS
Toluene	750	0.1 µg/L	NS	0.7	ND	2.3	ND	ND	NS	NS
Ethyl Benzene	750	0.5 µg/L	NS	4.7	ND	8.9	ND	ND	NS	NS
Xylenes	620	0.5 µg/L	NS	4.4	ND	9.4	2.5	ND	NS	NS
TPH	None	0.1 mg/L	NS	1.0	ND	NA	NA	NA	NS	NS

Brickland Refinery Site
Quarterly Analytical Results
(All results in µg/L except TPH in mg/L)

MW-12

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	06/27/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	ND	ND	1.9	ND	ND	15	NS	NS
Toluene	750	0.1 µg/L	ND	ND	ND	ND	ND	ND	NS	NS
Ethyl Benzene	750	0.5 µg/L	ND	ND	ND	ND	ND	ND	NS	NS
Xylenes	620	0.5 µg/L	ND	ND	ND	ND	ND	ND	NS	NS
TPH	None	0.1 mg/L	0.1	ND	ND	NA	NA	NA	NS	NS

MW-14

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	07/12/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	--	--	23000	2900	930	1100	NS	NS
Toluene	750	0.1 µg/L	--	--	ND	ND	ND	ND	NS	NS
Ethyl Benzene	750	0.5 µg/L	--	--	ND	ND	ND	25	NS	NS
Xylenes	620	0.5 µg/L	--	--	ND	ND	ND	ND	NS	NS
TPH	None	0.1 mg/L	--	--	NA	NA	NA	NA	NS	NS

MW-15

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	06/28/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	--	--	34	270	290	NA	NS	90
Toluene	750	0.1 µg/L	--	--	ND	ND	ND	NA	NS	ND
Ethyl Benzene	750	0.5 µg/L	--	--	13	21	ND	NA	NS	ND
Xylenes	620	0.5 µg/L	--	--	13	60	ND	NA	NS	ND
TPH	None	0.1 mg/L	--	--	NA	NA	NA	NA	NS	NA

Brickland Refinery Site
Quarterly Analytical Results
(All results in µg/L except TPH in mg/L)

MW-16

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	06/28/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	--	--	ND,ND	ND	ND	ND	ND	ND
Toluene	750	0.1 µg/L	--	--	ND,ND	ND	ND	ND	ND	ND
Ethyl Benzene	750	0.5 µg/L	--	--	ND,ND	ND	ND	ND	ND	ND
Xylenes	620	0.5 µg/L	--	--	2,11	ND	ND	ND	ND	ND
TPH	None	0.1 mg/L	--	--	NA	NA	NA	NA	NA	NA

MW-17

Parameter	WQCC Std.	Detection Limit	12/08/93	03/23/94	06/28/94	09/27/94	12/13/94	03/28/95	06/21/95	09/26/95
Benzene	10	0.5 µg/L	--	--	17	46,68	460	67	NS	NS
Toluene	750	0.1 µg/L	--	--	ND	21,25	ND	ND	NS	NS
Ethyl Benzene	750	0.5 µg/L	--	--	19	35,41	10	ND	NS	NS
Xylenes	620	0.5 µg/L	--	--	30	8,9.2	10	ND	NS	NS
TPH	None	0.1 mg/L	--	--	NA	NA	NA	NA	NS	NS

Notes: -- = Well did not exist
NA = Not available
ND = Not detected
NS = Not sampled
TPH = Total petroleum hydrocarbon
µg/L = Micrograms per liter
mg/L = Milligrams per liter