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REPORTS

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GROUNDWATER TECHNOLOGY

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April 13, 1995

Mr. Greg J. Lyssy
Project Coordinator
RCRA Technical Section - Enforcement Branch
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

FEDERAL EXPRESS DELIVERY

RE: Bloomfield Refining Company
#50 County Road 4990
Bloomfield, New Mexico
EPA ID No. NM089416416
Administrative Order on Consent - Docket No. VI-303-H
Response to USEPA Comments on the Draft RFI/CMS Report

Dear Mr. Lyssy:

This submittal provides Bloomfield Refining Company's (BRC) response to the USEPA comments on the draft *RCRA Facility Investigation/Corrective Measure Study Report* dated November 8, 1994, received on March 14, 1995. The format and content of our responses was discussed with you during our meeting in your offices on April 5, 1995. As indicated to you at that time, BRC intends to prepare a separate Corrective Measure Study (CMS) to comply with the outline in the Administrative Order on Consent, and will submit it within 60 days following approval of the final RCRA Facility Investigation (RFI) report. These responses therefore apply to the RFI portion of the USEPA's comments.

Should you have any questions or comments concerning this submittal, please do not hesitate to contact Chris Hawley of BRC at (505) 632-8013 or me at (505) 242-3113.

Sincerely,
Groundwater Technology, Inc.

Cymantha Liakos

Cymantha Liakos
Project Manager

cc: D. Roderick - BRC
J. Warr - BRC
R. Anderson - NMOCD
C. Muckelroy - NMED

RESPONSE TO USEPA COMMENTS ON THE 11/08/94 DRAFT RFI/CMS REPORT
BLOOMFIELD REFINING COMPANY

RFI REPORT GENERAL COMMENTS

GENERAL COMMENTS 1 AND 2:

Soil Background Concentrations and Groundwater Background Concentrations

The draft RFI report repeatedly states that metal concentrations in soil samples are within the range of naturally occurring metals. However, the draft report does not contain any information on the collection of background soil samples, or how the background results were determined. BRC shall describe background samples that were obtained or collect background samples from either (1) on-site locations that have not been affected by industrial activity, or (2) nearby off-site locations of similar soil types that have not been affected by industrial activity. Once the background samples have been obtained, an appropriate method of statistical evaluation, such as an analysis of variance (ANOVA) technique, should be utilized to determine the extent of soil contamination by metals. This comment must be addressed each time the draft RFI report discusses metal concentrations in soils.

The draft report does not contain any information on background groundwater samples for metals analysis, or how the naturally occurring levels in the groundwater were determined. BRC should describe the background samples that were obtained or collect background samples from either (1) on-site locations that have not been affected by industrial activity, or (2) nearby off-site monitoring well locations that have not been affected by industrial activity. Once the background samples are obtained an appropriate method of statistical evaluation, such as the ANOVA technique, should be utilized to determine the range for background metal concentrations in groundwater.

Response: Background metal concentrations for both soils and groundwater have been established based upon either historical background groundwater monitoring wells (MW-1, MW-5, and MW-8) which are up-gradient to the various solid waste management units or soil borings (B-7, B-8, B-9, and B-10) which did not exhibit any contamination (no detectable VOCs or SVOCs) and were located in relatively undisturbed areas of the site.

Background values for metals in soil, sediment and groundwater were established using a statistical procedure more commonly referred to as calculation of tolerance limits. The tolerance limit establishes a concentration limit which would be considered a maximum background value. These limits can be compared to the data collected from the site. If concentrations are less than the calculated limits, then the location can be considered free of impacts related to site activities. If the concentration of the sample exceeds the background limit, then that location has a reasonable probability of not being a typical background concentration and therefore would be considered impacted by site activities.

A description of the procedures is presented in Attachment A of this document. Tables 1, 2, 3, and 4 provide a summary of the background data along with the calculated limits. The concentrations of metals in soil and groundwater that were presented in the RFI are less than the calculated background values in all cases except for lead in the 10-12 foot sample boring B-4 (11 mg/kg), which exceeded the background level of 5

mg/kg. This sample contained 0.0065 mg/kg of toluene and 0.13 mg/kg of acetone. The sample collected from B-4 from 8-10 feet contained higher concentrations of VOCs but no detectable lead, suggesting that the lead in the deeper interval is not related to hydrocarbons. Additionally, a preliminary remediation goal of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, OSWER Directive #9355.4-12, USEPA, July 14, 1994. The 11 mg/kg concentration of lead in B-4 (10-12') is well below the 400 mg/kg value.

The calculated limits for metals in sediments were exceeded for copper in HD-4B, selenium in HD-1B, and zinc in HD-8S, although no hydrocarbons were detected in any of these samples. The metals are not believed to be derived from facility operations. The three most downstream sample locations did not contain metal concentrations exceeding tolerance limits.

Based on this analysis, metal concentrations in the soil, sediment and water samples collected at the site can be considered to be free of impact related to site activities.

GENERAL COMMENT 3:

Complete Delineation of Groundwater Contamination

The draft RFI report states that the horizontal extent of groundwater contamination has been determined in all directions except for southwest corner of the facility. However, MW-30 and MW-31, in the south central part of the facility, had VOC concentrations of 50,000 micrograms per liter (ug/l) and 64,800 ug/l, respectively. The only groundwater monitoring well located south of MW-30 is MW-6, at a distance of approximately 900 feet, and it has been dry for the duration of the RFI. Additional groundwater monitoring is needed in this area to fully delineate the extent of contamination.

Response: Based on geologic and hydrologic conditions in the vicinity of MW-30 and MW-31, the contamination present in these wells is believed to be associated with the area of separate phase hydrocarbons in the central area of the plant rather than being separate areas of contamination. MW-30 is located within the product storage area, and MW-31 is located along the southern margin of the area with SPH. If a significant area of contamination were present south of MW-30, it is likely that the westerly groundwater gradient would have transported contamination to the vicinity of MW-13. The last water sample collected from MW-13 was free of measurable concentrations of hydrocarbons and therefore provides an indirect means for defining the contamination south of MW-30.

In addition, a previous investigation (Engineering-Science, Inc, February 8, 1987) demonstrated that the top of the Nacimiento Formation increases in elevation south of the site. The screened interval of MW-6 extends to the top of the Nacimiento in an area where the Nacimiento is above the water table and overlying sediments are unsaturated. The saturated thickness at MW-30 is approximately 5 feet. Moving toward, MW-6, the saturated thickness would be expected to decrease to less 1 foot well before reaching MW-6. Therefore, the pinching out of the aquifer south of MW-30 delineates the extent of groundwater contamination.

Contamination in the vicinity of MW-30 and MW-31 will be addressed in the CMI, along with the SPH in the central part of the facility.

In addition, all of the monitoring and recovery wells in the northwest corner of the facility, located inside Hammond ditch, contain Separate Phase Hydrocarbon (SPH). The only monitoring well located north of Hammond ditch is MW-24. MW-24 has been dry for the duration of the RFI. Additional groundwater monitoring north and west of Hammond ditch is needed to fully delineate the extent of contamination in this area.

The draft RFI report does not contain any thickness maps showing the limits of groundwater contamination. These maps must be compiled to show the limits of groundwater contamination across the facility as well as off-site.

Response: The topography and soil stability on the north and west side of Hammond Ditch is not favorable for the installation of monitor wells. In addition, this strip of land is less than 50 feet in width in many places and installation of wells in this area would not result in significantly better plume definition than the current estimate that the plume boundary is between the SPH bearing wells in this area of the site and the outcrop of the Nacimiento at the bluff's edge. Currently, the Hammond Ditch is believed to represent a barrier to the migration of SPH. Residual hydrocarbons associated with historical hydrocarbon seeps along the river bluff are believed to be minimal due to the passage of time, the coarse-grained nature of the sediments in the saturated zone and the continual flushing by water infiltrating at the Hammond Ditch and discharging as seeps.

Additional monitoring wells will yield no added value in this area since hydrocarbons have been detected in the seeps and the area in-between is considered impacted. The next course of action should be remediation of SPH, which will result in eventual diminishment of hydrocarbons between the facility and the bluff.

Figures 4, 5, 6, 7, 8, 9, and 10 depict the extent of SPH, total targeted volatile organics, and total targeted semi-volatile organics, based on the May 24-25, 1994 monitoring data and the August 3-4, 1994 monitoring data. The maps show two main areas of hydrocarbon contamination. Dissolved hydrocarbon and SPH plumes are present along much of the south side of the facility extending southwest along the El Paso Natural Gas pipeline. The levels of SPH in this area are currently controlled by a number of recovery wells. Three additional monitor wells have been installed southwest of the site and plume definition is essentially completed with these wells (the results will be forwarded to USEPA before 1 May 1995). In the northwest corner of the site, another area of hydrocarbon contamination is present. In this area, a thin accumulation of SPH has been identified.

GENERAL COMMENT 4:

Groundwater Level in Monitoring Well MW-12

The potentiometric level in monitoring well MW-12 is approximately 10 feet below the potentiometric level in the nearest well. The draft RFI report does not discuss or explain the reasons for this extreme difference in the water levels. Is this well monitoring a different water-bearing strata? If so, which aquifer? A discussion on monitoring well MW-12 must be provided in the RFI report.

Response: Attachment B contains a copy of the well log for monitoring well MW-12. Well MW-12 is a relatively shallow well. The borehole extended to 17 feet and the screen was installed from 4 to 14 feet which extends to the top of the Nacimiento Formation. The elevation

of the top of bedrock in this area is approximately 8 feet lower than in nearby monitoring well MW-11. Since the perched aquifer follows the bedrock contour, groundwater elevations are also lower in this area than in other site wells.

GENERAL COMMENT 5:

Cross Sections

The draft RFI report does not contain any cross sections depicting subsurface geology. As such, the subsurface stratigraphy is difficult to analyze on a site-wide basis. All future submissions must contain the appropriate cross-sections, utilizing available soil borings, recovery wells, and groundwater monitoring wells to adequately characterize subsurface geology.

Response: The locations of the cross sections that have been developed are shown on Figure 1. Cross Section A-A' is shown as Figure 2 and represents a northwest to southeast profile of the site geology and hydrogeology. In general, both the surface topography and the surface of the Nacimiento dip to the west. With the exception of the area around Hammond Ditch, water elevations across the site decrease toward the west and define a relatively shallow, westward trending groundwater gradient. At Hammond Ditch, the saturated zone beneath the ditch is shown as a barrier to the migration of SPH to the north. The primary stratigraphic units in the line of section are clay and silty clay, sand and silty sand, sand with gravels and cobbles, and a gravel/cobble layer. The primary saturated zone across the site is a gravel and cobble layer that is present across much of the site. Cross section B-B' (Figure 3) is a southwest to northwest section through the western area of the facility. Stratigraphic units are similar to those shown on cross section A-A'.

GENERAL COMMENT 6:

Uppermost Aquifer Hydraulic Testing and Modeling

The Uppermost Aquifer Hydraulic Testing and Modeling (UAHTM) report states that the optimum design of a groundwater/product removal system can be best achieved utilizing flow models. The report does not state what computer modeling program and process will be utilized by BRC to design a groundwater/product removal system. Specific information on the modeling program and its application must be presented in order for EPA to determine the adequacy of such a design. This information would include a description of validation procedures, calibration methods, and process for determining aquifer boundary conditions. Please refer to Assessment Framework for Groundwater Model Applications, OSWER Directive #9029.00, EPA 500-B-94-003, July 1994, for guidance regarding the information that should be supplied to support a modeling design process.

Response: BRC does not feel this information is pertinent to the RFI and should not delay approval of the RFI Report. Information about the modeling program is related to the Corrective Measure Implementation (CMI) plan, which has yet to be developed. However, a general discussion of the modeling effort is provided herein:

As mentioned in section 5.0 of the UAHTM report, preliminary modeling was performed to evaluate the effects of groundwater pumping on the water levels of the uppermost aquifer and to estimate the transient capture zone in the vicinity of one pumping well, RW-22. The model was not developed to encompass the entire site or to design pump-

and-treat system to capture the dissolved hydrocarbon plume.

As part of the CMI plan development, additional modeling will be conducted using FLOWPATH. FLOWPATH, a two-dimensional numerical aquifer modeling code, calculates steady-state hydraulic head and drawdown distributions, groundwater velocities, pathlines, travel times, capture zones, and water balance (budget) throughout the model. The FLOWPATH model for this site would be developed and calibrated using constant head boundary conditions and flux nodes to simulate natural, pre-existing steady-state groundwater levels.

The model design would be derived from actual field conditions such as the vertical and lateral limits of the aquifer, geologic and hydraulic boundaries, variations in lithologies, and the presence of the irrigation canal north and northwest of the site. The calibration will consist of an evaluation of the budget (water-balance) within less than 2%, and a comparison to historic and static groundwater flow and gradients. A sensitivity analysis will be conducted by systematically adjusting the variables such as infiltration and groundwater flux or recharge, and by examining the resulting output to determine which parameters affect results the most. Modeling procedures would be documented in the CMI plan that would include figures depicting the model grid, the calibrated steady-state conditions, and the results of simulations involving multiple pumping wells.

After the model calibration and sensitivity analysis is complete, configurations for pumping wells would be simulated over a number of years to determine the extent of capture in the vicinity of pumping wells. After each simulation, transient flowpath and capture zones would be evaluated. The product of this effort would be locations and pumping rates for recovery wells that represent the best configuration for the capture of the downgradient edge of the plume. After the system is installed (or upgrades to the existing system are completed), the model will be validated by comparing actual drawdown observed in the pumping wells and nearby monitor wells to the drawdown simulated by the model.

Sufficient information is available from the RFI to perform the modeling described above.

Appendix G of the UAHTM report generally describes how Jacob's method of analysis was utilized for the determination of aquifer characteristics. Appendix G did not include detailed calculations regarding this analysis method and therefore, EPA cannot determine if this method was correctly applied. BRC shall include detailed calculations to illustrate how the aquifer parameters were determined. These calculations shall include a description of the data points that should not be included (i.e. due to the error for small time in the logarithmic approximation) in the determination of the straight line within the method.

Response: Detailed calculations are included on each plot (Appendix G), showing the time-recovery data collected in observation wells MP-3 and MP-4 (Appendix E), and in test well RW-22 (Appendix F). The slope of the water level recovery straight line(s), calculated from an observation well per one log-cycle, is used to solve the transmissivity equation using the well discharge rate. If observation wells are not present or if drawdown in the observation wells are insignificant, data from the pumping well can be used for the calculation of aquifer's transmissivity. Storage coefficient (S) cannot be calculated from the pumping well data.

The corrected time-recovery data for the observation wells MP-3 and MP-4 are plotted as water level recovery versus the log of time since pumping stopped. The drawdown data from these observation wells were corrected for liquid-phase hydrocarbons using the measured apparent thickness in the wells and the known specific gravity of the hydrocarbons. Time-recovery data from test well RW-19 was not used for analysis because the liquid-phase hydrocarbons were bailed from the well after pumping to estimate the rate of hydrocarbon recharge into the well. Because the liquid-phase hydrocarbon accumulation rate was variable in the observation wells (MP-3 and MP-4) during pumping of well RW-19, the aquifer test was curtailed and time-drawdown data were not used for aquifer characterization. Time-recovery data were used, however, to estimate the aquifer transmissivity and storage coefficient with the knowledge that the liquid-phase hydrocarbons probably effected the data, and the results may not be representative of the actual aquifer transmissivity. For this reason, additional testing was performed in a different area, using well RW-22.

Time-recovery data from the second of two steps of pumping from well RW-19 were used to estimate aquifer properties. The flow rate of 2 GPM during pumping step 2 was used for the data interpretation. Using the data collected in observation well MP-3, located 22.5 feet downgradient of pumping well RW-19, the slope of one straight line representing the entire recovery data resulted in a transmissivity value of 1,412 Ft^2/day and a storativity value of 0.015, representing unconfined aquifer conditions. However, data from observation well MP-4 indicate that two straight lines can be used for the calculation. The first line from the first twenty minutes of recovery resulted in a transmissivity value (T_1) of 746 Ft^2/day and a storativity (S_1) of 0.01, representing unconfined aquifer conditions (see revised calculation in Appendix G). The second line from the remaining 90 minutes of recovery resulted in a transmissivity value (T_2) of 850 Ft^2/day and a storativity (S_2) of 0.0045, representing semi-confined aquifer conditions. These values are affected by the presence of free product within the cone-of-depression.

During the additional testing using well RW-22, a step-drawdown test using three steps and a constant discharge-rate test were performed. Drawdown in the distant observation wells was insignificant and cannot be attributed to pumping. For this reason, only time-recovery data from test well RW-22 were used to estimate aquifer transmissivity. Time-recovery data were plotted as residual drawdown (being the difference between the static water level and the transient recovery level) versus dimensionless time (calculated as time since pumping started divided by time since pumping stopped). The straight line was drawn through the final 775 minutes of time-recovery data. The early portion of the time-recovery data, shown in the graph during approximately 135 minutes before cessation of pumping, represents the recovery of water level during the declining pumping rate caused by the pump failure. This portion of the data does not represent recovery period or aquifer response because pumping was in progress. Therefore, it was not used for interpretation, but is included in the data files and appears on the time-recovery graphs to document the entire test.

It should be noted here that during the second revision of the recovery data analysis, two values for the transmissivity and storativity can be calculated from observation well MP-4 (see Attachment C of this submittal). The values representing the first twenty minutes of recovery was probably affected by the presence of thicker SPH within the cone-of-depression. This results in estimated aquifer transmissivity T_1 of 5,586 gpd/ft and an estimated storage coefficient of S_1 of 0.01. The data representing the later recovery period resulted in higher transmissivity value, T_2 6,361 gpd/ft, and lower storativity, S_2 of 0.0045. Comparing the hydraulic parameters in two directions from the

pumping well calculated from observation wells MP-3 and MP-4, it appears that the aquifer is anisotropic and more permeable in the downgradient direction of flow, towards the northwest.

The second revision of water level recovery data of well RW-22 indicated that the slope of the straight line is 0.6 feet rather than 0.4 feet. This has resulted in a transmissivity value of 1,723 gpd/ft (230 Ft^2/day).

RFI REPORT SPECIFIC COMMENTS

Section 1.3, Phase II RFI - Soil Boring Investigation, page 3, last paragraph

The draft RFI report states that several metals were detected in soil samples, but concentrations were well within the range of background concentrations in soil. However, the draft report does not contain any information on the collection of background soil samples, or how the background results were determined. BRC shall describe the background samples that were obtained or collect background samples from either (1) on-site locations that have not been affected by industrial activity, or (2) nearby off-site locations of similar soil types that have not been affected by industrial activity. Once the background samples have been obtained, an appropriate method of statistical evaluation, such as an analysis of variance (ANOVA) technique should be utilized to determine the extent of soil contamination.

Response: Please see the response to comments 1 and 2 in the general comments section above. Table 3 of Attachment A contains data and calculations.

Section 1.3, Phase II RFI - Soil Boring Investigation, page 4, first paragraph

The draft RFI report states that three soil samples from the crude/product loading area contained detectable VOCs but the concentrations are not believed to be indicative of a release or contaminant source area requiring further delineation or remediation and no further action is proposed for the area....

These concentrations indicate that there has been a release to the environment. The full extent of the release must be therefore delineated. The location of the two borings with respect to the loading operations must be presented in greater detail. Are the two borings near the loading area, or are they located near the boundary of this SWMU? Additional information will be required in this area prior to determining no further action. The rationale for not fully delineating the release from this SWMU must be presented.

Response: Figure 10 shows the locations of soil borings B-3 and B-4. Soil boring B-4 is located near the sump pump approximately 50 feet from the product loading bays (the most likely location of a release). Soil boring B-3 is located within 50 feet the crude oil receiving area and the pipeline that extends from this area. Had significant releases occurred in these areas, the borings would have detected some evidence of these releases. Instead, the hydrocarbon concentrations in this area are near method detection limits and unlikely to represent a threat to groundwater through leaching. The hydrocarbon levels in the samples collected from B-3 and B-4 are believed to be the cumulative affect of product handling/ incidental spillage in this area and do not suggest that additional assessment is needed in this area.

Constituent	Residential Soil Level*	Industrial Soil Level*	B-3 (6-8')	B-4 (8-10')	B-4 (10-12')
Acetone	7,800	100,000	ND	ND	0.13
Benzene	22	99	ND	0.012	ND
Ethylbenzene	7,800	100,000	ND	0.004	ND
m,p-Xylene	160,000	1,000,000	ND	0.031	ND
o-Xylene	160,000	1,000,000	ND	0.022	ND
Toluene	16,000	200,000	ND	0.023	0.006
Methylene Chloride	85	380	0.11	ND	ND

Concentrations are in mg/kg.
* Denotes EPA Region III Risk-Based Concentrations (R.L. Smith, 11/08/94).
ND - Not Detected

As shown on the table above, when the concentrations of VOCs detected in soil samples from borings B-3 and B-4 are compared to USEPA Region III Risk-Based Concentrations for these constituents, they are orders of magnitude below both residential and industrial soil levels.

Metals concentrations in these soil samples were addressed under the response to General Comments 1 and 2. All concentrations were less than calculated background levels, with the exception of lead in the 10-12 foot sample from B-4 (11 mg/kg). This concentration is well below the preliminary remediation goal of 400 mg/kg for lead set based on the *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, OSWER Directive #9355.4-12, USEPA, July 14, 1994.

Section 1.4.1, First Groundwater Sampling Event, page 6, third paragraph

The draft RFI report states that metal concentrations in the groundwater monitoring wells are within background ranges and are below MCLs, indicating that metals are not constituents of concern at the BRC site. The following table summarizes the metal concentration levels in samples from the groundwater monitoring wells....

These concentrations indicated that there has been a release to the environment from the facility. The full extent of the release must therefore be delineated. The draft RFI report does not contain any information on background concentrations of metals in the groundwater. As such, additional groundwater monitoring will be required. This information must be provided.

Response: Pursuant to the above response for general comments 1 and 2, background concentrations for the four constituents have been calculated for groundwater. Historic data from wells MW-1, MW-5 and MW-8 were used since these wells are located upgradient of SWMUs, are monitored regularly, and generally do not contain detectable VOCs or SVOCs. The limits are as follows (see Tables 1 and 2 of Attachment A):

Arsenic:	0.179 mg/L
Chromium:	0.026 mg/L
Lead:	0.332 mg/L
Zinc:	0.532 mg/L

These values represent a reasonable estimate of what could be considered a background groundwater concentration for this site. Since all values reported in the table in the comment are less than the established limits, it is reasonable to conclude that the groundwater has not been impacted by the four analytes that were detected in the water samples. Therefore, additional groundwater monitoring for metals is not warranted.

Section 1.4.2, Second Groundwater Sampling Event, page 7, fourth paragraph

The draft RFI report states that metal concentrations in the groundwater monitoring wells are within background ranges and are below MCLs, indicating that metals are not constituents of concern at the BRC site. The following table summarizes the metal concentration levels in samples from the groundwater monitoring wells....

These concentrations indicated that there has been a release to the environment from the facility. The full extent of the release must therefore be delineated. The draft RFI report does not contain any information on background concentrations of metals in the groundwater. Additional groundwater monitoring will be required. This information must be provided.

Response: Similar to the response to the comment above, background levels have now been calculated for the four analytes. All values reported in the table in the comment are less than the estimated limits. Therefore, groundwater has not been impacted by the four analytes.

Section 1.4.2, Second Groundwater Sampling Event, page 8, first paragraph

The draft RFI report states that delineation of the horizontal extent of dissolved contamination is complete except to the southwest. EPA agrees that further delineation is needed in the southwest portion of the site. However, further delineation is also needed in the southern portion of the site as well as the northwest quadrant of the site.

Specifically, monitoring wells MW-30 and MW-31, in the central southern part of the facility, had VOC concentrations of 50,000 ug/l and 64,800 ug/l, respectively. The only groundwater monitoring well located south of MW-30 is MW-6, at a distance of approximately 900 feet, and it has been dry for the duration of the RFI. Additional groundwater monitoring is needed in this area to fully delineate the extent of contamination.

In addition all of the monitoring and recovery wells in the northwest corner of the facility, located inside Hammond ditch, contain Separate Phase Hydrocarbon (SPH). The only monitoring well located north of the Hammond ditch is MW-24. MW-24 has been dry for the duration of the RFI. Additional groundwater monitoring north and west of Hammond ditch is needed to fully delineate the extent of contamination in this area.

Response: See response to general comment 3.

Section 1.5.1, Aquifer Testing, pages 8-10

The draft RFI report indicates that several problems were encountered during the aquifer testing of wells RW-19 and RW-22. These problems include: 1) pump failure in well RW-22, 2) a leaking hose in RW-19, and 3) rapid accumulation of SPH in the cone-of-depression during pumping of RW-19, causing a premature end to the variable rate pumping test. The draft RFI report states that enough information was collected during the aquifer testing to develop the appropriate corrective measures. BRC must provide the documentation which substantiates that the aquifer testing is adequate and provides the required information.

Response: 1) The failure of pump in well RW-22 was due to the presence of dissolved hydrocarbon in groundwater. This observation shall be addressed during the selection of compatible pumps for the final design of the remediation system. 2) The leaking hose in pumping well RW-19 was immediately fixed before starting step one at 11:59 AM. The leak did not affect the test or the water level data. 3) As mentioned in section 4.0 of the report, Cooper and Jacob straight-line method; Appendix G, was used for the calculations of uppermost aquifer transmissivity, storativity, and hydraulic conductivity. A discussion of this method and its application can be found in Driscoll, 1989.
Groundwater Technology determined that enough information was collected during the aquifer testing to meet the objectives and to develop the appropriate corrective measures in the vicinity of the tested wells. The main objectives of the pumping test were to estimate the hydraulic parameters and the sustainable pumping rate from the tested wells. Test results indicate that pump-and-treat is a feasible alternative for the removal of dissolved hydrocarbon in groundwater. In addition, a sustainable pumping rate was sufficient to contain the volume of the natural groundwater flow under the existing field conditions.

Section 1.6.3, Results of Stream and Sediment Sampling, page 13

The draft RFI report states that Toluene was detected in three sediment samples from Hammond ditch. In addition, Phenanthrene and TPH were detected in two samples, and metals concentrations in the sediment samples were consistent with naturally occurring concentrations. Based on the sample analytical results, neither Hammond Ditch nor the San Juan River appear to have been significantly impacted, and no further action is proposed. The draft report does not determine the source of the Toluene, Phenanthrene, or TPH in the sediment samples and does not fully delineate the extent of contamination of these constituents. The complete extent of contamination in this area must be determined.

The draft report does not contain any information on the collection of background sediment samples, or how the background results were determined. BRC must provide information on the background samples or collect background sediment samples from either (1) on-site locations that have not been affected by industrial activity, or (2) nearby off-site locations of similar sediment types that have not been affected by industrial activity. Once the background samples are obtained, an appropriate method of statistical evaluation, such as the ANOVA technique, should be utilized to determine the extent of sediment contamination.

Response: It is agreed that extremely low concentrations of toluene and phenanthrene were detected in four of the twenty-one sediment samples collected during the RFI. It should be noted that the concentrations in the sediment for toluene were well below the

reported MCL for toluene (1.0 mg/L). In the event that toluene were released from the sediment, the resulting concentrations in groundwater would be much less than the MCL (note that water in the Hammond Ditch is not designated for potable use, so MCLs are conservative). Toluene is also volatile and readily biodegradable.

Although there no levels specific to stream sediments in the EPA Region III Risk-Based Concentrations, fish ingestion was considered in the exposure variables during the development of the risk-based levels. These levels are much more conservative than residential or soil levels and are used for comparison below (only toluene had a corresponding level):

Constituent	Fish Level	HD-4B	HD-5B	HD-7B	HD-9B
Toluene	270	ND	0.006	0.012	0.005
Phenanthrene	NE	1.3	ND	ND	1.2

Concentrations are in mg/kg.
* - Denotes EPA Region III Risk-Based Concentrations (R.L. Smith, 11/08/94).
NE - Not Established
ND - Not Detected

As shown, concentrations of toluene detected are well below the risk-based concentration. Based on this comparison and compared to the MCL, no further delineation or remediation is warranted.

As indicated in *Water-Related Environmental Fate of 129 Priority Pollutants, Volume 2, Halogenated Aliphatic Hydrocarbons, Halogenated Ethers, Monocyclic Aromatics, Phthalate Esters, Polycyclic Aromatic Hydrocarbons, Nitrosamines, and Miscellaneous Compounds*, Office of Water Planning and Standards, USEPA 440/4-79-029B, December 1979, the low concentrations of phenanthrene in the sediments do not appear to be significant when considering that phenanthrene is very insoluble in water (1.29 mg/L) and that the portion that does dissolve into the water column would most likely be rapidly degraded by photolysis. Phenanthrene strongly adsorbs onto sediment, reducing its exposure to the environment. This is evident from the high log octanal/water partition coefficient (4.44). Also, this compound is readily biodegraded. Given the extremely low concentrations of phenanthrene (1.3 mg/kg and 1.2 mg/kg), its strong adsorption to the sediments, and its ability to rapidly biodegrade, this compound should not be considered a concern.

It should also be noted that samples collected from the ditch did delineate the extent of hydrocarbon impacts. The most downstream samples had no detectable concentrations of toluene or phenanthrene (for lateral delineation). The limited depth (up to 4 feet) of sediments in the ditch delineates the vertical extent of impacts.

Similar to the procedure conducted for the soils and groundwater, an upper limit background concentration was calculated for the metals in the sediments. The methodology information is summarized in Attachment A of this submittal, with a summary of the data and limits presented in Table 4. All concentrations of metals were below calculated limits except:

- Copper in HD-4B was 180 mg/kg;
- Selenium in HD-1B was 11 mg/kg;
- Zinc in HD-8S was 180 mg/kg.

No VOCs or SVOCs were detected in any of these samples, so the occurence of metals is not associated with hydrocarbons. Metals are not constituents of concern at this site. None of the most downstream samples (HD-1, HD-2 and HD-3 side or bottom samples) exceeded the calculated limits. No further delineation or remediation is proposed.

Section 3.1.3.3, Crude and Product Loading Areas, page 30

The draft RFI report states that the crude and product loading areas and underground lines are locations of known or suspected releases. Low concentrations of BTEX were detected in one sample and the metals concentrations are within background ranges. These concentrations are not believed to be indicative of a contaminant source requiring further delineation or remediation and no further action is proposed. However, the constituent concentration levels for this area indicate that there has been a release to the environment. The full extent of the release must therefore be delineated. The location of the two borings with respect to the loading operations must be presented in greater detail. Are the two borings near the loading area, or are they located near the boundary of this SWMU? Additional information will be required in this area prior to determining no further action. The rationale for not fully delineating the release from this SWMU must be presented.

Response: See response above for Section 1.3, Phase II RFI - Soil Boring Investigation, page 4, first paragraph.

Section 4.1, Groundwater Contamination, page 35

The draft RFI report states that groundwater contamination has been delineated horizontally based on topography in the northwest (the bluff overlooking the San Juan River). However, all of the monitoring and recovery wells in the northwest corner of the facility, located inside the Hammond ditch, contain SPH. The only monitoring well located north of Hammond ditch is MW-24. MW-24 has been dry for the duration of the RFI. Additional groundwater monitoring north and west of Hammond ditch is needed in this area to fully delineate the extent of contamination. In addition, there have been historical oil seeps from the bluffs overlooking the San Juan River. These seeps will need to be remediated during the CMI phase. The facility must provide the information during the RFI/CMS that will be utilized to perform the corrective measures on the seeps.

Response: See response above for the second and third paragraphs of general comment 3.

Section 4.1, Groundwater Contamination, page 35

The draft RFI report states that groundwater contamination has been delineated horizontally based on non-detectable concentrations to the northeast, east and south and the absence of the shallow aquifer to the southeast (MW-6). However, MW-30 and MW-31, in the central southern part of the facility, had VOC concentrations of 50,000 ug/l and 64,800 ug/l, respectively. The only groundwater monitoring well located south of MW-30 is MW-6, a distance of approximately 900 feet, and it has been dry for the

duration of the RFI. Does BRC have additional information which indicates that the shallow aquifer pinches out towards the south? Additional groundwater monitoring is needed in this area to fully delineate the extent of contamination.

Response: See response above for the first paragraph of general comment 3.

Section 4.1, Groundwater Contamination, Constituents of Concern, page 36

The draft RFI report states that BTEX constituents were the only VOCs detected during the sampling events and SVOCs were detected at low concentrations in some samples. It is proposed that BTEX (Method 8020) only be utilized for future groundwater sample analysis. Analysis for SVOCs would resume for monitoring in support of site closure in the future. TPH and metals will be eliminated from the parameter list altogether. EPA concurs with the use of Method 8020 for VOC analysis. However, the following SVOCs have been detected in groundwater samples: 2,4-Dimethylphenol, 2-Methylnapthalene, 2-Methylphenol, 3-Methylphenol, Naphthalene, and Phenol. As such, Method 8270 analysis must continue for these SVOCs. In addition, the draft report does not contain any information on background groundwater samples for metals analysis, or how the naturally occurring levels were determined. BRC should provide information on background samples or collect background groundwater samples from either (1) on-site monitoring wells that have not been affected by industrial activity, or (2) off-site monitoring well locations that have not been affected by industrial activity. Metals analysis will continue until the appropriate background levels have been determined.

Response: Semi-volatile components were detected in nine of the eighteen monitor wells sampled during the RFI. The concentrations of the individual compounds are below 1 mg/l and are unlikely to represent a threat to human health or the environment. For screening purposes, the concentrations can be compared to the tap water standards developed for several of the components by EPA Region III (USEPA Region III Risk-Based Concentrations: R.L. Smith, 11/8/94) that are summarized below:

Contaminant	Tap Water Standard (ug/l)	Maximum Concentration (ug/l) at Site and Well from which Sample was Collected*
2,4-Dimethylphenol	730	160 (MW-30)
2-Methylnapthalene	---	580 (MW-30)
2-Methylphenol	1,800	82 (MW-31)
3-Methylphenol	1,800	210 (MW-31)
Naphthalene	---	850 (MW-30)
Phenol	22,000	110 (MW-31)

* Maximum concentrations are based on the May and August, 1994 sampling events.

The maximum concentrations at the site are less than the listed tap water concentrations, where developed. This comparison is not meant to replace a site-specific analysis of risk but instead is presented to show that the concentrations in the wells do not currently present a significant risk and therefore should not be included in the constituents of concern. In addition, the extent of these compounds across the site mirrors that of the BTEX components as shown in Figures 5, 6, 8 and 9, indicating a direct correlation between the parameters. BTEX levels detected were consistently higher than SVOCs. Therefore, the dissolved hydrocarbon plume will be adequately monitored by BTEX analyses, and the analysis of the semi-volatile components would not significantly enhance the ability of BRC to monitor the plume. For these reasons, BTEX by USEPA Method 8020 is the ideal indicator parameter for groundwater plume monitoring purposes. The number of wells, monitoring frequency and analytical parameters for a groundwater monitoring program will be proposed as part of the CMI.

For background concentrations of metals in groundwater, see response to general comment 2. The concentrations of metals in the groundwater are within the limits of what can be considered background levels and should not be considered as constituents of concern. As previously stated in the RFI Report, all metals concentrations in groundwater were below corresponding MCLs.

Section 5.1, Potential Receptors, Groundwater, page 37

According to the draft RFI report, two off-site private wells (Looney well and Brown well) are located downgradient of the facility in the shallow aquifer. The RFI report does not provide any information on the water quality of the off-site wells. Have either of these wells been sampled to determine if they have been impacted by facility operations? Additional information on these two wells must be provided in the RFI report.

Response: Figure 11 in this submittal shows the revised water well locations within a one mile radius of the BRC facility using the New Mexico township-range-section coordinate system. Well locations were incorrectly plotted in the original RFI report. Copies of the well logs are provided in Attachment D. As shown on the revised map, the Brown well (#5) is located on the north side of Hammond Ditch near Highway 44, more than 2,000 feet from the southwesternmost corner of the BRC facility. The Looney well (#6) is located north of the San Juan River, also near Highway 44. The revised, correct locations of these wells indicate that they are not at risk of hydrocarbon contamination from the BRC facility.

Section 5.5, Potential Receptors, Endangered/Threatened Species, page 39

The draft RFI report states that BRC has inquired with the State of New Mexico Department of Game and Fish regarding threatened and endangered species in the vicinity of the facility, but no response has been received. Has the information on threatened/endangered species been received from New Mexico? If so, this information needs to be incorporated into the RFI report. If the information has not been received from New Mexico, please provide me a copy of the contact list at New Mexico and EPA will contact the State.

Response: BRC has received information from the State of New Mexico Department of Game and

Fish about threatened and endangered species. The following is a table that summarizes the report from New Mexico.

STATUS LIST OF THREATENED AND ENDANGERED, PROPOSED & CANDIDATE SPECIES IN SAN JUAN COUNTY (DEC 1993)
NEW MEXICO DEPARTMENT OF GAME AND FISH

Invert Name	Scientific Name	Fed End.	Fed Threat	Fed Prop.	Fed Cand.	State End	State Threat
Roundtail Chub	Gila robusta				X		X
(Grahami) Roundtail Chub	*Gila robusta grahami*						X
Colorado Squawfish	Ptychocheilus lucius	X				X	
Flannelmouth Sucker	Catostomus latipinnis				X		
Razorback Sucker	Xyrauchen texanus	X					
White-faced Ibis	Plegadis chihi				X		
Bald Eagle	Haliaeetus leucocephalus	X					X
Northern Goshawk	Accipiter gentilis				X		
Ferruginous Hawk	Buteo regalis				X		
American Peregrine Falcon	Falco peregrinus anatum	X				X	
Western Snowy Plover	Charadrius alexandrinus nivosus		X		X		
Mexican Spotted Owl	Strix occidentalis lucida		X				
(Southwestern) Willow Flycatcher	Empidonax traillii extimus			X			X
Loggerhead Shrike	Lanius ludovicianus				X		
Gray Vireo	Vireo vicinior						X
Baird's sparrow	Ammodramus bairdii				X		X
Occult Little Brown Bat; Myotis	Myotis lucifugus occultus				X		
Swift Fox	Vulpes velox velox				X		

The New Mexico State Forestry Division provided a publication entitled "Inventory of Rare and Endangered Plants of New Mexico" printed June, 1994. Those plants found in San Juan County are:

- Mancos Milkvetch
- Knowlton's Cactus
- Small-Flower Devil's Claw
- Chuska Mt. Milkvetch
- Chaco Milkvetch
- Checker-Lily
- Mancos Saltplant
- Whipple's Devil's Claw
- Violet Milkvetch
- Naturita Milkvetch
- Aztec Gilia
- Mesa Verde Cactus
- Macdougal's False Carrot
- Arborales Milkvetch

- Westwater Buckwheat
- Durango Gumweed
- Desert Columbine
- Dune Buckwheat
- Splendid Phacelia
- San Juan Milkweed
- Narrow-Mouth Penstemon
- Lance-Leaf Loosestrife

The U.S. Fish and Wildlife Service provided a publication entitled "Endangered and Threatened Species of New Mexico 1987 (with 1988 Addendum)" which describes all federally protected plant and animal species. The species listed with habitats in the area of the BRC site are:

- Black-Footed Ferret
- Colorado Squaw Fish
- Mancos Milkvetch
- Mesa Verde Cactus

Of the plants and animals listed above, two are considered potential receptors: the Colorado squawfish and the razorback sucker. The San Juan River west of Farmington is designated as a critical habitat area for these fish. This information will be used during the risk assessment process to establish appropriate cleanup goals for the site.

Section 7.0, Field, Laboratory and/or Bench Scale Studies, page 44

The draft RFI report states that no additional testing is proposed prior to the development of the CMI plan. However, the air sparge interceptor trench will be reevaluated during periods of higher water levels, i.e., the irrigation season. The reevaluation should be accomplished as a field pilot test and incorporated into the final CMS report.

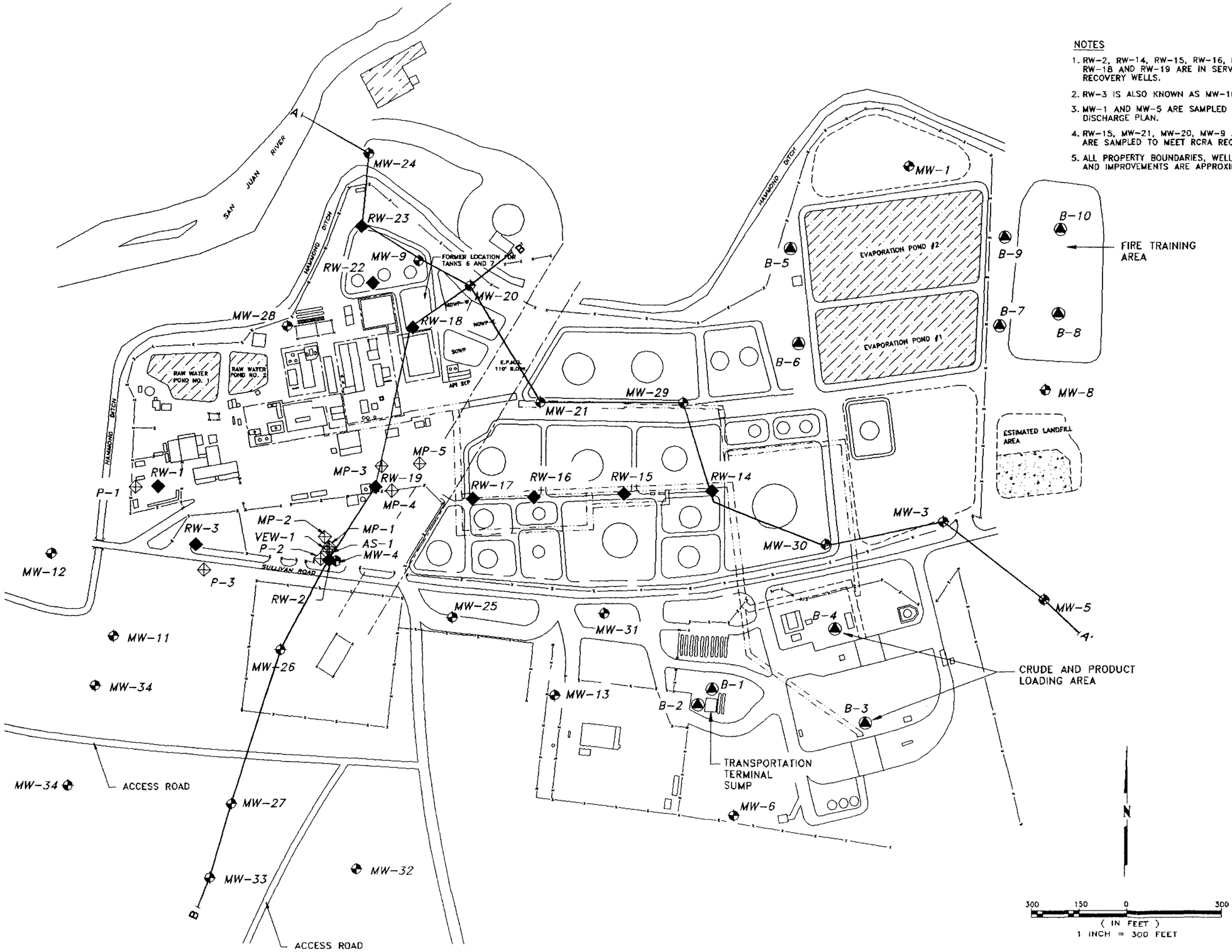
Response: The air sparge interceptor trench will be addressed in the Corrective Measure Study. Currently, water levels are too low to perform any field pilot testing.

Section 8.0, Corrective Measures Study, page 45

This section of the draft report does not contain the information required in the Corrective Action Plan (CAP) from the RCRA § 3008(h) Order on Consent. All of the required information must be provided. It is recommended that the CMS report be submitted as a separate document when all of the required information is assembled. The language detailing the CMS requirements of the CAP is reproduced below to facilitate the completion of the CMS report.

Response: The Corrective Measures Study will be resubmitted as a separate document and will address the required information.

FIGURES



NOTES

1. RW-2, RW-14, RW-15, RW-16, RW-17, RW-18 AND RW-19 ARE IN SERVICE RECOVERY WELLS.
2. RW-3 IS ALSO KNOWN AS MW-10.
3. MW-1 AND MW-5 ARE SAMPLED FOR DISCHARGE PLAN.
4. RW-15, MW-21, MW-20, MW-9 AND RW-18 ARE SAMPLED TO MEET RCRA REQUIREMENTS.
5. ALL PROPERTY BOUNDARIES, WELL LOCATIONS, AND IMPROVEMENTS ARE APPROXIMATE.

NO.	DATE	BY	REVISION

LEGEND

- PIPEWAY
- UNDERGROUND PIPEWAY
- FENCE
- MW-1 MONITORING WELL
- RW-1 RECOVERY WELL
- B-1 SOIL BORING
- P-1 PIEZOMETER
- LINE OF CROSS SECTION

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

MONITORING WELL AND RECOVERY WELL LOCATIONS

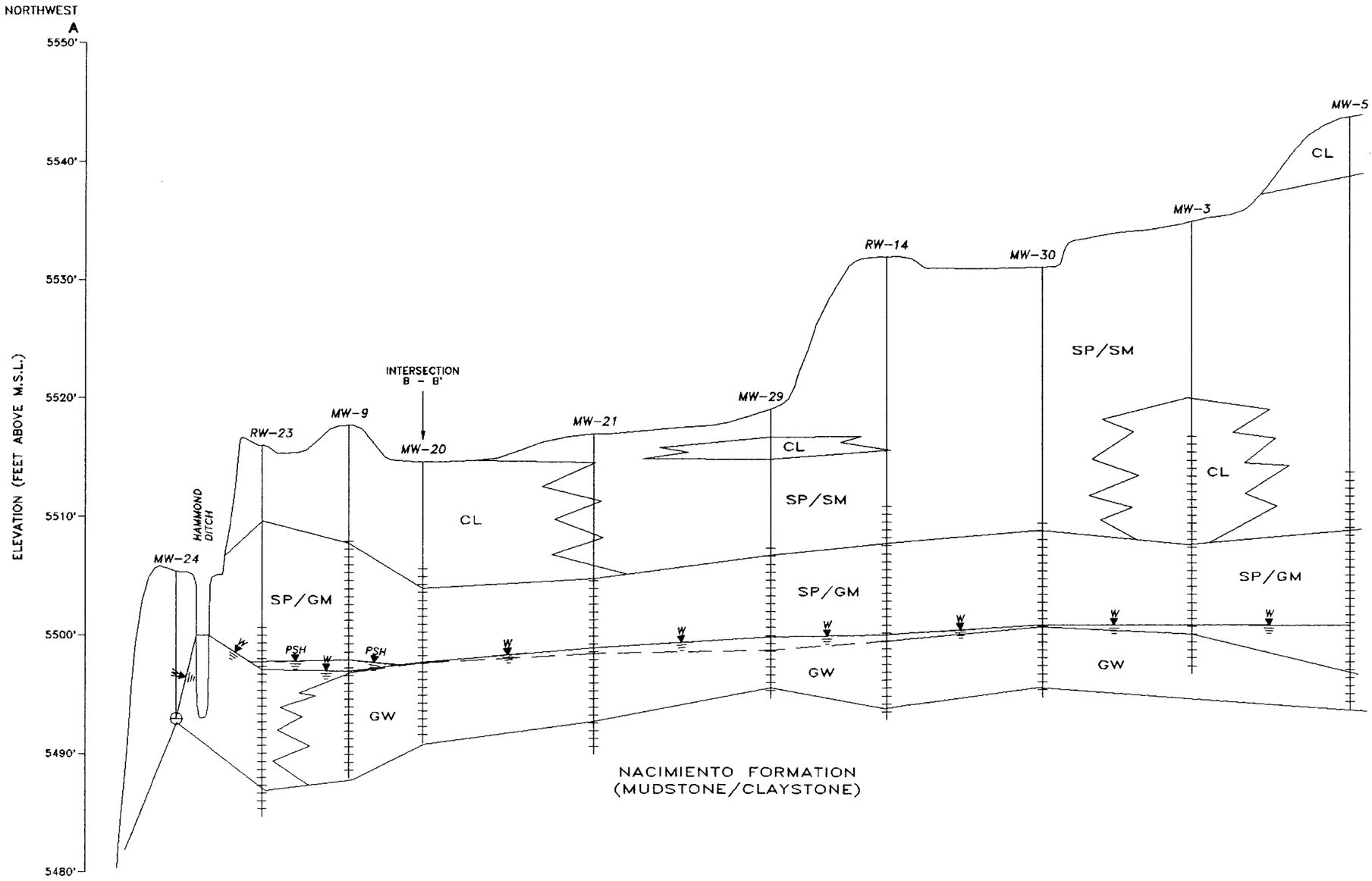
DESIGNED BY:	DRAFTED BY:	CHECKED BY:
RS	PJWH	

DATE:	FILE:
04/03/95	MW-LOCA1
PROJECT NO.: 023353014	CONTRACT:
DRAWING:	REVISION:

FIGURE 1

NOTES

1. SITE PLAN AND ORTHOPHOTO/TOPOGRAPHIC COMPOSITE, SAN JUAN ENGINEERS (09/24/91) USED TO DRAW TOPOGRAPHY BETWEEN WELLS.
2. ALL LITHOLOGIC CORRELATION LINES DASHED WHERE APPROXIMATE.



30X VERTICAL EXAGGERATION

10 5 0 10
VERTICAL SCALE (IN FEET)

300 150 0 300
HORIZONTAL SCALE (IN FEET)

NO.	DATE	BY	REVISION
–			

LEGEND

- BLANK INTERVAL OF WELL
- SCREENED INTERVAL OF WELL
- HORIZONTAL WELL
- W — GROUNDWATER ELEVATION AS MEASURED ON 03/01/95
- PSH — SEPARATE-PHASE HYDROCARBON ELEVATION AS MEASURED ON 03/01/95

USCS SYMBOL	DESCRIPTION
CL	CLAY
SP/SM	SAND AND SILTY SAND
SP/GM	SAND WITH GRAVELS AND COBBLES
GW	GRAVEL AND COBBLES

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

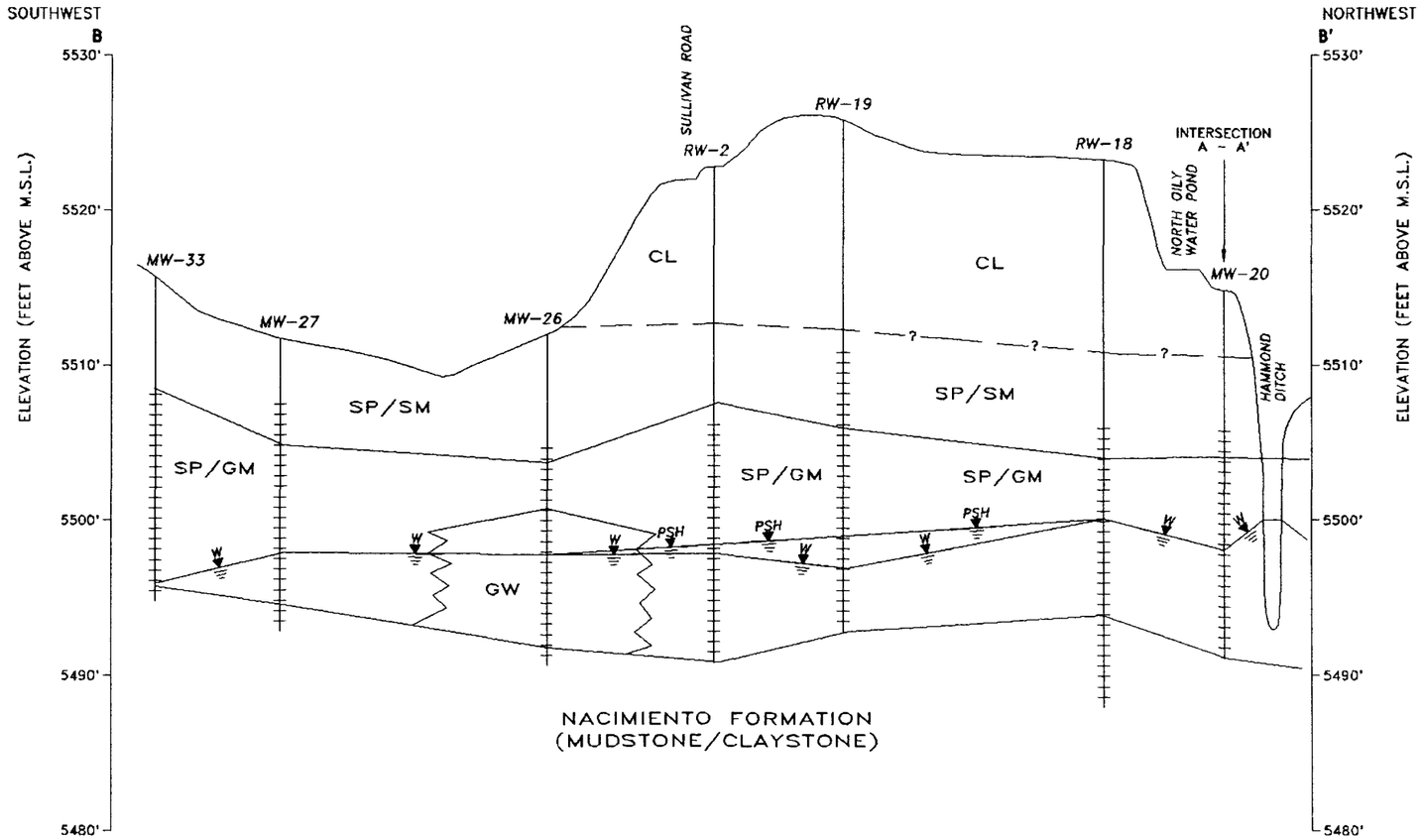
GEOLOGIC CROSS SECTION A - A'

PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
RS	PJWH	

DATE:	FILE:
04/04/95	3014CSA (1:10)
PROJECT NO.:	CONTRACT:
023353014	
DRAWING:	REVISION:

FIGURE 2



NOTES

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2. ALL LITHOLOGIC CORRELATION LINES DASHED WHERE APPROXIMATE.

30X VERTICAL EXAGGERATION

10 5 0 10
VERTICAL SCALE
(IN FEET)

300 150 0 300
HORIZONTAL SCALE
(IN FEET)

NO.	DATE	BY	REVISION
–			

LEGEND

- BLANK INTERVAL OF WELL
- SCREENED INTERVAL OF WELL
- W — GROUNDWATER ELEVATION AS MEASURED ON 03/01/95
- PSH — SEPARATE-PHASE HYDROCARBON ELEVATION AS MEASURED ON 03/01/95

USCS SYMBOL	DESCRIPTION
CL	CLAY
SP/SM	SAND AND SILTY SAND
SP/GM	SAND WITH GRAVELS AND COBBLES
GW	GRAVEL AND COBBLES

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
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ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

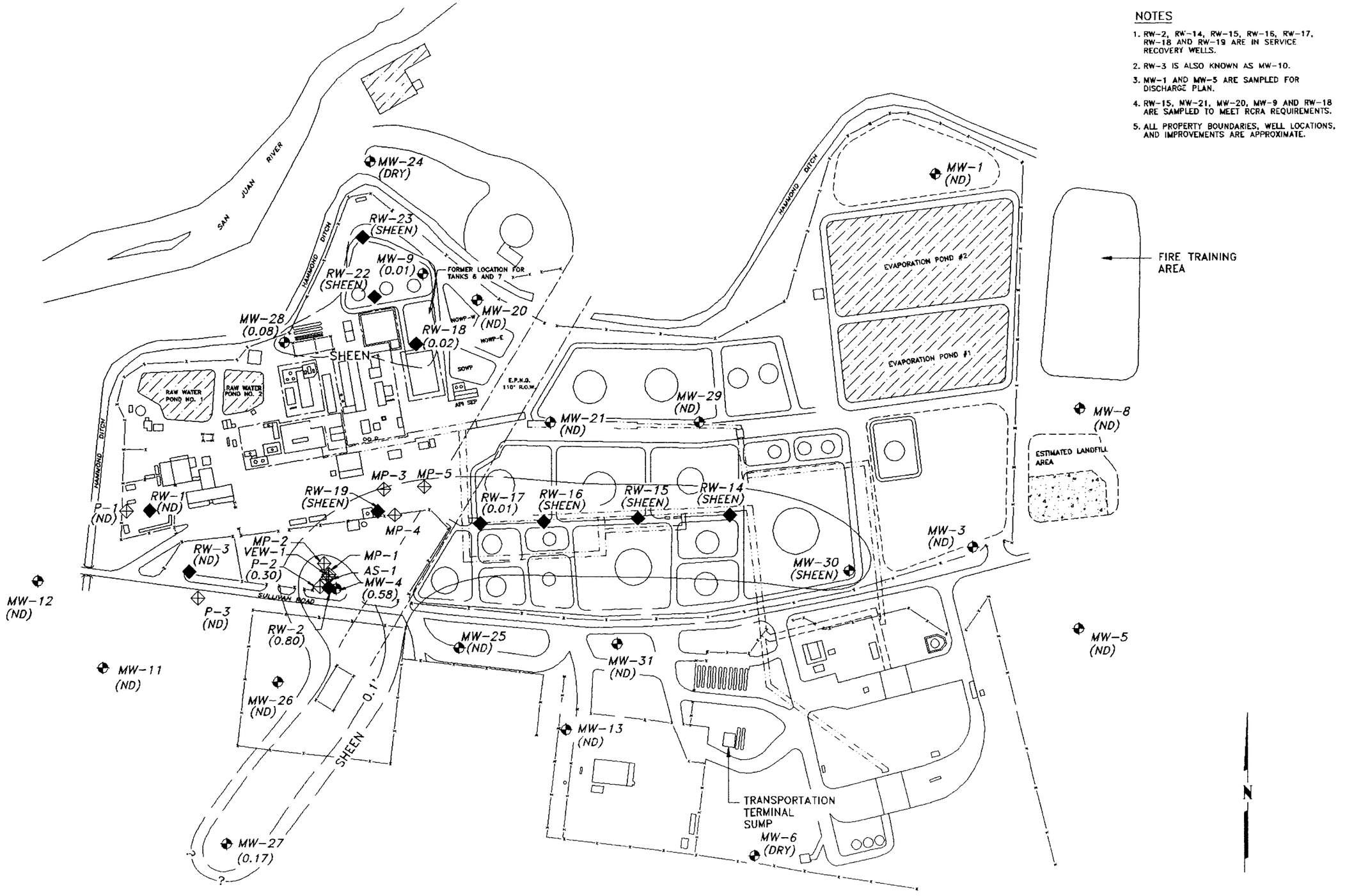
GEOLOGIC CROSS SECTION B - B'

PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
RS	PJWH	

DATE:	FILE:
04/04/95	3014CSB (1:10)
PROJECT NO.: 023353014	CONTRACT:
DRAWING:	REVISION:

FIGURE 3



NOTES

1. RW-2, RW-14, RW-15, RW-16, RW-17, RW-18 AND RW-19 ARE IN SERVICE RECOVERY WELLS.
2. RW-3 IS ALSO KNOWN AS MW-10.
3. MW-1 AND MW-5 ARE SAMPLED FOR DISCHARGE PLAN.
4. RW-15, MW-21, MW-20, MW-9 AND RW-18 ARE SAMPLED TO MEET RCRA REQUIREMENTS.
5. ALL PROPERTY BOUNDARIES, WELL LOCATIONS, AND IMPROVEMENTS ARE APPROXIMATE.

NO.	DATE	BY	REVISION

LEGEND

- PIPEWAY
- UNDERGROUND PIPEWAY
- FENCE
- MW-1 MONITORING WELL
- RW-1 RECOVERY WELL
- P-1 PIEZOMETER
- (ND)= NOT DETECTED
- (0.01)= SPH THICKNESS IN FEET
- SPH THICKNESS CONTOUR IN FEET DASHED WHERE APPROXIMATE

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
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ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

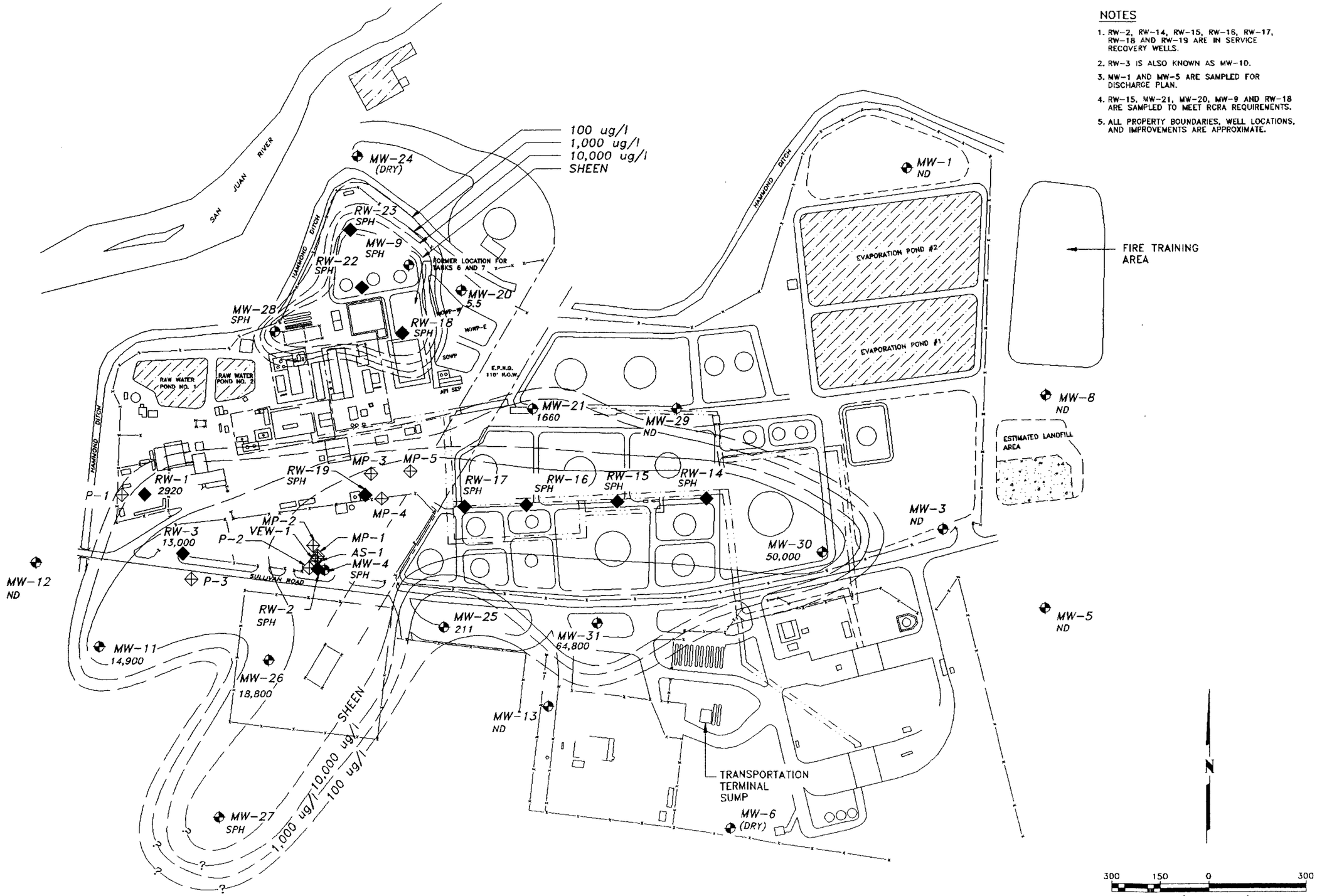
SEPARATE PHASE HYDROCARBON ISOPLETH MAP

MAY 24, 1994
PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
	J. ML	

DATE:	FILE:
JUNE 10, 1994	PSH-0594
PROJECT NO.: 023353014	CONTRACT:
DRAWING:	REVISION:

FIGURE 4



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5. ALL PROPERTY BOUNDARIES, WELL LOCATIONS, AND IMPROVEMENTS ARE APPROXIMATE.

NO.	DATE	BY	REVISION

LEGEND

- PIPEWAY
- UNDERGROUND PIPEWAY
- FENCE
- MW-1 MONITORING WELL
- RW-1 RECOVERY WELL
- P-1 PIEZOMETER
- ND NOT DETECTED
- VOC VOLATILE ORGANIC COMPOUNDS
- SPH SEPARATE-PHASE HYDROCARBONS
- VOC ISOPLETH IN ug/l DASHED WHERE APPROXIMATE. CONTOUR INTERVALS ARE 10,000, 1,000, AND 100 ug/l.

VOC CONCENTRATION IN ug/l

ATTENTION

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
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ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

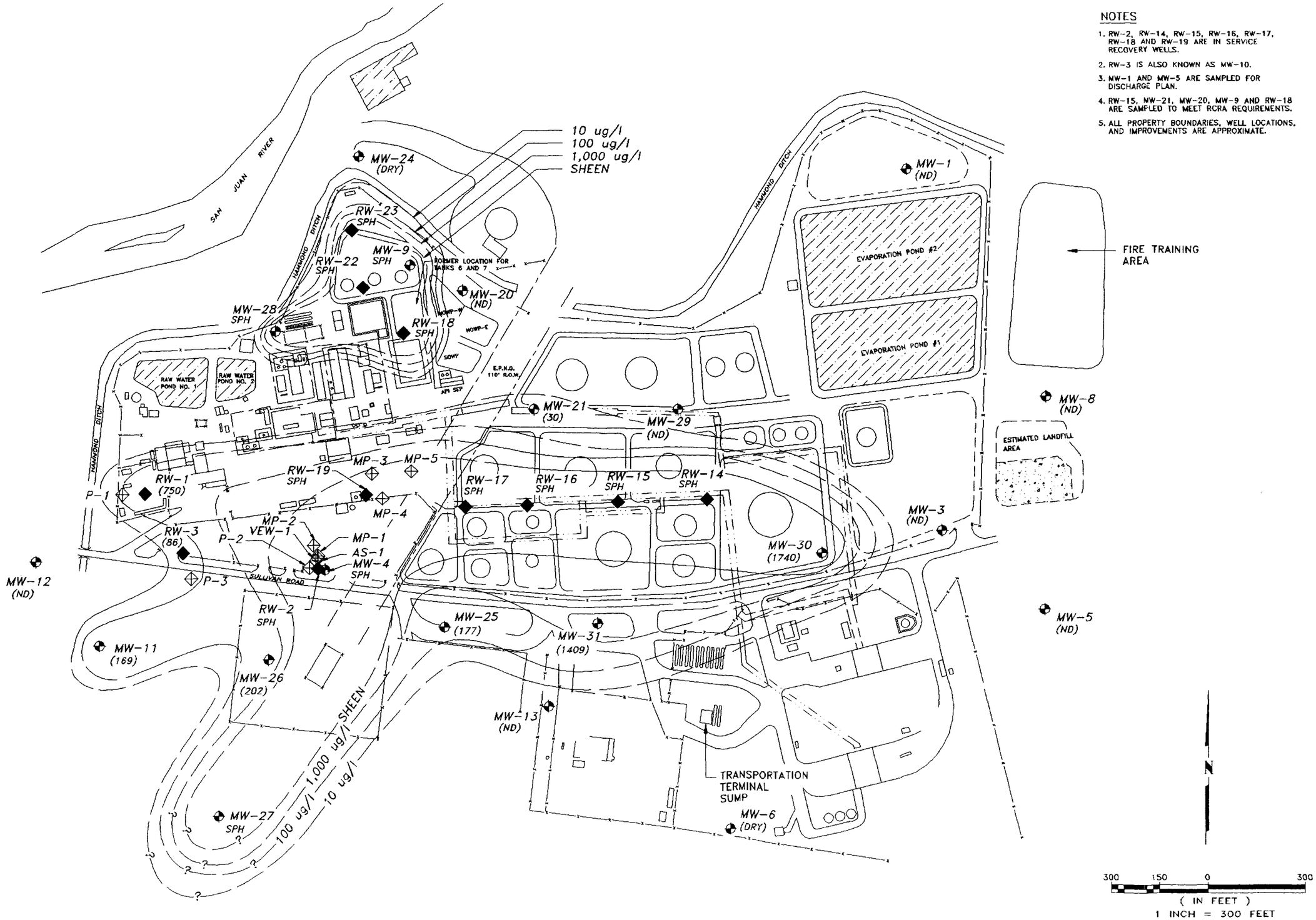
TOTAL TARGETED VOC IN GROUNDWATER ISOPLETH MAP

MAY 24 & 25, 1994
PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
	J. ML	

DATE:	FILE:
JUNE 22,1994	TVOC0594
PROJECT NO.:	CONTRACT:
023353014	
DRAWING:	REVISION:

FIGURE 5



NOTES

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4. RW-15, MW-21, MW-20, MW-9 AND RW-18 ARE SAMPLED TO MEET RCRA REQUIREMENTS.
5. ALL PROPERTY BOUNDARIES, WELL LOCATIONS, AND IMPROVEMENTS ARE APPROXIMATE.

NO.	DATE	BY	REVISION

LEGEND

- PIPEWAY
- UNDERGROUND PIPEWAY
- FENCE
- MW-1 MONITORING WELL
- RW-1 RECOVERY WELL
- P-1 PIEZOMETER
- SVOC SEMI-VOLATILE ORGANIC COMPOUNDS
- (169) SVOC CONCENTRATION IN ug/l
- ND NOT DETECTED
- SPH SEPARATE-PHASE HYDROCARBONS
- SVOC ISOPLETH IN ug/l DASHED WHERE APPROXIMATE. CONTOUR INTERVALS ARE 1,000, 100, AND 10 ug/l.

SVOC CONCENTRATION IN ug/l

ATTENTION

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

TOTAL TARGETED SVOC IN GROUNDWATER ISOPLETH MAP

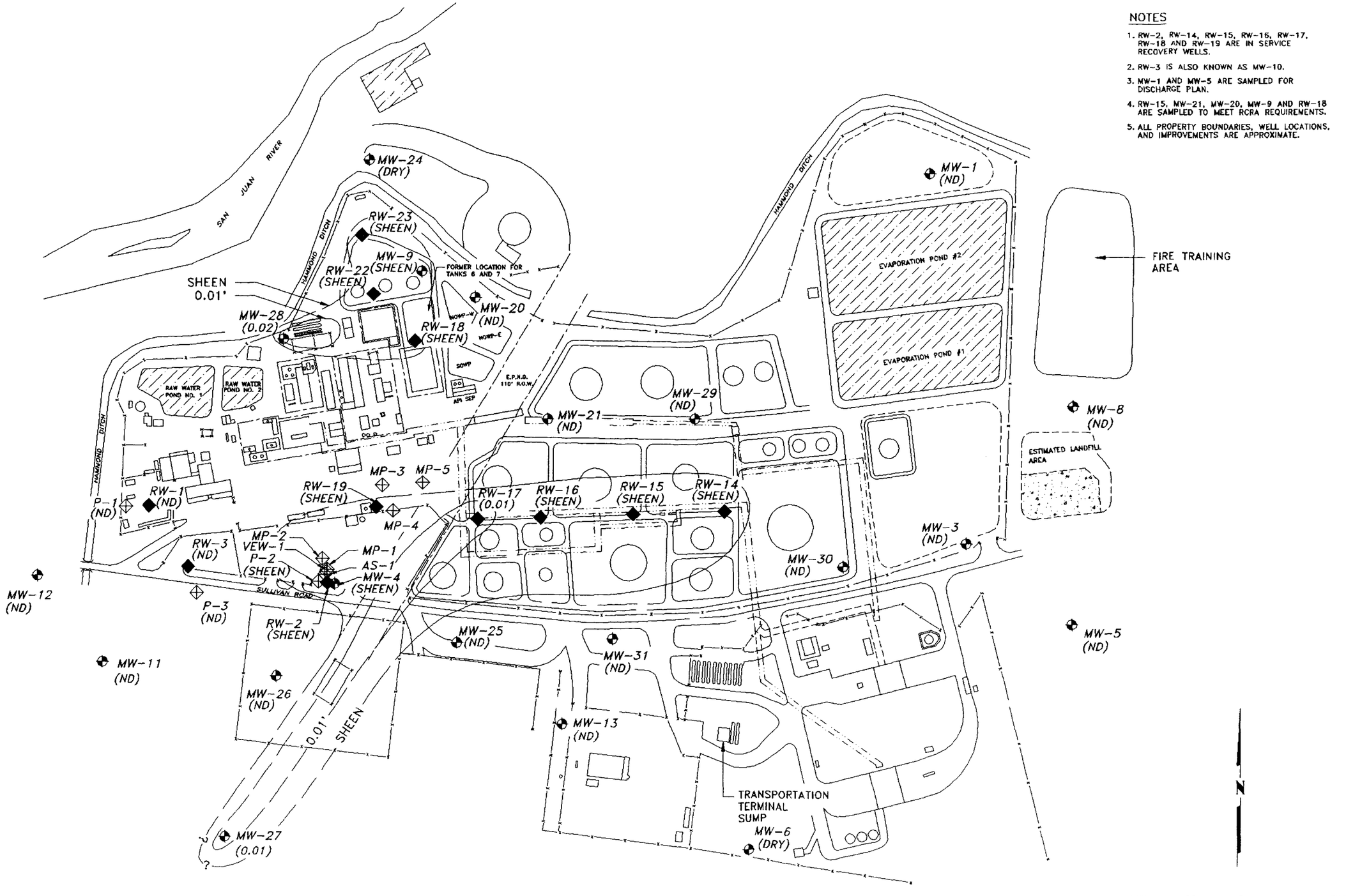
MAY 24 & 25, 1994
PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
	J. ML	

DATE:	FILE:
JUNE 22,1994	SVOC0594
PROJECT NO.:	CONTRACT:
023353014	

DRAWING: REVISION:

FIGURE 6



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5. ALL PROPERTY BOUNDARIES, WELL LOCATIONS, AND IMPROVEMENTS ARE APPROXIMATE.

NO.	DATE	BY	REVISION

LEGEND

- PIPEWAY
- UNDERGROUND PIPEWAY
- —x— FENCE
- MW-1 MONITORING WELL
- RW-1 RECOVERY WELL
- P-1 PIEZOMETER
- (ND)= NOT DETECTED
- (0.01)= SPH THICKNESS IN FEET
- SPH THICKNESS CONTOUR IN FEET DASHED WHERE APPROXIMATE

ATTENTION

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

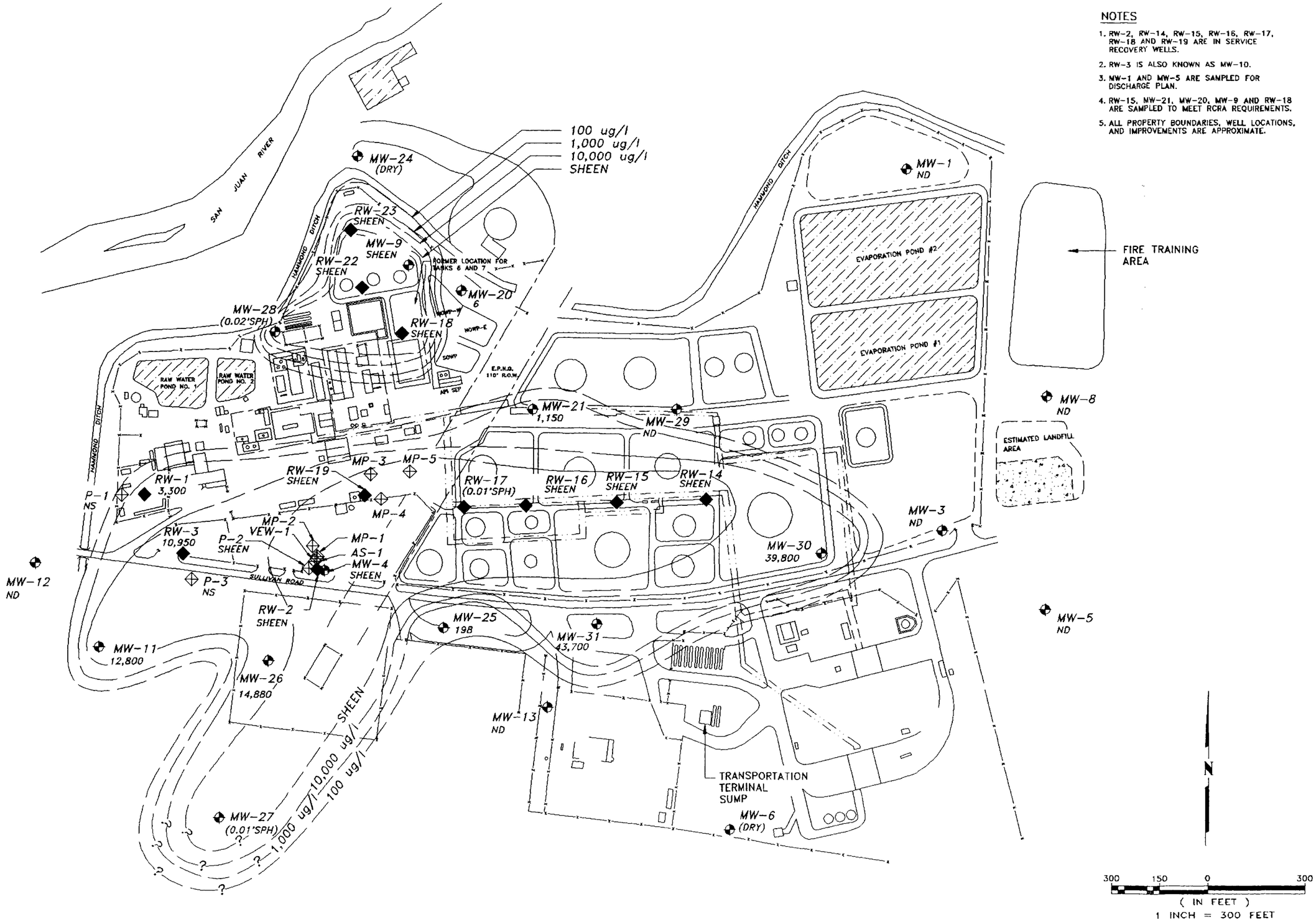
SEPARATE PHASE HYDROCARBON ISOPLETH MAP

AUGUST 2, 1994
PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
	J. ML	

DATE:	FILE:
SEPT. 28, 1994	PSH-0894
PROJECT NO.: 023353014	CONTRACT:
DRAWING:	REVISION:

FIGURE 7



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NO.	DATE	BY	REVISION

LEGEND

- PIPEWAY
- UNDERGROUND PIPEWAY
- FENCE
- MW-1 MONITORING WELL
- RW-1 RECOVERY WELL
- P-1 PIEZOMETER
- ND NOT DETECTED
- VOC VOLATILE ORGANIC COMPOUNDS
- SPH SEPARATE-PHASE HYDROCARBONS
- VOC ISOPLETH IN ug/l DASHED WHERE APPROXIMATE. CONTOUR INTERVALS ARE 10,000, 1,000, AND 100 ug/l.

VOC CONCENTRATION IN ug/l

ATTENTION

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

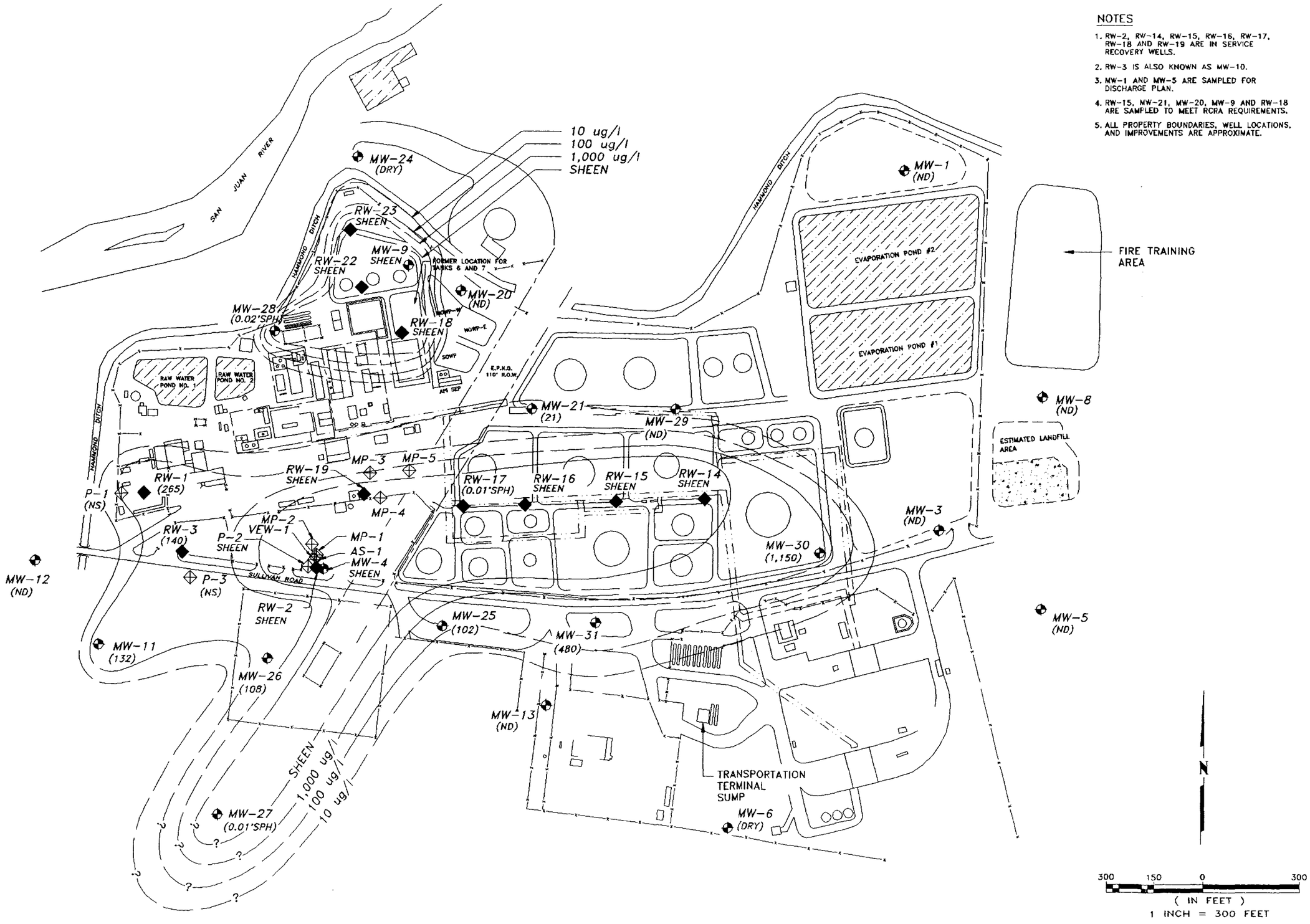
TOTAL TARGETED VOC IN GROUNDWATER ISOPLETH MAP

AUGUST 3 & 4, 1994
PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
	J. ML	

DATE:	FILE:
SEPT. 28, 1994	TVOC0894
PROJECT NO.: 023353014	CONTRACT:
DRAWING:	REVISION:

FIGURE 8



NOTES

1. RW-2, RW-14, RW-15, RW-16, RW-17, RW-18 AND RW-19 ARE IN SERVICE RECOVERY WELLS.
2. RW-3 IS ALSO KNOWN AS MW-10.
3. MW-1 AND MW-5 ARE SAMPLED FOR DISCHARGE PLAN.
4. RW-15, MW-21, MW-20, MW-9 AND RW-18 ARE SAMPLED TO MEET RCRA REQUIREMENTS.
5. ALL PROPERTY BOUNDARIES, WELL LOCATIONS, AND IMPROVEMENTS ARE APPROXIMATE.

NO.	DATE	BY	REVISION

LEGEND

- PIPEWAY
- UNDERGROUND PIPEWAY
- FENCE
- MW-1 MONITORING WELL
- RW-1 RECOVERY WELL
- P-1 PIEZOMETER
- SVOC SEMI-VOLATILE ORGANIC COMPOUNDS
- (108) SVOC CONCENTRATION IN ug/l
- ND NOT DETECTED
- SPH SEPARATE-PHASE HYDROCARBONS
- SVOC ISOPLETH IN ug/l DASHED WHERE APPROXIMATE. CONTOUR INTERVALS ARE 1,000, 100, AND 10 ug/l.

SVOC CONCENTRATION IN ug/l

ATTENTION

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

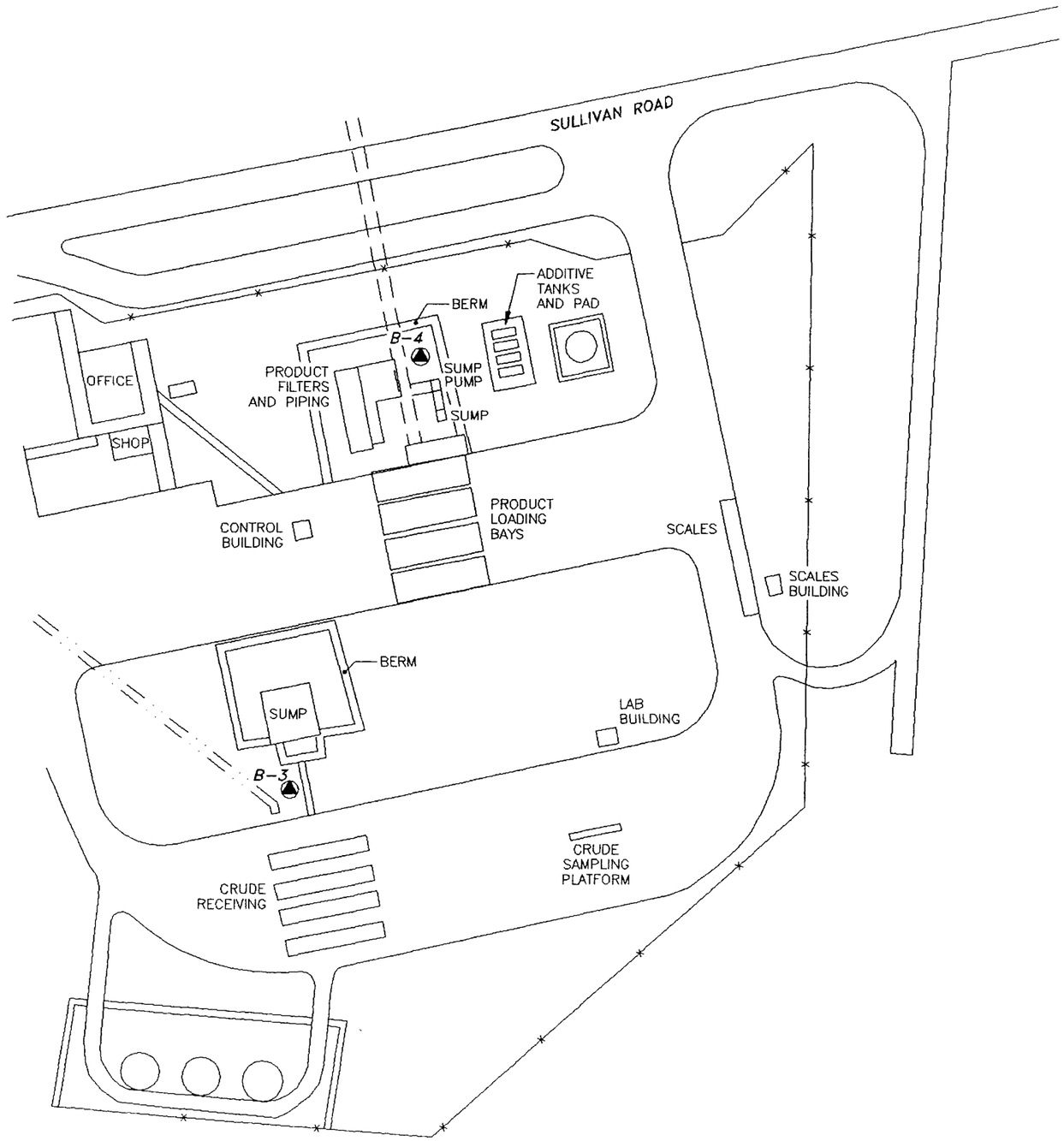
TOTAL TARGETED SVOC IN GROUNDWATER ISOPLETH MAP

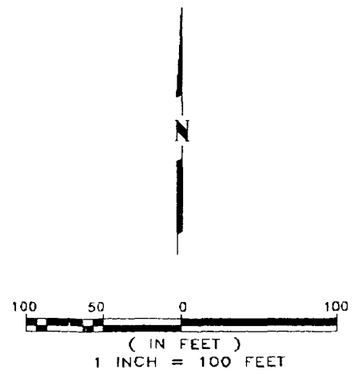
AUGUST 3 & 4, 1994
PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
	J. ML	

DATE:	FILE:
SEPT. 28, 1994	SVOC0894
PROJECT NO.: 023353014	CONTRACT:
DRAWING:	REVISION:

FIGURE 9





NO.	DATE	BY	REVISION

LEGEND

— · — · — PIPEWAY

— — — — UNDERGROUND PIPEWAY

—— x —— FENCE

B-4 SOIL BORING

ATTENTION

SIGNATURE	DATE
PROJECT GEO:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-3113

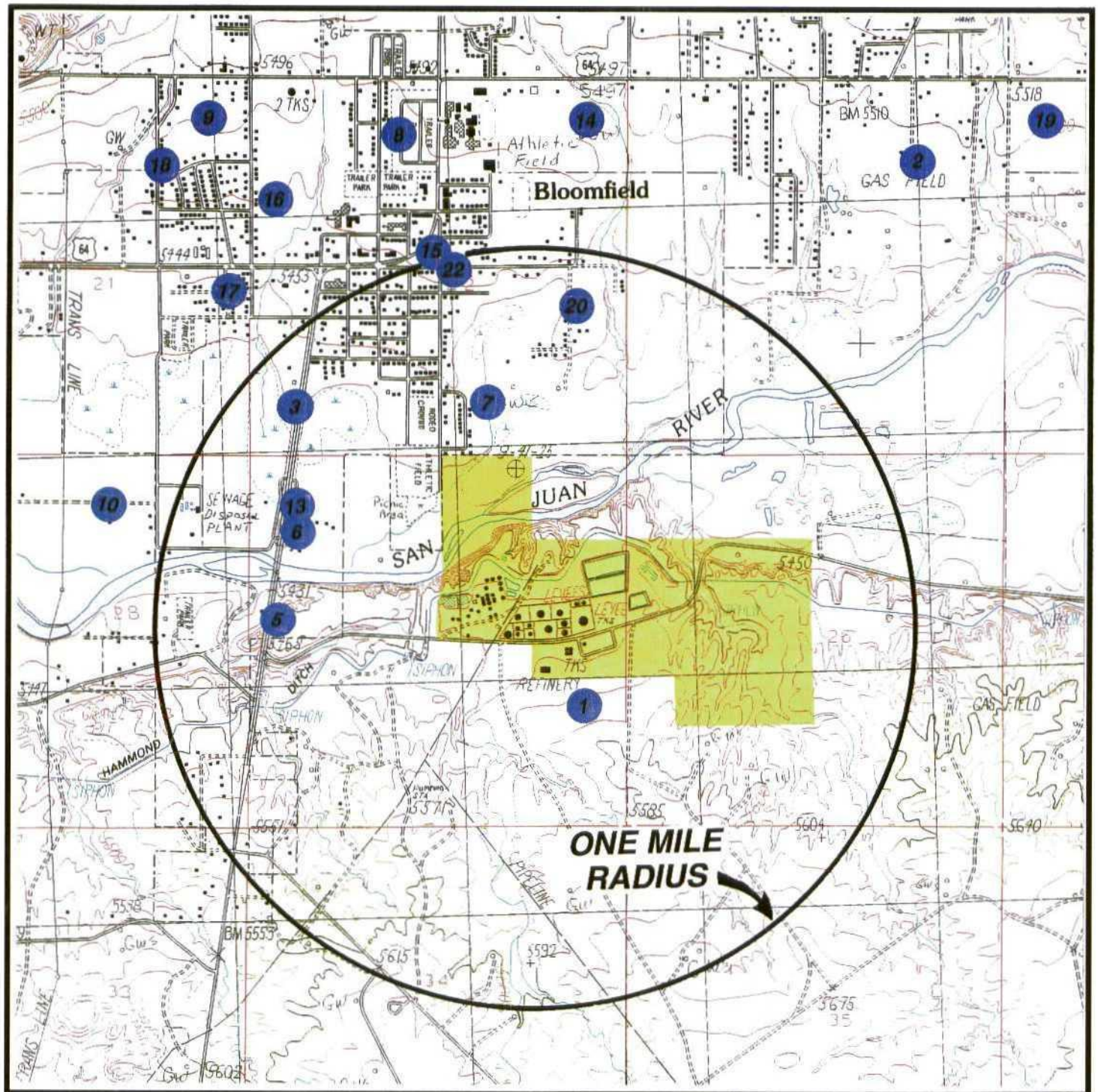
LOCATION OF SOIL BORINGS B-3 AND B-4

PHASE 3 RFI

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
RS	PJWH	

DATE:	FILE:
04/05/95	3014BL (1:100)
PROJECT NO.: 023353014	CONTRACT:
DRAWING:	REVISION:

FIGURE 10



LEGEND

SITE

WATER WELL LOCATION (SEE TABLE 1 FOR OWNER INFORMATION)

NOTES:

1) WELL NOS. 4, 11, & 12 NOT SHOWN SINCE LOCATIONS WERE NOT REPORTED ON WELL RECORDS. WELL NO. 21 IS NOT SHOWN, AS IT IS NOT IN THE VICINITY OF THE SITE.

2) WELLS NO. 15 AND 22 ARE APPROXIMATELY LOCATED.

BLOOMFIELD, N. MEX. QUADRANGLE
PROVISIONAL EDITION
1985
36107-F8-TF-024

NEW MEXICO
QUADRANGLE LOCATION

N

1000 0 2000
SCALE IN FEET

Bloomfield Refining Company
A Gary Energy Corporation Subsidiary
#50 COUNTY ROAD 4990
BLOOMFIELD, NEW MEXICO

GROUNDWATER TECHNOLOGY
2501 YALE BLVD. SE, SUITE 204
ALBUQUERQUE, N.M. 87106 (505) 242-3113

WATER WELLS WITHIN ONE MILE OF THE FACILITY

DESIGNED BY: CD	DETAILED BY: EF	CHECKED BY:
DATE:		FILE: BL-WELL LOC
PROJECT NO.: 023353014		CONTRACT:
DRAWING: FIGURE //		REVISION: -

ATTACHMENT A

Statistical Analyses for Background Determination

Calculation of Background Concentrations

As part of the response to EPA comments, the background concentrations for certain metals in groundwater, soil and sediments were estimated using data collected during the RFI. Standard statistical procedures consistent with EPA guidance documents and standard practices in the industry were used. More specifically, statistically based tolerance limits were used. A tolerance limit is a value for which there is only a small probability (i.e., 5.0%) that a portion of the population exceeds a specified limit (i.e., 95%). When defining a reasonable upper estimate of the background concentrations for a site, the one-sided upper tolerance limit (UTL) is used. For the purpose of this assessment, the calculated value is a limit which samples with concentrations less than the reported limit would be considered background.

The following formula is used to construct the upper bound limit:

$$UTL_{95\%} = \bar{x} + \kappa s \qquad (1)$$

where:

$\bar{x}$ = *the arithmetic average of the samples*
κ = *is an adjustment factor designed to include the specified portion of the popula*
s = *the sample standard deviation*

To construct a one-sided UTL with average coverage of 95 percent of the population, the κ multiplier in equation (1) can be computed as follows:

$$\kappa_{95\%} = t_{n-1,95\%}\sqrt{1 + \frac{1}{n}} \qquad (2)$$

where the t value represents the upper 95 percentile of the t-distribution with (n-1) degrees of freedom and n is the number of sample points.

The designated background samples were located in relatively undisturbed portions of the facility with no indication of hydrocarbon contamination. Data from wells MW-1, MW-5 and MW-8 were designated as background wells for metals concentrations in groundwater since these wells are located upgradient of SWMUs and have not historically contained detectable VOCs and SVOCs. Borings B-7 through B-9 were designated as background soil sampling results for metals since no detectable VOCs and SVOCs were identified in these samples. For similar reasons, sediment samples SJ-1S, SJ-2S, SJ-3S, HD-12S, HD-12B, HD-13S, HD-13B, HD-14S, and HD-14B were designated as background.

Table 1 presents the actual groundwater sampling results used in the calculations. The results are

summarized by well and by date. The summary of statistical calculations are summarized in Table 2 (groundwater), Table 3 (soils), and Table 4 (sediments). In all cases when values were reported as less than the detection limit, one-half the detection limit was substituted following EPA guidance. One additional requirement suggested in EPA guidance is to assess the distribution of the data (e.g., test if the data are normally distributed). To conduct a test of normality, a minimum of 10 data points are required. Therefore, only the groundwater monitoring data could be evaluated. For all four compounds, the data failed both the test of normality and the EPA suggested test for lognormality. Close inspection of the data indicated that the data more closely follow a lognormal distribution and therefore natural log transformed data were used.

The UTLs for ground water are presented in Table 1. UTLs were calculated for arsenic (0.179 mg/L), chromium (0.026 mg/L), lead (0.332 mg/L), and zinc (0.532 mg/L). Three columns of data were provided for each analyte. The first column presents the analytical data as it was reported from the laboratory; the second column presents the data after replacing non-detect values with one half the detection limit; and the last column presents the natural log transformed data. Summary statistics and the calculated UTLs are presented at the bottom of the table. Since the log transformed data are not in a standard scale, the calculated UTL for the transformed data had to be converted to a standard scale by exponentiate the UTL. This value is presented in the untransformed limits on the last line of the table.

Table 3 (Soils) and Table 4 (Sediments) present similar types of information as Table 1 except that the data were not log transformed. UTLs were calculated for eight different metals in soils: beryllium, cadmium, chromium, copper, lead, nickel, thallium, and zinc. The limits for are summarized on the last line of Table 3. UTLs were calculated for eight metals in sediments: arsenic, beryllium, chromium, copper, lead, nickel, selenium, and zinc. Again, the limits are summarized at the bottom of Table 4.

References:

Gilbert, Richard O., 1987. *Statistical Methods for Environmental Pollution Monitoring*. Van Nostrand Reinhold, New York.

U.S. Environmental Protection Agency, 1989. *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities - Interim Final Guidance*. Office of Solid Waste, Washington, D.C.

U.S. Environmental Protection Agency, 1992. *Statistical Training Course for Ground-water Monitoring Data Analysis*. Office of Solid Waste, Washington, D.C.

TABLE 1

Groundwater Data Used for Calculation of Background Concentrations
Bloomfield Refining Company
Bloomfield, New Mexico

Well	Date	As	Cr	Pb	Zn
MW-1	3/86	<0.05	<0.02	0.085	<0.001
	6/86	0.077	<0.02	0.065	0.20
	9/86	0.050	<0.02	0.15	0.24
	12/86	<0.05	<0.05	<0.05	0.012
	5/87	<0.05	<0.05	0.20	0.024
	11/87	<0.005	<0.02	<0.02	<0.01
	6/88	<0.005	<0.02	<0.20	0.03
	11/88	<0.005	<0.02	<0.02	<0.01
	5/89	<0.005	<0.02	0.05	-
	1/89	0.005	<0.02	<0.02	-
	6/90	0.0092	<0.02	0.007	-
	11/90	0.008	<0.02	<0.02	-
	6/91	<0.005	<0.02	<0.02	-
	10/91	<0.005	0.02	<0.02	-
	6/92	<0.005	<0.02	<0.02	-
	12/92	<0.005	<0.02	<0.02	-
MW-5	3/86	<0.05	<0.02	0.160	0.012
	6/86	0.087	<0.02	0.055	0.02
	9/86	0.07	<0.02	<0.05	0.02
MW-5	12/86	<0.05	<0.02	<0.05	0.016
	5/87	<0.05	<0.02	0.20	0.024
	11/87	<0.005	<0.02	<0.02	<0.01
	6/88	<0.005	<0.02	<0.02	<0.01

Well	Date	As	Cr	Pb	Zn
	11/88	<0.005	<0.02	0.07	<0.01
	5/89	<0.005	<0.02	0.06	-
	12/89	0.0006	<0.02	0.044	-
	6/90	0.0126	<0.02	0.005	-
	11/90	<0.005	<0.02	<0.02	-
	11/91	<0.005	0.03	<0.02	-
	7/92	<0.005	<0.02	0.11	-
	12/92	0.010	0.02	<0.02	-
MW-8	3/86	<0.05	<0.02	<0.05	<0.001
	6/86	0.072	<0.02	0.055	0.020
	7/86	0.030	<0.02	<0.05	0.020
	12/86	<0.05	<0.05	<0.05	0.016

Concentrations are in mg/kg.

As = Arsenic

Cr = Chromium

Pb = Lead

Zn = Zinc

Table 2
Summary Of Background Analytical Groundwater Data
Bloomfield Refining Company
RFI

Sample	Arsenic (mg/L)			Chromium (mg/L)			Lead (mg/L)			Zinc (mg/L)		
	Raw	1/2 Detect	Ln	Raw	1/2 Detect	Ln	Raw	1/2 Detect	Ln	Raw	1/2 Detect	Ln
1	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.05 <	0.025	-3.6888795	0.001 <	0.0005	-7.6009025
2	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.01 <	0.005	-5.2983174
3	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.01 <	0.005	-5.2983174
4	0.05 <	0.025	-3.6888795	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.01 <	0.005	-5.2983174
5	0.005 <	0.0025	-5.9914645	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.01 <	0.005	-5.2983174
6	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.01 <	0.005	-5.2983174
7	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.001 <	0.0005	-7.6009025
8	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.2	0.2	-1.6094379
9	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.24	0.24	-1.4271164
10	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.012	0.012	-4.4228486
11	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.05 <	0.025	-3.6888795	0.024	0.024	-3.7297014
12	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.05 <	0.025	-3.6888795	0.03	0.03	-3.5065579
13	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.012	0.012	-4.4228486
14	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.02	0.02	-3.912023
15	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.02	0.02	-3.912023
16	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.016	0.016	-4.1351666
17	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.02 <	0.01	-4.6051702	0.024	0.024	-3.7297014
18	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.05 <	0.025	-3.6888795	0.02	0.02	-3.912023
19	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.05 <	0.025	-3.6888795	0.02	0.02	-3.912023
20	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.05 <	0.025	-3.6888795	0.016	0.016	-4.1351666
21	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.085	0.085	-2.465104			
22	0.005 <	0.0025	-5.9914645	0.02 <	0.01	-4.6051702	0.065	0.065	-2.733368			
23	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.15	0.15	-1.89712			
24	0.05 <	0.025	-3.6888795	0.02 <	0.01	-4.6051702	0.2	0.2	-1.6094379			
25	0.077	0.077	-2.5639499	0.02 <	0.01	-4.6051702	0.05	0.05	-2.9957323			
26	0.005	0.005	-5.2983174	0.02 <	0.01	-4.6051702	0.007	0.007	-4.9618451			
27	0.0092	0.0092	-4.6885518	0.02 <	0.01	-4.6051702	0.16	0.16	-1.8325815			
28	0.008	0.008	-4.8283137	0.02 <	0.01	-4.6051702	0.055	0.055	-2.9004221			
29	0.087	0.087	-2.4418472	0.02 <	0.01	-4.6051702	0.2	0.2	-1.6094379			
30	0.07	0.07	-2.65926	0.02 <	0.01	-4.6051702	0.07	0.07	-2.65926			
31	0.0096	0.0096	-4.6459922	0.02 <	0.01	-4.6051702	0.06	0.06	-2.8134107			
32	0.0126	0.0126	-4.3740585	0.05 <	0.025	-3.6888795	0.044	0.044	-3.1235656			
33	0.01	0.01	-4.6051702	0.02	0.02	-3.912023	0.005	0.005	-5.2983174			
34	0.072	0.072	-2.6310892	0.03	0.03	-3.5065579	0.11	0.11	-2.2072749			
35	0.03	0.03	-3.5065579	0.02	0.02	-3.912023	0.055	0.055	-2.9004221			
Summary Statistics												
Mean		0.019	-4.723		0.012	-4.456		0.046	-3.675		0.034	-4.423
Std Dev		0.023	1.263		0.006	0.339		0.055	1.081		0.065	1.521
N of Samples		35	35		35	35		35	35		20	20
Upper Tolerance Limit (mg/L)		0.074	-1.720		0.026	-3.650		0.176	-1.103		0.195	-0.631
Untransformed Limit			0.179			0.026			0.332			0.532

GROUNDWATER TECHNOLOGY ®

Table 3
Summary Of Background Analytical Data For Soils
Bloomfield Refining Company
RFI

Sample Id	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Thallium (mg/kg)	Zinc (mg/kg)
B-7	0.25	1.8	5.7	5.3	5.0	4.8	14	21
B-8	0.57	3.2	9.3	7.1	5.0	7.0	21	33
B-9	0.25	0.77	2.5	2.5	5.0	1.6	5.0	8.0
B-10	1.2	2.3	6.0	2.5	5.0	4.7	13	22
Mean	0.57	2.02	5.88	4.35	5.00	4.53	13.25	21.00
Std Dev	0.45	1.01	2.78	2.26	0.00	2.22	6.55	10.23
N of Samples	4	4	4	4	4	4	4	4
Upper Tolerance Limit (mg/kg)	2.66	6.75	18.85	14.90	5.00	14.89	43.84	68.77

Table 4
Summary Of Background Analytical Data For Sediment
Bloomfield Refining Company
RFI

Sample ID	Arsenic mg/kg	Beryllium mg/kg	Chromium mg/kg	Copper mg/kg	Lead mg/kg	Nickel mg/kg	Selenium mg/kg	Zinc mg/kg
SJ-1S	16	0.25	8.6	5.8	2.5	4.9	5.0	16
SJ-2S	11	0.25	2.5	5.6	2.5	4.5	5.0	19
HD-12S	12	0.6	12	11	2.5	8.8	5.0	47
HD-12B	15	1.3	17	19	15	13	5.0	56
HD-13S	5.0	0.25	9.2	15	2.5	7.8	5.0	36
HD-13B	10	0.9	9.5	17	11	10	5.0	39
HD-14S	5.0	0.25	6.7	11	2.5	6.0	5.0	29
HD-14B	5.0	1.1	11	18	11	12	5.0	50
Mean	9.88	0.61	9.56	12.80	6.19	8.38	5.00	36.50
Std Dev	4.49	0.43	4.18	5.28	5.24	3.17	0.00	14.45
N of Samples	8	8	8	8	8	8	8	8
Upper Tolerance Limit (mg/kg)	30.8	2.6	29.1	37.5	30.6	23.2	5.0	104.0

Table 5
Summary of Results for the Test of Proportions
Bloomfield Refining Company
Phase V RFI

Sediment

Parameter	x	n	y	m	Pu	Pd	Sd	Z	Absolute Value of Z	Significant
Arsenic	6	8	10	23	0.75	0.43	0.21	1.54	1.54	No
Lead	3	8	10	23	0.375	0.43	0.20	-0.30	0.30	No
Selenium	0	8	1	23	0	0.04	0.07	-0.60	0.60	No

Soil

Parameter	x	n	y	m	Pu	Pd	Sd	Z	Absolute Value of Z	Significant
Lead	0	4	1	10	0	0.10	0.15	-0.66	0.66	No

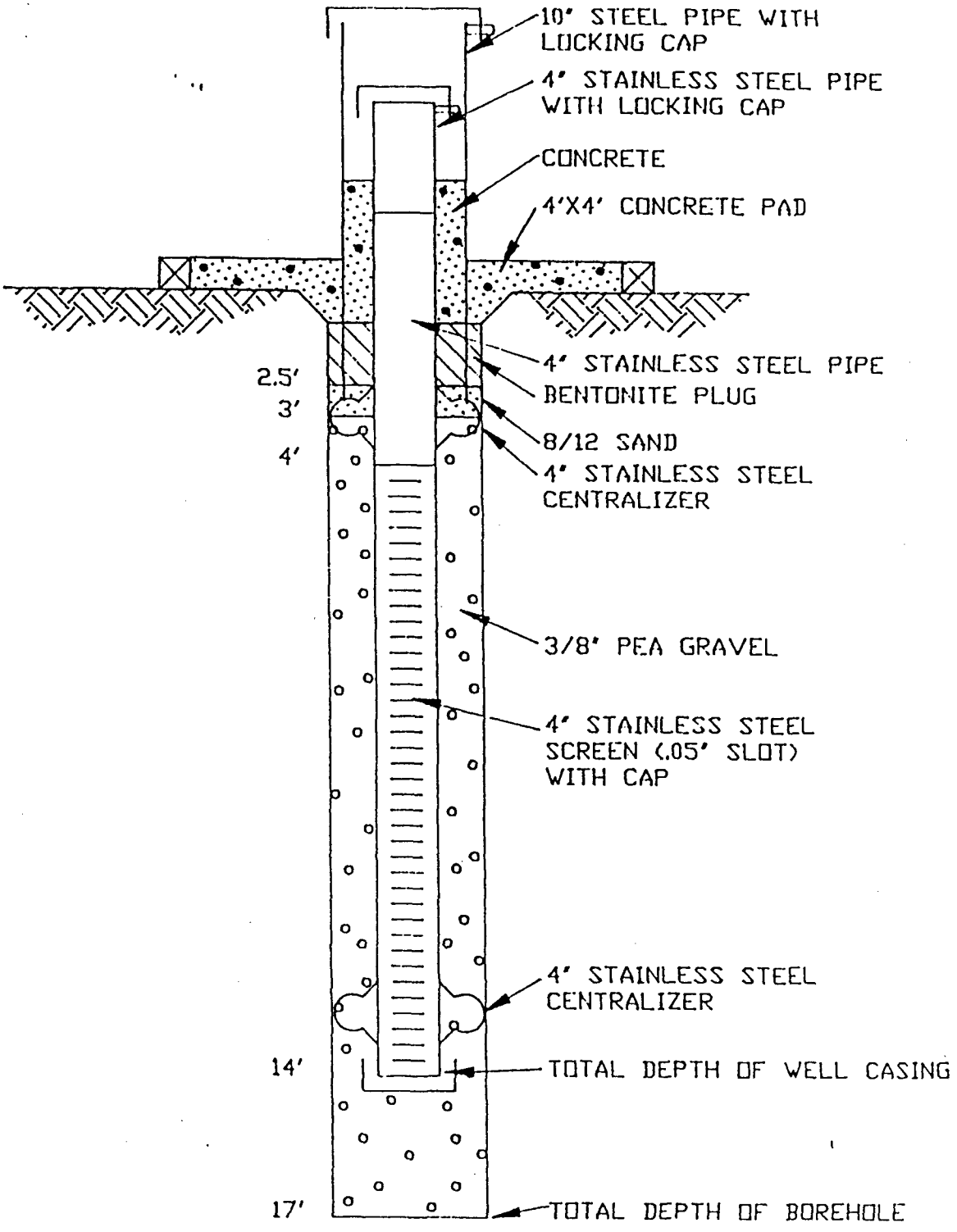
Groundwater

Parameter	x	n	y	m	Pu	Pd	Sd	Z	Absolute Value of Z	Significant
Arsenic	11	35	0	12	0.31429	0.00	0.14	2.22	2.22	*
Chromium	3	35	1	12	0.08571	0.08	0.09	0.03	0.03	No
Lead	15	35	8	12	0.42857	0.67	0.17	-1.42	1.42	No

Note: "*" indicates test of proportions was significant due detections in background wells not compliance wells.

ATTACHMENT B

Well Log for MW-12



MONITOR WELL BRC-12

LITHOLOGIC LOG

LOCATION MAP:

___1/4 ___1/4 ___1/4 ___1/4 S___ T___ R___

SITE ID: BRC LOCATION ID: BRC-12

SITE COORDINATES (ft.):

N _____ E _____

GROUND ELEVATION (ft. MSL): _____

STATE: NEW MEXICO COUNTY: SAN JUAN

DRILLING METHOD: AIR CASING DRIVER ROTARY

DRILLING CONTR.: BEEMAN BROTHERS

DATE STARTED: 8-1-87 DATE COMPLETED: 8-1-87

FIELD REP.: KASZUBA

COMMENTS: SATURATED FROM -5'--12'. TD=17'.
STEAM-CLEANED ALL TOOLS PRIOR TO DRILLING.

LOCATION DESCRIPTION: _____

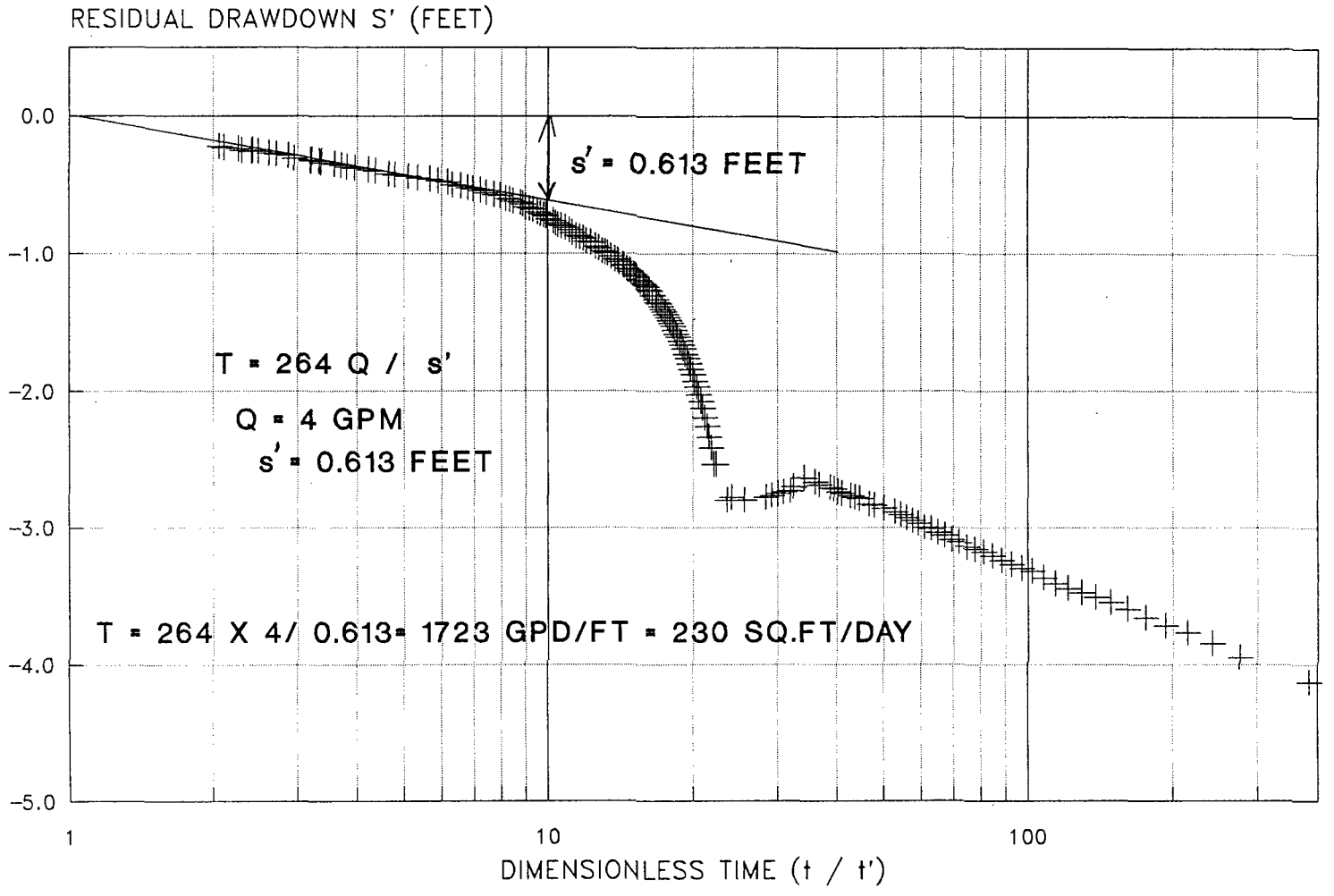
Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5				0- 5'	0- 5' SAND, mod yellowish brwn (10YR5/4), fine-to med-grained sand, unconsolidated, well-sorted, subrounded. No HC odor. Saturated @ ~5'.
				5- 9'	5- 9' SAND, as above. Saturated. Gravelly sand @ 9'. Subrounded gravel, 2" dia.
10				9-10'	9-10' SANDY CLAY, dusky yellow (5Y6/4), fine-to med-gr sand in clay matrix. No HC odor. Saturated.
				10-15'	10-15' SANDY CLAY, as above. Minor chips of clay (shale), ~10%. Saturated to -12'.
15				15-16'	15-16' SANDY CLAY, as above. Clay chips up to ½" (moderately consolidated clay or weathered shale). Contains <10% gypsum. No HC odor.
				16-17'	16-17' CLAYEY SAND, dusky yellow (5Y6/4), sand is fine-grained, well-sorted, No HC odor.
20					
25					
30					
35					
40					
45					
50					

ATTACHMENT C

Revised Aquifer Test Plots

GROUNDWATER TECHNOLOGY

BLOOMFIELD REFINING COMPANY, NEW MEXICO
WELL RW-22 WATER LEVEL RECOVERY
JUNE 9 AND 10, 1994



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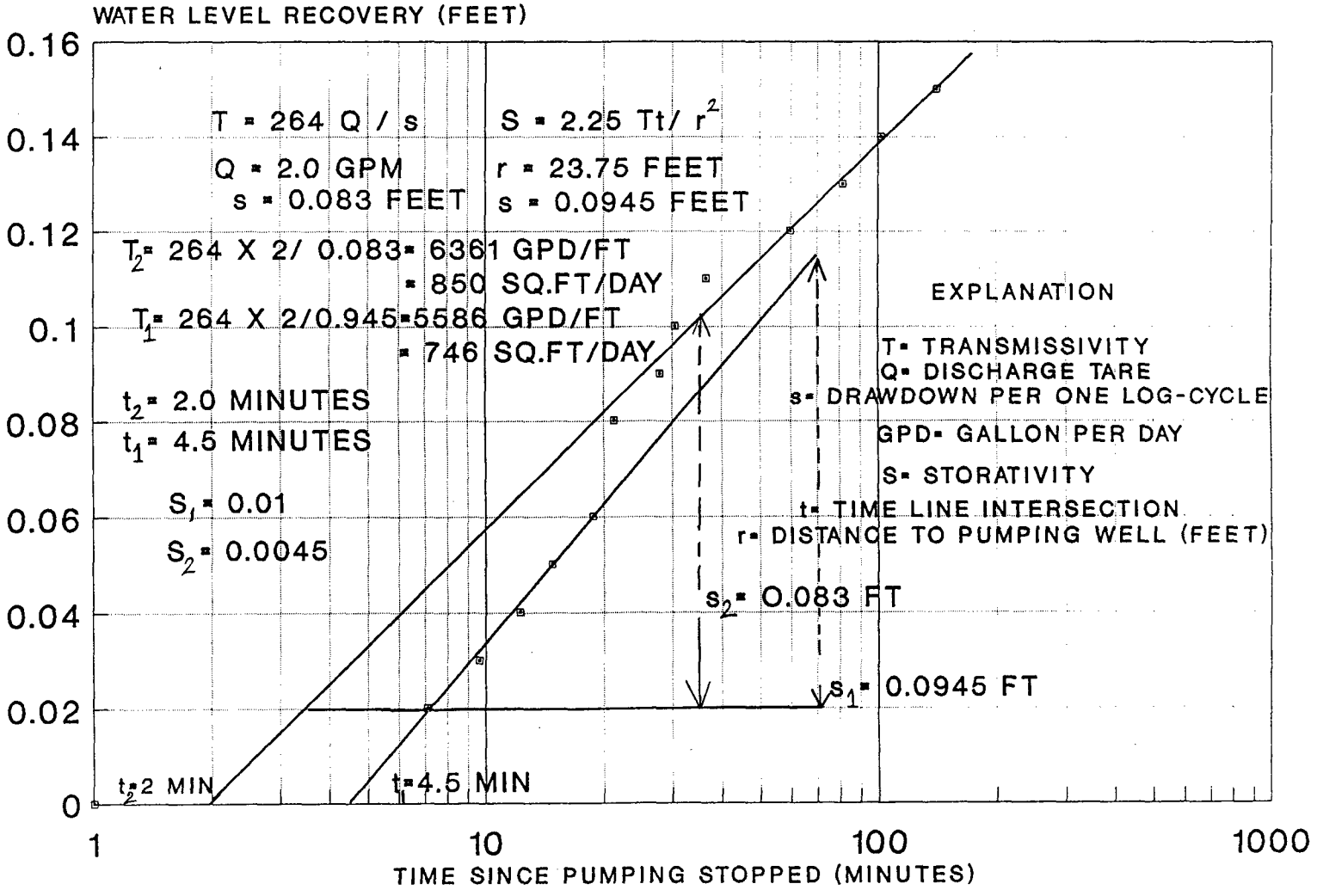
BLOOMFIELD REFINARY COMPANY, NEM MEXICO
OBS. WELL MP-4 RECOVERY (JUNE 8, 1994)



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ATTACHMENT D

Water Well Logs for Brown and Looney

STATE ENGINEER OFFICE
WELL RECORD

Revised June 1972

STATE ENGINEER OFFICE SANTA FE, N.M. 87501

Section 1. GENERAL INFORMATION

(A) Owner of well Edd H. BRown Owner's Well No. #1
Street or Post Office Address RT. #1 Box 248
City and State Aztec N.Mexico,

Well was drilled under Permit No. S.J. 700 and is located in the:

a. SW ¼ SW ¼ NW ¼ ¼ of Section 27 Township 29 N. Range 11 W. N.M.P.M.

b. Tract No. _____ of Map No. _____ of the _____

c. Lot No. _____ of Block No. _____ of the _____
Subdivision, recorded in San Juan County.

d. X= _____ feet, Y= _____ feet, N.M. Coordinate System _____ Zone in the _____ Grant.

(B) Drilling Contractor John C. Hargis License No. W.D. 724

Address RT. #1 Box 260-B Aztec N. Mex.

Drilling Began July 9 Completed July 10 Type tools Cable Size of hole 7 in.

Elevation of land surface or _____ at well is _____ ft. Total depth of well 20 ft.

Completed well is ☑ shallow ☐ artesian. Depth to water upon completion of well 7 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
10	20	10	Boulders & Sand	20

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
7	14	weld	0	20	20	Weld On Butler Larken none		

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

Section 5. PLUGGING RECORD

Plugging Contractor _____
Address _____
Plugging Method _____
Date Well Plugged _____
Plugging approved by: _____
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received 7/13/78

Quad _____ FWL _____ FSL _____

File No. SJ-700 Use Dom. Location No. 29N.11W.27 133
San Juan Co.

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
~~##~~ 0	20	20	Boulders Sanr & Gravel Brown

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

John C. Harris
Driller

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a pluggine record only Section 1(a) and Section 5 need be completed

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

Section 1. GENERAL INFORMATION

(A) Owner of well Don C. Looney Owner's Well No. ______

Street or Post Office Address PO Box 2462

City and State Bloomfield, N.M. 87413

Well was drilled under Permit No. SJ-2210 and is located in the:

a. S ½ NW ¼ NW ¼ ______ ¼ of Section 27 Township 29 N. Range 11 W. N.M.P.M.

b. Tract No. ______ of Map No. ______ of the ______

c. Lot No. ______ of Block No. ______ of the ______ Subdivision, recorded in ______ County.

d. X= ______ feet, Y= ______ feet, N.M. Coordinate System ______ Zone in the ______ Grant.

(B) Drilling Contractor Bob Savage License No. WD 847

Address PO. Box 2434 Farmington, N.M. 87499

Drilling Began 12-1-88 Completed 12-1-88 Type tools Rotary Size of hole 6 in.

Elevation of land surface or ______ at well is ______ ft. Total depth of well 32 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 8 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet		Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
From	To			
24	32	8	Water Sand + Gravel	8

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet		Length (feet)	Type of Shoe	Perforations	
			Top	Bottom			From	To
6	PVC	–			33	None	22	32

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet		Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement
From	To.				

Section 5. PLUGGING RECORD

Plugging Contractor ______

Address ______

Plugging Method ______

Date Well Plugged ______

Plugging approved by:

______ State Engineer Representative

No.	Depth in Feet		Cubic Feet of Cement
	Top	Bottom	
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received Dec 7 1988

Quad ______ FWL ______ FSL ______

File No. SJ-2210 Use Dom Location No. S½ NW¼ NW¼ T29N R11W Sec 27 (San Juan)

Section 6. LOG OF HOLE

th in Feet		Thickness in Feet	Color and Type of Material Encountered
From	To		
0	24	24	Top Soil
24	32	8	water SAND + GRAVEL

Section 7. REMARKS AND ADDITIONAL INFORMATION

lersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above
d hole.

Driller

CTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office
Section 5, shall be answered as completely and accurately as possible when any well is