Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

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Date: February 8, 1996
Refer to: EM/ER:96-046

FEB 12 1996

Ms. Barbara Driscoll
NM Federal Facilities Section
Multimedia Planning and Permitting Division
U.S. Environmental Protection Agency
Region 6, 6PD-N
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

SUBJECT: RESPONSE TO THE NOTICE OF DEFICIENCY (NOD) FOR SOLID WASTE MANAGEMENT UNIT (SWMU) 3-010(a)

Dear Barbara:

Enclosed is the Los Alamos National Laboratory's response to the Environmental Protection Agency's (EPA's) NOD concerning SWMU 3-010(a). A certification form signed by the appropriate officials is also enclosed. The NOD was received at the Los Alamos Area Office on November 11, 1995. The enclosed response repeats each comment from the NOD for convenience in reviewing.

Please contact Garry Allen at (505) 667-3394 or Bonnie Koch at (505) 665-7202, if you have any questions about this response to the NOD.

Sincerely,

for Jorg Jansen, Program Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

JJ/TT/bp

Enclosures: Response to NOD
Certification

Cy w/enc.):
G. Allen, CST-18, MS E525
B. Koch, LAAO, MS A316
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D. Griswold, ERD, AL, MS A906
J. Harry, EM/ER, MS M992
B. Hoditschek, NMED-HRMB
R. Kern, NMED-HRMB
N. Naraine, EM-453, DOE-HQ
T. Taylor, LAAO, MS A316 (2 copies)
N. Weber, Bureau Chief, NMED-AIP, MS J993
J. White, ESH-19, MS K498
S. Yanicak, NMED-AIP, MS J993
EM/ER File, MS M992
RPF, MS M707

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J. Vozella, LAAO, MS A316

CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title: Response To The Notice Of Deficiency For Operable Unit 1114

Name: for _____ Date: 2/7/96

Jorg Jansen, Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

or

Tom Baca, Program Director
Environmental Management
Los Alamos National Laboratory

Name: _____ Date: 2/7/96

Joseph Vozella,
Acting Assistant Area Manager of
Environment Projects
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DOE-Los Alamos Area Office

or

Theodore J. Taylor
Program Manager
Environment Restoration Program
DOE-Los Alamos Area Office

for KC X
Barbara

Response to the Notice of Deficiency for the RFI Report for Solid Waste Management Units

3-010(a)

Doc. Date = 2/8/96
rec'd 2/12/96

Field Unit 1

Environmental Restoration Project

February 1996

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

GENERAL COMMENT

LANL shall present a synopsis of the sampling that was approved at the site prior to a discussion of the results of sampling in all future reports. For example: A maximum of six boreholes are to be drilled based on the following information. These boreholes were to be drilled to a depth of x feet with samples collected every x feet and analyzed for the following constituents. This information assists the reader who does not then have to waste time locating the sampling plan and verifying what sampling was to occur at the site. In addition, it is a check for LANL to ensure that sampling was conducted as approved. Deviations from the approved sampling plan should be indicated and explained.

RESPONSE

All Los Alamos National Laboratory (LANL) Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) reports currently in preparation follow a format developed by the LANL Environmental Restoration (ER) Project Office. This format includes a synopsis of sampling activities for the site in two places: Chapter 1 contains a brief overview of RFI activities, and Chapter 5 contains a summary of sampling activities for each potential release site (PRS) or PRS aggregate included in the report. The annotated outline specifies that deviations from the work plan should be described in Chapter 5 of future RFI reports. In the RFI Report for Solid Waste Management Unit (SWMU) 3-010(a) (LANL 1995, 17-1276), written before the LANL ER Project Office RFI report format was completed, a synopsis of sampling activities that included deviations from the original sampling plan was provided in Subsection 4.1, Subsection 4.2, and Subsection 4.5. A more detailed description of Phase II sampling activities that were planned can be found in the Phase II RFI Work Plan for SWMU 3-010(a), Mercury Cleanup (LANL 1994, 17-1271). A summary of deviations from the work plan is included as Attachment 1 for this report only.

SPECIFIC COMMENTS

DEFICIENCY 1

2.3.4 Existence and Significance of Seep, p. 9

The seep identified in the bottom of the drainage downgradient from SWMU 3-010(a) was first observed and noted by New Mexico Environment Department, DOE Oversight Bureau staff. The existence of this seep may be a result of water leaking via fracture flow from the perched

aquifer located near SWMU 3-010(a). The conclusion LANL has reached regarding the origin of this seep in the first paragraph of this section cannot be substantiated without further investigation. Therefore, LANL should indicate that this is one possible explanation for the seep along with the above possibility.

RESPONSE

Leakage of water via fracture flow from a perched aquifer, as suggested in the Environmental Protection Agency (EPA) comment, assumes that a perched aquifer is present in the vicinity of SWMU 3-010(a). While LANL cannot, with certainty, rule out the presence of a perched saturated zone, LANL believes that there is little evidence supporting the existence of a major perched saturated zone at this location (see response to Deficiency 2a). Water was observed in Monitoring Well MW1 (completed from Borehole B1) at a depth of 25.17 ft on November 29, 1995 and at 25.37 ft on December 6, 1995, yet no seep was present in the drainage. Thus, although a source of water was present in the vicinity of the putative perched aquifer, no seep existed. LANL continues to believe that the source of water exposed in the seep, when present, is surface runoff through channel alluvium and fill in the paleocanyon under Building SM-30, and that the seep does not represent the edge of a perched saturated zone. Therefore, no change to the RFI report is necessary.

DEFICIENCY 2A

2.3.5 Hydrologic Model for SWMU 3-010(a), p. 12

LANL should rewrite text in this section to indicate the following information. The statement, "the presence of a major perched zone is unlikely" is questionable considering the fact that structural (fracture zones, faults, etc.) and rock properties may change laterally and vertically in this area. Physical evidence that supports the significance of the perched zone at SWMU 3-010(a) is the fact that a seep/spring discharges from the tuff approximately 3,000 feet due east at an elevation of approximately 7,320 feet. The referenced zone continuously discharges approximately 30 gallons per minute (gpm) or 43,200 gallons per day (gpd). Perched zones within in the tuff have been shown to be hydrologically complex, and assumptions concerning these zones are questionable until aquifer characterization is performed.

RESPONSE

The spring. As noted in discussions with New Mexico Environment Department (NMED) Agreement in Principle (AIP), the surface discharge is actually located 3 000 ft north of SWMU 3-010(a), rather than 3 000 ft due east as stated in Deficiency 2a. LANL believes that the cited discharge of water is caused by a leak in the Los Alamos County water system rather than a natural discharge. The surface discharge lies within a small natural drainage and flows from beneath a man-made pile of rubble composed of Bandelier Tuff. The rubble covering the slope of the natural drainage was apparently created during excavation of trenches to bury two water lines that lie at the top of and alongside the natural drainage (Fig. 1). One of these lines is a 14-in. steel pipe, the second is a 16-in. cast iron pipe. Several hundred yards northeast and upslope of the surface discharge, these lines are connected to three water storage tanks with a combined capacity of 16.5 million gal. (Fig. 1). According to Johnson Controls World Services, Inc. personnel, leaks in the water system, especially from cast iron pipes, are common (Baldridge 1996, 17-1279).

Additional considerations regarding aquifer characterization. LANL recognizes that perched aquifers are present within intervals of the Bandelier Tuff (such as the Guaje pumice beds at the base of the Otowi Member) and within the alluvial channel fill in some of the drainages (Broxton and Eller 1995, 1162). LANL also agrees that the structural and rock properties of Bandelier Tuff not only may, but do, differ laterally and vertically. In part, the presence and extent of perched saturated zones is controlled by inhomogeneities in structural and rock properties. These considerations, however, do not directly bear on the presence or absence of perched water at SWMU 3-010(a).

Saturated conditions do exist at SWMU 3-010(a). Observations from Monitoring Well MW1 are presented in Table 1.

TABLE 1

RESULTS OF MONITORING WELL MW1 OBSERVATIONS

DATE	DEPTH FROM TOP OF MW1 CASING TO STANDING WATER (FT)
November 29, 1995	25.17
December 6, 1995	25.37
December 13, 1995	25.42
December 20, 1995	21.18
January 3, 1996	19.97
January 10, 1996	20.21
January 22, 1996	20.54

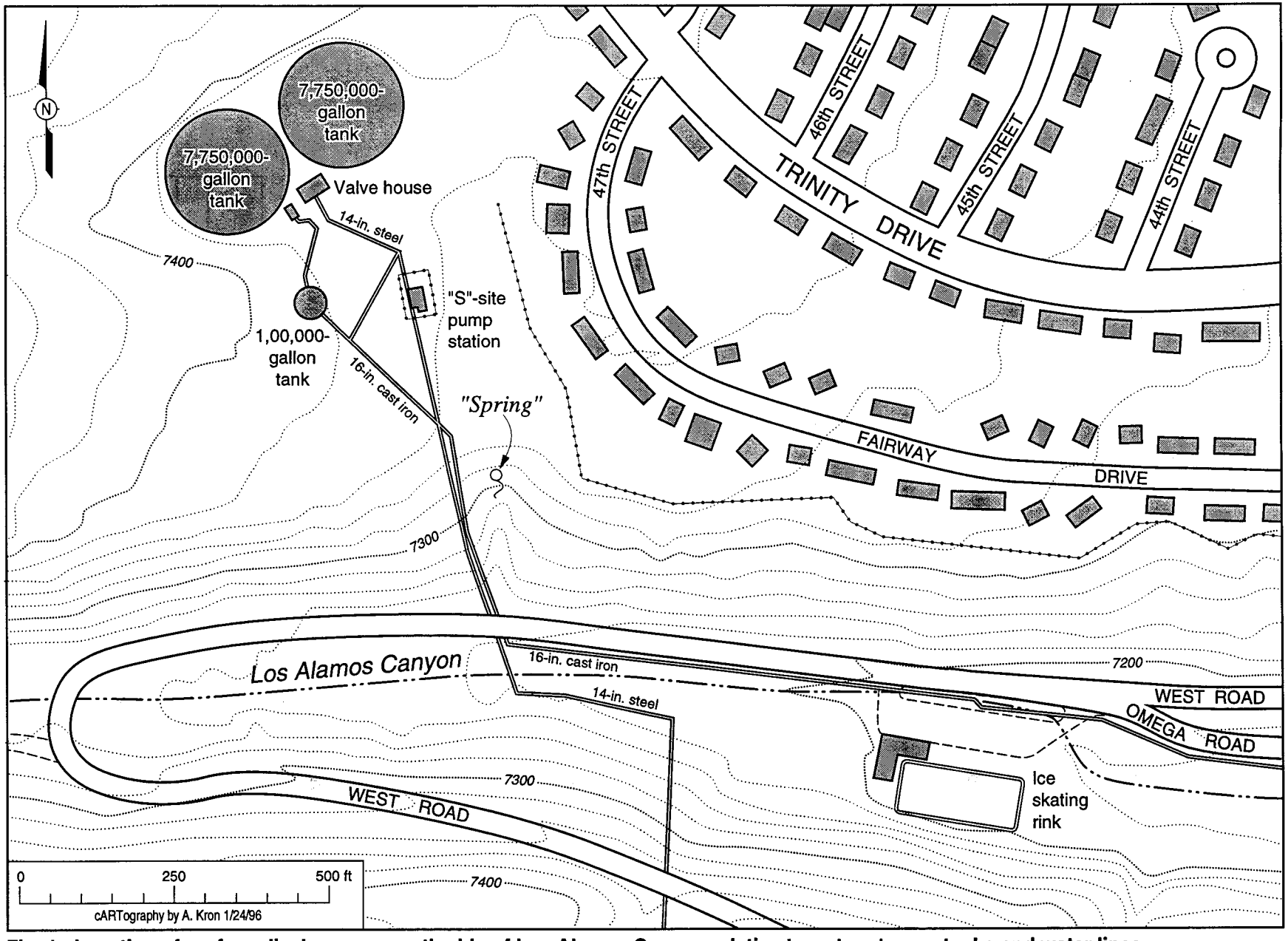


Fig. 1. Location of surface discharge on north side of Los Alamos Canyon relative to water storage tanks and water lines.

The presence of water in the well confirms that saturated conditions exist, and could indicate either or both of the following possibilities. First, a perched saturated zone could be present in the bedrock at SWMU 3-010(a). In this case, MW1 presumably penetrates the zone and records its level. Alternatively, a zone of saturation exists in the fill of the paleocanyon underlying SM-30 and parking lots. Water from the fill drains through fractures in the surface of the bedrock into monitoring well MW1. No perched, saturated zone is necessarily present in the bedrock.

LANL considers it unlikely that a major perched saturated zone is present in the bedrock at SWMU 3-010(a). First, a borehole (SHB-2) was drilled approximately 1 050 ft east of SWMU 3-010(a) at an elevation of 7 436 ft (Fig. 2 and Fig. 3). Because the hole was drilled to a depth of 200 ft, water should have been encountered at approximately 20 to 26 ft below the surface if a major perched aquifer was present at the level of the seep and of Borehole B1 (monitoring well MW1). Saturated conditions were not encountered at any depth in Borehole SHB-2. Second, the seep that was observed in the drainage at SWMU 3-010(a) is ephemeral, as are other seeps in the walls of this and adjacent drainages. The ephemeral nature of the seep is inconsistent with a major perched bedrock aquifer. However, LANL cannot eliminate the possibility that a perched saturated zone of minor extent is present in the bedrock.

LANL considers it more likely that the presence of water in the well does not indicate the presence of a perched bedrock aquifer. The variable water levels that were observed between September 22, 1994, and February 2, 1995 [see Table 4-11, p. 53 of RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276)], generally indicate lower levels in the dry months of September and October (approximately 21 to 23 ft below top of well) and higher levels in the wetter winter months of January and February (20 to 21 ft). In addition, the measurements on November 29, December 6, and December 13, 1995 [see response to Deficiency 1 of this Notice of Deficiency (NOD)], indicate that water levels continued to fall until Los Alamos experienced precipitation. On December 16-17, 1995, TA-6 [the closest recording station to SWMU 3-010(a)] received 0.27 in. of precipitation. Following the precipitation, the water level in MW1 rose significantly, and it has remained high. LANL's interpretation of these results is that the well receives water by flow from the artificial fill (Fig. 4) of the paleochannel through fractures in the surface of the bedrock. The fact that the water level in the well reacts quickly to precipitation events indicates that the saturated zone is small and closely connected to runoff. The December 16-17 precipitation has been augmented several times by snowfall during December 1995 and January 1996. The variable water level in MW1 is probably related to the variable melting and runoff rate related to variable daytime temperatures. Flow of water into the fill is augmented by drainage from the roof of SM-30 and from parking lots surrounding the building [see Subsection 2.3.2 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276)]. The asphalt surface of the

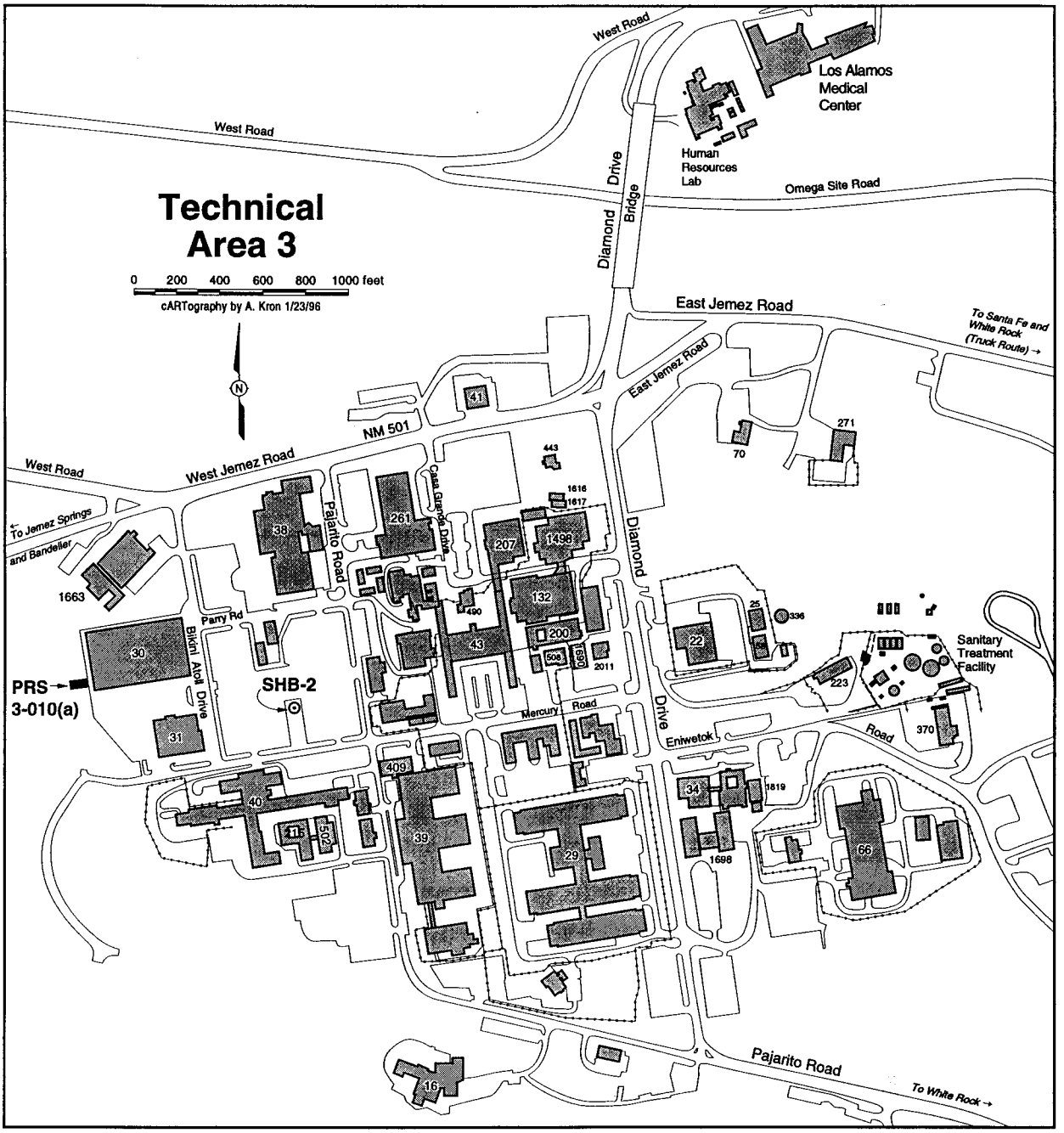


Fig. 2. Map of TA-3 showing location of core hole SHB-2.

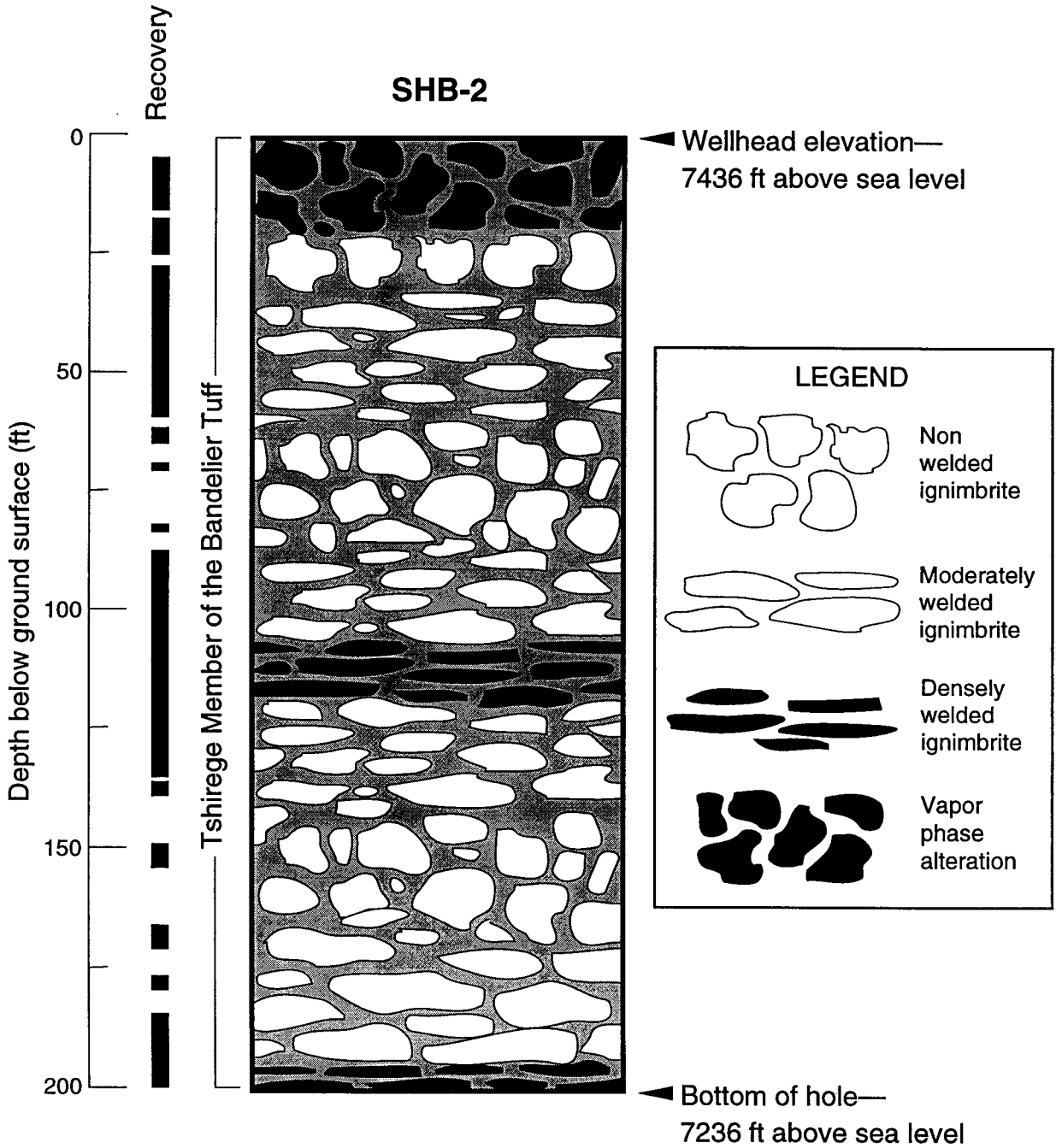


Fig. 3. Lithologic log for core hole SHB-2 (from Gardner et al. 1993).

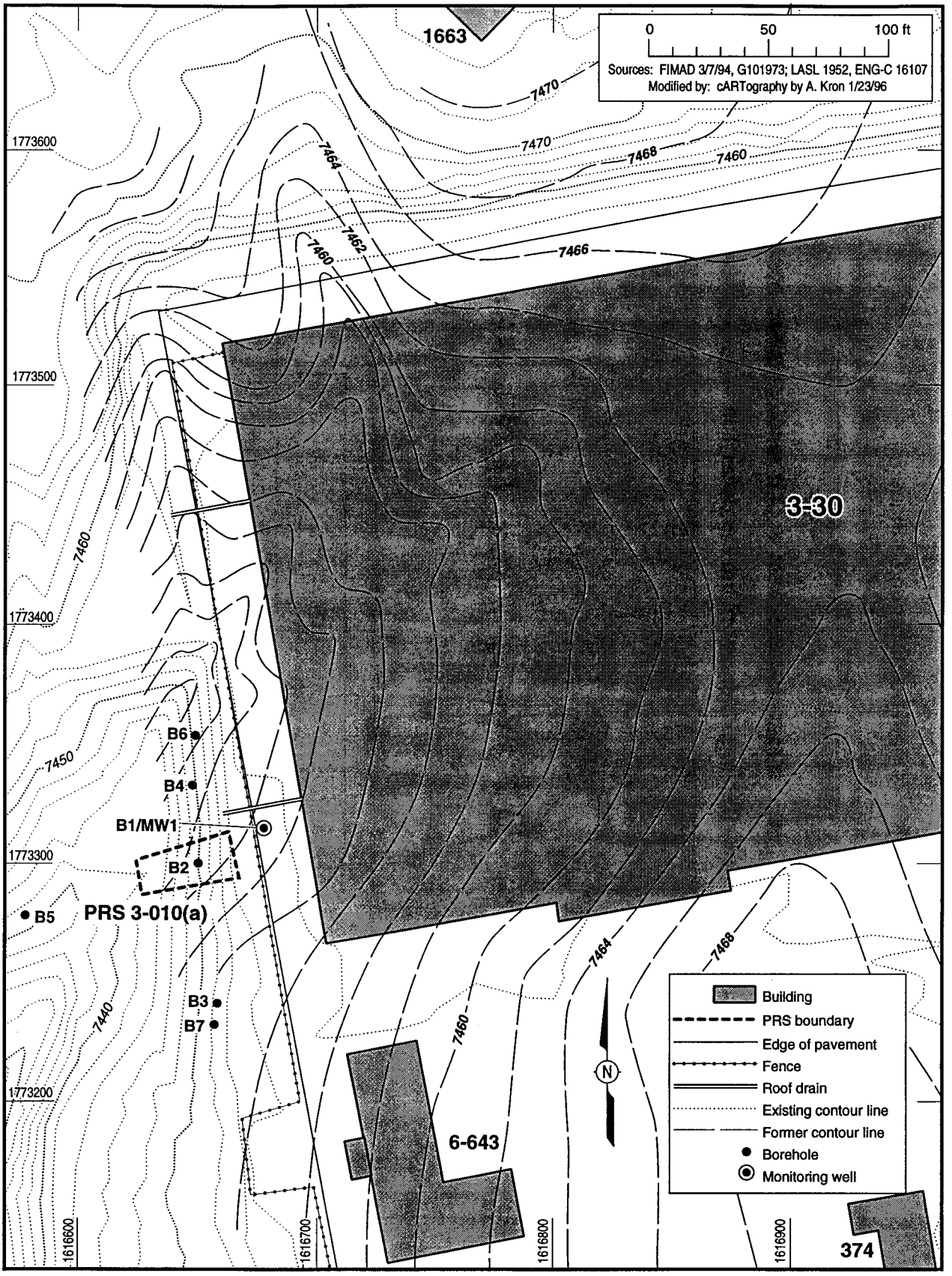


Fig. 4. Former and current topography of the TA-3-30 area.

parking lots may also reduce evapotranspiration, which increases moisture in the fill. A portion of the fill is water-saturated, perhaps perennially. During dry months, water drains from the fill as it dries out.

To support the above model, LANL notes that during the original investigation, fractures in the bedrock were observed in Borehole B1 at the depth at which water was first encountered in this hole [Subsection 2.3.3 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276)]. Saturated conditions were encountered at the fill/bedrock interface in Borehole B4. Wet, but unsaturated, conditions were encountered in the fill in Borehole B6. Water was not encountered in Boreholes B2, B3, and B5 (all located the farthest downstream of the array), despite the fact that they were drilled to depths exceeding 50 ft into the bedrock, which is below the level of the seep.

Based on the arguments presented above, LANL believes that a perched saturated zone of significant lateral extent is not present in the bedrock, and no revision to the RFI Report is necessary. Rather, a saturated zone of limited extent is present in the fill. The presence of water is more readily related to drainage from fill storage. LANL is continuing to measure the water level in MW1 to evaluate the amount, variability, and source of water.

DEFICIENCY 2B

Additional observations by the NMED DOE Oversight Bureau indicate that flow along the tuff/ alluvium interface may not be occurring. NMED staff observed exposed tuff along the road in the bottom of the channel below the SWMU, and water was not flowing at the interface between the alluvium and the tuff. However, the seep/spring downgradient from the SWMU was flowing at approximately 2 gpm.

RESPONSE

LANL agrees that these observations are important, but they are only part of the picture. At other sites along the sides of canyons and at roadcuts, LANL has observed water from soil and fill upslope moving preferentially downslope over the bedrock surface, as well as along fractures in the surface of the bedrock. The seep at SWMU 3-010(a) is composed of damp or water-saturated alluvium present at a flat reach above and at the base of a ledge of Bandelier Tuff in the drainage. Alluvium in the drainage forms a thin and discontinuous mantle over the bedrock. Water may move along fractures in the surface of the bedrock channel, or may enter the channel from banks downstream of the road, thus it may not be readily visible until collected at the flat reach of the channel where the seep occurs. Thicker accumulations of alluvium also

remain damp or saturated for longer periods of time after water has evaporated from thinner deposits of alluvium. No revision to the RFI report is necessary.

DEFICIENCY 2C

LANL should provide a map indicating the location of borehole SHB-2 in relation to this site along with any borehole information.

RESPONSE

The location of Borehole SHB-2 is shown on Fig. 2, which was excerpted from the Gardner document (Gardner et al. 1993, 0848) referenced in Subsection 2.3.5 on p. 12 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276). A lithologic log of the borehole is shown in Fig. 3.

DEFICIENCY 3A

3.2.1.2 Statistical Comparison to Background, p. 23

A statistical comparison to background should be conducted using the most current, revised background data. It is unclear whether enough data exists for a comparison of sediment data to background concentrations.

RESPONSE

EPA's comment at the October 18th LANL/SNL/EPA/DOE meeting indicated that reports written with the old background data did not have to be rewritten. No revisions to the RFI report are necessary; however, LANL has tabulated the differences resulting from using revised background data. The results are found in the response to Deficiency 3b.

With respect to background comparisons to sediment samples, it is LANL's plan to make background comparisons with the most relevant geological subset of LANL-wide background data. However, the current LANL-wide background data include a limited set of canyon sediment samples, which are not directly comparable with the sediment samples collected at PRS 3-010(a). Because relevant geological background data were not available, LANL proposes to use the entire LANL-wide soil background data (the combined A, B, and C soil horizon data).

DEFICIENCY 3B

The recalculated values for UTLs should also be used in the revised report.

RESPONSE

Based on discussions with EPA at the LANL/SNL/EPA/DOE meeting held October 18, 1995, a rewrite of the report based on the new upper tolerance limits (UTLs) is not needed. However, LANL has tabulated the differences resulting from using the UTL:95,95 in the screening assessment for SWMU 3-010(a). Two inorganic chemicals, barium and beryllium, were detected at concentrations greater than the UTL:95,95 but less than the UTL:99,95. Neither result is statistically greater than the range of background results, and neither chemical would be carried forward as a chemical of potential concern (COPC). One radionuclide, potassium-40, was detected at concentrations greater than the UTL:95,95 but less than the UTL:99,95. However, these concentrations are similar to the range of potassium-40 measurements for LANL soil. Based on site history, potassium-40 is not expected to be present as a result of activities at SWMU 3-010(a). For these reasons, potassium-40 would not be carried forward as a COPC. No changes to the COPC list result from using the new UTLs; therefore, no revisions to the RFI report are necessary.

DEFICIENCY 4

3.2.1.3 Comparison to Screening Action Levels, p. 25

LANL and EPA have agreed to screening action levels (SALs) generated by EPA Region 9, therefore, comparisons to SALs should be conducted by comparison to this list.

RESPONSE

The screening action levels (SALs) used in this report are the ones that were available in the Facility for Information Management and Display (FIMAD) when the report was written. No changes to the COPC list evaluated in the risk assessment would have resulted from using the current SAL list. If the new SALs were used, the total normalized sum for the carcinogens would be 0.507 instead of the 1.213 total noted in the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276). Using the new SALs would result in eliminating benzene, chloroform, and cis-1,3-dichloropropene in the screening assessment found in Subsection 4.3.3 instead of the risk assessment found in Subsection 4.6 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276). Because the report predates the current SALs and using the new SALs does not change the conclusion, no revision to the RFI report should be necessary.

DEFICIENCY 5

3.2.2 Ecotoxicological Screening Assessment Approach, p. 25

The method proposed for screening of chemicals of concern for ecological receptors has been reviewed and found to be inappropriate based on toxicological assumptions made. A summary of the EPA Region 6 method for determining ecotoxicological screening quotient (ESQs) is attached.

RESPONSE

In accordance with conversations between LANL ER Project personnel and EPA Region 6 officials, further ecological risk assessment at this site will be deferred until the site can be assessed as part of the new ecological exposure unit (ecozone) approach that is being developed by LANL in conjunction with EPA and the NMED.

DEFICIENCY 6

4.3.1 Ecotoxicological Screening Assessment, p. 30

Risk due to background for ecological receptors should be calculated or used by the facility manager in assessing the total site risk and establishing clean-up levels for chemicals of concern. Also, it would be more appropriate to conduct ecological risk assessments on a habitat specific basis, and not on a SWMU specific basis.

RESPONSE

In accordance with conversations between LANL ER Project personnel and EPA Region 6 officials, further ecological risk assessment at this site will be deferred until the site can be assessed as part of the new ecological exposure unit (ecozone) approach that is being developed by LANL in conjunction with EPA and the NMED.

DEFICIENCY 7

Figure 4-2, p. 33

Either a yes or no option is missing from the logic flow chart for the question "Site considered a residential or urban or industrial area?"

RESPONSE

Because further ecological risk assessment at this site is being deferred as stated in the responses to Deficiencies 5 and 6, there is no need to revise Fig. 4-2 for this report. However, any figures used in future ecological risk assessments will contain complete logic information.

DEFICIENCY 8

4.3.2 Background Comparison, Figure 4-3

The location of the samples collected next to the excavation presents misleading information, in that these samples were collected 30–50 ft away from the excavation and at the same elevation as the top of the area excavated. What was the purpose of these samples? Are they being used as background samples? These points cannot be used as confirmation of any cleanup activities at the site.

RESPONSE

The samples collected from these locations were used to determine if there was further surface deposition of waste oil (laterally from excavation) before the outfall pipe was installed under the roadway. The samples were not intended as background samples or confirmatory samples. The area to the south of the excavation is directly in line with a path from the back door, the first place waste oil might have been disposed of. No revision to the RFI report should be necessary.

DEFICIENCY 9A

4.3.3 SAL Comparison, p. 37

The citation used that states the SAL for TPH is based on migration potential of BTEX and assumes that the site is within 50 ft of usable water is from New Mexico UST regulations, and is not appropriate here. Also, on page one of this document it states that "following the 1992 sampling, LANL and the New Mexico Environment Department (NMED) Surface Water Quality Bureau of the Water Quality Control Commission entered into an agreement to remove all TPH-contaminated soils to a concentration of 100 ppm." TPH remaining after lift 3 in significantly above 100 ppm [*sic*]. This issue needs to be addressed.

RESPONSE

Sentences five through eight of Subsection 4.3.3 on p. 37 and p. 39 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276) should be replaced with the following:

> The term total petroleum hydrocarbon (TPH) is used to describe a variety of complex mixtures that contain individual chemicals of varying toxicity. There is little to no toxicity data available for TPH mixtures; therefore, the potential risks associated with these mixtures is generally evaluated based on the individual chemical components. However, for purposes of completing a screening assessment, LANL has adopted a value of 100 ppm TPH as a SAL. This level is taken from the part of the NMED's Underground Storage Tank (UST) regulations that addresses the potential migration of benzene, toluene, ethylbenzene, and xylenes (collectively referred to as BTEX) to groundwater when gasoline is present within 50 ft of usable groundwater. At this site, however, the petroleum mixture remaining in subsurface soil is mineral oil, not gasoline (see response to Deficiency 9b). Therefore, it should be noted that use of a SAL of 100 ppm TPH at SWMU 3-010(a) is very conservative.

The following paragraph should be added to the RFI report after the first paragraph of Subsection 1.2 on p. 1:

> LANL should have requested that the agreement with the NMED Surface Water Quality Bureau include a cleanup level of 100 ppm TPH **or** an alternative level based on site-specific considerations, as suggested by 40 CFR 264, Subpart S. The human health risk assessment revealed that the TPH levels present after completion of the VCA present no threat to human health for the site-specific scenario. On this basis, LANL believes there is no need for further action at PRS 3-010(a).

DEFICIENCY 9B

LANL must prove that the source of the TPH is mineral oil. This has not been demonstrated. TPH should be carried through to the risk assessment.

RESPONSE

The following revisions should be added to the revisions noted in the response to Deficiency 9a:

> As stated in Subsection 1.1 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276), SWMU 3-010(a) was used to dispose of vacuum pump oil from a pump repair area in Building TA-3-30. No other sources of TPH, such as fuel storage tanks, are associated with this SWMU. A fingerprint analysis was conducted on sample 0103-95-0028 to verify that TPH present in the sample was consistent with mineral oil or vacuum pump oil. The sample was analyzed qualitatively along with a vacuum pump oil and a diesel fuel sample for total extractable petroleum hydrocarbons (TEPH) using USEPA modified Method 8015. The results of the fingerprint analyses showed that the sample chromatogram very closely followed the patterns in the vacuum pump oil chromatogram. The comparison with the diesel oil chromatogram showed very distinct differences, with the sample chromatogram not containing most characteristics of the diesel fuel chromatogram. The analysis clearly shows the presence of vacuum pump oil (mineral oil) in the sample and indicates that diesel fuel is a very unlikely component in the sample. A copy of the TPH analytical report can be found in Attachment 2.

As stated above, there is little to no toxicity data for TPH mixtures. Therefore, the potential risks associated with exposure to these mixtures is evaluated based on the toxicity of individual compounds identified by other analytical methods (e.g., EPA Method 8240 for volatile organic compounds). The samples collected from SWMU 3-010(a) were analyzed for selected inorganic chemicals and/or volatile organic compounds, and results from these analyses were used to identify COPCs to include in the risk assessment. Therefore, no further revision to the RFI report is necessary.

DEFICIENCY 10

4.5.1 Soil-Vapor Probe Survey, p. 46

The NMED DOE Oversight Bureau staff indicate that the majority of soil-vapor data were obtained using a PID with 10.6 eV bulb. This bulb may not be capable of detecting the major solvent constituents that are of concern such as 1,1 DCA, 1,2 DCA, 1,1,1 TCA, and carbon

tetrachloride. LANL shall provide an explanation as to why this problem was not discussed in this report along with a discussion of this problem and its possible effects on the sampling outcome.

RESPONSE

The situation EPA references was discussed in depth with the NMED Department of Energy (DOE) Oversight Bureau staff at a meeting held on February 8, 1995, to update AIP staff on site progress. During the meeting it was agreed that the inadvertent use of the 10.6 eV bulb had been adequately addressed and that there was no need to address it in the RFI report. It was emphasized that the photoionization detector (PID) was merely a field screening tool for use in selecting the location of boreholes and not for use in plume definition. During the time it was used, the 10.6 eV bulb provided positive readings consistent with what might have been expected. The 10.6 eV bulb was obviously capable of screening organic vapors present in the soil to a degree sufficient for borehole placement. Based on the analytical laboratory data, LANL believes that the outcome of the investigation was not impacted by the unintentional use of the 10.6 eV bulb. No revisions to the RFI report should be necessary.

DEFICIENCY 11

4.5.2.1 and 4.5.2.2 Borehole Locations and Monitor Well Construction and Sampling, p. 51

Boreholes do not appear to correlate very well with the soil vapor survey. Soil vapor sampling point 03-2641 shows a PID reading of 976, and this is the southernmost soil vapor sampling point. The borehole locations do not appear to bound the area of contamination.

RESPONSE

LANL agrees that in many instances, the PID data do not appear to correlate very well with the laboratory data. It is unclear why sampling point 03-2641 showed a PID reading of 976 ppm. This value is anomalously high when compared to nearby data and is further suspect considering that the sample was obtained from a depth of only 1.5 ft in relatively loose, dry soil. For comparison purposes, a split soil gas sample was collected at this location under the direction of NMED AIP staff using their activated charcoal tube. The results of this sample indicated a total VOC content of only 0.117 ppm using a very conservative pump flow rate estimate of 0.3 L/min. This value is much closer to what might have been predicted based on laboratory data from the borehole samples, and it is clear that the original PID value of 976 ppm was erroneous.

It should also be noted that the soil gas data are not directly comparable to the soil data (or the soil SALs). The relationship between soil gas data and soil data is related to the chemical's Henry's constant and soil absorption coefficient, and the organic content of the soil. In addition, the reported soil gas concentration in µg/L, is not equivalent to "parts per billion" (ppb), which would be the case for soil data reported in units of µg/kg. For gases, this relationship is dependent on molecular weight, temperature, and pressure. Therefore, comparing soil gas data to soil data requires several calculations and/or conversions be completed beforehand. Using DCE in Borehole 2 as an example, 1 200 µg/L was detected in soil gas at 15 ft below ground surface (bgs). Assuming an organic carbon content of 0.5% (not uncommon at the Laboratory) and published values for DCE's Henry's constant and soil absorption coefficient, 1 200 µg/L in soil gas is equivalent to approximately 61 µg/kg in soil. This value compares well with the 34 µg/kg DCE detected in a soil sample collected between 15 and 15.5 feet bgs at this location. Although DCE was detected in the soil gas at other locations where it wasn't detected in soil, these soil gas concentrations would correspond to low soil concentrations. Therefore, both the soil gas data and the soil data demonstrate that the majority of the source has been removed.

PID field screening results were not intended to bound the area of contamination, but to determine locations for boreholes. The borehole data were intended to determine the extent of contamination, and LANL believes these data do serve this purpose. A discussion of whether the area of contamination has been adequately bounded at PRS 3-010(a) can be found in the response to Deficiency 17.

DEFICIENCY 12

4.5.2.3 Subsurface Sampling Approach, p. 54

LANL needs to provide more information on why drilling termination criteria was altered in the field. Text indicates that the criteria was changed but not why the criteria was changed.

RESPONSE

The Phase II RFI Work Plan for SWMU 3-010(a), Mercury Cleanup (LANL 1994, 17-1271) states that if VOCs were detected at a given interval, or if visual examination or field screening of soil/rock samples indicated the presence of TPH, then the borehole would be extended for another 5 ft. If VOCs were not detected, no visual staining was observed, and field screening did not reveal TPH within two successive 5-ft intervals, then the borehole would be terminated.

The following paragraphs should be inserted after sentence four of paragraph two in Subsection 4.5.2.3 on p. 54 of the RFI report:

> During completion of the first boring (B1), the criteria for determining how the drilling would be conducted and how the soil and tuff samples would be collected were revised in response to site conditions and to provide more real-time data by making better use of the onsite mobile chemistry analytical laboratory (MCAL). The MCAL was devoted full time to the investigation and was capable of processing many more samples on a daily basis than were requested in the Phase II RFI Work Plan for SWMU 3-010(a), Mercury Cleanup (LANL 1994, 17-1271). LANL therefore decided to analyze soil and soil vapor samples at 5-ft intervals from each borehole to determine how far to continue drilling and sampling.
>
> The revised procedure called for the bottom 6 in. of soil or tuff from each 5-ft interval to be analyzed by the MCAL for volatile organic compounds (VOCs) and total petroleum hydrocarbon (TPH). The decision to stop drilling required that no TPH be detected within two successive 5-ft intervals and that VOCs not be detected or demonstrate a clearly decreasing trend with depth.
>
> In essence, the revised criteria for terminating a borehole were very similar to the original criteria. The main difference was that the original criteria called for drilling to continue until PID field screening detected no VOCs in soil vapor samples. However, as the analytical data were evaluated during the drilling process, it was clear that as the VOC concentrations in soil reached nondetect, and as the VOC concentrations in the soil vapor simultaneously decreased into the parts per billion range, the PID was typically still reading several parts per million. Thus, the PID could not be used as an accurate measurement of VOC concentration in either soil or soil vapor and was not used for determining when to terminate a borehole.

DEFICIENCY 13

Table 4-13, p. 61

LANL shall explain why the uncertainty value for TPH is so high in Table 4-13.

RESPONSE

The value was a misprint. The uncertainty value for TPH in Table 4-13 on p. 61 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276) should be 1.5 ppm.

DEFICIENCY 14A

4.6.1.1 Phase II Water Samples, p. 61

The usefulness of comparing VOC values obtained from groundwater samples with respect to drinking water standards, SALs, etc is questionable due to the inadequacy of the ground water sampling procedures. The ground water samples collected do indicate that there is contamination in a perched upper aquifer which the SWMU may have or continue to be contributing to. RCRA evaluated contamination to the uppermost aquifer. [sic].

RESPONSE

As discussed in the response to Deficiency 2, geological evidence does not support the existence of a perched upper aquifer. As stated in Subsection 2.3 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276), water samples collected from the three boreholes did not meet the usual requirements for a monitoring well (i.e., the boreholes were not converted to monitoring wells and developed before samples were collected). However, this fact should result in measured values that overestimate the concentration of any COPCs detected in these samples. Therefore, any comparison to maximum contaminant/concentration levels (MCLs) or SALs is conservative, and is used here to place the measured values from both the seep and borehole water samples into perspective. In addition, the SAL value for tritium in Table 4-14 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276) was misprinted as 20 pCi/L. The value should be listed as 20 000 pCi/L, which, as stated in the text, indicates that the detected values of tritium are roughly a factor of ten or more below the drinking water MCLs. No further revision to the RFI report should be necessary.

DEFICIENCY 14B

Page 62 - Freon-113 is a synonym of 1,1,2-Trichloro-1,2,2-trifluoroethane and a SAL value of 59,000 µg/L can be used.

RESPONSE

The value 59 000 µg/L is equal to the tap water preliminary remediation goal (PRG) established by US EPA Region 9. LANL recently adopted the US Region 9 tap water PRGs as water SALs unless another federal or state standard had been developed. The exclusion of this chemical from the risk assessment because a SAL had not yet been adopted did not affect the results of the screening assessment, because Freon 113 was detected at a maximum concentration of 230 µg/L, which is approximately 0.4% of the newly adopted SAL. Therefore, no revision to the RFI report is necessary.

DEFICIENCY 15

4.6.3.5 Exposure Equations and Input Parameters, p. 83

The inhalation rates for both exposure scenarios seem overly conservative and it is unclear why EPA default parameters were note used. The exposure frequency for the trail user also seems overly conservative. LANL and EPA should discuss this issue and agree upon reality based default values.

RESPONSE

The inhalation rates, exposure frequencies, and the majority of the other exposure parameters used in this assessment are consistent with default exposure assumptions developed for risk assessments at LANL. Where possible, existing US EPA default parameters were adopted; however, there were several instances in which site-specific information regarding potential exposures at LANL was used to develop alternative default parameters. LANL's default exposure parameters have been submitted to and/or discussed with EPA Region 6 and NMED on several occasions, most recently as part of LANL's Risk-Based Corrective Action Process document (LANL/SNL 1996, 1277). Therefore, no revision to the RFI report is necessary. However, LANL would be interested in discussing these and other default assumptions with EPA Region 6 and/or NMED for use in future RFI reports.

DEFICIENCY 16

4.6.4.2 Toxicity Criteria for Carcinogenic Risks, p. 85

New proposed guidelines for carcinogen risk assessment have been published in the federal register (September, 1995) and may be used by LANL. The new procedures use the actual slope of the dose-response relationship instead of the upper 95% confidence interval of the slope, or allow development of a nonlinear relationship, or the use of a threshold value, which ever is most appropriate for the chemical of concern. The new guidance was developed to reduce the conservativism of risk assessment and predict actual risk posed by a chemical.

RESPONSE

LANL is aware of the newly proposed guidelines for carcinogen risk assessment and is pleased that EPA Region 6 approves of their use in LANL risk assessments. However, the results of the carcinogen risk assessment for SWMU 3-010(a) suggest that the presence of the COPCs in the subsurface should not result in excess cancer risks above the generally accepted risk range of one-in-ten thousand (1×10^{-4}) to one-in-one million (1×10^{-6}), especially given the conservative nature of the assessment. Therefore, use of the existing guidelines is sufficient for the purposes of this assessment, and no revision to the RFI report should be necessary.

DEFICIENCY 17

5.0 Conclusions and Recommendations, p. 89

The VCA appears to have reduced the threat to human health. It does not appear that the phase II investigation has bounded the area of contamination. Additional investigation is required to determine the impact on the perched aquifer zone and to bound the area of the plume. In addition, ecological risk concerns will need to be addressed for this site. EPA will make a final decision on this site when all issues have been addressed.

RESPONSE

EPA has raised three issues relevant to LANL's recommendation that SWMU 3-010(a) be proposed for no further action based on the post-cleanup risk assessment results.

<u>The Phase II investigation has not bounded the area of contamination.</u> The vast majority of the VOC source term was located in one data group, which is represented by the upper biased location. The data groups presented in Table 4-18 on p. 76 of the RFI Report for SWMU

3-010(a) (LANL 1995, 17-1276) represent slices of VOC plume, and clearly indicate that VOC concentration decreases as distance from the upper biased location increases. This relationship between concentration and distance is plotted in Figure 4-9 on p. 73 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276) and indicates that the upper biased location is at or near the center of the plume. Table 2 shows that the ratio of VOC concentrations between successive data groups dramatically decreases with distance from the center of the plume.

TABLE 2

COMPARISON OF VOC CONCENTRATIONS BY DATA GROUP

Data group comparison	Ratio of VOC concentration of specified data groups		
	1,2-DCA	1,1-DCE	1,1,1-TCA
Group 1: Group 2	40	240	240
Group 2: Group 3	3.5	2.3	20
Group 3: Group 4	1.4	1.1	2.1

In addition, LANL has produced a plan view version of Figure 4-10 from p. 74 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276). The plan view shown in Fig. 5 of this NOD response more clearly shows the spatial relationship of the data groups.

In addition, LANL restates that the Phase II data indicate that human health risk posed by the plume is low. Given that the estimated risk is low, any additional characterization is not likely to change the risk estimates in a significant manner.

LANL has shown that the plume decreases dramatically in all directions, and that the measured concentrations in the most distant boreholes are either at or near the detection limit for the significant risk drivers (1,2-DCA and 1,1-DCE). Given this additional information and clarification of Phase II results, LANL contends that the Phase II data have bounded the area adversely impacted by the VOC plume.

<u>The impact to the perched aquifer zone has not been assessed.</u> At present, limited sampling of the saturated zone beneath the asphalt has been conducted. There are waste management problems associated with attempting to develop the borehole into a monitoring well. More importantly, any potential perched saturated zone at the site is neither a pumpable drinking water resource nor even an aquifer (water trapped under asphalt is a better description). Thus, further characterization of this saturated zone is not warranted. (See responses to Deficiencies 1 and 2 for more discussion of site hydrogeology.)

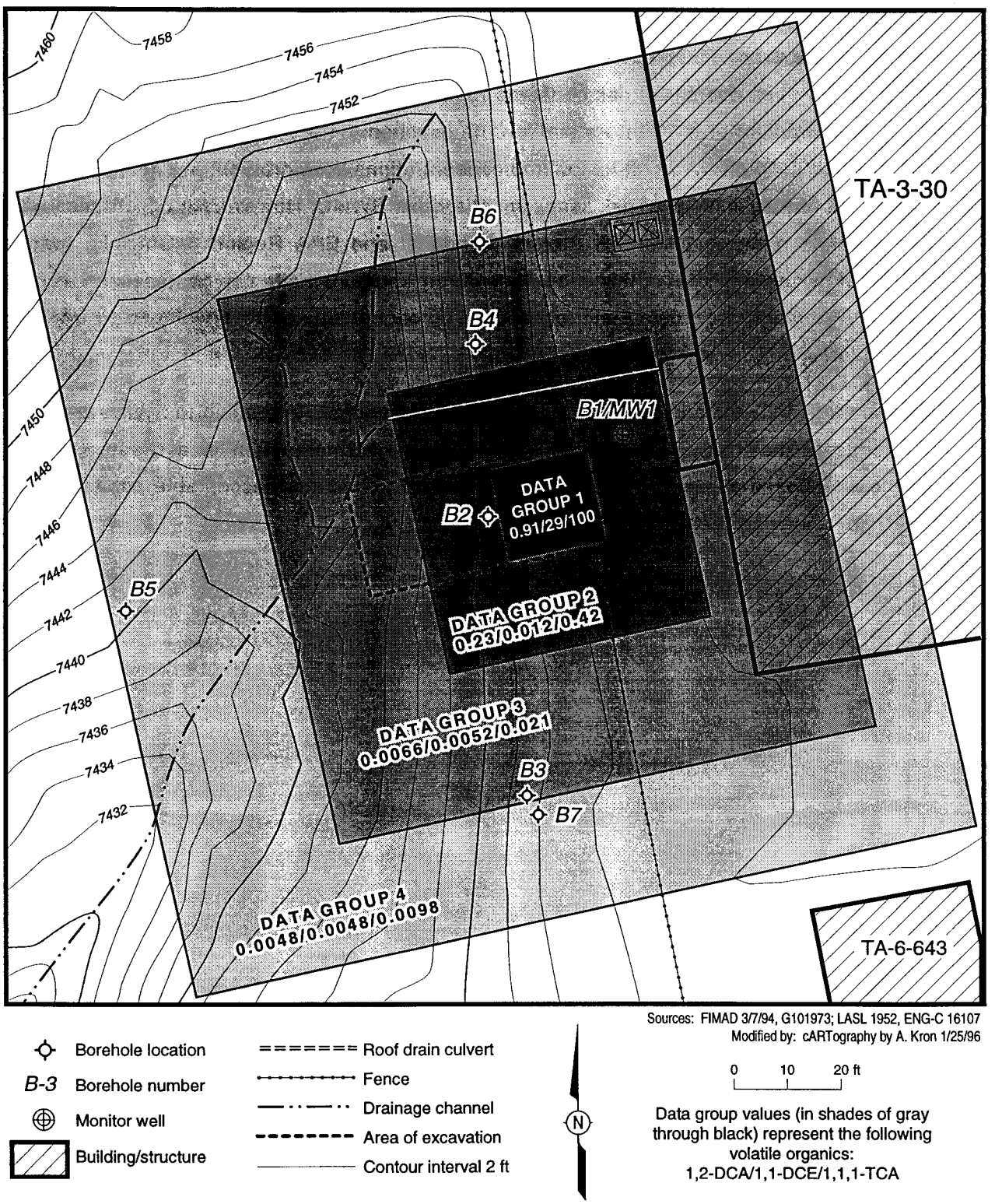


Fig. 5. Site map showing volatile organic concentrations by data groups.

Ecological risk concerns have not been addressed. There are no ecological risk concerns for the subsurface vapor plume because there is no ecological receptor directly impacted by this vapor plume. Thus ecological risk concerns relate to potential exposure at surface release points downgradient of the site. As stated in Subsection 4.4.3 of the RFI Report for SWMU 3-010(a) (LANL 1995, 17-1276), measured concentrations downgradient are minimal and do not warrant further ecological risk assessment for this SWMU. However, in accordance with conversations between LANL ER Project personnel and EPA Region 6 Officials, further ecological risk assessment at this site will be deferred until the site can be assessed as part of the new ecological exposure unit (ecozone) approach that is being developed by LANL in conjunction with EPA and the NMED.

In summary, LANL has addressed the three issues raised by EPA relating to SWMU 3-010(a) and requests that this SWMU be considered for no further action in a Class 3 permit modification based on the fact that the site no longer poses an unacceptable risk to human health or the environment.

REFERENCES

Baldridge S., February 1996. "Investigation of Surface Discharge North of SWMU 3-010(a)," Los Alamos National Laboratory Memorandum to File from S. Baldridge (EES-1), Los Alamos, New Mexico. **(Baldridge 1996, 17-1279)**

Broxton, D. E., and P. G. Eller (Eds), June 1995. "Earth Science Investigations for Environmental Restoration—Los Alamos National Laboratory Technical Area 21," Los Alamos National Laboratory Report LA-12934-MS, Los Alamos, New Mexico. **(Broxton and Eller 1995, 1162)**

Gardner, J. N., T. Kolbe, and S. Chang, January 1993. "Geology, Drilling, and Some Hydrologic Aspects of Seismic Hazards Program Core Holes, Los Alamos National Laboratory, New Mexico," Los Alamos National Laboratory Report LA-12460-MS, Los Alamos, New Mexico. **(Gardner et al. 1993, 0848)**

LANL (Los Alamos National Laboratory), September 20, 1994. "Phase II RFI Work Plan For SWMU 3-010(a), Mercury Cleanup, OU 1114 Environmental Restoration Project," prepared by ERM Program Management Company and Golder Federal Services, Inc., under subcontract F20780002-8M, work release 94-0058, Los Alamos, New Mexico. **(LANL 1994, 17-1271)**

LANL (Los Alamos National Laboratory), April 28, 1995. "RFI Report for Field Unit 1 SWMU 3-010(a)," Los Alamos National Laboratory Report LA-UR-95-1485, Los Alamos, New Mexico. **(LANL 1995, 17-1276)**

LANL/SNL (Los Alamos National Laboratory and Sandia National Laboratories), January 2, 1996. "Risk-Based Corrective Action Process," A. M. Dorries (Ed.), Los Alamos National Laboratory Report LA-UR-96-111, Los Alamos, New Mexico. **(LANL/SNL 1996, 1277)**

ATTACHMENT 1 DEVIATIONS FROM SWMU 3-010(A) PHASE II WORK PLAN

MEMORANDUM
ERM/GOLDER LOS ALAMOS PROJECT TEAM

To: Lynda Sobojinski

From: Steve Calhoun

Date: February 7, 1995

Subject Deviations From SWMU 3-010(a) Phase II Work Plan

Pursuant to your request, this memo has been prepared for the purpose of documenting deviations to the approved work plan for the Phase II RFI conducted between 12 September and 1 November 1994 at SWMU 3-010(a) (Mercury Site). This same text will be used in the Field Summary Report.

Deviations to the work plan occurred primarily because of unexpected site conditions and because of changes brought about by the capabilities of the on-site mobile chemistry laboratory. Significant deviations were implemented only after discussing with and receiving concurrence from the OUPL. None of the deviations are believed to have had a negative affect on the results of the investigation, and many represented a more cost-effective approach or resulted in the collection of greater amounts of useable data. For ease of discussion and understanding, the pertinent work plan text will be included or paraphrased, followed by a brief description of the manner in which the actual field activities deviated from the plan.

- *Work Plan Section 6.4.2.2, Soil Vapor Probe Survey: "The vapor probe survey locations will step out horizontally approximately 10 feet until no VOCs are detected".*

  Deviation: Because the soil vapor VOC plume was more pervasive than originally expected, and because of the relatively high and variable soil vapor VOC background concentrations, definition of the soil vapor VOC plume to nondetect levels was not possible nor was it considered necessary as a guide for placement of the borings to confirm the horizontal and vertical extent of significantly affected soils and to determine the magnitude of the VOCs remaining in the soils and tuff.

- *Work Plan Section 6.4.2.2, Soil Vapor Probe Survey: "The base [shaft] of the probe should be sealed either with modeling clay or a stiff bentonite slurry where the probe enters the soil column, to avoid short circuiting of the surface atmosphere into the soil vapor sample".*

  Deviation: The shaft of the probe, where it entered the soil column, was sealed using the insitu soils. The clayey nature of these soils was suitable for this purpose.

- *Work Plan Section 6.4.2.2, Soil Vapor Probe Survey: "If the PID indicates soil vapor values above background (ambient air readings), then a Tedlar bag sample should be withdrawn from the probe for analysis by the on-site GC/MS".*

  Deviation: The soil vapor probe survey was meant to be a screening tool with which to guide the number and location of boreholes. It was the analytical data for the soil and vapor samples collected from the boreholes that were to be used for determining the magnitude and extent of VOCs in the soils and tuff. Tedlar bag samples were therefore not collected during the soil vapor probe survey from most locations with above background PID readings. Two Tedlar bag samples were collected for GC/MS analysis, one from a location with very high PID values and one from a location with low PID values.

- Work Plan Section 6.4.2.3, Drilling and Downhole Soil Vapor Sampling: This section of the work plan describes in detail the drilling method, the soil and soil vapor sampling methods, and the borehole abandonment and core archival procedures. However, actual field conditions and other circumstances resulted in several deviations from these methods and procedures.

  1. *"The downhole soil vapor samples will be collected in syringes or tedlar bags and will be analyzed for VOCs and tritium using the on-site analytical laboratory."*

     Deviation: The mobile chemistry laboratory does not have capabilities for analyzing tritium in air or vapor samples; therefore, tritium analyses were not run on the Tedlar bag samples. As an alternative, a tritium monitor was obtained from HS-4 for use in screening soil vapor for tritium during the soil vapor probe surveys and the downhole packer tests.

2. *"The upper-most sleeve where the highest PID reading is found will be extruded into a sealable clear plastic bag and another PID reading will be taken after the VOCs have been allowed to volatilize into the head space of the bag and reach steady state. The adjacent lower sleeve will be capped and retained for potential analysis." and "If VOCs are detected at a given interval, or if visual examination or field screening of soil/rock samples indicates the presence of TPH, then the borehole will be extended for another 5 feet. If VOCs are not detected, no visual staining is observed, and field screening does not reveal TPH within two successive five-foot intervals, then the borehole will be terminated.*

Deviation: During the completion of the first boring (B1), the criteria for determining how the drilling would be conducted and how the soil and tuff samples would be collected were revised in response to site conditions and to provide more real-time data by making better use of the on-site mobile chemistry laboratory. The mobile chemistry laboratory was devoted full time to the investigation and was capable of processing many more samples on a daily basis than was called for in the original work plan. It was therefore decided to analyze soil and soil vapor samples every five feet from each borehole for the purpose of making decisions regarding the need to continue drilling and sampling. The revised procedure called for the bottom six inches of soil or tuff from each five-foot interval to be analyzed by the mobile chemistry laboratory for VOCs and TPH.

3. *"It is not anticipated that any borehole will encounter free water or perched water tables. In the event that perched water is encountered within ten feet below the deepest detectable contamination, the borehole will be extended five feet beyond the saturated zone and will be completed as a monitoring well. Specific work and implementation plans will be developed to address sampling requirements if this situation is encountered."*

Deviation: A sufficient quantity of ground water to warrant the installation of a monitoring well was encountered in two boreholes (B1 and B4). In each case, the saturated zone was within the zone of VOC contamination. After receiving the concurrence of all concerned individuals, a two-inch diameter PVC monitoring well was installed in Borehole B1 for the purpose of providing data relevant to the saturated zone and ground water quality. However, it seemed there was little to be gained by having two monitoring wells in close proximity to each other, and the decision was made to terminate and backfill Borehole B4.

As stated in the work plan, it was not considered highly probable that ground water would be encountered at the site, and consequently, there was little or no guidance relative to monitoring well installation and ground water sampling. If the installation of additional monitoring wells becomes necessary, they should only be installed as part of a subsequent phase of field work and pursuant to a work plan specifically addressing their installation.

4. *"If the downhole soil vapor from Boreholes 1A, 1B and 3 detects VOCs, then additional boreholes will be drilled further from the excavation."(see Figure 1)*

Deviation: The intent of the perimeter boreholes was to determine the lateral extent of significantly-affected soils. As installed, the location for Borehole B1 correlates to 1A, Borehole B4 correlates to 1B, and Borehole B5 correlates to 3. Low concentrations of VOCs were detected in all three boreholes, but only B4 was offset for additional sampling after lengthening the access road with a bulldozer. Physical restrictions; i.e., Building SM30 and the intermittent stream channel ravine prevented the offsetting of Boreholes B1 and B5. However, the analytical data from these boreholes demonstrated that the VOC and TPH concentrations were dramatically decreased from the concentrations in Borehole B2, thus achieving the basic objective of confirming the horizontal and vertical extent of significantly-affected soils.

5. *A minimum of three samples were to be submitted for laboratory analysis from all contaminated boreholes with a total depth of 25 feet or greater. These samples were to consist of the deepest sample where the presence of VOCs was detected using the PID, a sample collected from 5 feet below the deepest sample with field detectable VOCs, and the sample with the highest concentration of field detectable VOCs. For boreholes deeper than 25 feet, additional samples were to be collected based on the variability of the VOCs detected in the soil vapor of the borehole.*

Deviation: It was demonstrated during the Voluntary Corrective Action (VCA) that tritium was predominantly associated with TPH. It was also demonstrated by the Phase II mobile chemistry laboratory results that VOC and TPH concentrations were not similarly nor equally distributed. Therefore, TPH as opposed to VOC results were considered to be a better criterion for selecting samples for tritium testing and were used to select three additional samples from each borehole for fixed laboratory analysis of tritium and gross alpha/gamma. These three samples were to consist of, 1) the sample immediately above the highest TPH concentration, 2) the sample ten feet below the sample immediately above the highest TPH concentration, and 3) the sample from the bottom of the borehole.

6. *"Core barrel shoe should be adjusted out to lead the auger bit a short distance to enhance recovery and provide a subdiameter hole in which to seat the packer."*

Deviation: The indurated nature of the tuff prevented the adjustment of the core barrel as described in the work plan. When the core barrel was adjusted out so that the shoe lead the auger bit, drilling progress slowed to essentially zero. It was therefore necessary to withdraw the core barrel to the point at which the shoe was essentially flush with the auger bit teeth. Thus, there was no subdiameter hole in which to seat the packer. Instead, the packer was inflated within the auger bit annulus.

7. *Auger cuttings will be contained in 55-gallon disposal drums for temporary containment until the cuttings are characterized for final disposal, per the Waste Management Plan.*

Deviation: Waste minimization efforts resulted in cuttings being placed back into the boreholes when possible. This was done by backfilling the borehole with cuttings in the reverse order in which they came out. In cases where part or all of the cuttings were not placed back into the borehole, they were drummed as specified in the work plan.

8. *"This card will be displayed beside the core, contained within the split tube, and the card and core will be photographed."*

Deviation: None of the core samples were photographed since the majority of the samples were temporarily or permanently retained within the brass core barrel sleeves. Those core samples that were extruded from the sleeves, including those from the geologic characterization borehole, were typically disturbed to the extent that few if any photogenic qualities remained intact. For future reference, core from the geologic characterization borehole are archived in the Sample Management Facility.

9. *"Environmental sample material will be transferred to the appropriate sample containers with a decontaminated stainless steel or disposable scoop."*

Deviation: Soil and tuff samples for VOC and TPH analyses were retained within the brass core barrel sleeves. The ends of the sleeves were covered with Teflon tape and sealed with plastic caps prior to being delivered to the on-site mobile chemistry laboratory or being placed on ice in an insulated cooler.

10. *"Geotechnical samples will be taken from each borehole to provide representative coverage of all geological units encountered, however, a minimum of two samples will be taken from each borehole."*

Deviation: No geotechnical samples were collected from the environmental Boreholes B1 through B6 because collection in and extrusion from the brass sleeves resulted in highly disturbed material. As an approved option, the core samples from Borehole B7, drilled specifically for geologic characterization, were archived and are still available for geotechnical analyses.

11. *After five volumes have been purged, the sampler will attach a PID to the second position of the Tee-valve, turn off the sampling pump, switch the valve to the PID, and note the instrument readings. When the instrument readings have stabilized, a Tedlar bag will be attached to the Tee-valve, in the position previously occupied by the air sampling pump, the valve will be switched again, and a sample will be collected for analysis by GC/MS.*

Deviation: The PID readings rarely stabilized after purging five volumes. There could be several reasons for this; however, for consistency, the tedlar bags were always filled after purging five volumes, and after obtaining the PID and tritium readings, regardless of whether or not the PID readings had stabilized.

12. *"Following recovery of the final samples, all boreholes will be backfilled with a cement/bentonite slurry."*

Deviation: As previously discussed, the boreholes were backfilled with their own cuttings except for B1 due to installation of a monitor well. The 7.5-17.5 and 15-20-foot intervals from Boreholes B2 and B4, respectively, were drummed and replaced in the borehole with Pure Gold bentonite chips. The 0-35-foot interval from B6 would not fit back into the borehole and was also drummed.

- *Work Plan Section 6.4.2.4, Seep Sampling: "Seep sampling will be performed by excavating a 6-inch-deep depression or catchment basin at the seep location. Ground water will be permitted to fill the basin and the sampler will allow the water to flow through the basin until excessive turbidity is no longer present. A flexible Teflon hose will be placed in the upstream section of the basin, and flow will be directed into the sample bottle via the flexible Teflon hose."*

Deviation: The seep sample was collected on Monday, 18 October 1994 at a time when there was intermittent surface flow in the stream channel. Rainfall over the weekend had created a situation where, as you walked downstream

from the site, water would emerge from alluvium and flow along bedrock portions of the stream channel, only to percolate back into alluvium and again re-emerge on a bedrock portion of the channel further down stream. The sample was collected at a point where the water flowed over a bench in a bedrock portion of the channel by allowing the water to flow directly into the sample bottles.

- *Work Plan Section 6.4.3, Analytical Support: "The PID analyses will provide information for selecting appropriate samples for fixed laboratory analysis, as well as the depth of completion for the boreholes."*

Deviation: As previously discussed, decisions regarding fixed laboratory analyses and completion depths of the boreholes were based on Level III-equivalent, on-site, mobile chemistry laboratory results.

cc: Project File 19458.00

ATTACHMENT 2 TPH ANALYTICAL REPORT

AnalyticalTechnologies, Inc. 225 Commerce Drive Fort Collins, Colorado 80524 (303) 490-1511

JAN 1996 RECEIVED

RECEIVED JAN 12 1996 CST-18

January 10, 1996

Dr. John Miglio
LANL CST-3
TA-35, Bldg. 128
DP.01U, MS E509
Los Alamos, NM 87544

RE: ATI Workorder: 95-06-125
LANL Request Number: 466

Dear Dr. Miglio:

Thirteen soil samples and one water sample were received from LANL on June 15, 1995. The samples were originally scheduled for Volatile Organics analysis. The results for this analysis were sent on 6/30/95.

Subsequently, the client, Linda Sobiejinsky, requested that sample 0103-95-0028 be analyzed qualitatively for the presence of petroleum hydrocarbons, as Total Extractable Petroleum Hydrocarbons (TEPH) by USEPA Modified Method 8015. The TEPH fingerprint analysis was performed out of sample hold time on an unopened container, that had been refrigerated from the time of receipt.

Per you request, we compared the results with contemporaneous analyses of diesel fuel and vacuum pump oil. The sample TEPH chromatogram compared very favorably with the vacuum pump oil standard, and showed almost no characteristics of diesel fuel. ATI-CO's TEPH method detects extractable petroleum hydrocarbons ranging from C_8 - C_{38}. Sample 0103-95-0028 exhibited a large continuous peak ranging from C_{18} - C_{38}, with smaller peaks superimposed on the larger hump. The conclusions are based on the following observations:

1. The peak maxima of the sample and vacuum pump oil compare favorably.
2. Starting and ending points of the sample and vacuum pump oil peaks compare favorably.
3. The sample and vacuum pump oil chromatograms contain similar numbers and types of smaller peaks, superimposed on the major peak.
4. The major peak shape for the sample compares well with the vacuum pump oil standard.
5. The sample chromatogram did not contain the characteristic diesel PNA hump from C_8 - C_{20}.
6. The sample chromatogram did not contain C_8 - C_{24} distinct alkane peaks characteristic of diesel fuel.

The results are contained in the enclosed report. Please note that the chromatograms are presented as both individual plots and superimposed plots for easy comparison.

Analytical**Technologies,**Inc.

This data package is being submitted within the requested turn-around time of 45 days. It will be invoiced at the applicable contract billing rate for Routine Analyses.

Thank you for your confidence in Analytical Technologies, Inc.
Should you have any questions, please call.

Sincerely,

Steven Fry

Dr. Steven Fry
Program Director

SF/smf

Enclosures

Analytical Technologies
of Colorado, Inc.

QUALITY ASSURANCE
DATA REVIEW

Date: 01-10-96

ATI Workorder: 95-06-125 Analysis: 8015

The data contained in the following report have been reviewed and approved by the personnel listed below:

Sharon L. Jobes
Organic Chemist

CERTIFICATION

Analytical Technologies, Inc. certifies that the analyses reported herein are true, complete, and correct within the limits of the methods employed

A case narrative ✓ is ___ is not included with this report.

Analytical **Technologies** of Colorado, Inc.

TOTAL EXTRACTABLE HYDROCARBONS (DIESEL) CASE NARRATIVE

Client	ATI-CO	Date Received	Date Collected	Date Extracted	Date Analyzed
0103-95-0028	95-06-125-09	06-15-95	06-13-95	12-27-95	01-08-96

1. This report consists of 1 soil sample collected on 06-13-95 and received by ATI on 06-15-95.

2. The soil sample was extracted by adding a methanol /water solution to the soil followed by hexane. This mixture is shaken and the hexane portion of the two-phase solution is removed for analysis.

3. The extracts were then analyzed using GC with a DB-5.625 capillary column and a FID detector according to protocols generally based on SW-846 Method 8000. The procedures are based on this general method because SW-846 does not have a specific method for TEPH or diesel range organics. The only true modification from this method is that TEPH(diesel) is a multicomponent mixture and is quantitated by summing the entire range, rather than individual peaks. All positive results were quantitated using the responses from the initial calibration curve using the external standard technique. Also, a confirmation column is not used, because the analyte is a multicomponent mixture and the specific carbon range of the peaks detected are specified on the individual sample reporting forms.

4. The sample was unopened and stored cold from the initial collection. Further, the sample was analyzed out of hold time per the client's request.

5. The method blank associated with this project was below the reporting limits for all analytes.

6. The matrix spike and/or matrix spike duplicate failed the recovery/RPD criteria. The recoveries in the blank spike and blank spike duplicate were within control limits, which demonstrated the spike outliers in the matrix spikes were due to matrix effects, so not further action is needed. Blank Spike and Blank Spike Duplicate results are included.

7. All blank spike and blank spike duplicate recoveries and RPDs were within the acceptance criteria.

8. All surrogate recoveries were within acceptance criteria.

9. Due to high levels of target analytes, the sample was analyzed at a higher dilution. The detection limit has been adjusted accordingly.

10. The sample chromatogram indicates the presence of hydrocarbons in the range of C14-C44. The pattern is comparable to pump oil. The sample does not appear to contain diesel or gasoline. Chromatograms of a diesel standard, a pump oil standard, and the sample are included with this report.

11. All initial and continuing calibration criteria were within acceptance criteria.

SL

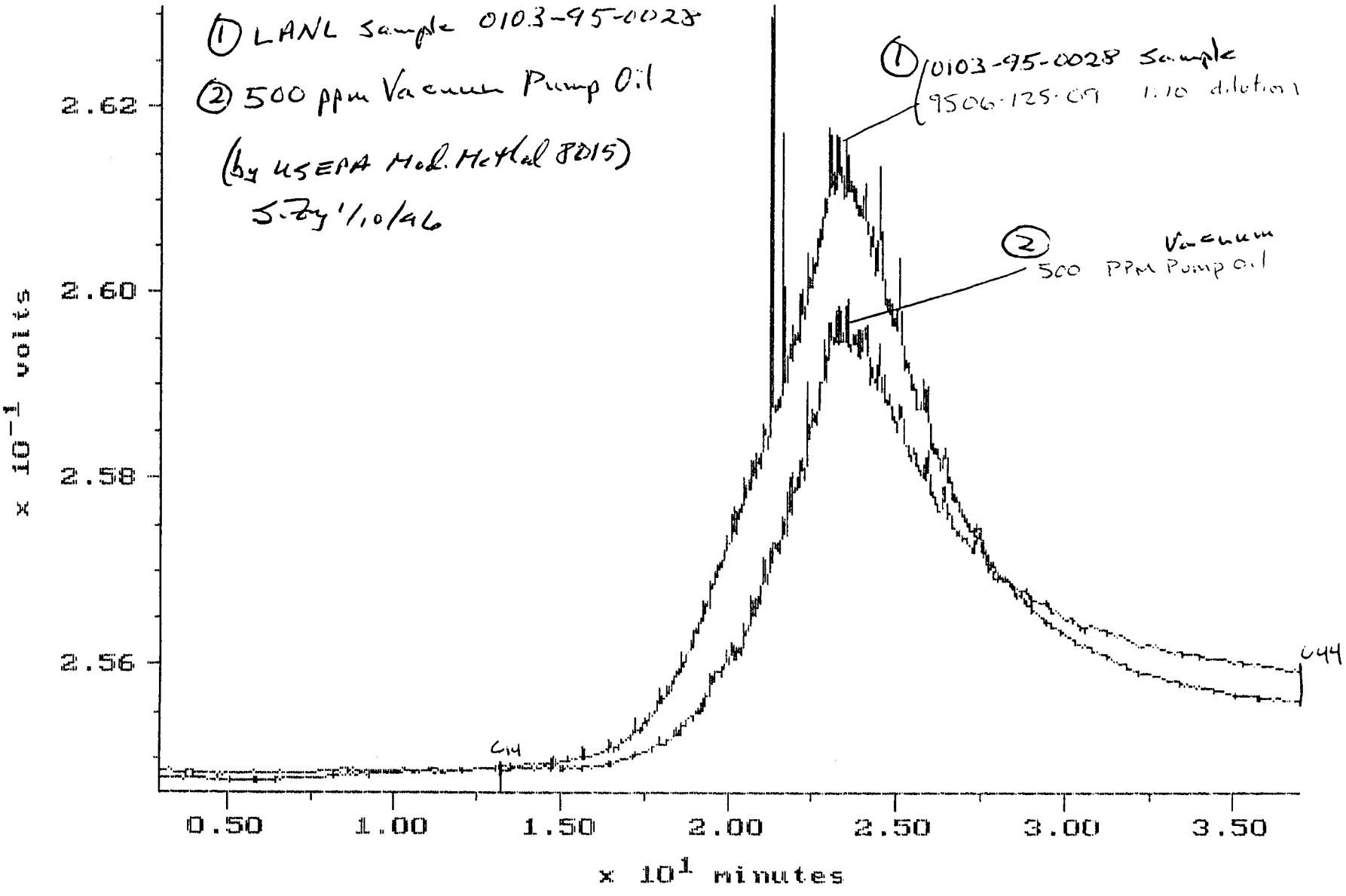
Sharon L. Jobes
Organic Chemist

1-10-96
Date

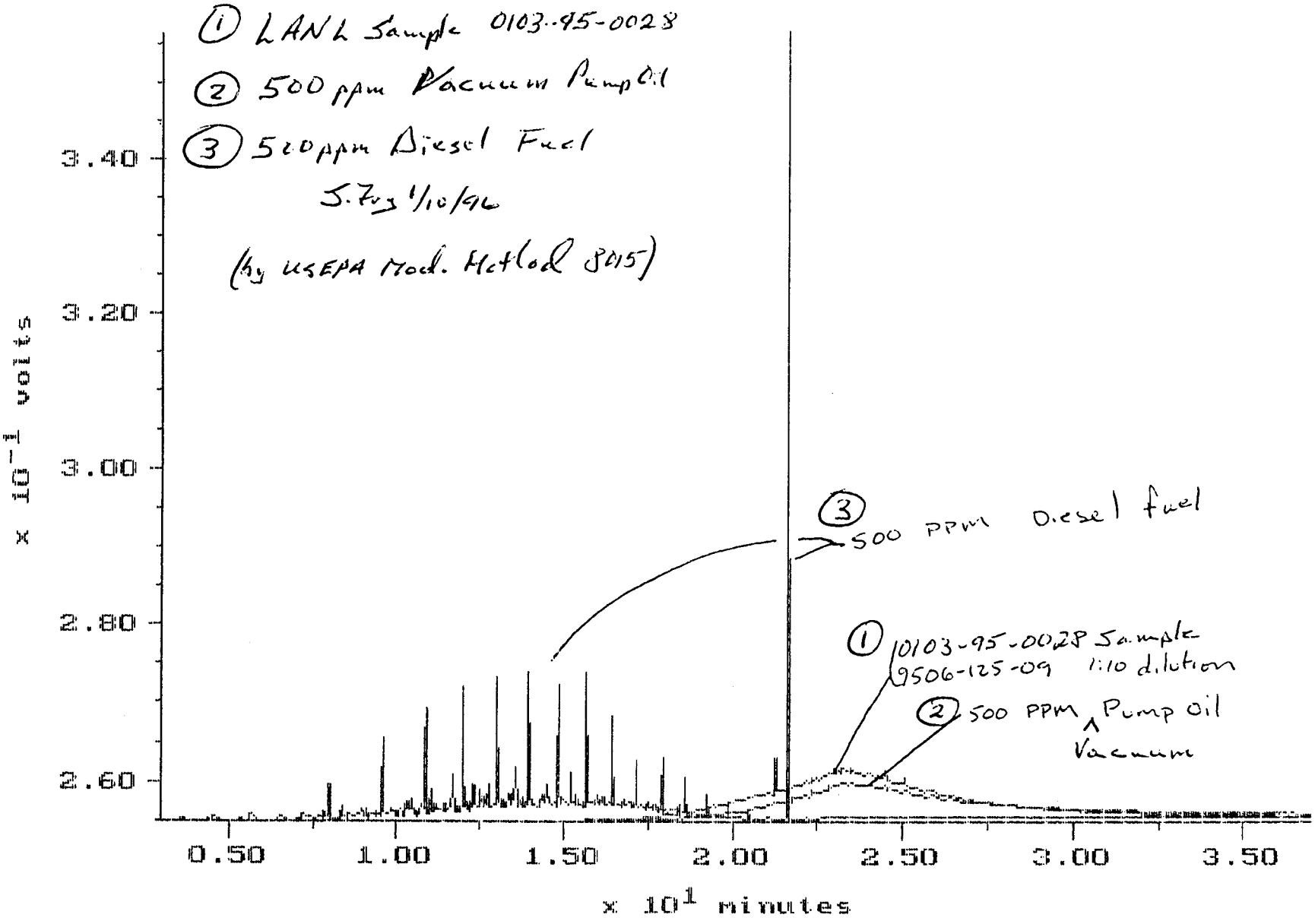
TMR
Reviewer's Initials

1/10/96
Date

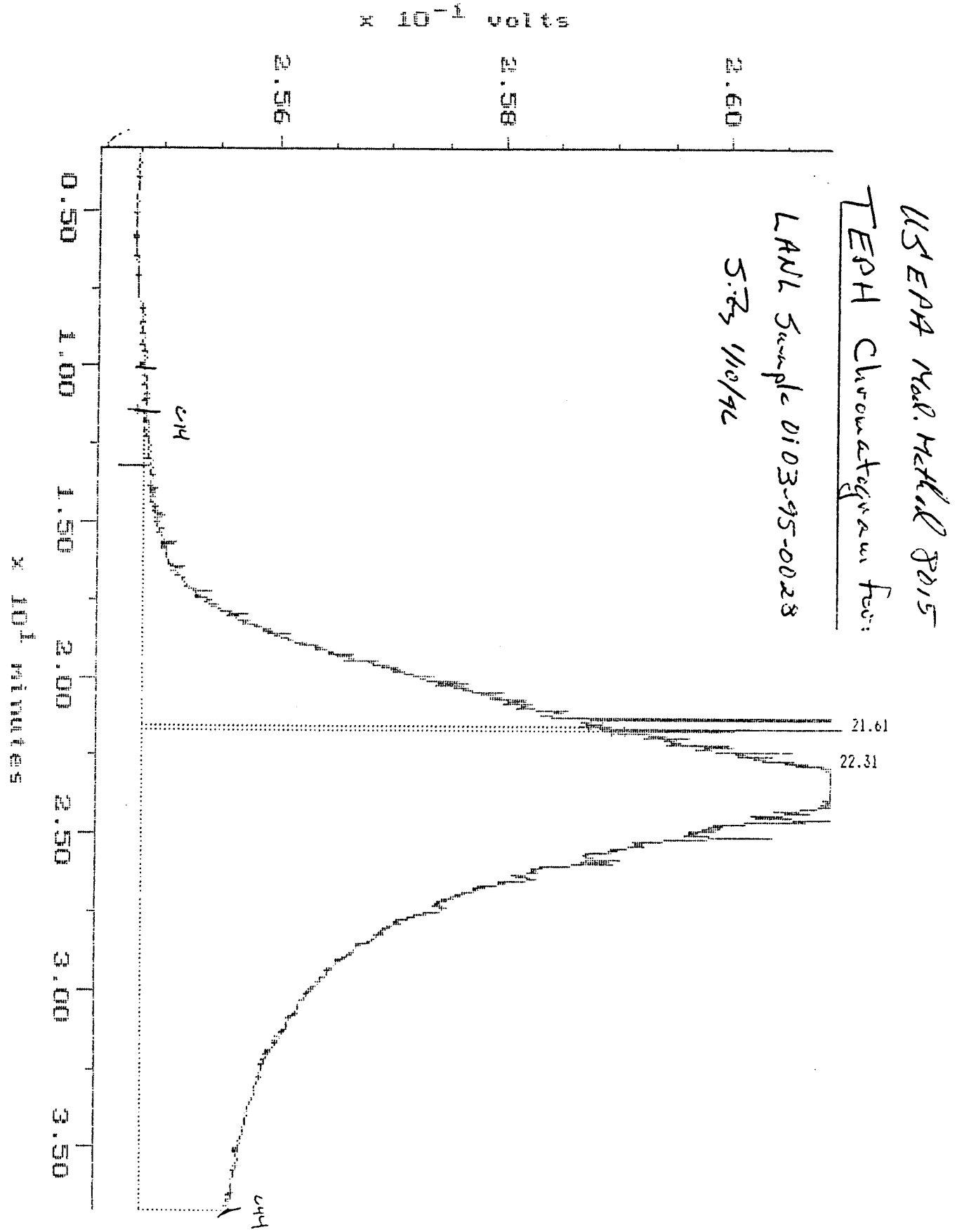
Superimposed TEPH Chromatograms for:



Superimposed Chromatograms of TEPH Results for:



Sample: 9506125-09 1 Channel: FID Filename: 0108F4
Acquired: 08-JAN-96 1 6 Method: C:\MAX\TEPH1\DESLFRNT Operator: sij

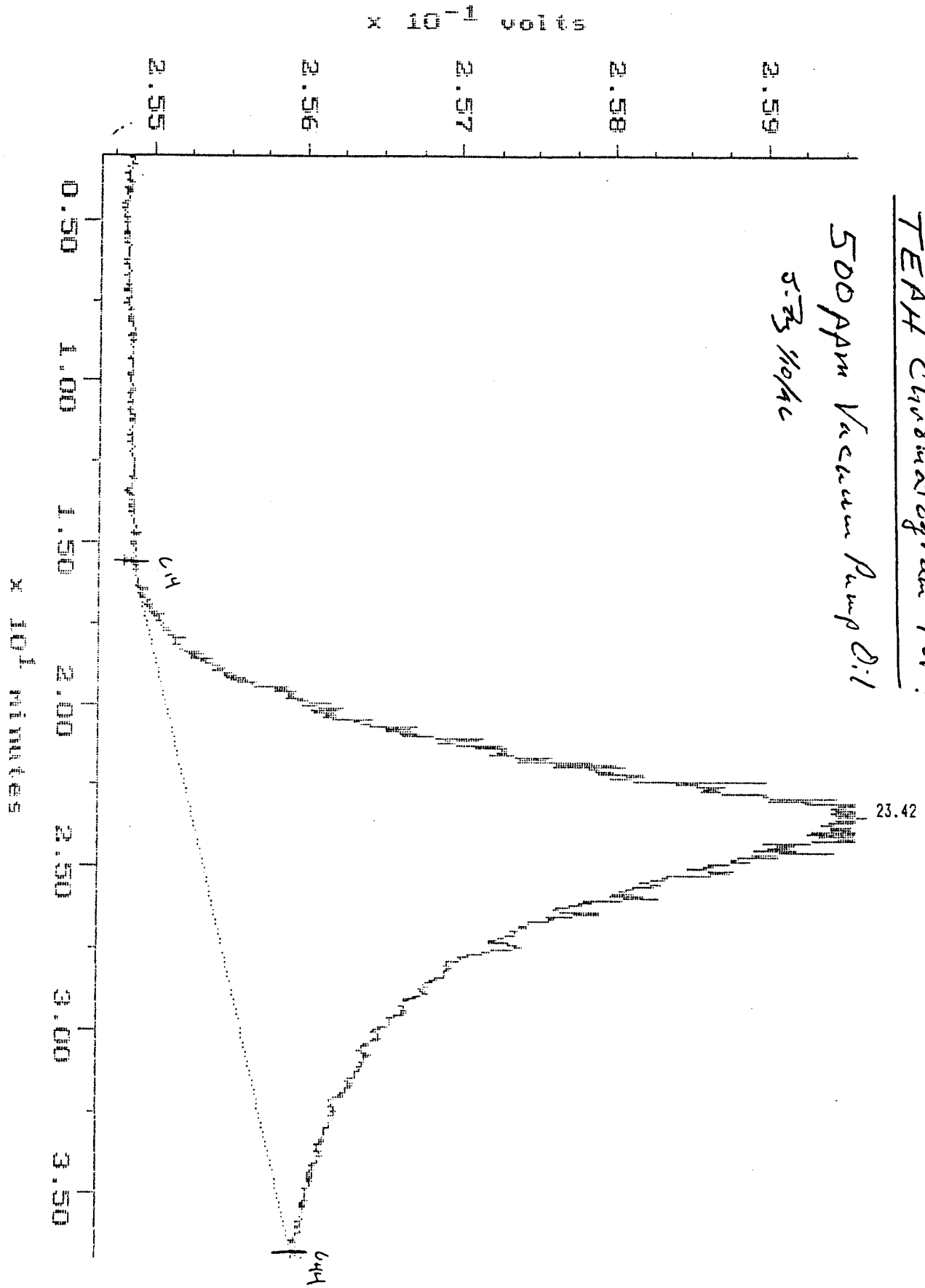


Sample: 500 PPM PUMP
Acquired: 05-JAN-96 22:03

Channel: FID
Method: C:\MAX\TEPH1\DESLFRNT

Filename: 0105F10
Operator: sij

USEPA Mod. Method 8015
TEPH Chromatogram For:
500 ppm Vacuum Pump Oil
5.73 ug/L



TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS

Modified Method 8015

Lab Name: Analytical Technologies, Inc.
Client Name: Los Alamos National Laboratory
Client Project ID: CST-03 Request #466
Lab Workorder Number: 95-06-125

Results are reported on a dry weight basis.

Date Collected: 06-13-95
Date Extracted: 12-27-95
Date Analyzed: 01-08-96
Sample Matrix: Soil
Initial Amount: 20 g
Percent Moisture: 15

Sample ID	Lab Sample ID	Final Volume (mL)	Concentration **TEPH** * (mg/kg)	Detection Limit (mg/kg)	Surrogate Percent Recovery
Reagent Blank	SRB1 12-27-95	5.0	ND	5.0	95
0103-95-0028	95-06-125-09 DIL	50	2800 **	50	DL

ND = Not Detected at or above the client requested detection limit.
Acceptable Surrogate % Recovery Limits: (64-166)
* - TEPH = Any combination of diesel and other hydrocarbons within the range of C8-C36 quantitated as diesel.
** = The chromatogram indicates the presence of hydrocarbons in the range of C14 - C44 that don't fit the diesel or gasoline pattern. The pattern is comparable to vacuum pump oil.
DIL = Dilution
DL = Diluted out

TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS BLANK SPIKE

Modified Method 8015

Lab Name: Analytical Technologies, Inc.
Client Name: Los Alamos National Laboratory
Client Project ID: CST-03 Request #466
Sample Matrix: Soil

Lab Sample ID: SBS 1 & 2 12-27-95
Date Extracted: 12-27-95
Date Analyzed: 01-10-96

Analyte	Spike Added (mg/kg)	Blank Spike Concentration (mg/kg)	Blank Spike Percent Recovery
TEPH	50.0	51.5	103

Analyte	Spike Added mg/kg	BSD Concentration mg/kg	BSD Percent Recovery	Blank Spike RPD
TEPH	50.0	51.8	104	1

SURROGATE RECOVERY

	BS % Recovery	BSD % Recovery	% Recovery Limits
Hexacosane	106	119	64 - 166

Acceptable Blank Spike % Recovery Limits: (43-139)

TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS MATRIX SPIKE

Modified Method 8015

Lab Name: Analytical Technologies, Inc.
Client Name: Los Alamos National Laboratory
Client Project ID: CST-03 Request #466
Lab Sample ID: 95-12-153-05

Results are reported on a wet weight basis.

Sample ID

In House

Date Extracted: 12-27-95
Date Analyzed: 12-29-95
Sample Matrix: Soil

Analyte	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS Percent Recover
TEPH	50.0	93	86.2	-14 *

Analyte	Spike Added (mg/kg)	MSD Concentration (mg/kg)	MSD Percent Recovery	Matrix Spike RPD
TEPH	50.0	112	39	26 *

SURROGATE RECOVERY

	MS % Recovery	MSD % Recovery	% Recovery Limits
Hexacosane	162	181 *	64 - 166

ND = Not Detected at or above the client requested detection limit.
Acceptable Matrix Spike % Recovery Limits: (21-129)

Qualifier *: Sample was spiked without previous knowledge of the extractable hydrocarbon concentration. The spiking level was not high enough to allow accurate determination of the matrix spike recovery due to the significant concentration of extractable hydrocarbons in the sample. Matrix spike recovery from a spiked reference matrix was satisfactory (see Blank Spike Results).

PERCENT MOISTURE

Sample Number	Dish Weight	Wet Weight	Dry Weight	Dry Wt. -Dish Wt.	% Moisture	% Solids
RB 06/22/95	1.08		1.08	0	ERR	ERR
95-06-125-01	1.08	10.16	10.19	9.11	10.33	89.67
95-06-125-02	1.09	10.06	10.26	9.17	8.85	91.15
95-06-125-03	1.08	10	9.41	8.33	16.70	83.30
95-06-125-04	1.08	10.08	9.72	8.64	14.29	85.71
95-06-125-05	1.08	10.09	9.85	8.77	13.08	86.92
95-06-125-06	1.07	10.04	10.04	8.97	10.66	89.34
95-06-125-07	1.07	10.08	9.57	8.5	15.67	84.33
95-06-125-08	1.09	9.99	9.6	8.51	14.81	85.19
95-06-125-09	1.09	9.97	9.61	8.52	14.54	85.46
95-06-125-10	1.07	10.07	9.51	8.44	16.19	83.81
DUP 95-06-125-10	1.09	10.07	9.44	8.35	17.08	82.92
95-06-125-11	1.08	10.04	9.39	8.31	17.23	82.77
95-06-125-12	1.07	9.95	9.45	8.38	15.78	84.22
95-06-125-13	1.07	9.94	9.83	8.76	11.87	88.13
95-				0	ERR	ERR
95-				0	ERR	ERR
95-				0	ERR	ERR
95-				0	ERR	ERR
95-				0	ERR	ERR
95-				0	ERR	ERR
95-				0	ERR	ERR
DUP 95-06-125-13	1.08	10.03	9.97	8.89	11.37	88.63

Sample #	Sample	DUP	RPD
95-06-125-10	16.19	17.08	5.35
95-06-125-13	11.87	11.37	4.34

Verified by_____

Date_____

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MAXIMA 820 PEAK INTEGRATION REPORT

Printed: 8-JAN-1996 13:31:34

SAMPLE: 9506125-09 1:10
#4 in Method: c:\max\tephl\
Acquired: 8-JAN-1996 12:43
Rate: 2.0 points/sec
Duration: 37.000 minutes
Operator: slj

Type: UNKN
Instrument: Diesel 1
Filename: 0108F4
Index: Disk

DETECTOR: FID

PK#	ID#	Peak Start (minutes)	Peak End (minutes)	Retention (minutes)	Type	Peak Area (microvolt-sec)	Peak Height (microvolt)	Area Percent	Hght Percent	Component Name
1		11.433	21.525	21.225	BP	570850.46	5407.3339	19.33	31.91	
2		21.525	21.650	21.608	PP	37634.378	5979.5385	1.27	35.28	
3		21.650	36.992	22.308	PD	2345323.9	5559.9218	79.40	32.81	
TOTAL						2953808.7	16946.794			

MAXIMA (c)1990 Dynamic Solutions, Division of Millipore

MAXIMA 820 PEAK INTEGRATION REPORT

Printed: 10-JAN-1996 13:40:49

SAMPLE: 500 PPM PUMPOIL
#10 in Method: c:\max\tephl\
Acquired: 5-JAN-1996 22:03
Rate: 2.0 points/sec
Duration: 37.000 minutes
Operator: slj

Type: UNKN
Instrument: Diesel 1
Filename: 0105F10
Index: Disk

DETECTOR: FID

PK#	ID#	Peak Start (minutes)	Peak End (minutes)	Retention (minutes)	Type	Peak Area (microvolt-sec)	Peak Height (microvolt)	Area Percent	Hght Percent	Component Name
1		15.592	36.750	23.417	BB	1661515.2	4259.3483	100.00	100.00	
TOTAL						1661515.2	4259.3483			