Report of Remedial Excavation Monitoring
Unocal Bulk Plant 0046
Bingen, Washington

March 18, 1996

For

Unocal ERS - West Region

GeoEngineers

File No. 0161-181-62-2150

GeoEngineers

15 YEARS

Consulting Engineers and Geoscientists
Offices in Washington, Oregon and Alaska

March 18, 1996

Unocal ERS - West Region
P.O. Box 76
Seattle, Washington 98111

Attention: Mr. Kipp Eckert, P.E.

We are submitting two copies of our report titled "Report of Remedial Excavation Monitoring" for Unocal Bulk Plant 0046 in Bingen, Washington. Our services for this project were authorized by Mr. Kipp Eckert. Contractual terms for our services are described in blanket contract number CTB1982G.

We appreciate the opportunity to be of continued service to Unocal. Please call if you have questions regarding this report.

Yours very truly,

GeoEngineers, Inc.

Julia Fowler, P.E.
Associate

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REPORT OF REMEDIAL EXCAVATION MONITORING
UNOCAL BULK PLANT 0046
BINGEN, WASHINGTON
FOR
UNOCAL ERS - WEST REGION

INTRODUCTION

This report summarizes the results of our 1995 remedial excavation monitoring services at Unocal Bulk Plant 0046, located at 217 East Steuben Street in Bingen, Washington. Ecology's (Washington Department of Ecology) UST (underground storage tank) site identification number for Unocal Bulk Plant 0046 is 008382. Ecology's LUST (leaking UST) incident number for the site is 3434. The location of the site is shown relative to surrounding physical features in Figure 1. The general site layout is shown in Figure 2.

The services completed for this phase of the project were conducted in September and October 1995 and included monitoring the excavation of petroleum hydrocarbon-contaminated soil from the bulk plant site and completing shallow hand explorations in unexplored areas of the site. The excavated contaminated soil was transported off site for disposal. Soil samples were obtained during excavation and exploration activities for field screening and chemical analysis.

BACKGROUND

SITE HISTORICAL INFORMATION

SAFE (SAFE Research, Inc) compiled historical information about the site and presented the site history in a report dated March 5, 1993. The historical information includes several general arrangement drawings and aerial photographs. Bulk Plant 0046 was constructed in 1924; the property use prior to 1924 is unknown. A description of the original facilities was not presented. By 1953, the facilities at the site consisted of four 19,450-gallon ASTs (aboveground storage tanks), one wooden loading rack, rail car and truck unloaders, one garage building, one office building, one septic tank, one cesspool, one 550-gallon heating oil UST, one warehouse, one 5,000-gallon diesel UST, and drum fillers. In the mid-1970s, a 1,000 gallon UST and associated fuel dispenser were installed east of the warehouse. The drum fillers were removed in 1981. One 20,000-gallon AST, new truck unloaders and associated concrete slab, and a drain line were installed in approximately the early 1980s. The wooden loading rack and original truck unloaders apparently were removed during the same period. The wooden loading rack was replaced with a steel loading rack in the same general vicinity. The heating oil UST and the 5,000-gallon diesel UST were removed in 1989. The approximate locations of these facilities are shown in Figure 2.

In addition to the facilities described above, we understand that a waste oil AST was formerly located near the southwest corner of the warehouse. The waste oil AST apparently was

moved to its current location, near the southwest corner of the garage. Three horizontal ASTs were installed in the tank farm area sometime in the early 1990s. Additionally, a small concrete containment area was constructed southwest of the horizontal ASTs. We were unable to determine the date of or purpose for the construction of the concrete containment area.

GEOENGINEERS' 1989 SUBSURFACE EXPLORATION

GeoEngineers observed the removal of the 5,000-gallon diesel UST located near the warehouse in 1989. GeoEngineers obtained soil samples from the limits of the UST excavation and hand-augered two soil borings (B-1 and B-2) in the vicinity of the UST excavation in 1989. A TPH (total petroleum hydrocarbon) concentration of 7,920 mg/kg (milligrams per kilogram) was detected in a soil sample obtained from the southern limit of the UST excavation at a depth of 1.0 foot. Additionally, TPH was detected at a concentration of 9,200 mg/kg in a soil sample obtained from a depth of approximately 1.5 feet in hand-auger boring B-2, located adjacent to the warehouse. The approximate locations of hand-auger borings B-1 and B-2 are shown in Figure 2. Our observations indicated that TPH-contaminated soil could extend beneath the warehouse. These results are presented in our report dated June 28, 1989.

GEOENGINEERS' 1990 SUBSURFACE EXPLORATION

We explored subsurface conditions further by drilling eight soil borings (B-1 through B-4 and MW-1 through MW-4) and constructing monitoring wells in four of the borings in April 1990. In addition, we hand-augered one soil boring (RP-1) in the stormwater retention pond located east of the warehouse. TPH was not detected at significant concentrations in soil samples obtained from the borings. Ethylbenzene, toluene and xylenes were detected in the soil samples at concentrations less than current MTCA (Model Toxics Control Act) Method A cleanup standards.

The depths to ground water in the monitoring wells ranged between approximately 6.06 feet (MW-1) to 14.30 feet (MW-4) below ground surface on May 17, 1990. The inferred direction of ground water flow was to the northeast. TPH was detected in ground water samples obtained in May 1990 from monitoring wells MW-1 and MW-4 at concentrations of 1.6 mg/l (milligrams per liter) and 0.8 mg/l, respectively. Ethylbenzene, toluene and xylenes were detected at concentrations less than current cleanup standards in the ground water sample obtained from monitoring well MW-1. Benzene was not detected in the MW-1 sample, and BETX (benzene, ethylbenzene, toluene and xylenes) were not detected in the ground water samples obtained from monitoring wells MW-2, MW-3 and MW-4. The results of our 1990 subsurface explorations are presented in our report dated August 27, 1990.

GEOENGINEERS' MAY 1994 SUBSURFACE STUDY

Subsurface conditions in the vicinity of a proposed card-lock facility at the site were explored in May 1990 by drilling one boring (B-5) in the approximate center of the proposed card

lock and one boring (MW-5) northeast (downgradient) of the proposed card lock. A monitoring well was constructed in boring MW-5. Petroleum-related hydrocarbons were not detected in the soil samples obtained from borings B-5 and MW-5. Ground water was not present in monitoring well MW-5. The results of our May 1994 study are presented in our report dated July 1, 1994.

GEOENGINEERS' JULY 1994 SUBSURFACE EXPLORATION

In July 1994, we explored for possible subsurface petroleum hydrocarbon-contaminated soil in unexplored areas of the site and evaluated the extent of petroleum hydrocarbon-contaminated soil in the vicinity of the warehouse by drilling 16 hand-auger borings and drilling three hollow stem-auger borings. During this study, petroleum hydrocarbon-like surface staining was observed in the vicinity of the former locations of the waste oil AST, the horizontal oil ASTs, the northwest corner of the warehouse, the north side of the warehouse, the 1,000-gallon UST, the waste oil AST, the east product pump valve, the truck unloaders and beneath the warehouse.

Diesel- and heavy oil-range hydrocarbons were detected in the soil samples obtained from soil borings B-8 and HA-7 through HA-11 and surface samples S-1 and S-2. GeoEngineers estimated that approximately 465 cubic yards (in place volume) of petroleum hydrocarbon-contaminated soil were present at various locations of the site. The results are presented in our report dated October 20, 1994.

PURPOSE AND SCOPE

The purpose of our supplemental services described in this report was to monitor excavation of the known petroleum hydrocarbon-contaminated soil. In addition, we explored select areas of the site for possible soil contamination that had not been previously explored. For the purposes of this report, we divided the site into two portions (west and east). The results of our previous studies indicated that diesel- and oil-contaminated soil was present beneath the site; gasoline-contaminated soil was not encountered. Therefore, chemical analyses for gasoline-range hydrocarbons generally were not conducted during remedial excavation monitoring activities, unless the area excavated had not been previously explored. Surface staining associated with a 1,000-gallon UST located in the southwest corner of the site was not addressed during our activities. We understand that the UST is owned and maintained by others. The specific scope of our supplemental services included the following:

REMEDIAL EXCAVATION - WEST PORTION OF THE SITE

1. Obtain one surface soil sample from the vicinity of the current truck loading rack for qualitative chemical analysis of petroleum hydrocarbons by Ecology Method TPH-HCID.
2. Monitor the excavation of petroleum hydrocarbon-contaminated soil from the west portion of the site in the vicinity of the current truck loading rack, horizontal ASTs, current product pumps and former pumps.
3. Obtain soil samples from the limits of the remedial excavations and field screen the soil

samples for petroleum hydrocarbons using visual, headspace vapor and sheen screening methods.

4. Submit the samples to a laboratory for analysis of one or more of the following: petroleum hydrocarbons by Ecology Method TPH-HCID, gasoline-range hydrocarbons by Ecology Method WTPH-G, diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended, and BETX by EPA (U.S. Environmental Protection Agency) Method 8020.
5. Based on field screening results, assist the contractor in segregating and placing the excavated soil into noncontaminated and contaminated soil stockpiles.

DRAIN LINE DISCHARGE AREA AND RETENTION POND SURFACE SAMPLING

6. Obtain surface soil samples from the vicinity of the drain line discharge area and the eastern retention pond and field screen the soil samples for evidence of petroleum hydrocarbons.
7. Submit the soil samples to a laboratory for analysis of petroleum hydrocarbons by WTPH-HCID and/or quantitative analysis of diesel- and oil-range hydrocarbons by WTPH-D Extended.

REMEDIAL EXCAVATION - EAST PORTION OF THE SITE

8. Monitor remedial excavation of contaminated soil from the vicinity of the former locations of the waste oil AST, warehouse, retention pond, drain line discharge area, and former truck loading rack.
9. Obtain soil samples from the limits of the excavation for quantitative analysis of diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended.
10. Based on field screening results, assist the contractor in segregating and placing the excavated soil into noncontaminated and contaminated soil stockpiles.

SOIL STOCKPILE SAMPLING AND DISPOSAL PERMITTING

11. Obtain samples from the contaminated soil stockpile and submit the samples to a laboratory for analysis of one or more of the following: petroleum hydrocarbons by Ecology Method WTPH-HCID, gasoline-range hydrocarbons by Ecology Method WTPH-G, diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended, BETX by EPA Method 8020, VOCs (volatile organic compounds) by EPA Method 8240, SVOCs (semivolatile organic compounds) by EPA Method 8270, eight TCLP (toxicity characteristic leaching procedure) metals by EPA Methods 1311, 6010 and 7470 and PCBs (polychlorinated biphenyls) by EPA Method 8080.
12. Obtain a permit to transport petroleum hydrocarbon-contaminated soil to Roosevelt Regional Landfill in Roosevelt, Washington for disposal.
13. Obtain soil samples from the noncontaminated soil stockpile for analysis of diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended.
14. Obtain a surface sample of soil from beneath one of the contaminated soil stockpiles, after

the stockpile has been moved. Submit the sample to a laboratory for quantitative analysis of diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended.

15. Review and incorporate into this report the results of analytical testing of soil samples that were obtained by the contractor from beneath select soil stockpile locations.

SURFACE STAINED AREAS

16. Monitor the excavation of gravel and soil with oil-like staining in the driveway areas of the site and beneath the current location of the waste oil AST adjacent to the garage.
17. Obtain soil samples from the base of the excavations and field screen the soil samples.
18. Submit the soil samples to a laboratory for quantitative analysis of diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended.
19. Evaluate the field and laboratory data with regard to current regulatory criteria.

SITE CONDITIONS

The bulk plant was in operation at the time of our remedial excavation monitoring activities; however, many normal activities were suspended. Prior to beginning remedial excavation activities, PEMCO (Petroleum Equipment and Maintenance Company, Inc.) of Portland, Oregon removed the warehouse, and the bulk plant operator (Mr. David Garwood) emptied and removed the horizontal ASTs.

At the time of our remediation monitoring activities, facilities or features at the site included five vertical ASTs, the small concrete containment area, four product pumps (designated 1 through 4 from west to east in this report), truck unloaders and associated concrete pad, a waste oil AST, a garage, a truck loading rack and associated concrete pad, an office, and a retention pond in the southeast corner of the site. The west, south and east portions of the site are surrounded by a concrete retaining wall approximately 1.0 to 1.5 feet high. A subsurface drain line extended from the horizontal AST retention pond intercepting catch basins in the current truck unloaders concrete pad, and the loading rack concrete pad and discharged to the surface behind the warehouse. In general, the portions of the site not occupied by surface facilities were paved with gravel.

REMEDIAL EXCAVATION - WEST PORTION OF THE SITE

PEMCO completed remedial excavations in the west portion of the site (exclusive of driveway surface stained areas) in the vicinity of the loading rack, horizontal ASTs, pump number 2, pump number 4, and the former pumps between September 11 and October 16, 1995. The approximate limits of the excavations in the west portion of the site are shown in Figure 3. GeoEngineers field screened the soil and obtained samples for chemical analysis. Our field methods are described in Appendix A. The chemical analytical results are summarized in Table 1. Laboratory reports are presented in Appendix B.

LOADING RACK EXCAVATION

GeoEngineers obtained one surface soil sample (sample 4) from a stained area on the south side of the loading rack for characterization purposes. Sample 4 was qualitatively analyzed for petroleum hydrocarbons by Ecology Method WTPH-HCID. Gasoline-, diesel- and oil-range hydrocarbons were detected. However, the laboratory reported that the detection of gasoline- and oil-range hydrocarbons appear to be due to overlap from diesel-range hydrocarbons.

Prior to beginning excavation in the vicinity of the loading rack, PEMCO removed a steel stairway and product piping in the vicinity of the loading rack. PEMCO excavated approximately 8 cubic yards (in place volume) of diesel-contaminated soil from the south and west sides of the loading rack and beneath the west footing of the loading rack to a maximum depth of 3.5 feet. The soil encountered in the excavation consisted of brown silt with gravel. GeoEngineers obtained eight soil samples (samples 17, 18, 37 and 41 through 45) from the final limits of the loading rack excavation. Samples 17 and 18 were analyzed for petroleum hydrocarbons by Ecology Method WTPH-HCID and diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Petroleum hydrocarbons were not detected or were detected at concentrations less than MTCA Method A cleanup levels in the eight samples.

HORIZONTAL AST EXCAVATION

PEMCO excavated diesel- and oil-contaminated soil that was identified during our July 1994 subsurface study from the location of the two easternmost ASTs to a maximum depth of approximately 3.0 feet. The soil encountered in the excavation consisted of brown silt with sand. GeoEngineers obtained soil samples 7 through 12 from the limits of the excavation on September 13. The samples were analyzed for diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Diesel- and oil-range hydrbcarbons were detected in sample 10 (obtained from the north base of the excavation) and sample 12 (obtained from the south wall of the excavation) at concentrations exceeding MTCA Method A cleanup levels.

Additional contaminated soil was removed from the base and south wall of the excavation. Samples 19 and 20 were obtained from the extended base of the excavation and analyzed by Ecology Method WTPH-D Extended. Diesel- and oil-range hydrocarbons were not detected in samples 19 and 20. Samples 29, 30 and 31 were obtained from the extended east and south walls of the excavation and analyzed by Ecology Method WTPH-D Extended. Diesel- and oil-range hydrocarbons were not detected in samples 29 and 30. Diesel-range hydrocarbons were detected in sample 31 (obtained from the south wall of the excavation) at a concentration less than the MTCA Method A cleanup level. Oil-range hydrocarbons were detected in sample 31 at a concentration of 260 mg/kg, which slightly exceeds the MTCA Method A cleanup level. Sample 31 was obtained from beneath the retention pond wall. Consequently, additional contaminated soil could not be removed without removing the retention pond wall and damaging the concrete containment area. The volume of contaminated soil removed from the horizontal AST excavation was approximately 40 cubic yards (in-place volume).

PRODUCT PUMP EXCAVATIONS

PEMCO excavated the areas of visible staining beneath the valves of pumps number 2 and number 4. The approximate excavation boundaries are shown in Figure 3. Chemical analytical results are summarized in Table 1. Laboratory reports are presented in Appendix B.

Pump Number 2

PEMCO excavated approximately 2 cubic yards (in place volume) of soil with visible staining from beneath a valve near product pump number 2. GeoEngineers obtained a soil sample (sample 14) from the base of the excavation at an approximate depth of 2.5 feet. Soil encountered in the excavation consisted of silty gravel from the surface to an approximate depth of 1.0 foot. Brown silt with gravel was encountered from the base of the silty gravel to an approximate depth of 2.5 feet. Because soil contamination in this area had not been characterized previously, sample 14 was analyzed for gasoline-range hydrocarbons by Ecology Method WTPH-G and for diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Gasoline- and oil-range hydrocarbons were not detected in sample 14. Diesel-range hydrocarbons were detected in sample 14 at a concentration of 130 mg/kg, which is less than the MTCA Method A cleanup level.

Pump Number 4

PEMCO excavated contaminated soil from an area beneath a valve near product pump number 4 to an approximate depth of 4.5 feet. Soil encountered in the excavation consisted of silty gravel from the surface to an approximate depth of 1.0 foot. Brown silt with gravel was encountered from the base of the silty gravel to an approximate depth of 4.5 feet.

GeoEngineers obtained soil samples 15 and 16 from the base of the excavation at an approximate depth of 2.5 feet. Samples 15 and 16 were analyzed for gasoline-range hydrocarbons by Ecology Method WTPH-G and diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Gasoline-, diesel- and oil-range hydrocarbons were not detected in sample 15 and gasoline-range hydrocarbons were not detected in sample 16. Diesel- and oil-range hydrocarbons were detected in sample 16 at concentrations of 620 mg/kg and 920 mg/kg, respectively, which exceed MTCA Method A cleanup levels.

PEMCO excavated additional soil, from the vicinity of sample 16, to an approximate depth of 4.5 feet. GeoEngineers obtained sample 63 from the base of the excavation for analysis of diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Diesel-range hydrocarbons were detected at a concentration of 170 mg/kg in sample 63; oil-range hydrocarbons were not detected. The volume of soil removed from this excavation was approximately 8 cubic yards (in place volume).

FORMER PUMPS EXCAVATION

The results of GeoEngineers' July 1994 subsurface study indicated the presence of diesel-contaminated soil in the vicinity of the former pumps. Prior to beginning the 1995 remedial excavation activities in this area, PEMCO removed the existing truck unloaders and a portion of the product piping. PEMCO began excavating contaminated soil from the vicinity of the former truck unloaders. During remedial excavation activities, PEMCO removed the current truck unloaders concrete pad and catch basin to access contaminated soil. We observed that the drain line, extending southeast from the catch basin, was broken and appeared to have been broken prior to removing the concrete pad and catch basin. In addition, the water supply line for the site was broken during remedial excavation.

Contaminated soil was removed to approximate depths between 8 and 9 feet where excavation activities were discontinued because basalt bedrock was encountered. The bedrock in the base of the excavation was observed to slope down to the south. Soil encountered during remedial excavation consisted of sandy silt with gravel. A zone of soil with petroleum-like staining was observed along the south wall of the remedial excavation between depths of about 7 feet and 9 feet (bedrock surface) below ground surface.

GeoEngineers obtained samples 21 through 25 from the west, north and east walls of the excavation. Sample 26 was obtained from soil and small pieces of basalt that were present on the bedrock surface at the base of the southeast corner of the excavation. The samples were analyzed for diesel-range hydrocarbons by Ecology Method WTPH-D. Diesel-range hydrocarbons were not detected in samples 21 through 25. Diesel-range hydrocarbons were detected in sample 26 at a concentration of 3,700 mg/kg, which exceeds the MTCA Method A cleanup standard. The soil and loose bedrock represented by sample 26 were subsequently removed from the excavation.

GeoEngineers obtained three soil samples (38, 39 and 40) from the stained zone in the south wall of the excavation. The samples were analyzed for diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Diesel-range hydrocarbons were detected in the samples at concentrations ranging between 2,400 mg/kg and 6,000 mg/kg. Oil range-hydrocarbons either were not detected in the samples or were detected at concentrations less than the MTCA Method A cleanup level. According to the laboratory report, the detected oil-range hydrocarbons in the samples were due to overlap from diesel-range hydrocarbons. The south wall of the excavation was approximately 1 foot from the south property line. Therefore, additional soil could not be removed from this area without encroaching onto property south of the site.

The volume of contaminated soil removed from the former pumps excavation was approximately 312 cubic yards (in place volume). The contaminated soil was placed in a stockpile located north of the warehouse. Approximately 20 cubic yards (in place volume) of apparently noncontaminated soil were stockpiled in an area north of the former location of the warehouse.

PEMCO removed approximately 2,235 gallons of water from the excavation between October 10 and 16 prior to backfilling the excavation. The water originated from the broken

water line and from surface runoff. The water was transported to Oil Re-Refining, Inc. in Woodland, Washington for disposal. The disposal receipt is presented in Appendix C.

DRAIN LINE DISCHARGE AREA AND RETENTION POND SURFACE SAMPLING

GeoEngineers obtained three surface samples (13, 27 and 28) from the drain line discharge area behind the warehouse between September 13 and September 25, 1995 for qualitative analysis of petroleum hydrocarbons by Ecology Method WTPH-HCID. Gasoline-, diesel- and oil-range hydrocarbons were detected in each sample. The laboratory reported that the hydrocarbons detected in the gasoline range are due to overlap of diesel-range hydrocarbons. The samples were qualitatively analyzed for diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Diesel- and oil-range hydrocarbons were detected in the samples at concentrations exceeding MTCA Method A cleanup levels.

Three soil samples (samples 46, 47 and 48) also were obtained from the surface of the retention pond area. The samples were qualitatively analyzed for diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Diesel- and oil-range hydrocarbons were detected in the samples at concentrations exceeding MTCA Method A cleanup levels. The results of the drain line discharge area and retention pond surface sample analyses are summarized in Table 2. The laboratory reports are presented in Appendix B.

REMEDIAL EXCAVATION - EAST PORTION OF THE SITE

GENERAL

During previous investigations, diesel- and oil-range hydrocarbon-contaminated soil was encountered beneath the warehouse, in the vicinity of the northwest corner of the warehouse and in the vicinity of the former location of the waste oil AST (located near the southwest corner of the warehouse). The results of the surface sampling conducted during this study indicated the presence of contaminated soil in the drain line discharge area and the southeast retention pond. In addition, during remedial excavation activities conducted west of the warehouse, contaminated soil was encountered that may have been associated with the former loading rack.

Remedial excavation activities in the east portion of the site were conducted between September 19 and October 19, 1995. PEMCO excavated soil from (1) beneath the former warehouse, (2) the area of surface staining in the vicinity of the northwest corner of the warehouse, (3) the vicinity of the former waste oil AST, (4) the drain line discharge area behind the warehouse, and (5) the southeast retention pond area. The remedial excavations in the east portion of the site merged into one large, shallow excavation because of the relative location and areal extent of contaminated soil. Approximately 320 cubic yards (in place volume) of soil were excavated from the combined excavations in the southeast portion of the site.

GeoEngineers field screened the soil removed from the excavations. Noncontaminated soil was not generated during excavation in these areas. The approximate limits of the remedial

excavation and soil sample locations are shown in Figure 4. We obtained soil samples from the limits of the excavations for chemical analysis. Based on chemical analytical results, additional contaminated soil was removed from the vicinity of the former loading rack and additional soil samples were obtained for chemical analysis. Chemical analytical results for the soil samples obtained from the remedial excavations in the east portion of the site, exclusive of the areas of driveway staining, are summarized in Table 3. Laboratory reports are presented in Appendix B.

SOIL CONDITIONS

The maximum depth of the combined excavation ranged between approximately 2.0 feet and 3.5 feet below ground surface. In general, soil encountered in the excavation consisted of brown silt with gravel. In the area west of the warehouse, the surface was paved with gravel to an approximate depth of 0.3 foot. Silt with gravel was encountered beneath this gravel surface to an approximate depth of 1.3 feet. A layer of gravel fill with petroleum hydrocarbon-like staining was encountered beneath the thin silt with gravel layer to an approximate depth of 1.8 feet.

SOIL SAMPLING AND ANALYSIS

GeoEngineers obtained soil samples 32 through 36, 49 through 62, 64 through 93 and 108 through 110 during excavation activities in the eastern portion of the site. These samples were analyzed for diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended.

Diesel- and/or oil-range hydrocarbons were detected in samples 32, 56, 64, 65 and 66 at concentrations exceeding MTCA Method A cleanup standards. Samples 32 and 56 were obtained from the same general area. Additional soil was removed from the vicinity of samples 32 and 56 and the area was resampled (Sample 92). Diesel- and oil-range hydrocarbons were not detected in sample 92.

Diesel-range hydrocarbons were detected in samples 64 and 66 at concentrations of 3,800 mg/kg and 1,600 mg/kg. Oil-range hydrocarbons were detected in samples 64, 65 and 66 at concentrations of 12,000 mg/kg, 750 mg/kg and 4,200 mg/kg, respectively. Additional soil could not be removed from the vicinities of samples 64, 65 and 66 because of the proximity of the concrete retaining wall and the property boundary.

DRIVEWAY SURFACE STAINING EXCAVATION

GeoEngineers conducted a visual reconnaissance of the site's driveways to locate areas of surface staining. Numerous areas of oil-like staining were observed in the vicinity of the garage, loading rack and office. PEMCO excavated the stained surface material from each of these areas to an approximate depth of 1 foot. Approximately 10 cubic yards (in place volume) of contaminated soil were excavated. GeoEngineers obtained one to two soil samples from each excavated area (samples 94 through 107) for chemical analysis of diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Approximate soil sample locations are

shown in Figures 3 and 4. Diesel- and oil-range hydrocarbons either were not detected or were detected at concentrations less than MTCA Method A cleanup levels in samples 94 through 107. The analytical results are summarized in Table 4.

SOIL STOCKPILE SAMPLING AND SOIL DISPOSITION

GENERAL

Excavated soil was segregated into contaminated soil stockpiles placed at various locations on the site and one stockpile of apparently noncontaminated soil. Soil stockpiles, with the exception of a contaminated soil stockpile (stockpile A) that was located east of the loading rack, were placed on plastic sheeting. Additionally, a large contaminated soil stockpile (stockpile B) that was located north of the former location of the warehouse was not placed entirely on plastic sheeting. GeoEngineers obtained representative samples of the stockpiled soil for chemical analysis. In addition, GeoEngineers obtained a surface soil sample for chemical analysis from beneath the location of stockpile A, after the stockpile had been removed. Additionally, PEMCO obtained surface soil samples from beneath the former locations of stockpiles A and B for chemical analysis. Chemical analytical results are summarized in Table 5. Laboratory reports are presented in Appendix B.

DISPOSAL PROFILING

GeoEngineers obtained 4 representative samples of stockpiled contaminated soil (SP-1, SP-2, SP-4 and SP-5) on September 18 and 19 for disposal profiling. Samples SP-1 and SP-2 were obtained from soil that was excavated from the loading rack, horizontal AST, and former pump areas. Samples SP-1 and SP-2 were analyzed for hydrocarbon identification by Ecology Method WTPH-HCID. Gasoline- and diesel-range hydrocarbons were detected in samples SP-1 and SP-2. However, the detected gasoline-range hydrocarbons were due to overlap from the diesel range, according to the laboratory report. The samples were quantitatively analyzed for diesel-range hydrocarbons by Ecology Method WTPH-D. Diesel was detected in samples SP-1 and SP-2 at concentrations of 1,600 mg/kg and 1,100 mg/kg, respectively.

Samples SP-4 and SP-5 were obtained from soil that was excavated from the location of the former waste oil AST. Samples SP-4 and SP-5 were analyzed for gasoline-range hydrocarbons by Ecology Method WTPH-G; diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended; BETX by EPA Method 8020; VOCs and SVOCs by EPA Methods 8240 and 8270; eight leachable metals by EPA Method 1311, 6010 and 7470; and PCBs by EPA Method 8080.

Gasoline-range hydrocarbons were detected in SP-4 and SP-5 at concentrations of 10 mg/kg and 7.6 mg/kg, respectively. Diesel-range hydrocarbons were detected in SP-4 and SP-5 at concentrations of 3,300 mg/kg and 2,600 mg/kg, respectively, and oil-range hydrocarbons were detected in SP-4 and SP-5 at concentrations of 7,400 mg/kg and 7,300 mg/kg, respectively. Toluene and xylenes were detected in SP-4 at concentrations of 0.016 mg/kg and 0.024 mg/kg, respectively. BETX were not detected in SP-5. Methylene chloride was detected in samples

SP-4 and SP-5 at concentrations of 0.077 mg/kg and 0.086 mg/kg, respectively. The detected methylene chloride likely is a result of laboratory contamination, according to the laboratory report. Leachable barium was detected in SP-4 and SP-5 at concentrations of 0.68 mg/l and 0.57 mg/l, respectively. These concentrations of leachable barium are typical for native soil in this area. PCBs were not detected.

NONCONTAMINATED SOIL STOCKPILE

Approximately 20 cubic yards (in place volume) of apparently noncontaminated soil removed from the former pumps excavation were placed in a stockpile located north of the warehouse. GeoEngineers obtained soil samples SP-6, SP-7 and SP-8 from the apparently noncontaminated soil stockpile for chemical analysis of diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Diesel- and oil-range hydrocarbons were detected in sample SP-6 at concentrations less than MTCA Method A cleanup levels. Oil-range hydrocarbons were detected in sample SP-7 and diesel-range hydrocarbons were detected in sample SP-8 at concentrations exceeding MTCA Method A cleanup levels. Approximately 10 cubic yards (in place volume) of contaminated soil represented by samples SP-7 and SP-8 were segregated from the stockpile and transported off site for disposal. The remaining 10 cubic yards were returned to the former pumps excavation as backfill. GeoEngineers did not observe backfilling activities.

SOIL TRANSPORTATION AND DISPOSAL

PEMCO transported approximately 710 cubic yards (in-place volume) or approximately 923 cubic yards (stockpile volume) of contaminated soil from the site to Roosevelt Regional Landfill in Roosevelt, Washington for disposal between October 9 and October 30, 1995. Approximately 1,015 tons of soil were transported to the landfill, according to the tippage summary provided by the landfill. The tippage summary is presented in Appendix C.

GEOENGINEERS' STOCKPILE REMOVAL CONFIRMATION SAMPLING

GeoEngineers obtained one sample (sample 111) of silty gravel from beneath the location of the contaminated soil stockpile (stockpile A) which had not been placed on plastic sheeting. The approximate location where sample 111 was obtained is shown in Figure 4. Sample 111 was analyzed for diesel- and oil-range hydrocarbons by Ecology Method WTPH-D Extended. Diesel- and oil-range hydrocarbons were detected in sample 111 at concentrations exceeding MTCA Method A cleanup levels.

PEMCO'S STOCKPILE REMOVAL CONFIRMATION SAMPLING

PEMCO obtained four soil samples from beneath the locations where contaminated soil stockpiles A and B had been located. PEMCO obtained the samples on November 14, 1995. PEMCO designated the samples 1 through 4; however, the samples will be referred to as

samples P-1 through P-4 in this report. Samples P-1 and P-2 were obtained from the former location of stockpile B that was placed north of the warehouse. Samples P-3 and P-4 were obtained from the former location of stockpile A that was placed west of the warehouse, in the vicinity where GeoEngineers obtained sample 111. The approximate locations of samples P-1 through P-4 are shown on Figure 4. PEMCO provided these locations to GeoEngineers on a GeoEngineers' site plan, which is presented in Appendix D.

Samples P-1 through P-4 were obtained from between the ground surface to an approximate depth of 0.5 foot. PEMCO submitted samples P-1 through P-4 to a laboratory for qualitative analysis of petroleum hydrocarbons by Ecology Method WTPH-HCID. Petroleum hydrocarbons were not detected in samples P-1 through P-4. The results are summarized in Table 5. The laboratory report and chain of custody are presented in Appendix B.

CONCLUSIONS

The volumes (in-place) of contaminated soil and excavated areas are as follows:

Location	Cubic Yards
Loading Rack	8
Horizontal ASTs	40
Product Pumps	10
Former Pumps	322
Combined East Areas	320
Driveways	10
Total	710

The contaminated soil was transported to Roosevelt Regional Landfill in Roosevelt, Washington for disposal. The total tonnage, based on the summary of weight tickets, was approximately 1,015 tons.

Oil-related contaminated soil remains in the south wall of the horizontal AST excavation (sample 31) at a concentration of 260 mg/kg. This contaminated soil could not be removed without removing the retention pond concrete dike wall and the containment area. We anticipate that contaminated soil represented by sample 31 is limited in extent and extends from the surface to a maximum depth of 3 feet below ground surface.

A zone of diesel-related contaminated soil, approximately 2 feet thick, remains in the south wall of the former pumps excavation (samples 38, 39 and 40) at a maximum detected concentration of 6,000 mg/kg. Additional contaminated soil could not be removed without encroaching onto property owned by Burlington Northern Railroad.

Diesel- and/or oil-contaminated soil remains in the south wall of the large east remedial excavation (samples 64, 65 and 66) at a maximum diesel-range concentration of 3,800 mg/kg and a maximum oil-range concentration of 12,000 mg/kg. Contaminated soil in this area was encountered from the surface to an approximate depth of 3.0 feet.

LIMITATIONS

We have prepared this report for use by Unocal. This report may be made available to regulatory agencies. The report is not intended for use by others, and the information contained herein is not applicable to other sites.

Our interpretation of subsurface conditions is based on field observations and analytical data obtained from widely spaced soil sample locations and test pit explorations. It is always possible that areas with petroleum hydrocarbon contamination exist in parts of the site that were not explored or sampled.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to be of continued service to Unocal. Please call if you have questions concerning this report.

Yours very truly,

GeoEngineers, Inc.

Patrick J. Sullivan, R.G.
Geologist

Julia Fowler, P.E.
Associate

PJS:JF:mln
Document ID: 0161181r.r5

TABLE 1 (Page 1 of 2)
SUMMARY OF FIELD SCREENING AND SOIL CHEMICAL ANALYTICAL DATA[1]
BULK PLANT - WEST PORTION

Soil Sample Number[2]	Date Sampled	General Location Sample	Depth of Sample (feet)	Field Screening Results[3]		Hydrocarbon Identification (Ecology Method WTPH-HCID) (mg/kg)			Gasoline-range Hydrocarbons (Ecology Method WTPH-G) (mg/kg)	Diesel- and Oil-range Hydrocarbons (Ecology Method WTPH-D Extended) (mg/kg)		BETX[4] (EPA Method 8020) (mg/kg)			
				Headspace Vapor (ppm)	Sheen	Gasoline	Diesel	Oil		Diesel	Oil	B	E	T	X
Loading Rack Excavation															
4[5]	09/11/95	Surface, south side of loading rack	0.1	--	HS	Detected[6]	Detected	Detected[6]	--	--	--	--	--	--	--
17	09/14/95	Base, central portion	3.0	<100	SS	<20	<50	<100	--	44	<50	--	--	--	--
18	09/14/95	Base, west end	3.0	<100	NS	<20	<50	<100	--	40	<50	--	--	--	--
37	10/09/95	Base, east end	3.5	<100	SS	--	--	--	--	<25	<50	--	--	--	--
41	10/09/95	North wall	2.5	<100	SS	--	--	--	--	<25	<50	--	--	--	--
42	10/09/95	South wall	2.0	<100	NS	--	--	--	--	<25	<50	--	--	--	--
43	10/09/95	South wall, west end	2.0	<100	SS	--	--	--	--	<25	<50	--	--	--	--
44	10/09/95	West wall	2.5	<100	SS	--	--	--	--	<25	<50	--	--	--	--
45	10/09/95	North wall, west end	2.5	<100	SS	--	--	--	--	<25	<50	--	--	--	--
Horizontal AST Excavation															
7	09/13/95	North wall, west end	2.0	<100	NS	--	--	--	--	<25	<50	--	--	--	--
8	09/13/95	Base, west end	2.5	<100	NS	--	--	--	--	<25	<50	--	--	--	--
9	09/13/95	West wall	2.5	<100	NS	--	--	--	--	<25	<50	--	--	--	--
10[5]	09/13/95	Base, north end	2.0	<100	NS	--	--	--	--	1,500	4,400	--	--	--	--
11	09/13/95	Base, east end	2.0	<100	NS	--	--	--	--	<25	<50	--	--	--	--
12[5]	09/13/95	South wall	1.0	<100	NS	--	--	--	--	390	750	--	--	--	--
19	09/14/95	Base, north end	3.0	<100	NS	--	--	--	--	<25	<50	--	--	--	--
20	09/14/95	Base, south end	3.0	<100	NS	--	--	--	--	<25	<50	--	--	--	--
29	09/25/95	East wall	1.0	<100	NS	--	--	--	--	<25	<50	--	--	--	--
30	09/25/95	South wall, east end	1.0	<100	SS	--	--	--	--	<25	<50	--	--	--	--
31	10/09/95	South wall, west end	1.5	<100	SS	--	--	--	--	180	260	--	--	--	--
MTCA Method A Cleanup Standards									100	200	200	0.5	20	40	20

Notes appear on page 2 of 2.

TABLE 1 (Page 2 of 2)

Soil Sample Number[2]	Date Sampled	General Location Sample	Depth of Sample (feet)	Field Screening Results[3]		Hydrocarbon Identification (Ecology Method WTPH-HCID) (mg/kg)			Gasoline-range Hydrocarbons (Ecology Method WTPH-G) (mg/kg)	Diesel- and Oil-range Hydrocarbons (Ecology Method WTPH-D Extended) (mg/kg)		BETX[4] (EPA Method 8020) (mg/kg)			
				Headspace Vapor (ppm)	Sheen	Gasoline	Diesel	Oil		Diesel	Oil	B	E	T	X
Product Pump Excavations															
14	09/14/95	Below product pump #2	2.5	<100	NS	--	--	--	<2	130	<50	<0.013	<0.013	<0.013	<0.013
15	09/14/95	Below product pump #4, south end	2.5	<100	SS	--	--	--	<2	<25	<50	<0.013	<0.013	0.017	<0.013
18[5]	09/14/95	Below product pump #4, north end	2.5	<100	NS	--	--	--	<2	620	920	<0.013	<0.013	<0.013	<0.013
63	10/16/95	Below product pump #4, north end	4.5	<100	SS	--	--	--	--	170	<50	--	--	--	--
Former Pumps Excavation															
21	09/14/95	West wall	8.0	<100	NS	--	--	--	--	<25	--	--	--	--	--
22	09/19/95	North wall	7.0	<100	NS	--	--	--	--	<25	--	--	--	--	--
23	09/19/95	East wall	7.0	<100	SS	--	--	--	--	<25	--	--	--	--	--
24	09/19/95	Southeast corner	8.5	<100	SS	--	--	--	--	<25	--	--	--	--	--
25	09/19/95	North wall	7.0	<100	NS	--	--	--	--	<25	--	--	--	--	--
26[5]	09/19/95	Base, southeast corner	9.0	--	HS	--	--	--	--	3,700	--	--	--	--	--
38	10/09/95	South wall, east end	8.0	260	HS	--	--	--	--	3,300	100[6]	--	--	--	--
39	10/09/95	South wall, center	8.0	260	HS	--	--	--	--	6,000	<50	--	--	--	--
40	10/09/95	South wall, west end	8.0	100	HS	--	--	--	--	2,400	98[6]	--	--	--	--
MTCA Method A Cleanup Standards									100	200	200	0.5	20	40	20

Notes:

[1]Laboratory analyses were performed by North Creek Analytical of Portland, Oregon. See Appendix B for the laboratory reports.

[2]Approximate sample locations are shown in Figure 3.

[3]Field screening methods are described in Appendix A. NS = no sheen, SS = slight sheen, MS = moderate sheen, HS = heavy sheen

[4]B = benzene, E = ethylbenzene, T = toluene, X = xylenes

[5]The soil represented by this sample was subsequently removed during excavation activities.

[6]The laboratory report indicates that the hydrocarbons detected in this range appear to be due to overlap from the diesel range.

ppm = parts per million, mg/kg = milligrams per kilogram, '--' = not analyzed

No. 161181X

TABLE 2
SUMMARY OF FIELD SCREENING AND SOIL CHEMICAL ANALYTICAL DATA[1]
DRAIN LINE DISCHARGE AREAS AND RETENTION POND

Soil Sample Number[2]	Date Sampled	General Location Sample	Depth of Sample (feet)	Field Screening Results[3]		Hydrocarbon Identification (Ecology Method WTPH-HCID)			Diesel- and Oil-range Hydrocarbons (Ecology Method WTPH-D Extended) (mg/kg)	
				Headspace Vapor (ppm)	Sheen	Gasoline	Diesel	Oil	Diesel	Oil
13[4]	09/13/95	Surface sample, south side of warehouse	0.0 - 0.5	<100	NS	Detected[5]	Detected	Detected	11,000	4,800
27[4]	09/25/95	Surface sample, south side of warehouse	0.0 - 0.5	<100	SS	Detected[5]	Detected	Detected	3,300	2,400
28[4]	09/25/95	Surface sample, south side of warehouse	0.0 - 0.5	<100	SS	Detected[5]	Detected	Detected	12,000	4,000
46[4]	10/09/95	Surface, retention pond	0.0 - 0.5	<100	MS	--	--	--	2,800	3,600
47[4]	10/09/95	Surface, retention pond	0.0 - 0.5	<100	MS	--	--	--	26,000	16,000
48[4]	10/09/95	Surface, retention pond	0.0 - 0.5	<100	NS	--	--	--	2,600	1,800

Notes:

[1]Laboratory analyses were performed by North Creek Analytical of Portland, Oregon. See Appendix B for the laboratory reports.

[2]Approximate sample locations are shown in Figure 4.

[3]Field screening methods are described in Appendix A. NS = no sheen, SS = slight sheen, MS = moderate sheen

[4]The soil represented by this sample was subsequently removed during excavation activities.

[5]The laboratory report indicates that the hydrocarbons detected in this range appear to be due to overlap from the diesel range.

ppm = parts per million, mg/kg = milligrams per kilogram, "--" = not analyzed

TABLE 3 (Page 1 of 2)
SUMMARY OF FIELD SCREENING AND SOIL CHEMICAL ANALYTICAL DATA[1]
BULK PLANT - EAST PORTION

Soil Sample Number[2]	Date Sampled	General Location of Sample	Depth of Sample (feet)	Field Screening Results[3]		Diesel- and Oil-range Hydrocarbons (Ecology Method WTPH-D Extended) (mg/kg)	
				Headspace Vapor (ppm)	Sheen	Diesel	Oil
32[4]	10/09/95	Wall, former loading rack	1.0	<100	SS	590[5]	1,900
33	10/09/95	Base, former loading rack	3.0	<100	SS	<25	<50
34	10/09/95	Base, former waste oil AST	3.0	<100	SS	<25	<50
35	10/09/95	North wall, former loading rack	1.0	<100	NS	<25	<50
36	10/09/95	Waste oil AST	1.0	<100	SS	86	130
49	10/09/95	Base, waste oil AST	3.0	<100	SS	<25	<50
50	10/09/95	Base, warehouse	3.0	<100	SS	41	82
51	10/09/95	Base, warehouse	3.0	<100	SS	<25	<50
52	10/11/95	Base, warehouse	3.0	<100	SS	<25	<50
53	10/11/95	Base, warehouse	3.0	<100	SS	<25	<50
54	10/11/95	Base, warehouse	3.5	<100	SS	<25	<50
55	10/11/95	Base, warehouse	3.5	<100	SS	31[5]	<50
56[4]	10/11/95	Wall, former loading rack	1.0	<100	NS	600	2,500
57	10/11/95	Base, warehouse	3.5	<100	SS	<25	<50
58	10/11/95	Base, warehouse	3.0	<100	SS	<25	<50
59	10/11/95	North wall	1.5	<100	NS	<25	<50
60	10/11/95	Base, west of warehouse	2.0	<100	NS	<25	<50
61	10/11/95	West of warehouse	1.0	<100	SS	<25	<50
62	10/11/95	Base, west of warehouse	2.0	<100	SS	<25	<50
64	10/16/95	South wall	2.0	<100	SS	3,800	12,000
65	10/16/95	South wall	2.0	<100	SS	190	750
66	10/16/95	South wall	2.0	<100	SS	1,600	4,200
67	10/16/95	South wall	2.0	<100	SS	86	120
68	10/16/95	South wall	2.0	<100	SS	<25	110
69	10/16/95	Base, warehouse	3.0	<100	SS	<25	200
70	10/16/95	Base, warehouse	3.0	<100	SS	<25	<50
71	10/16/95	North wall	2.0	<100	SS	<25	<50
72	10/16/95	West of warehouse	1.5	<100	SS	<25	<50
73	10/16/95	Wall, west of warehouse	1.5	<100	SS	<25	<50
74	10/16/95	Base, retention pond	2.5	<100	SS	<25	<50
75	10/16/95	Base, retention pond	2.5	<100	SS	<25	<50
76	10/16/95	Base, retention pond	2.5	<100	SS	<25	<50
77	10/16/95	Base, retention pond	2.0	<100	SS	<25	<50
78	10/16/95	Base, retention pond	2.0	<100	SS	<25	<50
79	10/17/95	South wall, retention pond	2.0	<100	SS	<25	69
MTCA Method A Cleanup Standards						200	200

Notes appear on page 2 of 2.

TABLE 3 (Page 2 of 2)

Soil Sample Number[2]	Date Sampled	General Location of Sample	Depth of Sample (feet)	Field Screening Results[3]		Heavy Oil-range Hydrocarbons (Ecology Method WTPH-D Extended) (mg/kg)	
				Headspace Vapor (ppm)	Sheen	Diesel	Oil
80	10/17/95	East wall, retention pond	2.0	<100	SS	<25	<50
81	10/17/95	East wall, retention pond	2.0	<100	SS	<25	<50
82	10/17/95	North wall, retention pond	2.0	<100	SS	<25	<50
83	10/17/95	North wall, warehouse	2.0	<100	SS	<25	<50
84	10/17/95	North wall, warehouse	2.0	<100	SS	<25	<50
85	10/17/95	West wall, former loading rack	2.0	<100	SS	<25	<50
86	10/17/95	South wall, former loading rack	2.0	<100	SS	140	<50
87	10/17/95	Base, former loading rack	3.5	<100	SS	<25	<50
88	10/17/95	West wall, former loading rack	2.0	<100	SS	<25	<50
89	10/17/95	North wall, former loading rack	2.0	<100	SS	<25	<50
90	10/17/95	East wall, former loading rack	2.0	<100	SS	<25	<50
91	10/17/95	Base, former loading rack	3.0	<100	SS	<25	<50
92	10/17/95	Base, former loading rack	3.5	<100	SS	<25	<50
93	10/17/95	North wall, former loading rack	2.0	<100	SS	<25	<50
108	10/19/95	Wall, west of warehouse	1.5	--	--	<25	<50
109	10/19/95	Base, west of warehouse	2.0	--	--	<25	<50
110	10/19/95	Wall, west of warehouse	1.0	--	--	<25	<50
MTCA Method A Cleanup Standards						200	200

Notes:

[1]Laboratory analyses were performed by North Creek Analytical of Portland, Oregon. See Appendix B for the laboratory reports.

[2]Approximate sample locations are shown in Figure 4.

[3]Field screening methods are described in Appendix A. NS = no sheen, SS = slight sheen, MS = moderate sheen, HS = heavy sheen

[4]The soil represented by this sample was subsequently removed during excavation activities.

[5]The laboratory report indicates that the hydrocarbons detected in this range appear to be due to overlap from the heavy oil range.

ppm = parts per million

mg/kg = milligrams per kilogram

"--" = not analyzed

TABLE 4
SUMMARY OF FIELD SCREENING AND SOIL CHEMICAL ANALYTICAL DATA[1]
DRIVEWAY SURFACE STAINING EXCAVATIONS

Soil Sample Number[2]	Date Sampled	General Location Sample	Depth of Sample (feet)	Field Screening Results[3]		Diesel- and Oil-range Hydrocarbons (Ecology Method WTPH-D Extended) (mg/kg)	
				Headspace Vapor (ppm)	Sheen	Diesel	Oil
94	10/19/95	South of garage	1.0	<100	SS	<25	<50
95	10/19/95	Southwest of garage	1.0	<100	SS	<25	<50
96	10/19/95	Current waste oil AST	1.0	<100	SS	75	100
97	10/19/95	South of garage	1.0	<100	SS	<25	<50
98	10/19/95	South of garage	1.0	<100	SS	<25	<50
99	10/19/95	East of garage	1.0	<100	SS	<25	<50
100	10/19/95	North of current loading rack	1.0	<100	SS	<25	<50
101	10/19/95	North of current loading rack	1.0	<100	SS	44	69
102	10/19/95	South of garage	1.0	<100	SS	<25	<50
103	10/19/95	Southeast of garage	1.0	<100	SS	<25	<50
104	10/19/95	Southeast of office	1.0	<100	SS	<25	<50
105	10/19/95	Southeast of office	1.0	<100	SS	<25	<50
106	10/19/95	East of office	1.0	<100	SS	<25	<50
107	10/19/95	Northwest of warehouse	1.0	<100	SS	<25	<50
MTCA Method A Cleanup Standards						200	200

Notes:
[1]Laboratory analyses were performed by North Creek Analytical of Portland, Oregon. See Appendix B for the laboratory reports.
[2]Approximate sample locations are shown in Figures 3 and 4.
[3]Field screening methods are described in Appendix A. SS = slight sheen
ppm = parts per million
mg/kg = milligrams per kilogram

TABLE 5 (Page 1 of 2)
SUMMARY OF FIELD SCREENING AND SOIL CHEMICAL ANALYTICAL DATA[1]
STOCKPILES AND RELATED SURFACE SAMPLES

Soil Sample Number	Date Sampled	General Location Sample	Field Screening Results[2]		Hydrocarbon Identification (Ecology Method WTPH-HCID[3]) (mg/kg)			Gasoline-range Hydrocarbons (Ecology Method WTPH-G) (mg/kg)	Diesel- and Oil-range Hydrocarbons (Ecology Method WTPH-D Extended (mg/kg)		BETX[3] (EPA Method 8020) (mg/kg)				Volatile and Semi-volatile Organic Compounds[4] (EPA Methods 8240 and 8270) (mg/kg)	TCLP Metals[5] (EPA Methods 1311, 6010 and 7470) (mg/l)
			Headspace Vapor (ppm)	Sheen	Gasoline	Diesel	Oil		Diesel	Oil	B	E	T	X		
SP-1[6]	09/18/95	Contaminated soil stockpile	<100	HS	Detected[7]	Detected	<100	--	1,600	--	--	--	--	--	--	--
SP-2[6]	09/18/95	Contaminated soil stockpile	<100	MS	Detected[7]	Detected	<100	--	1,100	--	--	--	--	--	--	--
SP-4[6,8]	09/19/95	Contaminated soil stockpile	<100	MS	--	--	--	10	3,300	7,400	<0.013	<0.013	0.016	0.024	Methylene chloride[9] - 0.077	Barium - 0.68
SP-5[6,8]	09/19/95	Contaminated soil stockpile	<100	MS	--	--	--	7.6	2,600	7,300	<0.013	<0.013	<0.013	<0.013	Methylene chloride[9] - 0.086	Barium - 0.57
SP-6	09/25/95	Noncontaminated soil stockpile	<100	SS	--	--	--	--	130	130	--	--	--	--	--	--
SP-7[6]	09/25/95	Noncontaminated soil stockpile	<100	SS	--	--	--	--	140[11]	300	--	--	--	--	--	--
SP-8[6]	09/25/95	Noncontaminated soil stockpile	<100	SS	--	--	--	--	210	130	--	--	--	--	--	--
111	10/19/95	Gravel beneath contaminated soil stockpile A	<100	SS	--	--	--	--	630	220	--	--	--	--	--	--
P-1[10]	11/14/95	Beneath contaminated soil stockpile B	--	--	<23	<57	<110	--	--	--	--	--	--	--	--	--
P-2[10]	11/14/95	Beneath contaminated soil stockpile B	--	--	<23	<57	<110	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Standards								100	200	200	0.5	20	40	20	0.5	NE

Notes appear on page 2 of 2.

TABLE 5 (Page 2 of 2)

Soil Sample Number	Date Sampled	General Location Sample	Field Screening Results[2]		Hydrocarbon Identification (Ecology Method WTPH-HCID[3]) (mg/kg)			Gasoline-range Hydrocarbons (Ecology Method WTPH-G) (mg/kg)	Diesel- and Oil-range Hydrocarbons (Ecology Method WTPH-D Extended (mg/kg)		BETX[3] (EPA Method 8020) (mg/kg)				Volatile and Semi-volatile Organic Compounds[4] (EPA Methods 8240 and 8270) (mg/kg)	TCLP Metals[5] (EPA Methods 1311, 6010 and 7470) (mg/l)
			Headspace Vapor (ppm)	Sheen	Gasoline	Diesel	Oil		Diesel	Oil	B	E	T	X		
P-3[10]	11/14/95	Beneath contaminated soil stockpile A	--	--	<22	<56	<110	--	--	--	--	--	--	--	--	--
P-4[10]	11/14/95	Beneath contaminated soil stockpile A	--	--	<22	<56	<110	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Standards								100	200	200	0.5	20	40	20	0.5	NE

Notes:

[1]Laboratory analyses were performed by North Creek Analytical of Portland, Oregon. See Appendix B for the laboratory reports.

[2]Field screening methods are described in Appendix A. SS = slight sheen, MS = moderate sheen, HS = heavy sheen

[3]B = benzene, E = ethylbenzene, T = toluene, X = xylenes

[4]Only detected analytes are shown. A list of analytes and detection limits are presented in the laboratory reports in Appendix B.

[5]TCLP = toxicity characteristic leaching procedure. Analytes include arsenic, barium, cadmium chromium, lead, mercury, selenium and silver. Only those analytes detected are shown. Detection limits are included in the laboratory reports in Appendix B.

[6]The soil represented by this sample was transported off site for disposal.

[7]The laboratory report indicates that the hydrocarbons detected in this range appear to be due to overlap from the diesel range.

[8]This sample was analyzed for PCBs (polychlorinated biphenyls) by EPA Method 8080. PCBs were not detected. Detection limits are presented in the laboratory reports in Appendix B.

[9]The laboratory report indicates that the detection of methylene chloride may be a result of laboratory contamination.

[10]Samples were obtained by PEMCO.

[11]The laboratory report indicates that the hydrocarbons detected in this range appear to be due to overlap from the oil range.

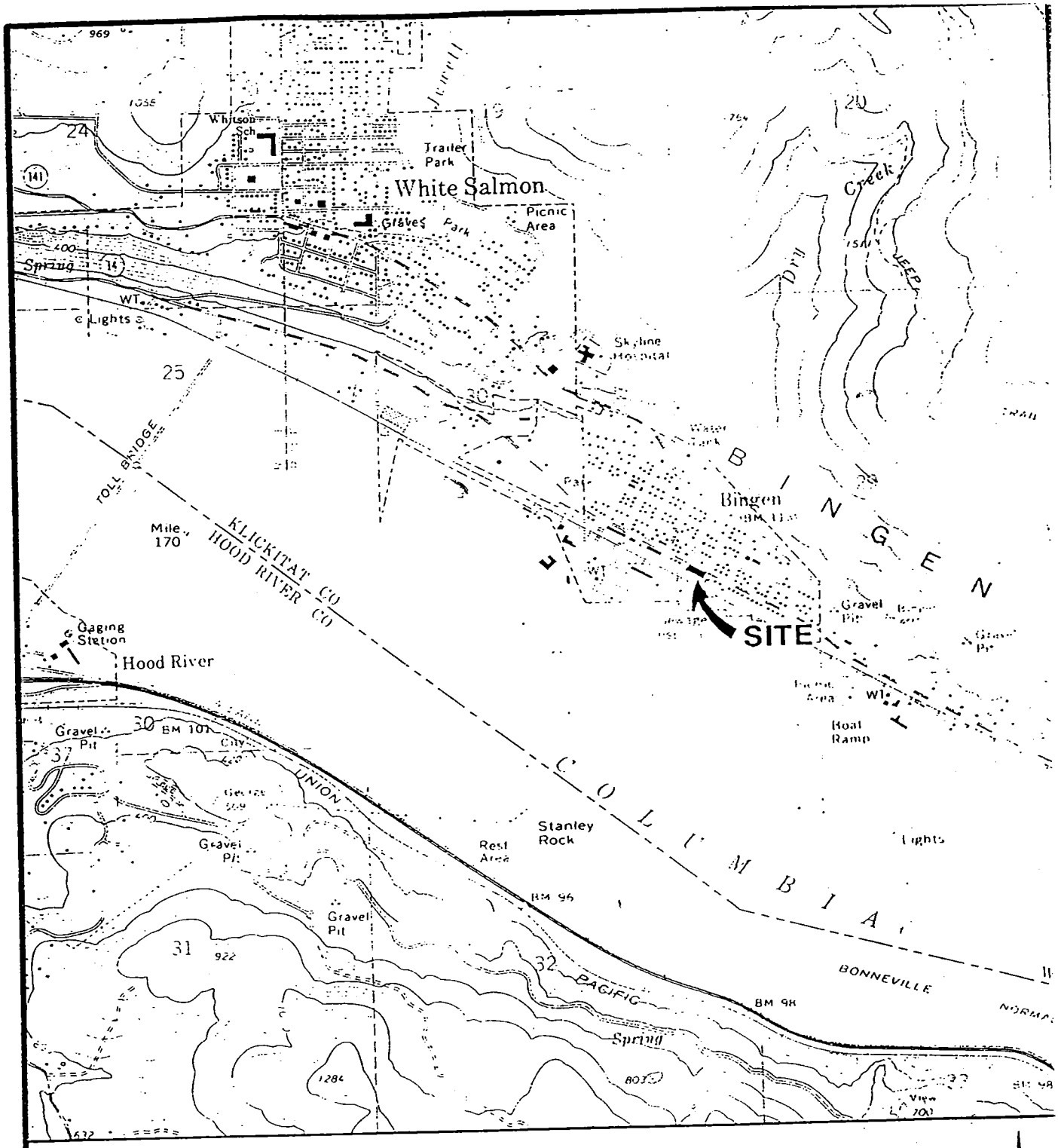
ppm = parts per million

mg/kg = milligrams per kilogram

mg/l = milligrams per liter

"--" = not analyzed

NE = not established



REFERENCE: USGS 7.5' TOPOGRAPHIC MAP, "WHITE SALMON, WA".

0 2000 4000

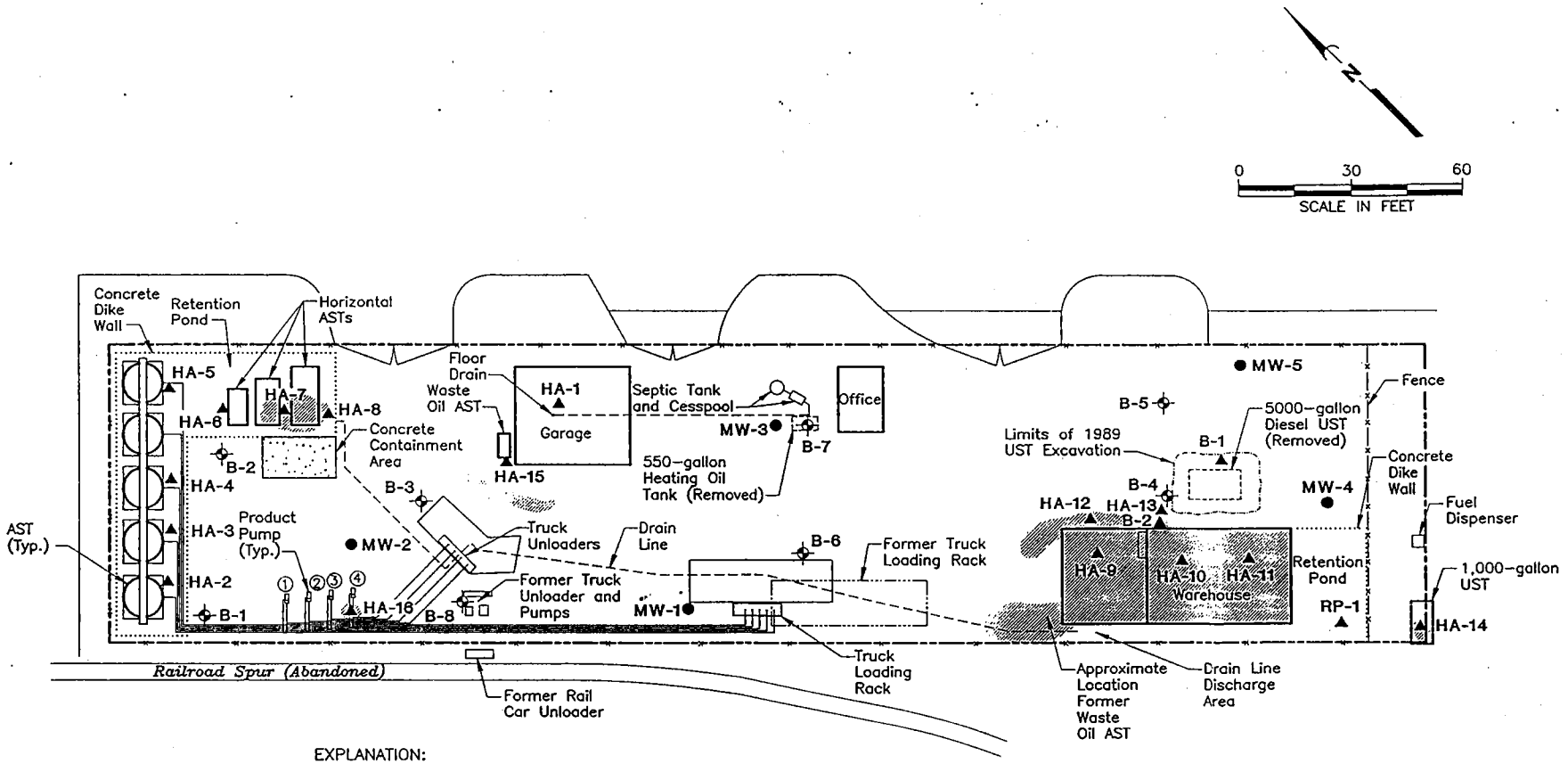
SCALE IN FEET

N

Geo Engineers

VICINITY MAP

FIGURE 1



EXPLANATION:

MW-1●	MONITORING WELL
B-1 ⊕	BORING LOCATION
B-1 ▲	HAND-AUGER BORING
UST	UNDERGROUND STORAGE TANK
AST	ABOVEGROUND STORAGE TANK
	AREAS OF PETROLEUM HYDROCARBON-LIKE STAINING

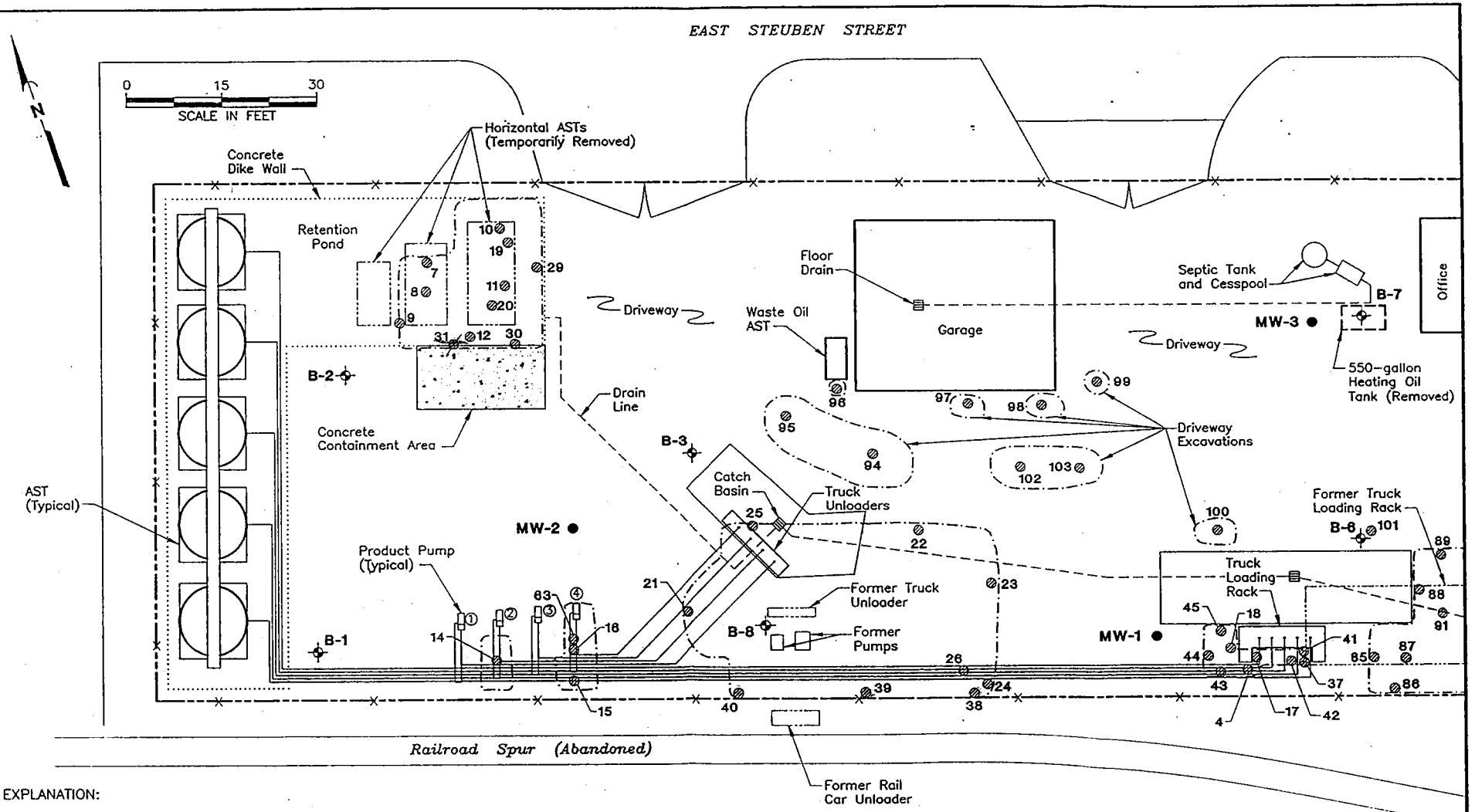
Note: The locations of all features shown are approximate.

Reference: Undated drawing entitled, "General Arrangement Marketing Station, Bingen, Washington," by Unocal.

Geo Engineers

SITE PLAN

FIGURE 2



EXPLANATION:

MW-2 ●	MONITORING WELL	AST	ABOVEGROUND STORAGE TANK
B-1 ⊕	BORING		APPROXIMATE LIMITS OF REMEDIAL EXCAVATION
14 ⊘	SOIL SAMPLE		
UST	UNDERGROUND STORAGE TANK		

Note: The locations of all features shown are approximate.

Reference: Undated drawing entitled, "General Arrangement Marketing Station, Bingen, Washington," by Unocal.

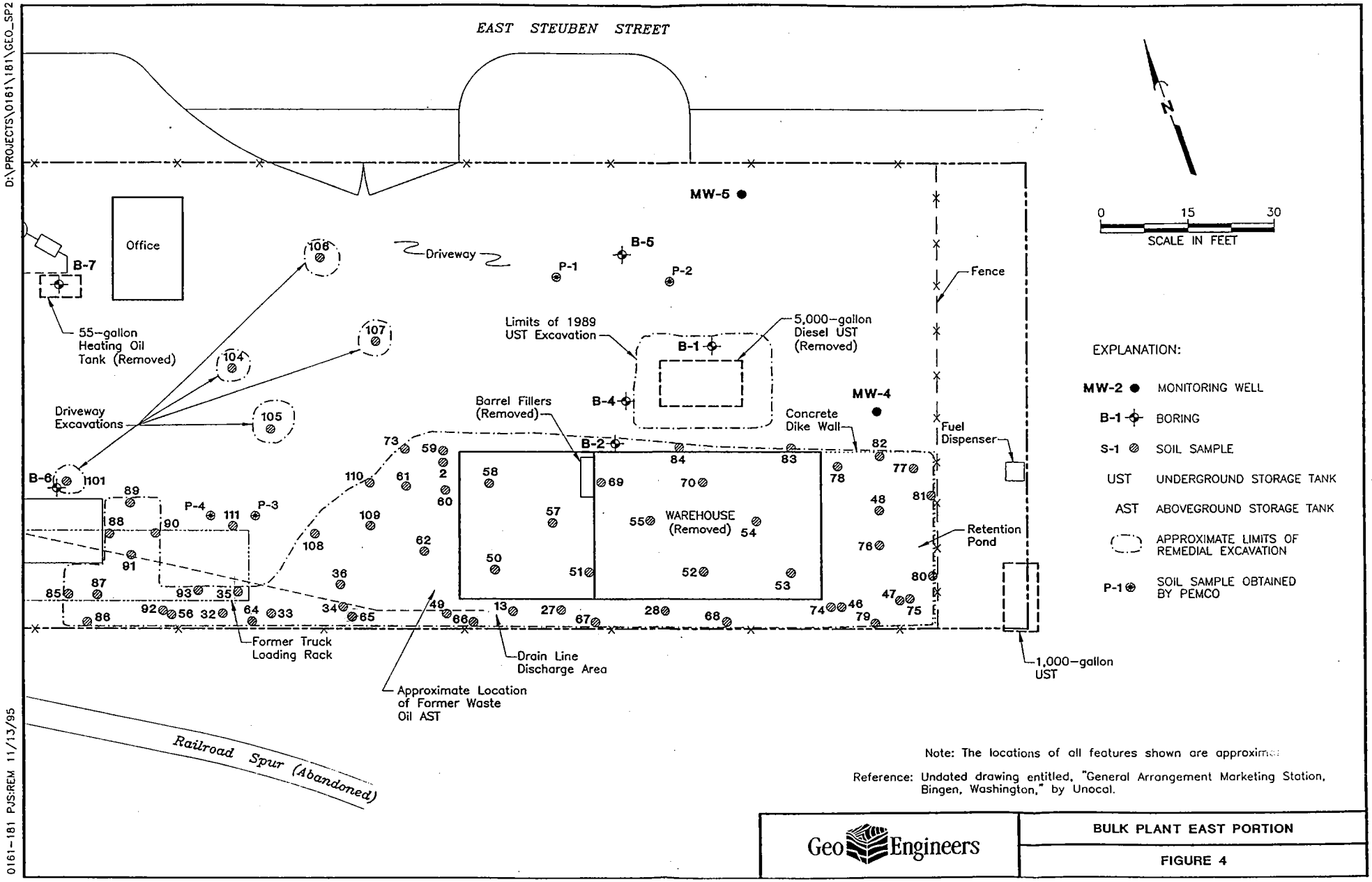
Geo Engineers

BULK PLANT WEST PORTION

FIGURE 3

D:\PROJECTS\0161\181\GEO_SP1

0161-181 PJS:REM 11/13/95


D:\PROJECTS\0161\181\GEO_SP2
EAST STEUBEN STREET
MW-5
Office
B-7
55-gallon Heating Oil Tank (Removed)
106
Driveway
B-5
P-1
P-2
Fence
Limits of 1989 UST Excavation
5,000-gallon Diesel UST (Removed)
B-1
107
104
Driveway Excavations
105
B-4
Barrel Fillers (Removed)
MW-4
Concrete Dike Wall
Fuel Dispenser
B-2
B-6
101
WAREHOUSE (Removed)
Retention Pond
P-4
P-3
111
1,000-gallon UST
Former Truck Loading Rack
Drain Line Discharge Area
Approximate Location of Former Waste Oil AST
Railroad Spur (Abandoned)
0161-181 PJS:REM 11/13/95
N
0
15
30
SCALE IN FEET
EXPLANATION:
MW-2 MONITORING WELL
B-1 BORING
S-1 SOIL SAMPLE
UST UNDERGROUND STORAGE TANK
AST ABOVEGROUND STORAGE TANK
APPROXIMATE LIMITS OF REMEDIAL EXCAVATION
P-1 SOIL SAMPLE OBTAINED BY PEMCO
Note: The locations of all features shown are approximate
Reference: Undated drawing entitled, "General Arrangement Marketing Station, Bingen, Washington," by Unocal.
GeoEngineers
BULK PLANT EAST PORTION
FIGURE 4

APPENDIX A

FIELD PROCEDURES

REMEDIAL EXCAVATIONS AND SHALLOW EXPLORATIONS

PEMCO of Portland, Oregon began remedial excavation activities at the site of Unocal Bulk Plant 0046 in September 1995 using a track-mounted excavator. A GeoEngineers representative obtained soil samples directly from the limits of the remedial excavation, from soil in the excavator bucket and from soil stockpiles for field screening and chemical analysis. In addition, several shallow hand explorations were excavated by GeoEngineers' field staff using a shovel. Our field staff obtained samples of soil that did not come into contact with the shovel during exploration activities. Soil samples were transferred to glass jars supplied by the laboratory. The jars were sealed with Teflon-lined lids. Our field staff wore latex gloves when obtaining soil samples and transferring the soil to laboratory containers.

FIELD SCREENING OF SOIL SAMPLES

A GeoEngineers representative performed field screening tests on the soil samples obtained from the biotreatment mounds, test pits and remedial excavations. Field screening results are used as a general guideline to delineate areas of possible petroleum-related contamination. In addition, screening results are used to aid in the selection of soil samples for chemical analysis. The screening methods used include (1) visual screening, (2) water sheen screening and (3) headspace vapor screening using a Bacharach TLV Sniffer.

Visual screening consists of observing the soil for stains indicative of petroleum-related contamination. Visual screening is generally more effective when contamination is related to heavy petroleum hydrocarbons, such as motor oil, or when hydrocarbon concentrations are high. Water sheen screening and headspace vapor screening are more sensitive methods that have been effective in detecting contamination at concentrations less than the regulatory cleanup guidelines.

Water sheen screening involves placing soil in water and observing the water surface for signs of sheen. Sheen classifications are as follows:

No Sheen (NS)	No visible sheen on the water surface.
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly.
Moderate Sheen (MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface.
Heavy Sheen (HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen.

Headspace vapor screening involves placing a soil sample in a plastic sample bag. Air is captured in the bag, and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a Bacharach TLV Sniffer is inserted in the bag, and the TLV Sniffer measures the

concentration of combustible vapors present within the sample bag headspace. The TLV Sniffer measures combustible vapor concentrations in ppm (parts per million) and is calibrated to hexane. The TLV Sniffer is designed to quantify combustible gas concentrations in the range between 100 ppm and 10,000 ppm.

Field screening results are site- and excavation-specific. The results vary with temperature, moisture content, soil type and type of contaminant.

APPENDIX B

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

Chain-of-custody procedures were followed during the transport of the field samples to the analytical laboratory. The samples were held in cold storage pending extraction and/or analysis. The analytical results, analytical methods reference and laboratory QA/QC (quality assurance/quality control) records are included in this appendix. The analytical results are also summarized in the text and tables of this report.

ANALYTICAL DATA REVIEW

The laboratory maintains an internal quality assurance program, as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike recoveries, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory reports. The laboratory compared each group of samples with the existing data quality goals and noted any exceptions in the laboratory report. The laboratory QA/QC and data quality exceptions documented by the laboratory were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "National Functional Guidelines For Organic Data Review," draft dated 1991, and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses," dated 1988.

ANALYTICAL DATA REVIEW SUMMARY

Several minor data quality exceptions were noted in the laboratory report or during our review. However, it is our opinion that these exceptions do not significantly affect the quality of the data, and, based on the data quality review, the data are acceptable for their intended use.

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GeoEngineers

SEP 2 9 1995

Routing

File

September 28, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

RE: JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Sep. 18, 1995. For your reference, these analyses have been assigned our NCA # P509231.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-HCID per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509231
Matrix: soil
Sampled: 09/11/95
Received: 09/18/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
4	P509231-4	Gasoline	DET *[1]	20	09/20/95	09/21/95
		Diesel	DET	50		
		Heavy/Oil	DET *[2]	100		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509231
Received: 09/18/1995

Sample Name	Analyte	Result	Control Limits
WTPH-HCID per Washington State DOE			
4	4-Bromofluorobenzene	– *[3]	50-150
	1-Chlorooctadecane	– *[3]	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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COMMENTS

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509231
Received: 09/18/1995

1. Detected hydrocarbons in the gasoline range appear to be due to overlap of diesel range hydrocarbons.

2. Detected hydrocarbons in the heavy/oil range appear to be due to overlap of diesel range hydrocarbons.

3. Unable to calculate surrogate recovery due to high analyte concentration.

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September 28, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P509231.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

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BATCH QUALITY CONTROL RESULTS
WTPH-HCID per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509231
Received: 09/18/95

METHOD BLANK
Batch # FV95015d
Results In mg/kg (ppm)

Compound	Result	MRL
Gasoline	ND	20
Diesel	ND	50
Heavy/Oil	ND	100
Date Prepared	09/20/95	
Date Analyzed	09/20/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene (y)	--	50-150
1-Chlorooctadecane	92	50-150

(y) Not added.

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: 0046
Site Address:
City, State, ZIP: DUNCAN WA
Site Release Number:
Unocal Manager: MR. KIFF ECKERT, P.E.
CERT INFO: (check one) o Evaluation o Remediation
o Detection o Demolition xClosure o Miscellaneous

CONSULTANT INFORMATION

Firm: GEOENGINEERS INC Project Number: 161-181-P62
Address: 9504 SW BRIDGEPORT RD.
PORTLAND, OR 97224
Phone: 624-9274 Fax: 620-5940
Project Manager: PAT SULLIVAN
Sample Collection by: PJS

Chain of Custody Record #:

Quality Assurance Data Level:
[A] [B]
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days:
[10] [5] [3] [2] [1]

o Oregon o Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 1	9/11/95 1:40	S	2																PS09231-1
2. 2	" 1:45	S	2																2
3. 3	" 1:50	S	2																3
4. 4	" 2:00	S	2	X															4
5. 5	" 2:15	S	2																5
6. 6	" 2:30	S	2																6
7.																			
8.																			
9.																			
10.																			

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	CEI	9/18/95	Sarah A. Kipp	GEI	9/18/95 1640
2. Sarah A. Kipp	GEI	9/18/95 1705	Kevin L. Starling	NCA	9-18-95 1705
3.					

Final Report Approval

Were all requested results provided? [yes] [no] Define
Were results within requested turnaround? [yes] [no] "No"
Final Approval Signature: on back

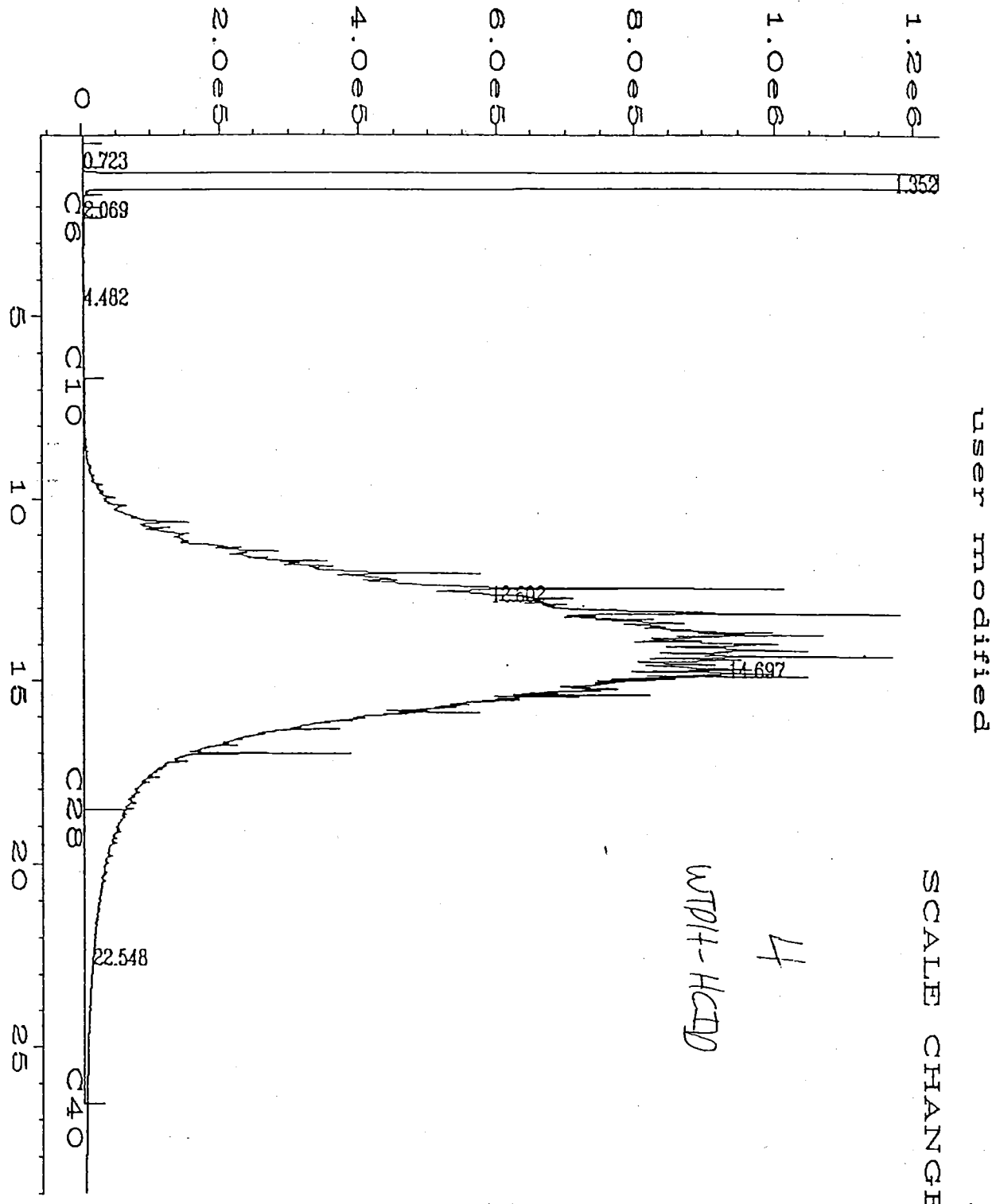
Firm: Date:

Page 1 of 1

Comments: HOLD ALL SAMPLES
Run HCID only. On # 4, run Quant Per PS 9/20 AV

Distribution: White - Laboratory Yellow - Consultant Photocop. ocal

:v. 2.2, 11/94



Data File Name	: D:\HPCHEM\1\DATA\S092095A\038R0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID1	Vial Number	: 38
Sample Name	: 509231-4	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 21 Sep 95 03:09 AM	Instrument Method	: HCID.MTH
Report Created on	: 21 Sep 95 12:17 PM	Analysis Method	: HCIDR.MTH
Last Recalib on	: 20 SEP 95 02:22 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

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September 26, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

GeoEngineers
SEP 29 1995
Routing
File

Attention: Pat Sullivan

RE: JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Sep. 14, 1995. For your reference, these analyses have been assigned our NCA # P509166.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-HCID per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509166
Matrix: soil
Sampled: 09/13/95
Received: 09/14/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
13	P509166-7	Gasoline	DET *1	20	09/14/95	09/14/95
		Diesel	DET	50		
		Heavy/Oil	DET	100		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509166
Matrix: soil
Sampled: 09/13/95
Received: 09/14/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
7	P509166-1	Diesel/Related	ND	25	09/14/95	09/14/95
		Heavy oil/Related	ND	50		
8	P509166-2	Diesel/Related	ND	25	09/14/95	09/15/95
		Heavy oil/Related	ND	50		
9	P509166-3	Diesel/Related	ND	25	09/14/95	09/14/95
		Heavy oil/Related	ND	50		
10	P509166-4	Diesel/Related	1500	25	09/14/95	09/14/95
		Heavy oil/Related	4400	50		
11	P509166-5	Diesel/Related	ND	25	09/14/95	09/14/95
		Heavy oil/Related	ND	50		
12	P509166-6	Diesel/Related	390	25	09/14/95	09/14/95
		Heavy oil/Related	750	50		
13	P509166-7	Diesel/Related	11000	250	09/19/95	09/19/95
		Heavy oil/Related	4800	500		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509166
Received: 09/14/1995

Sample Name	Analyte	Result	Control Limits
WTPH-HCID per Washington State DOE			
13	4-Bromofluorobenzene	123	50-150
	1-Chlorooctadecane	– *2	50-150
WTPH-D Extended per Washington State DOE			
7	1-Chlorooctadecane	95	50-150
8	1-Chlorooctadecane	94	50-150
9	1-Chlorooctadecane	80	50-150
10	1-Chlorooctadecane	– *2	50-150
11	1-Chlorooctadecane	80	50-150
12	1-Chlorooctadecane	89	50-150
13	1-Chlorooctadecane	67	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

COMMENTS

Client:	GeoEngineers, Inc.	NCA Number:	P509166
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	09/14/1995

1. Detected hydrocarbons in the gasoline range appear to be due to overlap of diesel range hydrocarbons.

2. Unable to calculate surrogate recovery due to high analyte concentration.

NORTH CREEK ANALYTICAL

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September 26, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P509166.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

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BATCH QUALITY CONTROL RESULTS
WTPH-HCID per Washington State DOE

Client:	GeoEngineers, Inc.	**NCA Project #:**	P509166
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	09/14/95

METHOD BLANK
Batch # FV95015b
Results In mg/kg (ppm)

Compound	Result	MRL
Gasoline	ND	20
Diesel	ND	50
Heavy/Oil	ND	100
Date Prepared	09/14/95	
Date Analyzed	09/14/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	88	50-150
1-Chlorooctadecane	99	50-150

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509166
Received: 09/14/95

METHOD BLANK
Batch # FX95024a
Results in mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	09/14/95	
Date Analyzed	09/14/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	92	50-150

METHOD BLANK
Batch # FX95024c
Results in mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	09/19/95	
Date Analyzed	09/19/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	83	50-150

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509166
Received: 09/14/95

DUPLICATE
Batch # FX95024a
Results In mg/kg (ppm)

Duplicate ID P509166-1

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

DUPLICATE
Batch # FX95024b
Results In mg/kg (ppm)

Duplicate ID P509233-6

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

LABORATORY CONTROL SAMPLE
Batch # FX95024a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	160	133	50-150

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number:
Site Address:
City, State, ZIP: Bingen Washington
Site Release Number:
Unocal Manager: Kipp Eckert
CERT INFO: (check one) o Evaluation X Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers Project Number: 0161-181-P62
Address: 7504 SW Bridgeport Road Portland OR 97224
Phone: (503) 624-9274 Fax: (503) 624-9274
Project Manager: Pat Sullivan
Sample Collection by: Sarah Kingery

Chain of Custody Record #:

Quality Assurance Data Level: A B
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | X | 1

14.3°

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	Washington Hydrocarbon Methods: TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 7	9-13-95 1040	S	1						X										P5091606-1
2. 8	9-13-95 1040	S	1						X										2
3. 9	9-13-95 1040	S	1						X										3
4. 10	9-13-95 1330	S	1						X										4
5. 11	9-13-95 1320	S	1						X										5
6. 12	9-13-95 1330	S	1						X										6
7. ~~13~~ 13	9-13-95 1345	S	1	X					(X)										7
8.																			
9.																			
10.																			

	Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1.	Sarah A. Kingery	GeoEngineers	9/13/95 1400	Sara McClurg	NCA	1230 9-14-95
2.						
3.						

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back

Firm: Date:

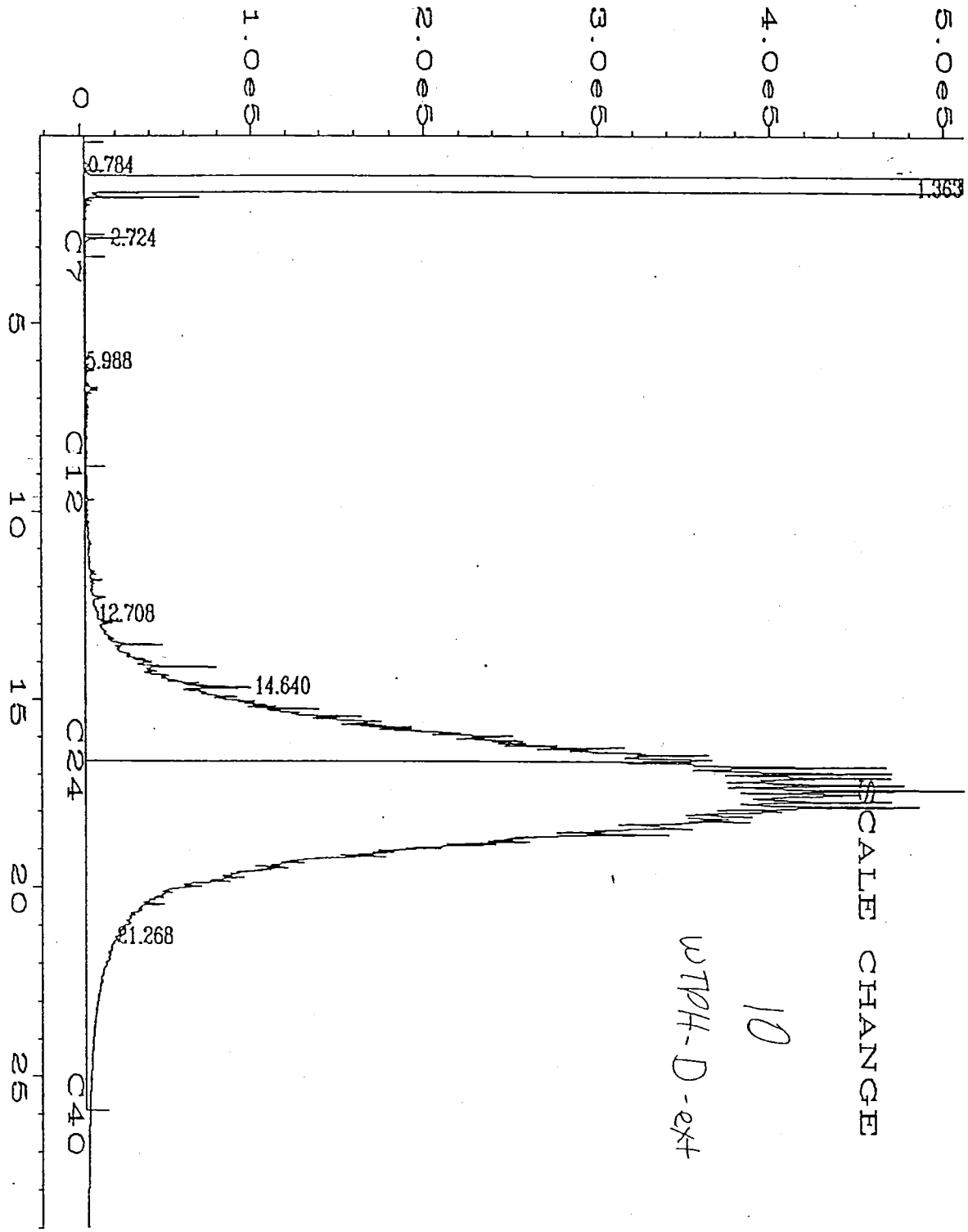
Page 1 of 1

Comments: FAX COPY OF C.O.C. to Pat Sullivan.

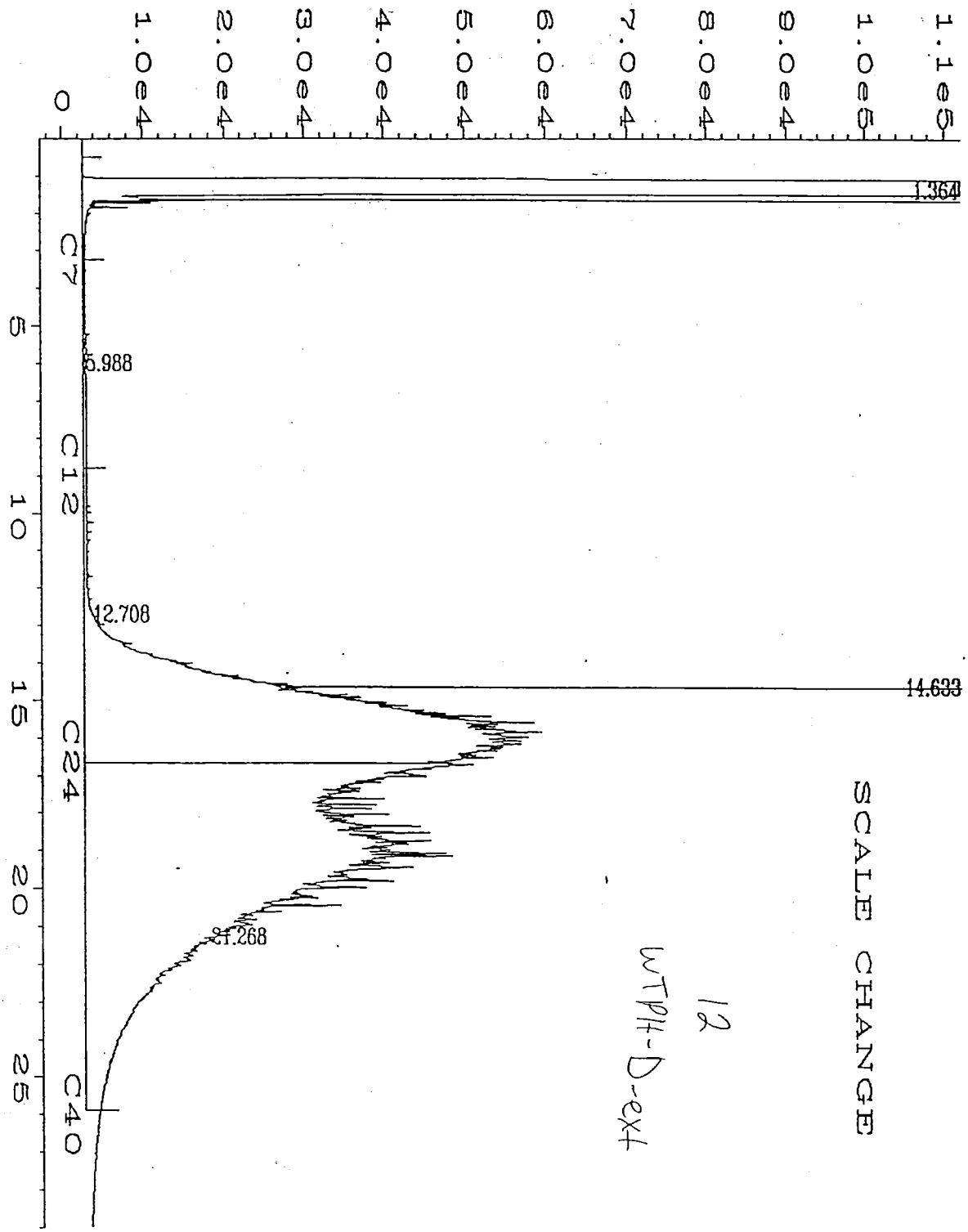
Distribution: White - Laboratory Yellow - Consultant Photocopy cal

v. 2.2, 11/94

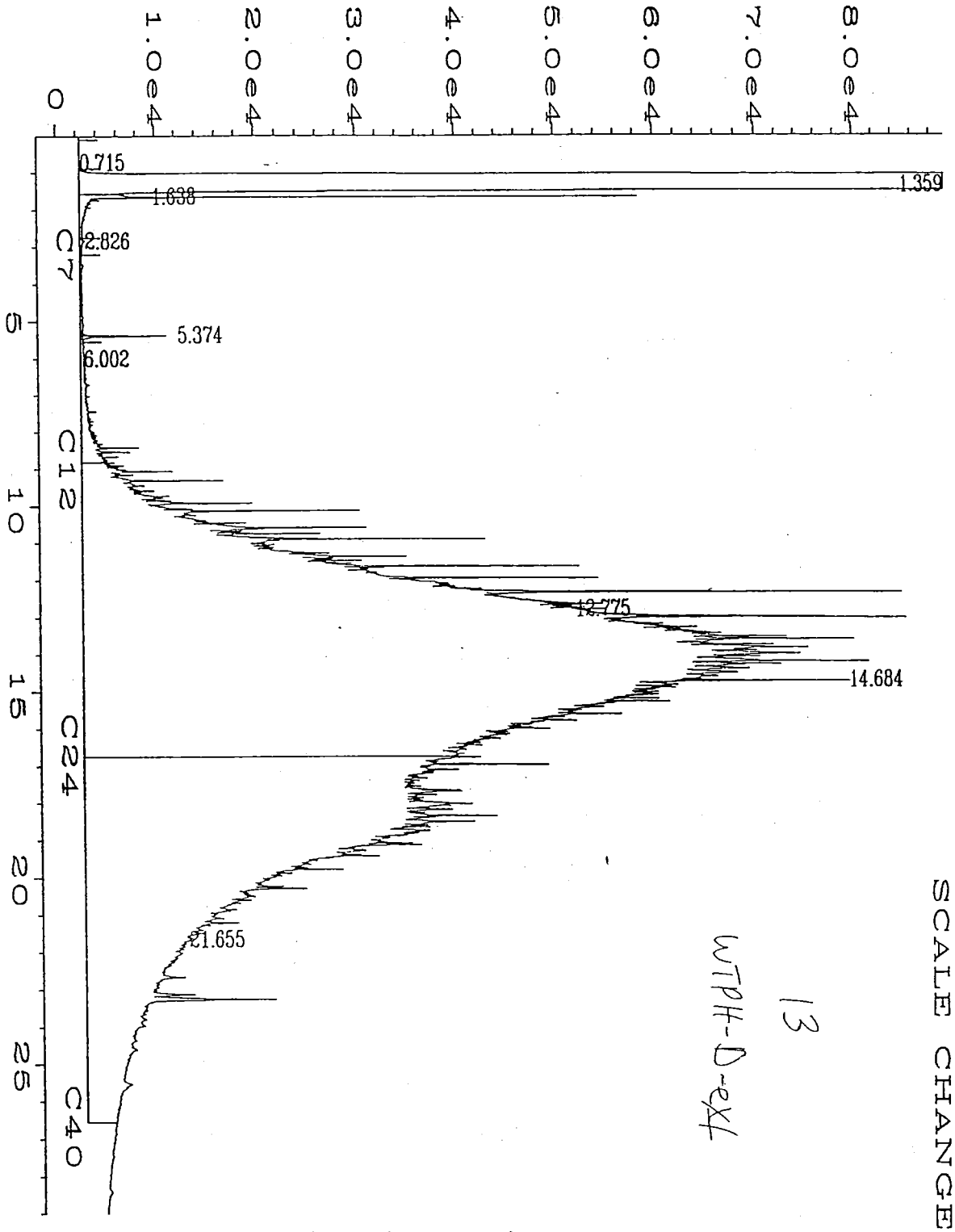
20



Data File Name	: D:\HPCH\1\DATA\S091495\005F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 5
Sample Name	: 509166-4	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 14 Sep 95 09:00 PM	Instrument Method:	TPHD.MTH
Report Created on:	15 Sep 95 10:58 AM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: D:\HPCH\1\DATA\S091495\007F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 7
Sample Name	: 509166-6	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 14 Sep 95 10:26 PM	Instrument Method	: TPHD.MTH
Report Created on	: 15 Sep 95 11:00 AM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: D:\HPCHEM\1\DATA\S091495\030R0201.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID1	Vial Number	: 30
Sample Name	: 509166-7	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 2
Acquired on	: 14 Sep 95 07:23 PM	Instrument Method	: HCID.MTH
Report Created on	: 15 Sep 95 10:58 AM	Analysis Method	: HCIDR.MTH
Last Recalib on	: 14 SEP 95 06:38 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

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September 26, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

GeoEngineers
SEP 29 1995
Routing
File

Attention: Pat Sullivan

RE: JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Sep. 18, 1995. For your reference, these analyses have been assigned our NCA # P509233.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-HCID per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509233
Matrix: soil
Sampled: 09/18/95
Received: 09/18/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
SP-1	P509233-7	Gasoline	DET *[1]	20	09/19/95	09/19/95
		Diesel	DET	50		
		Heavy/Oil	ND	100		
SP-2	P509233-8	Gasoline	DET *[1]	20	09/19/95	09/19/95
		Diesel	DET	50		
		Heavy/Oil	ND	100		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-G per Washington State DOE (C7-C12)
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509233
Matrix: soil
Sampled: 09/18/95
Received: 09/18/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
14	P509233-1	Gasoline/Related	ND	2.0	09/18/95	09/19/85
15	P509233-2	Gasoline/Related	ND	2.0	09/18/95	09/19/85
16	P509233-3	Gasoline/Related	ND	2.0	09/18/95	09/19/85

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D per Washington State DOE (C12-C24)
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509233
Matrix: soil
Sampled: 09/18/95
Received: 09/18/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
21	P509233-6	Diesel/Related	ND	25	09/18/95	09/19/95
SP-1	P509233-7	Diesel/Related	1600	25	09/20/95	09/20/95
SP-2	P509233-8	Diesel/Related	1100	25	09/20/95	09/20/95

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D Extended per Washington State DOE
Results in mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509233
Matrix: soil
Sampled: 09/18/95
Received: 09/18/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
14	P509233-1	Diesel/Related	130	25	09/18/95	09/18/95
		Heavy oil/Related	ND	50		
15	P509233-2	Diesel/Related	ND	25	09/18/95	09/18/95
		Heavy oil/Related	ND	50		
16	P509233-3	Diesel/Related	620	250	09/18/95	09/19/95
		Heavy oil/Related	920	500		
19	P509233-4	Diesel/Related	ND	25	09/18/95	09/19/95
		Heavy oil/Related	ND	50		
20	P509233-5	Diesel/Related	ND	25	09/18/95	09/19/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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BTEX per EPA 8020
Results In ug/kg (ppb)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509233
Matrix: soil
Sampled: 09/18/95
Received: 09/18/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
14	P509233-1	Benzene	ND	13	09/18/95	09/19/85
		Toluene	ND	13		
		Ethylbenzene	ND	13		
		Xylenes (total)	ND	13		
15	P509233-2	Benzene	ND	13	09/18/95	09/19/85
		Toluene	17	13		
		Ethylbenzene	ND	13		
		Xylenes (total)	ND	13		
16	P509233-3	Benzene	ND	13	09/18/95	09/19/85
		Toluene	ND	13		
		Ethylbenzene	ND	13		
		Xylenes (total)	ND	13		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509233
Received: 09/18/1995

Sample Name	Analyte	Result	Control Limits
WTPH-HCID per Washington State DOE			
SP-1	4-Bromofluorobenzene	– *2	50-150
	1-Chlorooctadecane	– *2	50-150
SP-2	4-Bromofluorobenzene	– *2	50-150
	1-Chlorooctadecane	139	50-150
WTPH-G per Washington State DOE (C7-C12)			
14	4-Bromofluorobenzene	84	50-150
	Trifluorotoluene	101	50-150
15	4-Bromofluorobenzene	102	50-150
	Trifluorotoluene	80	50-150
16	4-Bromofluorobenzene	97	50-150
	Trifluorotoluene	85	50-150
WTPH-D per Washington State DOE (C12-C24)			
21	1-Chlorooctadecane	89	50-150
SP-1	1-Chlorooctadecane	77	50-150
SP-2	1-Chlorooctadecane	80	50-150
WTPH-D Extended per Washington State DOE			
14	1-Chlorooctadecane	96	50-150
15	1-Chlorooctadecane	85	50-150
16	1-Chlorooctadecane	68	50-150
19	1-Chlorooctadecane	85	50-150
20	1-Chlorooctadecane	89	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509233
Received: 09/18/1995

Sample Name	Analyte	Result	Control Limits
BTEX per EPA 8020			
14	4-Bromofluorobenzene	98	63-126
15	4-Bromofluorobenzene	104	63-126
16	4-Bromofluorobenzene	101	63-126

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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COMMENTS

Client:	GeoEngineers, Inc.	NCA Number:	P509233
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	09/18/1995

1. Detected hydrocarbons in the gasoline range appear to be due to overlap of diesel range hydrocarbons.

2. Unable to calculate surrogate recovery due to high analyte concentration.

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September 26, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P509233.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{(\text{Measured Concentration})}{(\text{Actual Concentration})} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{(\text{Result of Test 1} - \text{Result of Test 2})}{(\text{Result of Test 1} + \text{Result of Test 2})/2} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

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BATCH QUALITY CONTROL RESULTS
WTPH-HCID per Washington State DOE

Client: GeoEngineers, Inc. **NCA Project #:** P509233
Project: UNOCAL #0046, BINGEN, WA **Received:** 09/18/95

METHOD BLANK
Batch # FV95015c
Results in mg/kg (ppm)

Compound	Result	MRL
Gasoline	ND	20
Diesel	ND	50
Heavy/Oil	ND	100
Date Prepared	09/19/95	
Date Analyzed	09/19/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	154 (y)	50-150
1-Chlorooctadecane	87	50-150

(y) Surrogate recovery is out of control limits.

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BATCH QUALITY CONTROL RESULTS
WTPH-G per Washington State DOE (C7-C12)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509233
Received: 09/18/95

METHOD BLANK
Batch # BT95064d
Results In mg/kg (ppm)

Compound	Result	MRL
Gasoline/Related	ND	2.0
Date Prepared	09/18/95	
Date Analyzed	09/18/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	88	50-150
Trifluorotoluene	84	50-150

DUPLICATE
Batch # BT95064c
Duplicate ID P509138-5
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Gasoline	ND	ND	0	50

LABORATORY CONTROL SAMPLE
Batch # BT95064a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Gasoline	31	29	94	50-150

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BATCH QUALITY CONTROL RESULTS
WTPH-D per Washington State DOE (C12-C24)

Client:	GeoEngineers, Inc.	NCA Project #:	P509233
Project:	UNOCAL #0046, BINGEN, WA	Received:	09/18/95

METHOD BLANK
Batch # FX95025a
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Date Prepared	09/20/95	
Date Analyzed	09/20/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	83	50-150

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BATCH QUALITY CONTROL RESULTS
WTPH-D per Washington State DOE (C12-C24)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509233
Received: 09/18/95

DUPLICATE
Batch # FX95025a
Results In mg/kg (ppm)

Duplicate ID P509233A-7

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/related	1,400	1,800	25	50

LABORATORY CONTROL SAMPLE
Batch # FX95025a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/related	120	110	92	50-150

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509233
Received: 09/18/95

METHOD BLANK
Batch # FX95024b
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	09/18/95	
Date Analyzed	09/18/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	86	50-150

DUPLICATE
Batch # FX95024b
Duplicate ID P509233-6
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

LABORATORY CONTROL SAMPLE
Batch # FX95024a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/related	120	160	133	50-150

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BATCH QUALITY CONTROL RESULTS
BTEX per EPA 8020

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509233
Received: 09/18/95

METHOD BLANK
Batch # BS95029b
Results In ug/kg (ppb)

Compound	Result	MRL
Benzene	ND	13
Toluene	ND	13
Ethylbenzene	ND	13
Xylenes (total)	ND	13
Date Prepared	09/13/95	
Date Analyzed	09/13/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	94	63-126

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE
Batch # BS95029a **Spike ID P509012-1**
Results In ug/kg (ppb)

Compound	Spike Added	Sample Conc	MS Conc	MS %Rec
Benzene	20	ND	16.2	81
Chlorobenzene	20	ND	16.0	80
Ethylbenzene	20	ND	16.6	83
Toluene	20	ND	16.2	81
o-Xylene	20	ND	16.6	83

Compound	Spike Added	MSD Conc	MSD % Rec	RPD	QC Limit RPD	QC Limit % Rec
Benzene	20	17.8	89	9.4	17	56-123
Chlorobenzene	20	18.0	90	12	16	53-124
Ethylbenzene	20	18.4	92	11	20	45-130
Toluene	20	17.9	90	11	24	54-123
o-Xylene	20	18.4	92	11	20	50-127

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BATCH QUALITY CONTROL RESULTS
BTEX per EPA 8020

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509233
Received: 09/18/95

LABORATORY CONTROL SAMPLE
Batch # BS95029b
Results In ug/kg (ppb)

Compound	True	Found	% Rec	QC Limit % Rec
Benzene	20	18.6	93	69-138
Chlorobenzene	20	19.0	95	72-137
Ethylbenzene	20	19.6	98	61-141
Toluene	20	18.9	95	53-151
o-Xylene	20	19.7	99	62-144

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: #0046
Site Address:
City, State, ZIP: UNOCAL BINGEN
Site Release Number:
Unocal Manager:
CERT INFO: (check one) o Evaluation (X) Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers Project Number: 0161-181-PL02
Address:
Phone: (503) 624-9274 Fax:
Project Manager: Pat Sullivan
Sample Collection by: Sarah Kingery

Chain of Custody Record #:

Quality Assurance Data Level: (A) (B)
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | 2 | (X)

~~o Oregon~~ (X) Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 14	9-18-95 1030	S	1				X		X										PS09233-1
2. 15	9-18-95 1030	S	1				X		X										2
3. 16	9-18-95 1030	S	1				X		X										21.6 3
4. 19	9-18-95 1130	S	1						X										4
5. 20	9-18-95 1130	S	1						X										5
6. 21	9-18-95 1405	S	1					X											6
7. SP-1	9-18-95 1400	S	2	X				X											7
8. SP-2	9-18-95 1400	S	2	X				X											8
9. SP-3	9-18-95 1400	S	2																Hold 9
10.																			

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. Sarah A. Kingery	GEI	9/18/95 1705	Kari Stuby	NCA	9-18-95 1705
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back
Firm: Date

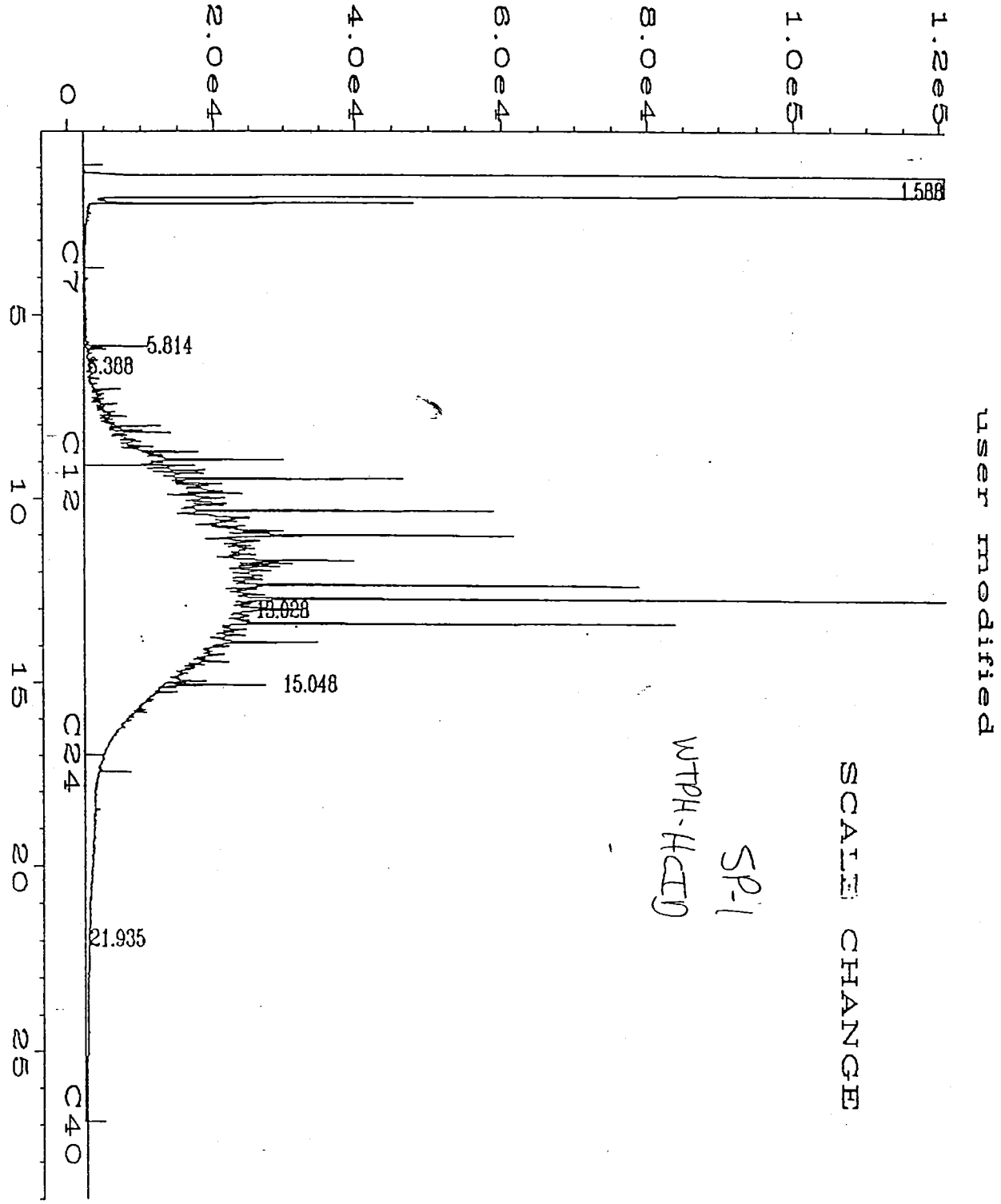
Page 1 of 1

Comments:

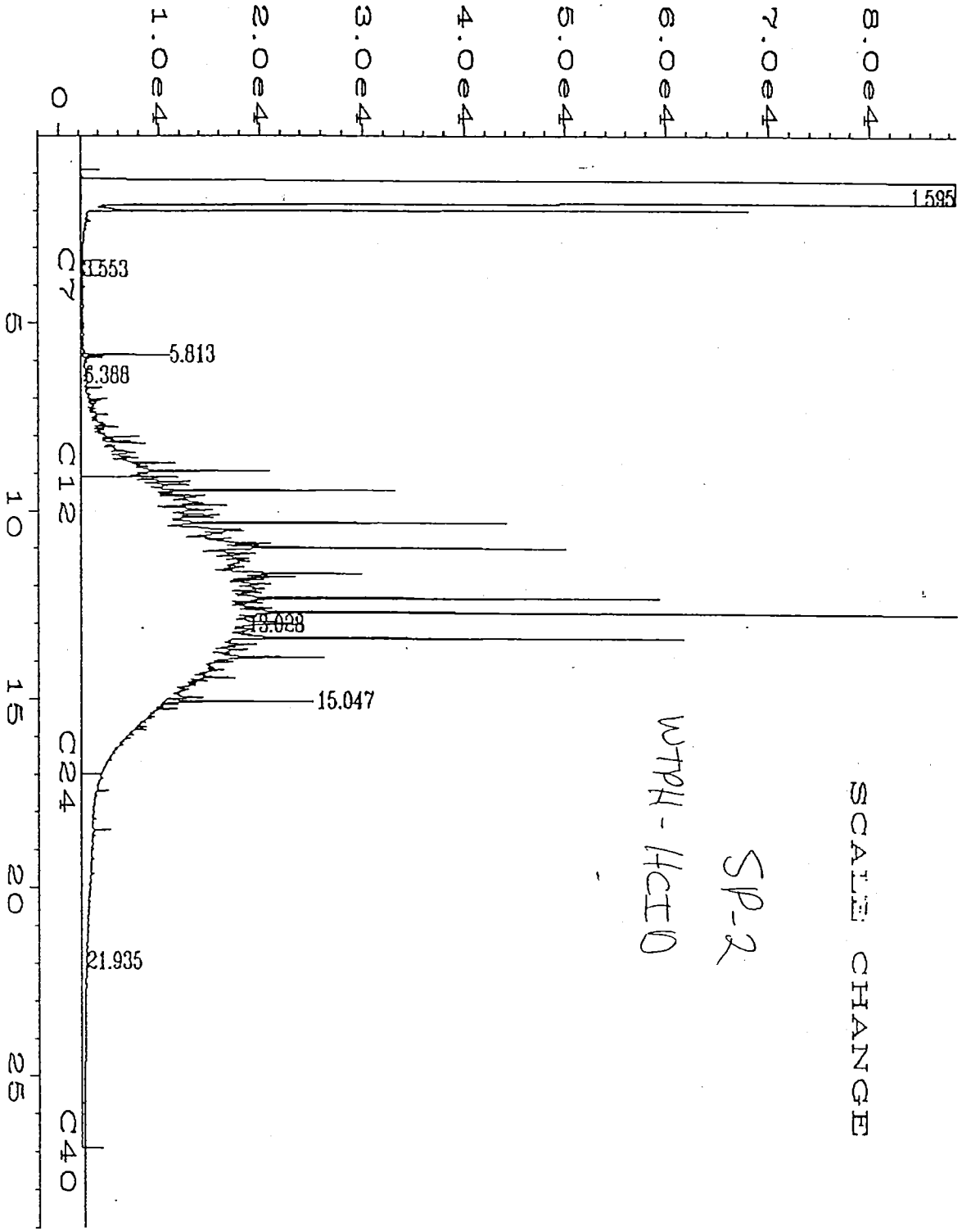
v. 2.2, 11/94

Distribution: White - Laboratory Yellow - Consultant Photocopy ocal

42

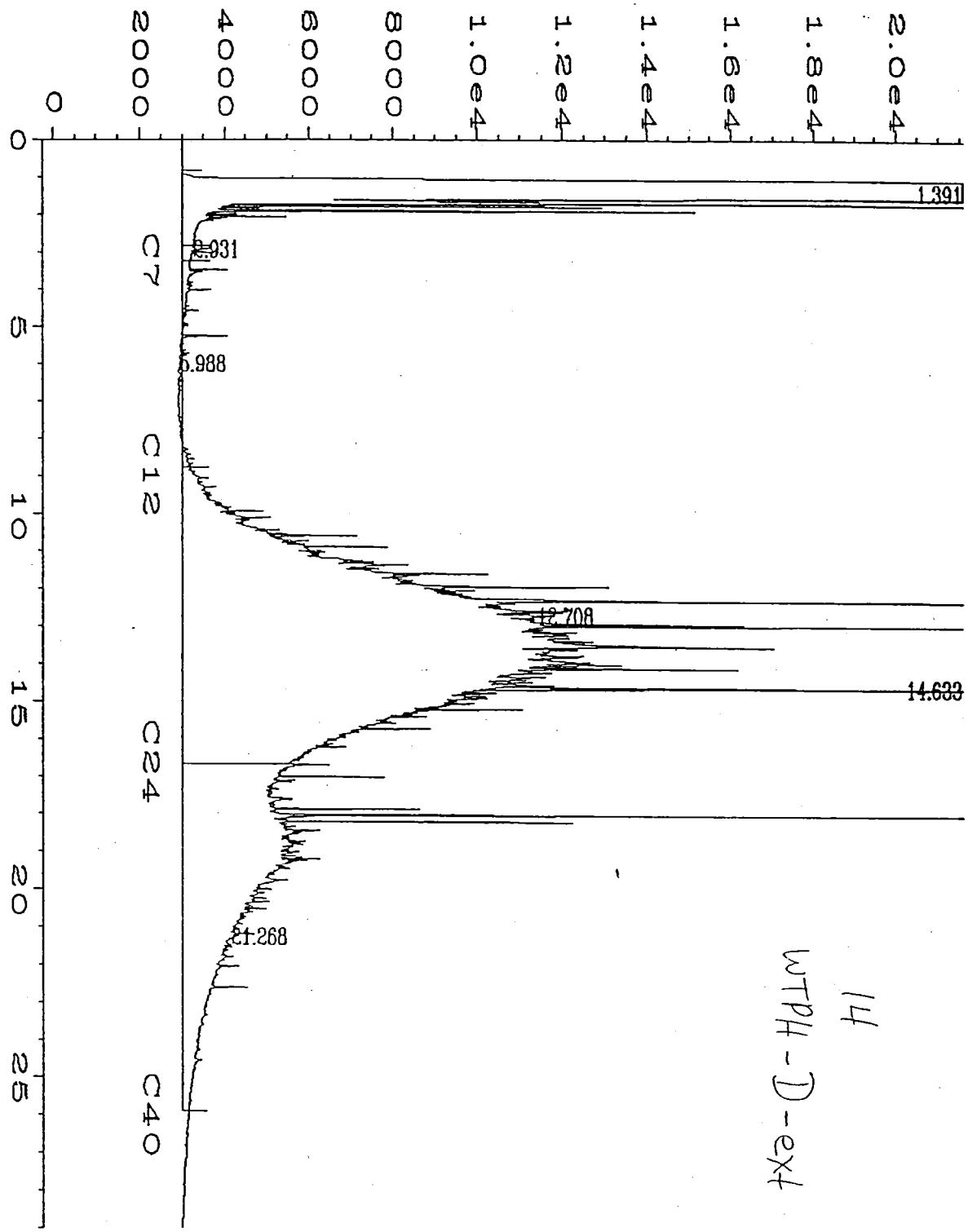


Data File Name	: D:\HPCH\1\DATA\S091995\029R0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 29
Sample Name	: 509233-7	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 Sep 95 02:56 PM	Instrument Method	: HCID.MTH
Report Created on	: 20 Sep 95 11:35 AM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name : D:\HPCH\1\DATA\S091995\030R0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 509233-8
Run Time Bar Code:
Acquired on : 19 Sep 95 03:47 PM
Report Created on: 20 Sep 95 11:38 AM
Last Recalib on : 19 SEP 95 02:53 PM
Multiplier : 1

Page Number : 1
Vial Number : 30
Injection Number : 1
Sequence Line : 1
Instrument Method: HCID.MTH
Analysis Method : HCIDR.MTH
Sample Amount : 0
ISTD Amount :



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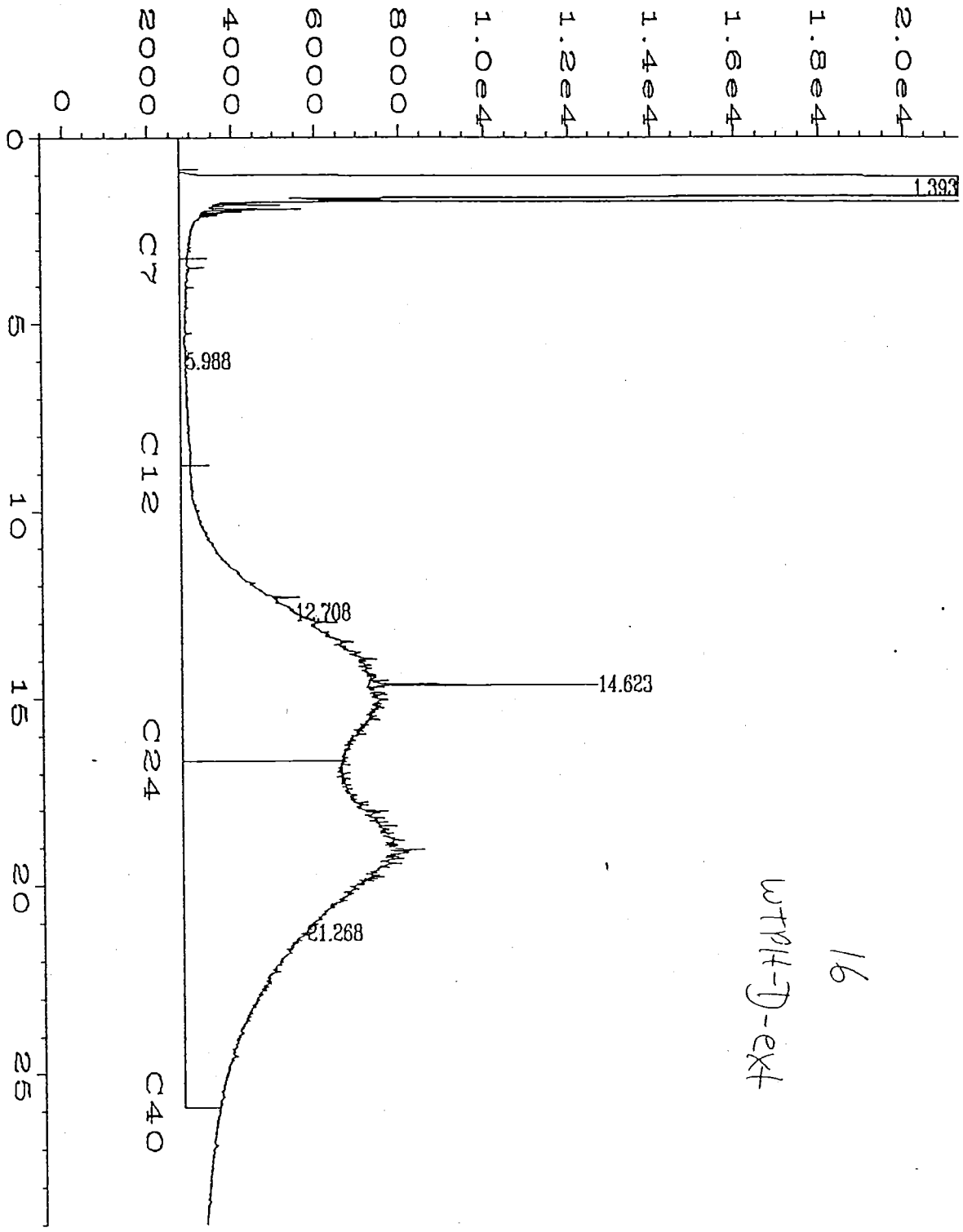
WTPH-D-ext

Data File Name	: D:\HPCH\1\DATA\S091895B\013F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 13
Sample Name	: 509233-1	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 18 Sep 95 10:50 PM	Instrument Method	: TPHD.MTH
eport Created on	: 18 Sep 95 11:30 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 0.4883	ISTD Amount	:



user modified

with D-ext

16

Data File Name : D:\HPCH\1\DATA\S091895B\019F0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 509233-3 x10
Run Time Bar Code:
Acquired on : 19 Sep 95 03:05 AM
Report Created on: 19 Sep 95 03:45 AM
Last Recalib on : 31 AUG 95 01:40 PM
Multiplier : 4.931

Page Number : 1
Vial Number : 19
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHD.MTH
Sample Amount : 0
ISTD Amount :

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September 27, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

GeoEngineers
SEP 2 9 1995
Routing
File

Attention: Pat Sullivan

RE: JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Sep. 18, 1995. For your reference, these analyses have been assigned our NCA # P509232.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-HCID per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509232
Matrix: soil
Sampled: 09/14/95
Received: 09/18/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
17	P509232-1	Gasoline	ND	20	09/19/95	09/19/95
		Diesel	ND	50		
		Heavy/Oil	ND	100		
18	P509232-2	Gasoline	ND	20	09/19/95	09/19/95
		Diesel	ND	50		
		Heavy/Oil	ND	100		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509232
Matrix: soil
Sampled: 09/14/95
Received: 09/18/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
17	P509232-1	Diesel/Related	44	25	09/22/95	09/22/95
		Heavy oil/Related	ND	50		
18	P509232-2	Diesel/Related	40	25	09/22/95	09/22/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509232
Received: 09/18/1995

Sample Name	Analyte	Result	Control Limits
WTPH-HCID per Washington State DOE			
17	4-Bromofluorobenzene	104	50-150
	1-Chlorooctadecane	107	50-150
18	4-Bromofluorobenzene	103	50-150
	1-Chlorooctadecane	104	50-150
WTPH-D Extended per Washington State DOE			
17	1-Chlorooctadecane	75	50-150
18	1-Chlorooctadecane	78	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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September 27, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P509232.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

BATCH QUALITY CONTROL RESULTS
WTPH-HCID per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509232
Received: 09/18/95

METHOD BLANK
Batch # FV95015c
Results in mg/kg (ppm)

Compound	Result	MRL
Gasoline	ND	20
Diesel	ND	50
Heavy/Oil	ND	100
Date Prepared	09/19/95	
Date Analyzed	09/19/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	154 (y)	50-150
1-Chlorooctadecane	87	50-150

(y) Surrogate recovery is out of control limits.

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509232
Received: 09/18/95

METHOD BLANK
Batch # FX95026b
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	09/22/95	
Date Analyzed	09/22/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	103	50-150

DUPLICATE
Batch # FX95026a
Results In mg/kg (ppm)

Duplicate ID P509253-1

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	2,900	2,200	28	50

LABORATORY CONTROL SAMPLE
Batch # FX95026a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	120	100	50-150

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: 0046
Site Address:
City, State, ZIP: Bingen WA
Site Release Number:
Unocal Manager: Kipp Eckert
CERT INFO: (check one) o Evaluation X Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers Project Number: 0161-181-P62
Address: 7504 SW Bridgeport Road
Portland OR 97224
Phone: (503) 624-9274 Fax: (503) 620-5940
Project Manager: Pat Sullivan
Sample Collection by: S. Kingery

Chain of Custody Record #:

Quality Assurance Data Level:
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days:
10 5 3 2 1

Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME		MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS Semi.Vols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. ~~14~~	9-14-95	0900	S	1																P509232-
2. ~~15~~	9-14-95	1020	S	1																
3. ~~16~~	9-14-95	1020	S	1																12.3
4. 17	9-14-95	1310	S	1	X					X										-1
5. 18	9-14-95	1310	S	1	X					X										-2
6.																				
7.																				
8.																				
9.																				
10.																				

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. Sarah A. Kingery	GET	9/18/95 1705	Karin Stahlnecker	WCA	9.18.95 1705
2.					
3.					

Final Report Approval

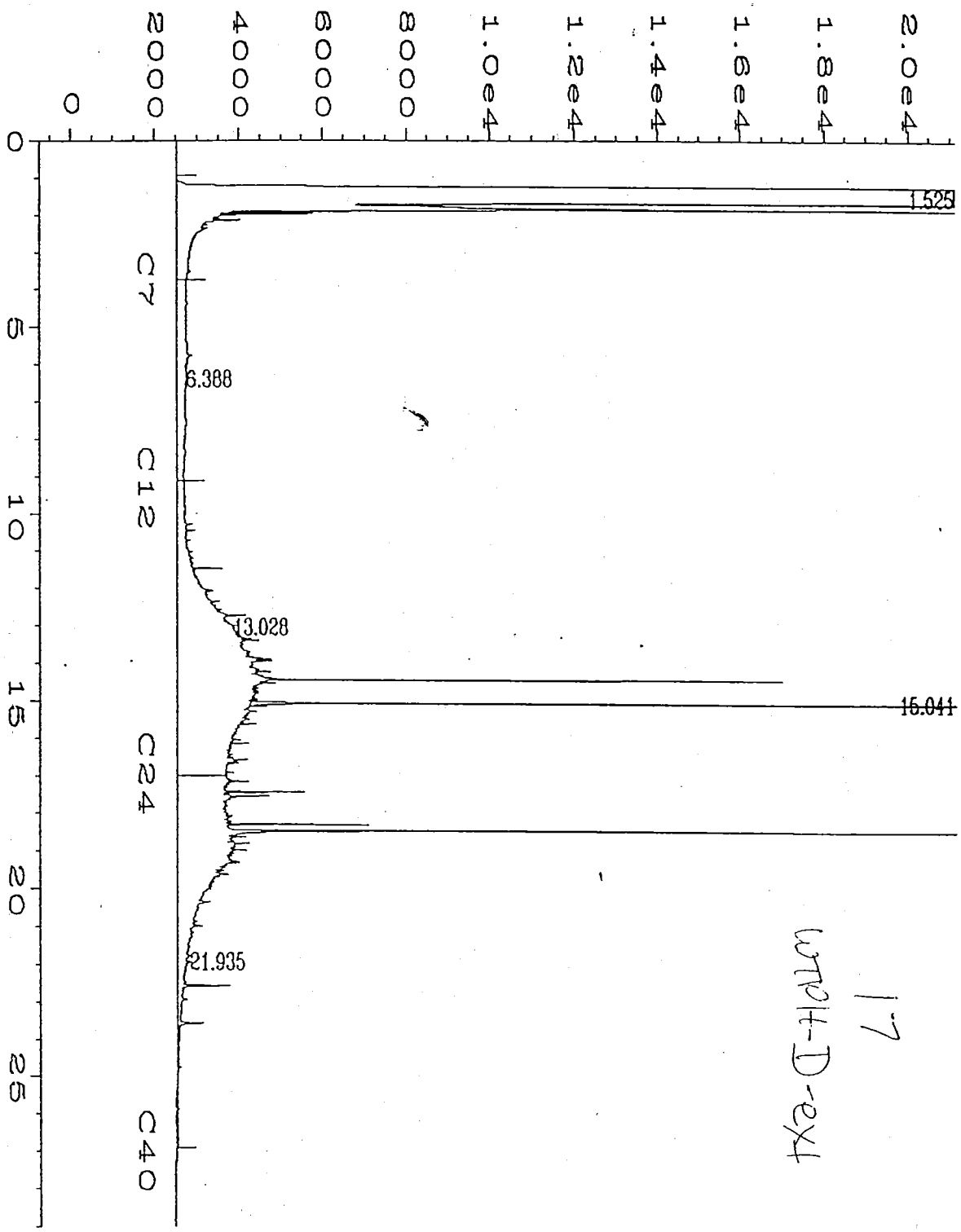
Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back
Firm: Date:

Page 1 of 1
Rev. 2.2, 11/94

Comments:

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

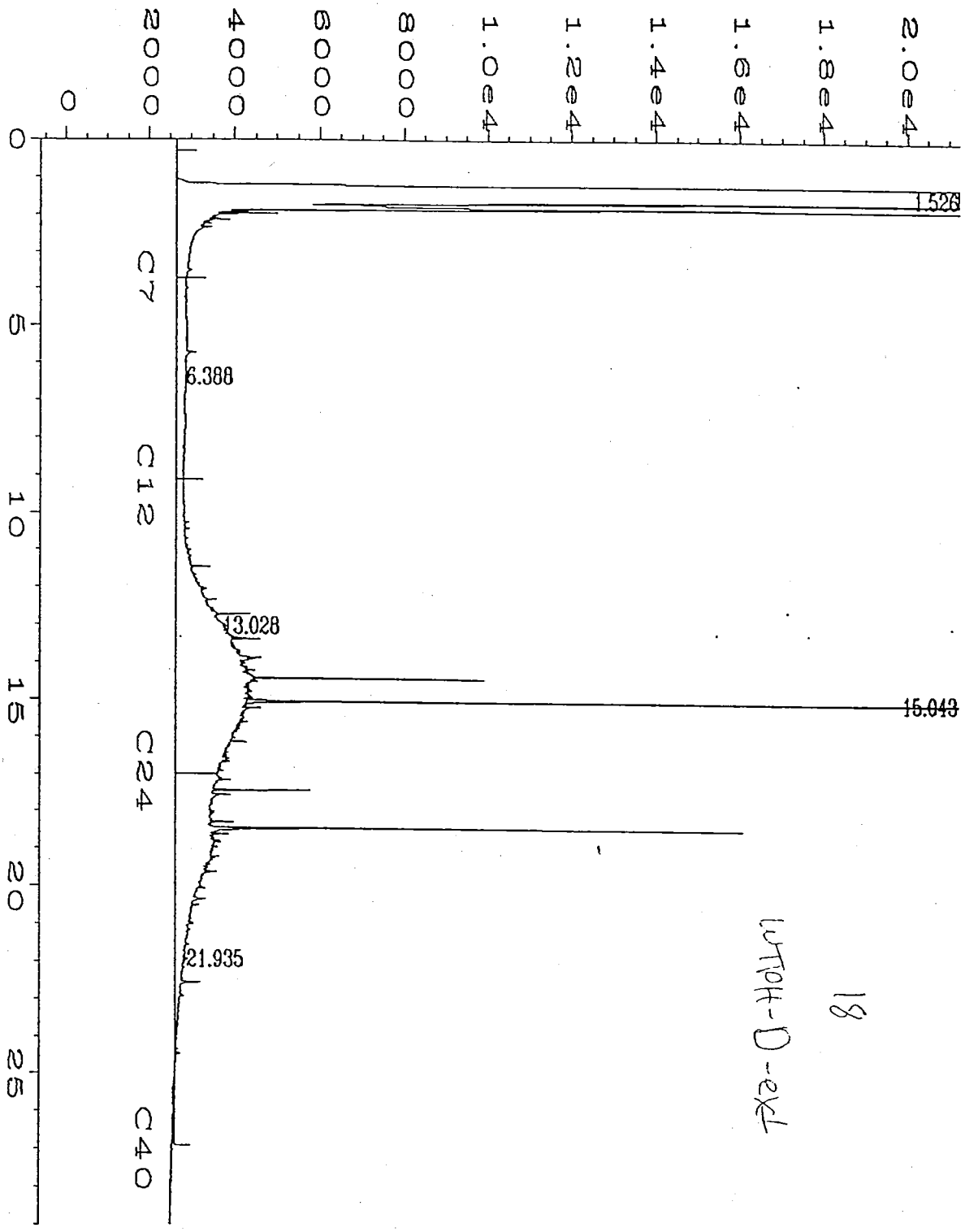
55



user modified

Data File Name : D:\HPCH\1\DATA\S092195\030R0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 509232A-1
Run Time Bar Code:
Acquired on : 22 Sep 95 06:55 PM
Report Created on: 25 Sep 95 01:51 PM
Last Recalib on : 19 AUG 95 06:21 PM
Multiplier : 1

Page Number : 1
Vial Number : 30
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHDR.MTH
Sample Amount : 0
ISTD Amount :



user modified

18

TPH-D-ext

Data File Name : D:\HPCH\1\DATA\S092195\031R0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 509232A-2
Run Time Bar Code:
cquired on : 22 Sep 95 07:38 PM
Report Created on: 25 Sep 95 01:52 PM
Last Recalib on : 19 AUG 95 06:21 PM
Multiplier : 1

Page Number : 1
Vial Number : 31
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHDR.MTH
Sample Amount : 0
ISTD Amount :

NORTH CREEK ANALYTICAL

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October 4, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

RE: JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Sep. 20, 1995. For your reference, these analyses have been assigned our NCA # P509253.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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TCLP per EPA 1311, 6010, 7470
Results in mg/L (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Sampled: 09/19/95
Received: 09/20/95

Client ID	Lab ID	Analyte	Result	MRL	Date Extracted	Date Prepared	Date Analyzed
SP-5	P509253-2	Arsenic	ND	0.50	09/25/95	09/26/95	10/03/95
		Barium	0.57	0.50			
		Cadmium	ND	0.010			
		Chromium	ND	0.010			
		Lead	ND	0.20			
		Mercury	ND	0.00020			
		Selenium	ND	0.25			
		Silver	ND	0.010			

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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TCLP per EPA 1311, 6010, 7470
Results In mg/L (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Sampled: 09/19/95
Received: 09/20/95

Client ID	Lab ID	Analyte	Result	MRL	Date Extracted	Date Prepared	Date Analyzed
SP-4	P509253-1	Arsenic	ND	0.50	09/25/95	09/26/95	10/03/95
		Barium	0.68	0.50			
		Cadmium	ND	0.010			
		Chromium	ND	0.010			
		Lead	ND	0.20			
		Mercury	ND	0.00020			
		Selenium	ND	0.25			
		Silver	ND	0.010			

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-G per Washington State DOE (C7-C12)
Results In mg/kg (ppm)

Client:	GeoEngineers, Inc.	**NCA Project #:**	P509253
Project:	UNOCAL #0046, BINGEN, WA	**Matrix:**	soil
		Sampled:	09/19/95
		Received:	09/20/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
SP-4	P509253-1	Gasoline/Related	10	2.0	09/21/95	09/21/95
SP-5	P509253-2	Gasoline/Related	7.6	2.0	09/21/95	09/21/95

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client:	GeoEngineers, Inc.	**NCA Project #:**	P509253
Project:	UNOCAL #0046, BINGEN, WA	**Matrix:**	soil
		Sampled:	09/19/95
		Received:	09/20/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
SP-4	P509253-1	Diesel/Related	3300	250	09/20/95	09/20/95
		Heavy oil/Related	7400	500		
SP-5	P509253-2	Diesel/Related	2600	250	09/20/95	09/20/95
		Heavy oil/Related	7300	500		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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BTEX per EPA 8020
Results In ug/kg (ppb)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Sampled: 09/19/95
Received: 09/20/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
SP-4	P509253-1	Benzene	ND	13	09/21/95	09/21/95
		Toluene	16	13		
		Ethylbenzene	ND	13		
		Xylenes (total)	24	13		
SP-5	P509253-2	Benzene	ND	13	09/21/95	09/21/95
		Toluene	ND	13		
		Ethylbenzene	ND	13		
		Xylenes (total)	ND	13		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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Volatile Organic Compounds per EPA 8240
Results In ug/kg (ppb)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Received: 09/20/95
Sampled: 09/19/95
Prepared: 09/26/95
Analyzed: 09/26/95

Client ID	Lab ID	Analyte	Result	MRL
SP-4	P509253-1	Acetone	ND	25
		Acrolein	ND	200
		Acrylonitrile	ND	10
		Benzene	ND	2.0
		Bromodichloromethane	ND	2.0
		Bromoform	ND	2.0
		Bromomethane	ND	10
		2-Butanone	ND	25
		Carbon Disulfide	ND	2.0
		Carbon Tetrachloride	ND	2.0
		Chlorobenzene	ND	2.0
		Chloroethane	ND	10
		Chloroform	ND	2.0
		Chloromethane	ND	10
		Dibromochloromethane	ND	2.0
		Dibromomethane	ND	2.0
		1,4-Dichloro-2-butene	ND	10
		1,2-Dichlorobenzene	ND	2.0
		1,3-Dichlorobenzene	ND	2.0
		1,4-Dichlorobenzene	ND	2.0
		Dichlorodifluoromethane	ND	5.0
		1,1-Dichloroethane	ND	2.0
		1,2-Dichloroethane	ND	2.0
		1,1-Dichloroethene	ND	2.0
		cis-1,2-Dichloroethene	ND	2.0
		trans1,2Dichloroethene	ND	2.0
		1,2-Dichloropropane	ND	2.0
		cis-1,3-Dichloropropene	ND	2.0
		trans1,3Dichloropropene	ND	2.0
		Ethyl Methacrylate	ND	2.0
		Ethylbenzene	ND	2.0
		2-Hexanone	ND	5.0
		Iodomethane	ND	2.0
		4-Methyl-2-pentanone	ND	5.0
		Methylene Chloride	77 *1	10
		Styrene	ND	2.0
		1,1,2,2-Tetrachloroethane	ND	2.0
		Tetrachloroethene	ND	2.0
		Toluene	ND	2.0
		1,1,1-Trichloroethane	ND	2.0

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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Volatile Organic Compounds per EPA 8240
Results In ug/kg (ppb)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Received: 09/20/95
Sampled: 09/19/95
Prepared: 09/26/95
Analyzed: 09/26/95

Client ID	Lab ID	Analyte	Result	MRL
SP-4 (continued)	P509253-1			
		1,1,2-Trichloroethane	ND	2.0
		Trichloroethene	ND	2.0
		Trichlorofluoromethane	ND	2.0
		1,2,3-Trichloropropane	ND	2.0
		Vinyl Acetate	ND	5.0
		Vinyl Chloride	ND	5.0
		Xylenes (total)	ND	2.0

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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Volatile Organic Compounds per EPA 8240
Results In ug/kg (ppb)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Received: 09/20/95
Sampled: 09/19/95
Prepared: 09/26/95
Analyzed: 09/26/95

Client ID	Lab ID	Analyte	Result	MRL
SP-5	P509253-2	Acetone	ND	25
		Acrolein	ND	200
		Acrylonitrile	ND	10
		Benzene	ND	2.0
		Bromodichloromethane	ND	2.0
		Bromoform	ND	2.0
		Bromomethane	ND	10
		2-Butanone	ND	25
		Carbon Disulfide	ND	2.0
		Carbon Tetrachloride	ND	2.0
		Chlorobenzene	ND	2.0
		Chloroethane	ND	10
		Chloroform	ND	2.0
		Chloromethane	ND	10
		Dibromochloromethane	ND	2.0
		Dibromomethane	ND	2.0
		1,4-Dichloro-2-butene	ND	10
		1,2-Dichlorobenzene	ND	2.0
		1,3-Dichlorobenzene	ND	2.0
		1,4-Dichlorobenzene	ND	2.0
		Dichlorodifluoromethane	ND	5.0
		1,1-Dichloroethane	ND	2.0
		1,2-Dichloroethane	ND	2.0
		1,1-Dichloroethene	ND	2.0
		cis-1,2-Dichloroethene	ND	2.0
		trans1,2Dichloroethene	ND	2.0
		1,2-Dichloropropane	ND	2.0
		cis-1,3-Dichloropropene	ND	2.0
		trans1,3Dichloropropene	ND	2.0
		Ethyl Methacrylate	ND	2.0
		Ethylbenzene	ND	2.0
		2-Hexanone	ND	5.0
		Iodomethane	ND	2.0
		4-Methyl-2-pentanone	ND	5.0
		Methylene Chloride	86 *[1]	10
		Styrene	ND	2.0
		1,1,2,2-Tetrachloroethane	ND	2.0
		Tetrachloroethene	ND	2.0
		Toluene	ND	2.0
		1,1,1-Trichloroethane	ND	2.0

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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Volatile Organic Compounds per EPA 8240
Results In ug/kg (ppb)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Received: 09/20/95
Sampled: 09/19/95
Prepared: 09/26/95
Analyzed: 09/26/95

Client ID	Lab ID	Analyte	Result	MRL
SP-5 (continued)	P509253-2			
		1,1,2-Trichloroethane	ND	2.0
		Trichloroethene	ND	2.0
		Trichlorofluoromethane	ND	2.0
		1,2,3-Trichloropropane	ND	2.0
		Vinyl Acetate	ND	5.0
		Vinyl Chloride	ND	5.0
		Xylenes (total)	ND	2.0

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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BNAs per EPA 8270
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Received: 09/20/95
Sampled: 09/19/95
Prepared: 09/28/95
Analyzed: 09/29/95

Client ID	Lab ID	Analyte	Result	MRL
SP-4	P509253-1	Acenaphthene	ND	0.50
		Acenaphthylene	ND	0.50
		Anthracene	ND	0.50
		Benzo(a)anthracene	ND	0.50
		Benzo(a)pyrene	ND	0.50
		Benzo(b)fluoranthene	ND	0.50
		Benzo(g,h,i)perylene	ND	0.50
		Benzo(k)fluoranthene	ND	0.50
		Benzoic Acid	ND	1.0
		Benzyl Alcohol	ND	0.50
		4-Bromophenyl Phenyl Ether	ND	0.50
		Butylbenzyl Phthalate	ND	0.50
		4-Chloro-3-methylphenol	ND	0.50
		4-Chloroaniline	ND	2.0
		bis(2-Chloroethoxy)methane	ND	0.50
		bis(2-Chloroethyl)ether	ND	0.50
		bis(2-Chloroisopropyl)ether	ND	0.50
		2-Chloronaphthalene	ND	0.50
		2-Chlorophenol	ND	0.50
		4-Chlorophenyl Phenyl Ether	ND	0.50
		Chrysene	ND	0.50
		Di-n-butylphthalate	ND	0.50
		Di-n-octylphthalate	ND	0.50
		Dibenzo(a,h)anthracene	ND	0.50
		Dibenzofuran	ND	0.50
		1,2-Dichlorobenzene	ND	1.0
		1,3-Dichlorobenzene	ND	1.0
		1,4-Dichlorobenzene	ND	1.0
		3,3'-Dichlorobenzidine	ND	1.0
		2,4-Dichlorophenol	ND	0.50
		Diethylphthalate	ND	0.50
		2,4-Dimethylphenol	ND	1.0
		Dimethylphthalate	ND	0.50
		4,6-Dinitro-2-methylphenol	ND	1.0
		2,4-Dinitrophenol	ND	2.0
		2,4-Dinitrotoluene	ND	0.50
		2,6-Dinitrotoluene	ND	0.50
		bis(2-Ethylhexyl)phthalate	ND	2.0
		Fluoranthene	ND	0.50
		Fluorene	ND	0.50

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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BNAs per EPA 8270
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Received: 09/20/95
Sampled: 09/19/95
Prepared: 09/28/95
Analyzed: 09/29/95

Client ID	Lab ID	Analyte	Result	MRL
SP-4 (continued)	P509253-1			
		Hexachlorobenzene	ND	0.50
		Hexachlorobutadiene	ND	1.0
		Hexachlorocyclopentadiene	ND	1.0
		Hexachloroethane	ND	1.0
		Indeno(1,2,3-cd)pyrene	ND	0.50
		Isophorone	ND	0.50
		2-Methylnaphthalene	ND	0.50
		2-Methylphenol	ND	0.50
		4-Methylphenol	ND	0.50
		Naphthalene	ND	0.50
		2-Nitroaniline	ND	0.50
		3-Nitroaniline	ND	1.0
		4-Nitroaniline	ND	0.50
		Nitrobenzene	ND	0.50
		2-Nitrophenol	ND	0.50
		4-Nitrophenol	ND	1.0
		N-Nitroso-di-n-propylamine	ND	0.50
		N-Nitrosodiphenylamine	ND	0.50
		Pentachlorophenol	ND	1.0
		Phenanthrene	ND	0.50
		Phenol	ND	0.50
		Pyrene	ND	0.50
		1,2,4-Trichlorobenzene	ND	0.50
		2,4,5-Trichlorophenol	ND	0.50
		2,4,6-Trichlorophenol	ND	0.50

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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BNAs per EPA 8270
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Received: 09/20/95
Sampled: 09/19/95
Prepared: 09/28/95
Analyzed: 09/29/95

Client ID	Lab ID	Analyte	Result	MRL
SP-5	P509253-2	Acenaphthene	ND	0.50
		Acenaphthylene	ND	0.50
		Anthracene	ND	0.50
		Benzo(a)anthracene	ND	0.50
		Benzo(a)pyrene	ND	0.50
		Benzo(b)fluoranthene	ND	0.50
		Benzo(g,h,i)perylene	ND	0.50
		Benzo(k)fluoranthene	ND	0.50
		Benzoic Acid	ND	1.0
		Benzyl Alcohol	ND	0.50
		4-Bromophenyl Phenyl Ether	ND	0.50
		Butylbenzyl Phthalate	ND	0.50
		4-Chloro-3-methylphenol	ND	0.50
		4-Chloroaniline	ND	2.0
		bis(2-Chloroethoxy)methane	ND	0.50
		bis(2-Chloroethyl)ether	ND	0.50
		bis(2-Chloroisopropyl)ether	ND	0.50
		2-Chloronaphthalene	ND	0.50
		2-Chlorophenol	ND	0.50
		4-Chlorophenyl Phenyl Ether	ND	0.50
		Chrysene	ND	0.50
		Di-n-butylphthalate	ND	0.50
		Di-n-octylphthalate	ND	0.50
		Dibenzo(a,h)anthracene	ND	0.50
		Dibenzofuran	ND	0.50
		1,2-Dichlorobenzene	ND	1.0
		1,3-Dichlorobenzene	ND	1.0
		1,4-Dichlorobenzene	ND	1.0
		3,3'-Dichlorobenzidine	ND	1.0
		2,4-Dichlorophenol	ND	0.50
		Diethylphthalate	ND	0.50
		2,4-Dimethylphenol	ND	1.0
		Dimethylphthalate	ND	0.50
		4,6-Dinitro-2-methylphenol	ND	1.0
		2,4-Dinitrophenol	ND	2.0
		2,4-Dinitrotoluene	ND	0.50
		2,6-Dinitrotoluene	ND	0.50
		bis(2-Ethylhexyl)phthalate	ND	2.0
		Fluoranthene	ND	0.50
		Fluorene	ND	0.50

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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BNAs per EPA 8270
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Received: 09/20/95
Sampled: 09/19/95
Prepared: 09/28/95
Analyzed: 09/29/95

Client ID	Lab ID	Analyte	Result	MRL
SP-5 (continued)	P509253-2			
		Hexachlorobenzene	ND	0.50
		Hexachlorobutadiene	ND	1.0
		Hexachlorocyclopentadiene	ND	1.0
		Hexachloroethane	ND	1.0
		Indeno(1,2,3-cd)pyrene	ND	0.50
		Isophorone	ND	0.50
		2-Methylnaphthalene	ND	0.50
		2-Methylphenol	ND	0.50
		4-Methylphenol	ND	0.50
		Naphthalene	ND	0.50
		2-Nitroaniline	ND	0.50
		3-Nitroaniline	ND	1.0
		4-Nitroaniline	ND	0.50
		Nitrobenzene	ND	0.50
		2-Nitrophenol	ND	0.50
		4-Nitrophenol	ND	1.0
		N-Nitroso-di-n-propylamine	ND	0.50
		N-Nitrosodiphenylamine	ND	0.50
		Pentachlorophenol	ND	1.0
		Phenanthrene	ND	0.50
		Phenol	ND	0.50
		Pyrene	ND	0.50
		1,2,4-Trichlorobenzene	ND	0.50
		2,4,5-Trichlorophenol	ND	0.50
		2,4,6-Trichlorophenol	ND	0.50

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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PCB's per EPA 8080
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Matrix: soil
Sampled: 09/19/95
Received: 09/20/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
SP-4	P509253-1	PCB 1016	ND	0.050	09/28/95	10/02/95
		PCB 1221	ND	0.10		
		PCB 1232	ND	0.050		
		PCB 1242	ND	0.050		
		PCB 1248	ND	0.050		
		PCB 1254	ND	0.050		
		PCB 1260	ND	0.050		
SP-5	P509253-2	PCB 1016	ND	0.050	09/28/95	10/02/95
		PCB 1221	ND	0.10		
		PCB 1232	ND	0.050		
		PCB 1242	ND	0.050		
		PCB 1248	ND	0.050		
		PCB 1254	ND	0.050		
		PCB 1260	ND	0.050		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509253
Received: 09/20/1995

Sample Name	Analyte	Result	Control Limits
WTPH-G per Washington State DOE (C7-C12)			
SP-4	4-Bromofluorobenzene	113	50-150
	Trifluorotoluene	84	50-150
SP-5	4-Bromofluorobenzene	118	50-150
	Trifluorotoluene	71	50-150
WTPH-D Extended per Washington State DOE			
SP-4	1-Chlorooctadecane	– *2	50-150
SP-5	1-Chlorooctadecane	126	50-150
BTEX per EPA 8020			
SP-4	4-Bromofluorobenzene	104	63-126
SP-5	4-Bromofluorobenzene	103	63-126
Volatile Organic Compounds per EPA 8240			
SP-4	4-Bromofluorobenzene	90	74-121
	1,2-Dichloroethane-d4	89	70-121
	Toluene-d8	88	81-117
SP-5	4-Bromofluorobenzene	71 *3	74-121
	1,2-Dichloroethane-d4	86	70-121
	Toluene-d8	83	81-117

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509253
Received: 09/20/1995

Sample Name	Analyte	Result	Control Limits
BNAs per EPA 8270			
SP-4	2-Fluorobiphenyl	93	30-115
	2-Fluorophenol	87	25-121
	Nitrobenzene-d5	70	23-120
	Phenol-d6	83	24-113
	p-Terphenyl-d14	88	18-137
	2,4,6-Tribromophenol	82	19-122
SP-5	2-Fluorobiphenyl	98	30-115
	2-Fluorophenol	66	25-121
	Nitrobenzene-d5	72	23-120
	Phenol-d6	69	24-113
	p-Terphenyl-d14	99	18-137
	2,4,6-Tribromophenol	75	19-122
PCB's per EPA 8080			
SP-4	2,4,5,6-Tetrachloro-m-xylene	87	36-121
SP-5	2,4,5,6-Tetrachloro-m-xylene	80	36-121

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509253
Received: 09/20/1995

Sample Name	Analyte	Result	Control Limits
WTPH-G per Washington State DOE (C7-C12)			
SP-4	4-Bromofluorobenzene	113	50-150
	Trifluorotoluene	84	50-150
SP-5	4-Bromofluorobenzene	118	50-150
	Trifluorotoluene	71	50-150
WTPH-D Extended per Washington State DOE			
SP-4	1-Chlorooctadecane	– *2	50-150
SP-5	1-Chlorooctadecane	126	50-150
BTEX per EPA 8020			
SP-4	4-Bromofluorobenzene	104	63-126
SP-5	4-Bromofluorobenzene	103	63-126
Volatile Organic Compounds per EPA 8240			
SP-4	4-Bromofluorobenzene	90	74-121
	1,2-Dichloroethane-d4	89	70-121
	Toluene-d8	88	81-117
SP-5	4-Bromofluorobenzene	71 *3	74-121
	1,2-Dichloroethane-d4	86	70-121
	Toluene-d8	83	81-117

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509253
Received: 09/20/1995

Sample Name	Analyte	Result	Control Limits
BNAs per EPA 8270			
SP-4	2-Fluorobiphenyl	93	30-115
	2-Fluorophenol	87	25-121
	Nitrobenzene-d5	70	23-120
	Phenol-d6	83	24-113
	p-Terphenyl-d14	88	18-137
	2,4,6-Tribromophenol	82	19-122
SP-5	2-Fluorobiphenyl	98	30-115
	2-Fluorophenol	66	25-121
	Nitrobenzene-d5	72	23-120
	Phenol-d6	69	24-113
	p-Terphenyl-d14	99	18-137
	2,4,6-Tribromophenol	75	19-122
PCB's per EPA 8080			
SP-4	2,4,5,6-Tetrachloro-m-xylene	87	36-121
SP-5	2,4,5,6-Tetrachloro-m-xylene	80	36-121

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509253
Received: 09/20/1995

Sample Name	Analyte	Result	Control Limits
WTPH-G per Washington State DOE (C7-C12)			
SP-4	4-Bromofluorobenzene	113	50-150
	Trifluorotoluene	84	50-150
SP-5	4-Bromofluorobenzene	118	50-150
	Trifluorotoluene	71	50-150
WTPH-D Extended per Washington State DOE			
SP-4	1-Chlorooctadecane	– *2	50-150
SP-5	1-Chlorooctadecane	126	50-150
BTEX per EPA 8020			
SP-4	4-Bromofluorobenzene	104	63-126
SP-5	4-Bromofluorobenzene	103	63-126
Volatile Organic Compounds per EPA 8240			
SP-4	4-Bromofluorobenzene	90	74-121
	1,2-Dichloroethane-d4	89	70-121
	Toluene-d8	88	81-117
SP-5	4-Bromofluorobenzene	71 *3	74-121
	1,2-Dichloroethane-d4	86	70-121
	Toluene-d8	83	81-117

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509253
Received: 09/20/1995

Sample Name	Analyte	Result	Control Limits
BNAs per EPA 8270			
SP-4	2-Fluorobiphenyl	93	30-115
	2-Fluorophenol	87	25-121
	Nitrobenzene-d5	70	23-120
	Phenol-d6	83	24-113
	p-Terphenyl-d14	88	18-137
	2,4,6-Tribromophenol	82	19-122
SP-5	2-Fluorobiphenyl	98	30-115
	2-Fluorophenol	66	25-121
	Nitrobenzene-d5	72	23-120
	Phenol-d6	69	24-113
	p-Terphenyl-d14	99	18-137
	2,4,6-Tribromophenol	75	19-122
PCB's per EPA 8080			
SP-4	2,4,5,6-Tetrachloro-m-xylene	87	36-121
SP-5	2,4,5,6-Tetrachloro-m-xylene	80	36-121

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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COMMENTS

Client:	GeoEngineers, Inc.	NCA Number:	P509253
Project:	UNOCAL #0046, BINGEN, WA	Received:	09/20/1995

1. Methylene Chloride detected in this sample is possibly due to laboratory contamination, a result of sample exposure to an extraction area where Methylene Chloride is present.

2. Unable to calculate surrogate recovery due to high analyte concentration.

3. Surrogate recovery is out of control limits due to matrix interference.

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October 16, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P509253.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

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BATCH QUALITY CONTROL RESULTS
TCLP per EPA 1311, 6010, 7470

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

METHOD BLANK
Batch # KR95105a
Results In mg/L (ppm)

Compound	Result	MRL
Arsenic	ND	0.50
Barium	ND	0.50
Cadmium	ND	0.010
Chromium	ND	0.010
Lead	ND	0.20
Selenium	ND	0.25
Silver	ND	0.010
Date Extracted	09/25/95	
Date Prepared	09/26/95	
Date Analyzed	10/03/95	

MATRIX SPIKE
Batch # KR95105a
Results In mg/L (ppm)

Spike ID P509253-1a

Compound	Spike Added	Sample Conc	MS Conc	MS % Rec	QC Limit % Rec
Arsenic	5.0	ND	5.4	108	50-150
Barium	10	0.68	11	103	50-150
Cadmium	1.0	ND	0.93	93	50-150
Chromium	5.0	ND	4.8	96	50-150
Lead	5.0	ND	4.7	94	50-150
Selenium	1.0	ND	1.0	100	50-150
Silver	2.0	ND	2.0	100	50-150

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BATCH QUALITY CONTROL RESULTS
TCLP per EPA 1311, 6010, 7470

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

LABORATORY CONTROL SAMPLE
Batch # KR95105a
Results in mg/L (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Arsenic	5.0	5.3	106	95-120
Barium	10	10	100	78-116
Cadmium	1.0	0.96	96	84-120
Chromium	5.0	4.6	92	83-116
Lead	5.0	4.8	96	89-117
Selenium	1.0	1.1	110	87-123
Silver	2.0	2.0	100	76-112

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BATCH QUALITY CONTROL RESULTS
TCLP per EPA 1311, 6010, 7470

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

METHOD BLANK
Batch # ZT95135a
Results in mg/L (ppm)

Compound	Result	MRL
Mercury	ND	0.00020
Date Extracted	09/25/95	
Date Prepared	09/28/95	
Date Analyzed	09/29/95	

MATRIX SPIKE
Batch # ZT95135a
Results in mg/L (ppm)

Spike ID P509253B-1

Compound	Spike Added	Sample Conc	MS Conc	MS % Rec	QC Limit % Rec
Mercury	0.0050	ND	0.0043	86	50-150

LABORATORY CONTROL SAMPLE
Batch # ZT95135a
Results In

Compound	True	Found	% Rec	QC Limit % Rec
Mercury	0.0050	0.0052	104	89-104

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BATCH QUALITY CONTROL RESULTS
WTPH-G per Washington State DOE (C7-C12)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

METHOD BLANK
Batch # BT95067b
Results In mg/kg (ppm)

Compound	Result	MRL
Gasoline/Related	ND	2.0
Date Prepared	09/21/95	
Date Analyzed	09/21/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	94	50-150
Trifluorotoluene	84	50-150

DUPLICATE
Batch # BT95067a
Duplicate ID P509248-1
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Gasoline	5.7	4.7	20	50

LABORATORY CONTROL SAMPLE
Batch # BT95067a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Gasoline	31	35	113	50-150

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc. **NCA Project #:** P509253
Project: UNOCAL #0046, BINGEN, WA **Received:** 09/20/95

METHOD BLANK
Batch # FX95026a
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	09/20/95	
Date Analyzed	09/20/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	79	50-150

DUPLICATE
Batch # FX95026a **Duplicate ID P509253-1**
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	2,900	2,200	28	50

LABORATORY CONTROL SAMPLE
Batch # FX95026a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	120	100	50-150

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BATCH QUALITY CONTROL RESULTS
BTEX per EPA 8020

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

METHOD BLANK
Batch # BS95030b
Results In ug/kg (ppb)

Compound	Result	MRL
Benzene	ND	13
Toluene	ND	13
Ethylbenzene	ND	13
Xylenes (total)	ND	13
Date Prepared	09/21/95	
Date Analyzed	09/21/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	90	63-126

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE
Batch # BS95030a **Spike ID P509212-1**
Results In ug/kg (ppb)

Compound	Spike Added	Sample Conc	MS Conc	MS %Rec
Benzene	20	ND	17.1	86
Chlorobenzene	20	ND	17.6	88
Ethylbenzene	20	ND	18.1	91
Toluene	20	ND	17.9	90
o-Xylene	20	ND	18.0	90

Compound	Spike Added	MSD Conc	MSD % Rec	RPD	QC Limit RPD	QC Limit % Rec
Benzene	20	16.3	82	4.8	17	56-123
Chlorobenzene	20	17.0	85	3.5	16	53-124
Ethylbenzene	20	17.4	87	4.5	20	45-130
Toluene	20	16.9	85	5.7	24	54-123
o-Xylene	20	17.3	87	3.4	20	50-127

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BATCH QUALITY CONTROL RESULTS
BTEX per EPA 8020

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

LABORATORY CONTROL SAMPLE
Batch # BS95030a
Results In ug/kg (ppb)

Compound	True	Found	% Rec	QC Limit % Rec
Benzene	20	17.1	86	69-138
Chlorobenzene	20	18.0	90	72-137
Ethylbenzene	20	18.4	92	61-141
Toluene	20	17.6	88	53-151
o-Xylene	20	18.3	92	62-144

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BATCH QUALITY CONTROL RESULTS
Volatile Organic Compounds per EPA 8240

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

METHOD BLANK
Batch # VS95029c
Results In ug/kg (ppb)

Compound	Result	MRL
Acetone	ND	25
Acrolein	ND	200
Acrylonitrile	ND	10
Benzene	ND	2.0
Bromodichloromethane	ND	2.0
Bromoform	ND	2.0
Bromomethane	ND	10
2-Butanone	ND	25
Carbon Disulfide	ND	2.0
Carbon Tetrachloride	ND	2.0
Chlorobenzene	ND	2.0
Chloroethane	ND	10
Chloroform	ND	2.0
Chloromethane	ND	10
Dibromochloromethane	ND	2.0
Dibromomethane	ND	2.0
1,4-Dichloro-2-butene	ND	10
1,2-Dichlorobenzene	ND	2.0
1,3-Dichlorobenzene	ND	2.0
1,4-Dichlorobenzene	ND	2.0
Dichlorodifluoromethane	ND	5.0
1,1-Dichloroethane	ND	2.0
1,2-Dichloroethane	ND	2.0
1,1-Dichloroethene	ND	2.0
cis-1,2-Dichloroethene	ND	2.0
trans1,2Dichloroethene	ND	2.0
1,2-Dichloropropane	ND	2.0
cis-1,3-Dichloropropene	ND	2.0
trans1,3Dichloropropene	ND	2.0
Ethyl Methacrylate	ND	2.0
Ethylbenzene	ND	2.0
2-Hexanone	ND	5.0
Iodomethane	ND	2.0
4-Methyl-2-pentanone	ND	5.0
Methylene Chloride	ND	10
Styrene	ND	2.0
1,1,2,2-Tetrachloroethane	ND	2.0
Tetrachloroethene	ND	2.0
Toluene	ND	2.0
1,1,1-Trichloroethane	ND	2.0
1,1,2-Trichloroethane	ND	2.0
Trichloroethene	ND	2.0
Trichlorofluoromethane	ND	2.0
1,2,3-Trichloropropane	ND	2.0
Vinyl Acetate	ND	5.0

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BATCH QUALITY CONTROL RESULTS
Volatile Organic Compounds per EPA 8240

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

Vinyl Chloride	ND	5.0
Xylenes (total)	ND	2.0
Date Prepared	09/26/95	
Date Analyzed	09/26/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	97	74-121
1,2-Dichloroethane-d4	88	70-121
Toluene-d8	97	81-117

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BATCH QUALITY CONTROL RESULTS
Volatile Organic Compounds per EPA 8240

Client: GeoEngineers, Inc. **NCA Project #:** P509253
Project: UNOCAL #0046, BINGEN, WA **Received:** 09/20/95

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE
Batch # VS95029a **Spike ID P509251-3**
Results In ug/kg (ppb)

Compound	Spike Added	Sample Conc	MS Conc	MS %Rec
Benzene	20	ND	20	100
Chlorobenzene	20	ND	18	90
1,1-Dichloroethene	20	ND	23	115
Toluene	20	ND	18	90
Trichloroethene	20	ND	18	90

Compound	Spike Added	MSD Conc	MSD % Rec	RPD	QC Limit RPD	QC Limit % Rec
Benzene	20	22	110	9.5	21	66-142
Chlorobenzene	20	19	95	5.4	21	60-133
1,1-Dichloroethene	20	22	110	4.4	22	59-172
Toluene	20	19	95	5.4	21	59-139
Trichloroethene	20	18	90	0	24	62-137

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BATCH QUALITY CONTROL RESULTS
Volatile Organic Compounds per EPA 8240

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509253
Received: 09/20/95

LABORATORY CONTROL SAMPLE
Batch # VS95029c
Results In ug/kg (ppb)

Compound	True	Found	% Rec	QC Limit % Rec
Benzene	20	19	95	66-142
Chlorobenzene	20	19	95	60-133
1,1-Dichloroethene	20	21	105	59-172
Toluene	20	19	95	59-139
Trichloroethene	20	19	95	62-137

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BATCH QUALITY CONTROL RESULTS
BNAs per EPA 8270

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509253
Received: 09/20/95

METHOD BLANK
Batch # B509578a
Results in mg/kg (ppm)

Compound	Result	MRL
Acenaphthene	ND	0.50
Acenaphthylene	ND	0.50
Anthracene	ND	0.50
Benzo(a)anthracene	ND	0.50
Benzo(a)pyrene	ND	0.50
Benzo(b)fluoranthene	ND	0.50
Benzo(g,h,i)perylene	ND	0.50
Benzo(k)fluoranthene	ND	0.50
Benzoic Acid	ND	1.0
Benzyl Alcohol	ND	0.50
4-Bromophenyl Phenyl Ether	ND	0.50
Butylbenzyl Phthalate	ND	0.50
4-Chloro-3-methylphenol	ND	0.50
4-Chloroaniline	ND	2.0
bis(2-Chloroethoxy)methane	ND	0.50
bis(2-Chloroethyl)ether	ND	0.50
bis(2-Chloroisopropyl)ether	ND	0.50
2-Chloronaphthalene	ND	0.50
2-Chlorophenol	ND	0.50
4-Chlorophenyl Phenyl Ether	ND	0.50
Chrysene	ND	0.50
Di-n-butylphthalate	ND	0.50
Di-n-octylphthalate	ND	0.50
Dibenzo(a,h)anthracene	ND	0.50
Dibenzofuran	ND	0.50
1,2-Dichlorobenzene	ND	1.0
1,3-Dichlorobenzene	ND	1.0
1,4-Dichlorobenzene	ND	1.0
3,3'-Dichlorobenzidine	ND	1.0
2,4-Dichlorophenol	ND	0.50
Diethylphthalate	ND	0.50
2,4-Dimethylphenol	ND	1.0
Dimethylphthalate	ND	0.50
4,6-Dinitro-2-methylphenol	ND	1.0
2,4-Dinitrophenol	ND	2.0
2,4-Dinitrotoluene	ND	0.50
2,6-Dinitrotoluene	ND	0.50
bis(2-Ethylhexyl)phthalate	ND	2.0
Fluoranthene	ND	0.50
Fluorene	ND	0.50
Hexachlorobenzene	ND	0.50
Hexachlorobutadiene	ND	1.0
Hexachlorocyclopentadiene	ND	1.0
Hexachloroethane	ND	1.0
Indeno(1,2,3-cd)pyrene	ND	0.50

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BATCH QUALITY CONTROL RESULTS
BNAs per EPA 8270

Client: GeoEngineers, Inc. **NCA Project #:** P509253
Project: UNOCAL #0046, BINGEN, WA **Received:** 09/20/95

Isophorone	ND	0.50
2-Methylnaphthalene	ND	0.50
2-Methylphenol	ND	0.50
4-Methylphenol	ND	0.50
Naphthalene	ND	0.50
2-Nitroaniline	ND	0.50
3-Nitroaniline	ND	1.0
4-Nitroaniline	ND	0.50
Nitrobenzene	ND	0.50
2-Nitrophenol	ND	0.50
4-Nitrophenol	ND	1.0
N-Nitroso-di-n-propylamine	ND	0.50
N-Nitrosodiphenylamine	ND	0.50
Pentachlorophenol	ND	1.0
Phenanthrene	ND	0.50
Phenol	ND	0.50
Pyrene	ND	0.50
1,2,4-Trichlorobenzene	ND	0.50
2,4,5-Trichlorophenol	ND	0.50
2,4,6-Trichlorophenol	ND	0.50
Date Prepared	09/28/95	
Date Analyzed	09/29/95	

Surrogate Recovery (%)	Result	Control Limit
2-Fluorobiphenyl	80	30-115
2-Fluorophenol	83	25-121
Nitrobenzene-d5	65	23-120
Phenol-d6	86	24-113
p-Terphenyl-d14	ND	18-137
2,4,6-Tribromophenol	ND	19-122

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BATCH QUALITY CONTROL RESULTS
BNAs per EPA 8270

Client: GeoEngineers, Inc. **NCA Project #:** P509253
Project: UNOCAL #0046, BINGEN, WA **Received:** 09/20/95

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE
Batch # B509578a **Spike ID B509250-04**
Results In mg/kg (ppm)

Compound	Spike Added	Sample Conc	MS Conc	MS %Rec
Acenaphthene	3.35	ND	1.7	51
4-Chloro-3-Methylphenol	6.7	ND	3.7	55
2-Chlorophenol	6.7	ND	3.7	55
1,4-Dichlorobenzene	3.35	ND	1.3	39
2,4-Dinitrotoluene	3.35	ND	1.8	54
4-Nitrophenol	6.7	ND	2.6	39
Nitroso-di-n-propylamine	3.35	ND	1.6	48
Phenol	6.7	ND	3.6	54
Pyrene	3.35	ND	2.2	66
1,2,4-Trichlorobenzene	3.35	ND	1.5	45

Compound	Spike Added	MSD Conc	MSD % Rec	RPD	QC Limit RPD	QC Limit % Rec
Acenaphthene	3.35	1.8	54	5.7	19	40-116
4-Chloro-3-Methylphenol	6.7	3.8	57	3.6	21	45-105
2-Chlorophenol	6.7	4.1	61	11	25	37-104
1,4-Dichlorobenzene	3.35	1.7	51	27	34	20-109
2,4-Dinitrotoluene	3.35	1.9	57	5.4	22	16-104
4-Nitrophenol	6.7	2.7	40	2.5	31	21-93
Nitroso-di-n-propylamine	3.35	1.7	51	6.1	17	35-120
Phenol	6.7	4	60	11	27	45-108
Pyrene	3.35	2.2	66	0	31	35-143
1,2,4-Trichlorobenzene	3.35	1.7	51	13	22	13-118

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BATCH QUALITY CONTROL RESULTS
PCB's per EPA 8080

Client:	GeoEngineers, Inc.	**NCA Project #:**	P509253
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	09/20/95

METHOD BLANK
Batch # B509578a
Results In mg/kg (ppm)

Compound	Result	MRL
PCB 1016	ND	0.050
PCB 1221	ND	0.050
PCB 1232	ND	0.050
PCB 1242	ND	0.050
PCB 1248	ND	0.050
PCB 1254	ND	0.050
PCB 1260	ND	0.050
Date Prepared	09/28/95	
Date Analyzed	10/02/95	

Surrogate Recovery (%)	Result	Control Limit
2,4,5,6-Tetrachloro-m-xylene	87	36-121

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BATCH QUALITY CONTROL RESULTS
PCB's per EPA 8080

Client: GeoEngineers, Inc. **NCA Project #:** P509253
Project: UNOCAL #0046, BINGEN, WA **Received:** 09/20/95

LABORATORY CONTROL SAMPLE AND LABORATORY CONTROL SAMPLE DUPLICATE
Batch # B509578a
Results In mg/kg (ppm)

Compound	True	Found	% Rec
PCB 1260	0.33	0.24	72

Compound	Dup True	Dup Found	Dup % Rec	RPD	QC Limit RPD	QC Limit % Rec
PCB 1260	0.33	0.26	79	9.3	18	42-140

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: 0046
Site Address:
City, State, ZIP: BINGEN WA
Site Release Number:
Unocal Manager: Kipp Eckert
CERT INFO: (check one) o Evaluation X Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers Project Number: 0161-181-P62
Address:
Phone: (503)624-9274 Fax:
Project Manager: Pat Sullivan
Sample Collection by: Sarah Kingery

Chain of Custody Record #:

Quality Assurance Data Level: [A] [B]
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | 2 | 1

PCB Fuel

o Oregon X Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. SP-4	9-14-95 / 1030	S	2				X		X				X	X	X			X	P509253-1
2. SP-5	9-14-95 / 1030	S	2				X		X				X	X	X			X	2
3.																			
4.																			
5.																			
6.																			
7.																			
8.																			
9.																			
10.																			

13.8°

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. Sarah A. Kingery	GeoEngineers	9/19/95 1200	Sara McClurg	NCA	821 m 9-20-95 950
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back

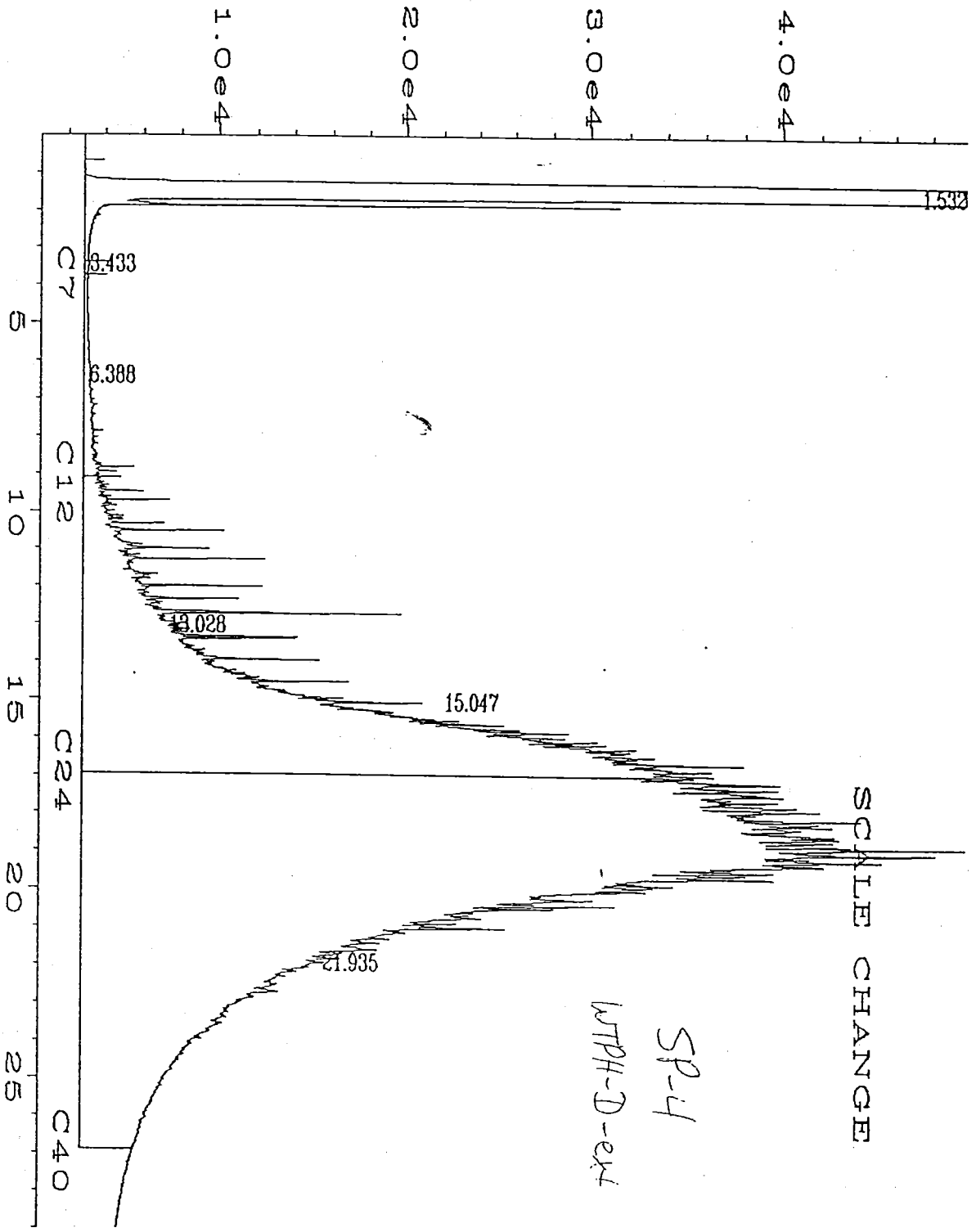
Firm: Date:

Page 1 of 1
2.2, 11/94

Comments: Please call Pat Sullivan when received for list of ANALYSES.

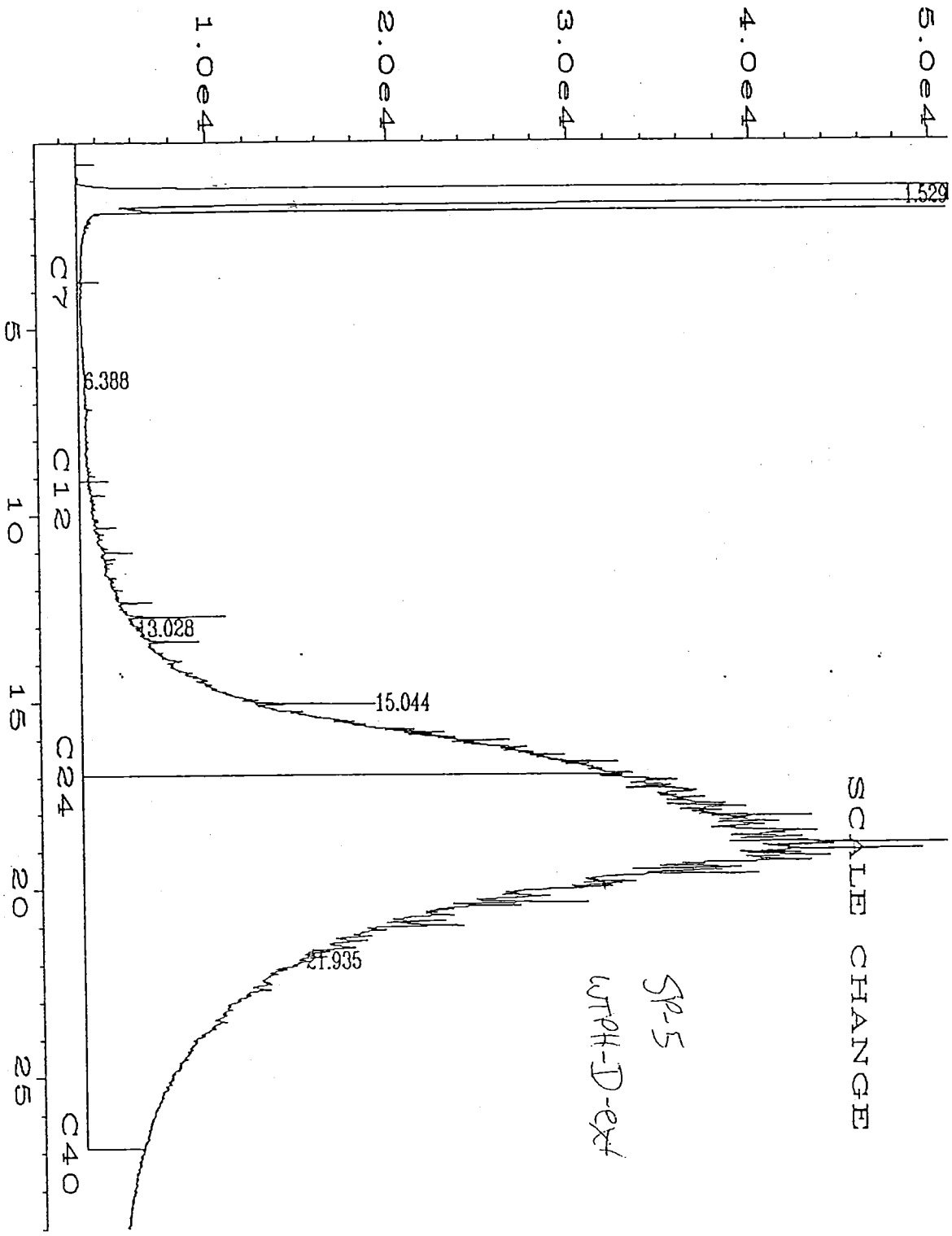
Distribution: White - Laboratory Yellow - Consultant Photocopy - 1

94



Data File Name : D:\HPCH\1\DATA\S092095A\031R0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 509253-1 x10
Run Time Bar Code:
Acquired on : 20 Sep 95 10:06 PM
Report Created on: 21 Sep 95 04:20 PM
Last Recalib on : 19 AUG 95 06:21 PM
Multiplier : 1

Page Number : 1
Vial Number : 31
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHDR.MTH
Sample Amount : 0
ISTD Amount :



Data File Name : D:\HPCH\1\DATA\S092095A\033R0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 509253-2 x10
Run Time Bar Code:
Acquired on : 20 Sep 95 11:30 PM
Report Created on: 21 Sep 95 04:26 PM
Last Recalib on : 19 AUG 95 06:21 PM
Multiplier : 1

Page Number : 1
Vial Number : 33
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHDR.MTH
Sample Amount : 0
ISTD Amount :

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September 26, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

GeoEngineers
SEP 29 1995
Routing
File

Attention: Pat Sullivan

RE: JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Sep. 20, 1995. For your reference, these analyses have been assigned our NCA # P509258.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-D per Washington State DOE (C12-C24)
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509258
Matrix: soil
Sampled: 09/19/95
Received: 09/20/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
22	P509258-1	Diesel/Related	ND	25	09/20/95	09/20/95
23	P509258-2	Diesel/Related	ND	25	09/20/95	09/20/95
24	P509258-3	Diesel/Related	ND	25	09/20/95	09/21/95
25	P509258-4	Diesel/Related	ND	25	09/20/95	09/21/95
26	P509258-5	Diesel/Related	3700	25	09/20/95	09/21/95

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509258
Received: 09/20/1995

Sample Name	Analyte	Result	Control Limits
WTPH-D per Washington State DOE (C12-C24)			
22	1-Chlorooctadecane	78	50-150
23	1-Chlorooctadecane	75	50-150
24	1-Chlorooctadecane	82	50-150
25	1-Chlorooctadecane	78	50-150
26	1-Chlorooctadecane	87	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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September 26, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 0161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P509258.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

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BATCH QUALITY CONTROL RESULTS
WTPH-D per Washington State DOE (C12-C24)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509258
Received: 09/20/95

METHOD BLANK
Batch # FX95025a
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Date Prepared	09/20/95	
Date Analyzed	09/20/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	83	50-150

DUPLICATE
Batch # FX95025y
Duplicate ID P509143-19
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/related	4,400	4,200	4.7	50

LABORATORY CONTROL SAMPLE
Batch # FX95025a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/related	120	110	92	50-150

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP#0046
Site Address: 217 E Steuben
City, State, ZIP: Bingen WA 98605
Site Release Number:
Unocal Manager: Kipp Eckert
CERT INFO: (check one) o Evaluation [X] Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers Project Number: 0161-181-P62
Address: 7504 SW Bridgeport Road Portland OR
Phone: (503)624-9274 Fax:
Project Manager: Pat Sullivan
Sample Collection by: Sarah Kingery

Chain of Custody Record #:

Quality Assurance Data Level: [X] [B]
A: Standard Summary
B: Standard + Chromatograms
Laboratory Turnaround Days: 10 5 3 2 [1]

~~Oregon~~ [X] Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 22	9-19-95 /	S	1					X											P509258-1
2. 23	1442	S	1					X											2
3. 24	1530	S	1					X											3
4. 25	1530	S	1					X											4
5. 26	1550	S	1		-			X											5
6.																			14.5
7.																			
8.																			
9.																			
10.																			

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. Sarah K. Kingery	GeoEngineers	9/20/95 0935	[illegible]	NCA	9/20/95@1010
2. [illegible]			[illegible]	NCA	9/20/95 1150
3.					

Page 1 of 1
Rev. 2.2, 11/94

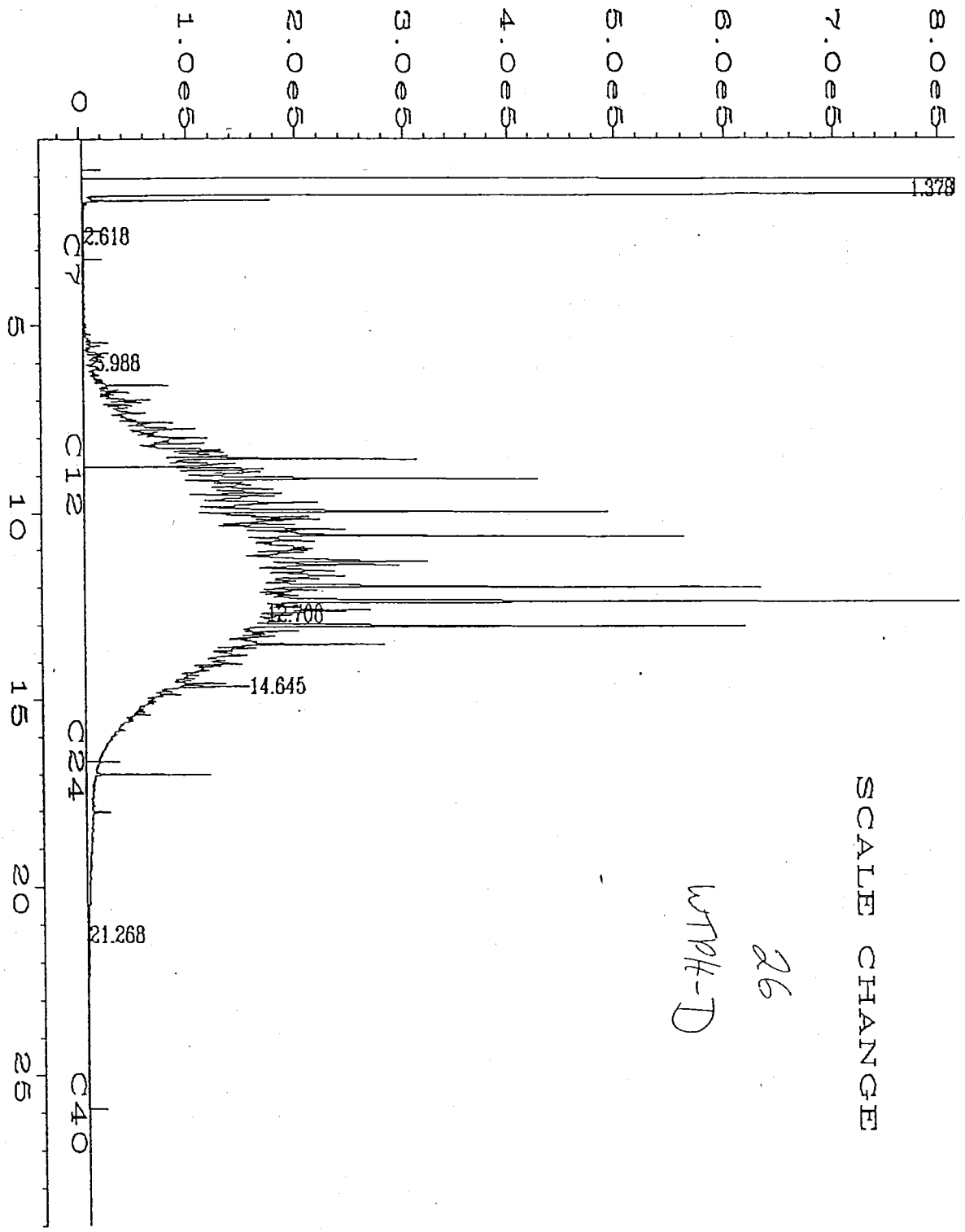
Comments: FAX results to PAT SULLIVAN

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No" on back
Final Approval Signature:
Firm: Date:

103



Data File Name	: D:\HPCH\1\DATA\S092095A\013F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 13
Sample Name	: 509258-5	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 21 Sep 95 01:37 AM	Instrument Method	: TPHD.MTH
Report Created on	: 21 Sep 95 04:45 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

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October 9, 1995

GeoEngineers

OCT 0 9 1995

Routing

File

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

RE: JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Sep. 26, 1995. For your reference, these analyses have been assigned our NCA # P509357.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-HCID per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509357
Matrix: soil
Sampled: 09/25/95
Received: 09/26/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
27	P509357-4	Gasoline	DET *[1]	20	09/27/95	09/28/95
		Diesel	DET	50		
		Heavy/Oil	DET	100		
28	P509357-5	Gasoline	DET *[1]	20	09/27/95	09/28/95
		Diesel	DET	50		
		Heavy/Oil	DET	100		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D Extended per Washington State DOE

Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509357
Matrix: soil
Sampled: 09/25/95
Received: 09/26/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
SP-6	P509357-1	Diesel/Related	130	25	09/27/95	09/27/95
		Heavy oil/Related	130	50		
SP-7	P509357-2	Diesel/Related	140 *2	25	09/27/95	09/27/95
		Heavy oil/Related	300	50		
SP-8	P509357-3	Diesel/Related	210	25	09/27/95	09/27/95
		Heavy oil/Related	130	50		
27	P509357-4	Diesel/Related	3300	100	09/29/95	09/29/95
		Heavy oil/Related	2400	200		
28	P509357-5	Diesel/Related	12000	100	09/29/95	09/29/95
		Heavy oil/Related	4000	200		
29	P509357-6	Diesel/Related	ND	25	09/27/95	09/27/95
		Heavy oil/Related	ND	50		
30	P509357-7	Diesel/Related	ND	25	09/27/95	09/27/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P509357
Received: 09/26/1995

Sample Name	Analyte	Result	Control Limits
WTPH-HCID per Washington State DOE			
27	4-Bromofluorobenzene	87	50-150
	1-Chlorooctadecane	95	50-150
28	4-Bromofluorobenzene	106	50-150
	1-Chlorooctadecane	106	50-150
WTPH-D Extended per Washington State DOE			
SP-6	1-Chlorooctadecane	82	50-150
SP-7	1-Chlorooctadecane	73	50-150
SP-8	1-Chlorooctadecane	88	50-150
27	1-Chlorooctadecane	83	50-150
28	1-Chlorooctadecane	73	50-150
29	1-Chlorooctadecane	98	50-150
30	1-Chlorooctadecane	82	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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COMMENTS

Client:	GeoEngineers, Inc.	NCA Number:	P509357
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	09/26/1995

1. Detected hydrocarbons in the gasoline range appear to be due to overlap of diesel range hydrocarbons.

2. Detected hydrocarbons in the diesel range appear to be due to overlap of heavy/oil range hydrocarbons.

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October 9, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P509357.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

NORTH CREEK ANALYTICAL
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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

BATCH QUALITY CONTROL RESULTS
WTPH-HCID per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P509357
Received: 09/26/95

METHOD BLANK
Batch # FV95016a
Results In mg/kg (ppm)

Compound	Result	MRL
Gasoline	ND	20
Diesel	ND	50
Heavy/Oil	ND	100
Date Prepared	09/27/95	
Date Analyzed	09/27/95	

Surrogate Recovery (%)	Result	Control Limit
4-Bromofluorobenzene	78	50-150
1-Chlorooctadecane	89	50-150

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client:	GeoEngineers, Inc.	**NCA Project #:**	P509357
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	09/26/95

METHOD BLANK
Batch # FX95026c
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	09/27/95	
Date Analyzed	09/27/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	92	50-150

METHOD BLANK
Batch # FX95026d
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	09/29/95	
Date Analyzed	09/29/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	90	50-150

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P509357
Received: 09/26/95

DUPLICATE
Batch # FX95026c
Results In mg/kg (ppm)

Duplicate ID P509354-1

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	100	120	19	50

LABORATORY CONTROL SAMPLE
Batch # FX95026a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	120	100	50-150

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 0046
Site Address: 217 E. STEUBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ☒ Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers, Inc. Project Number: 161-181-P02
Address: 7504 SW BRIDGEPORT RD.
PORTLAND, OR 97224
Phone: 503/624 9274 Fax: 620 5940
Project Manager: PAT SULLIVAN
Sample Collection by: RVK

Chain of Custody Record #:

Quality Assurance Data Level: ☒ A ☐ B
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | ☒ 2 | 1

o Oregon o Washington / Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID w/TPH-Hcid	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended w/TPH-D Ext	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)					
1. SP-6	9/25/95 1320	S	1					X	X										X	RK			
2. SP-7	1325	"	1					X	X										X	RK			
3. SP-8	1330		1					X	X										X				
4. 27	1340		1	X				X	X														
5. 28	1350		1	X				X	X														
6. 29	1440		1					X	X														
7. 30	1445	"	1					X	X														
8.																							
9.																							
10.																							

7.2°

NCA SAMPLE NUMBER
P509357-1
2
3
4
5
6
7
8

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GE-PO	9-26-95 0840	Sara McClurg	NCA	9-26-95 0840
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back

Firm: Date:

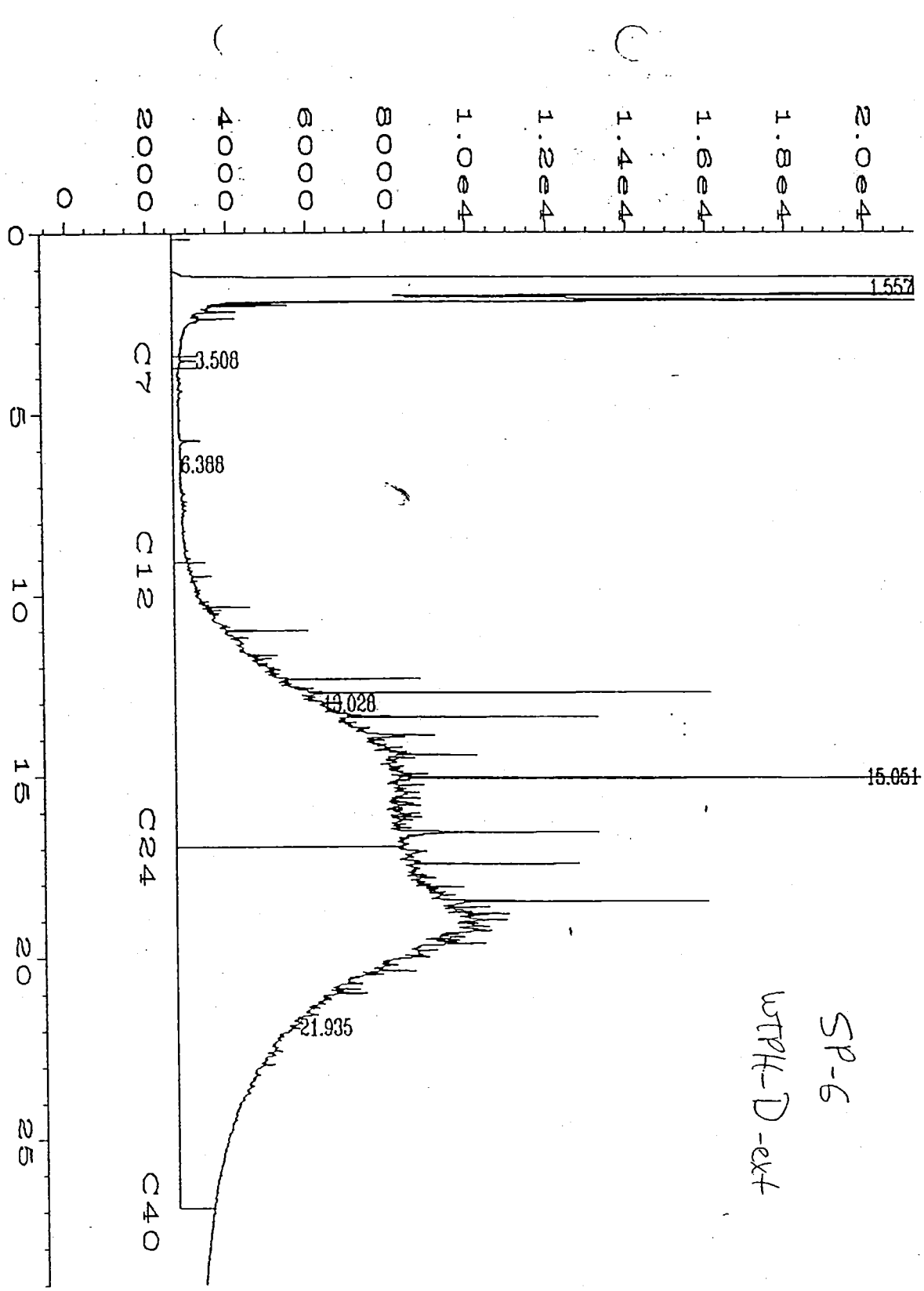
Page 1 of 1

Rev. 2.2, 11/94

Comments: PHA WILL CALL W/ ANALYSIS REQUEST FOR SAMPLES SP-6, SP-7 & SP-8. RK

Distribution: White - Laboratory; Yellow - Consultant; Photocopy - Unocal

115

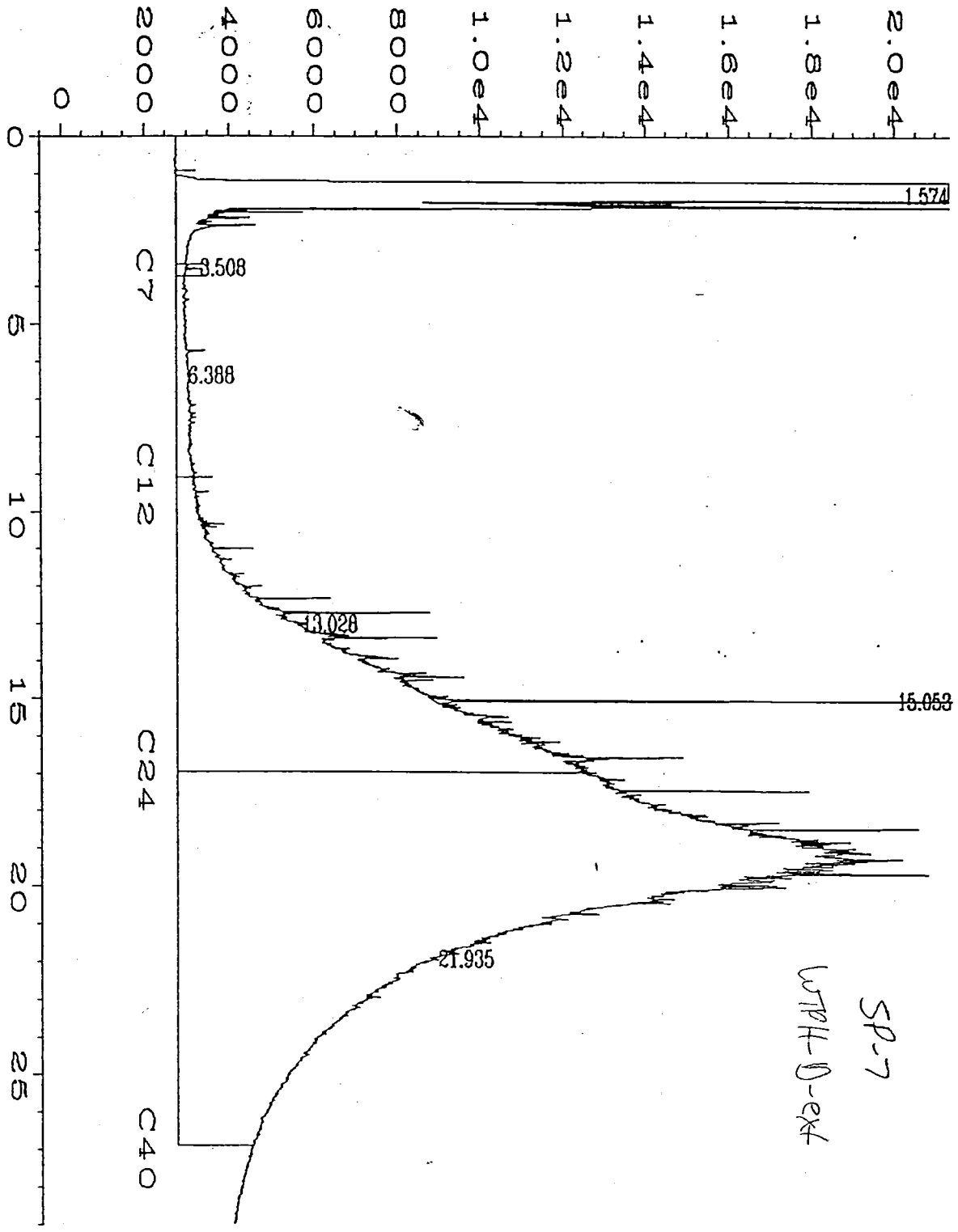


user modified

Sp-6
wtph-D-ext

Data File Name : D:\HPCH\1\DATA\S092695\029R0101.D

Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 29
Sample Name	: 509357-1	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 27 Sep 95 05:03 PM	Instrument Method:	TPHD.MTH
Report Created on:	28 Sep 95 03:11 PM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



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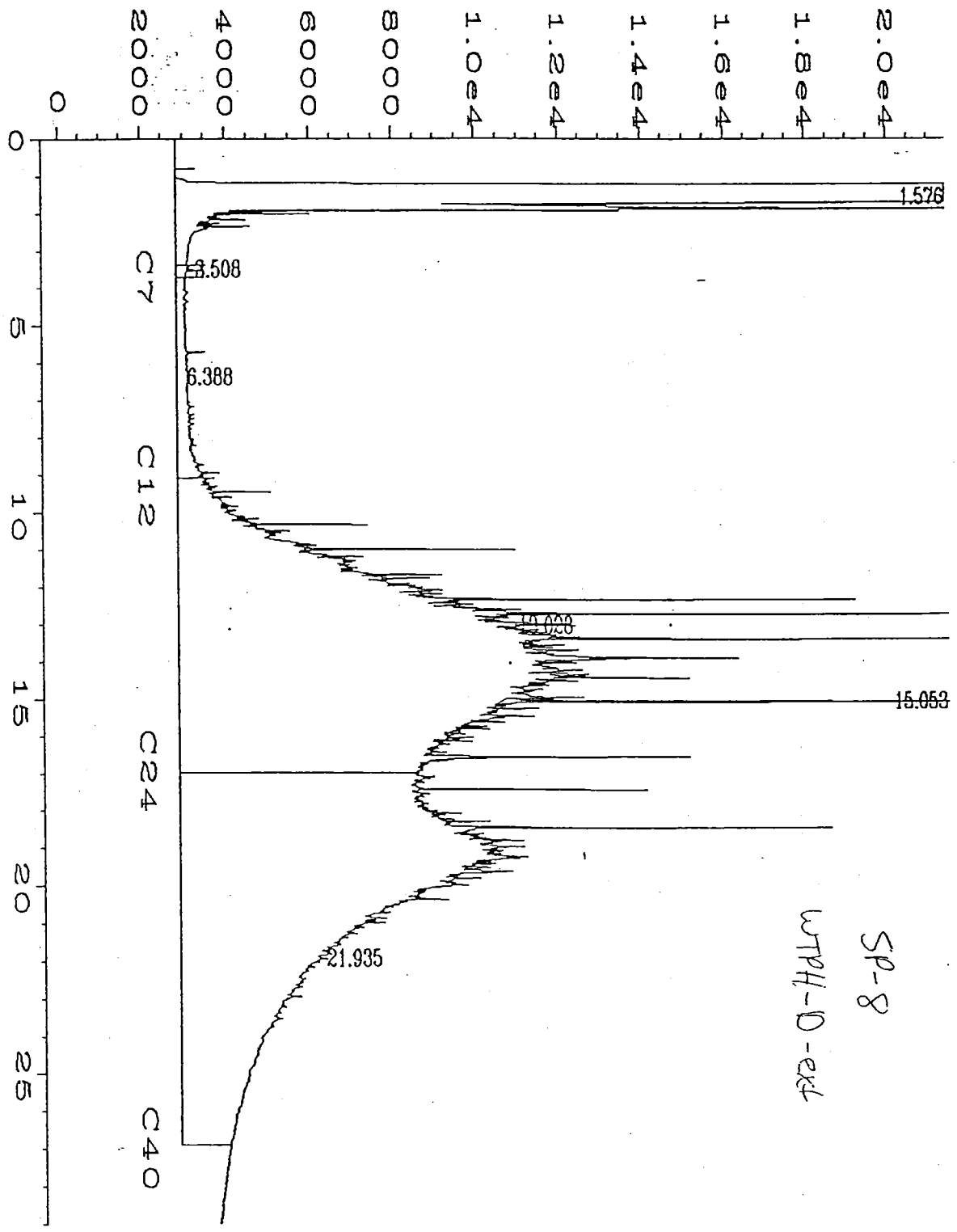
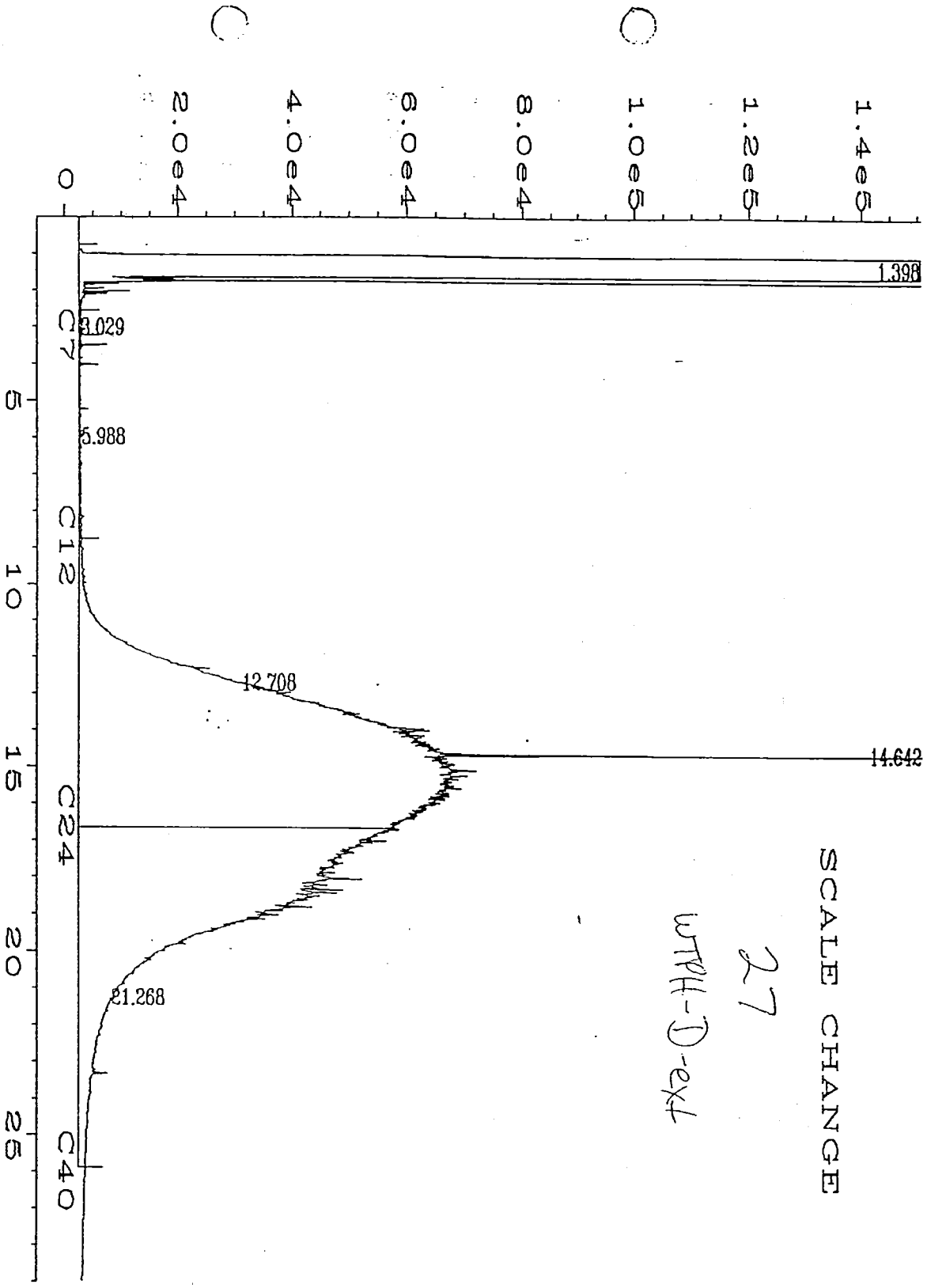
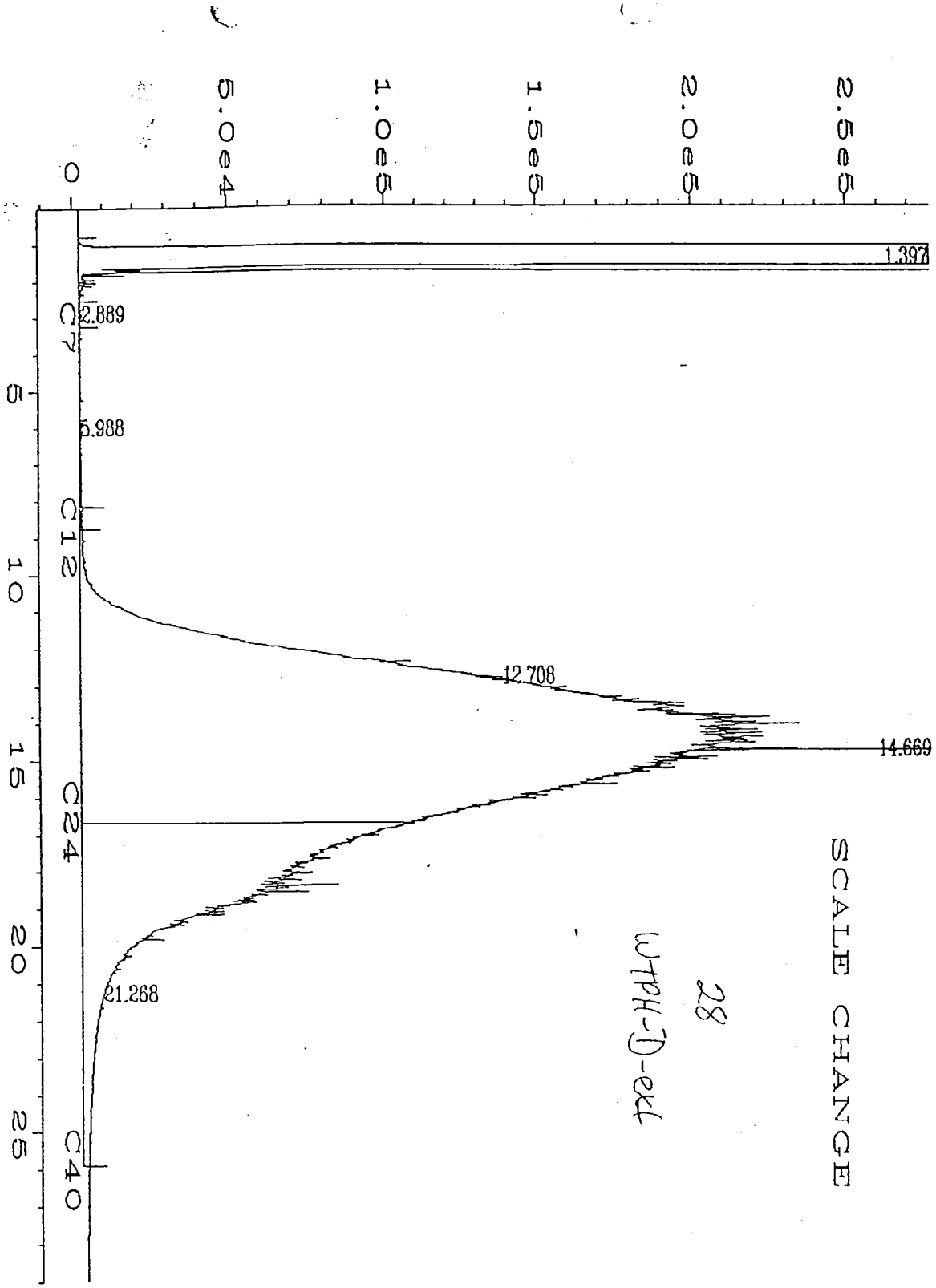
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 30
Sample Name	: 509357-2	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 27 Sep 95 05:40 PM	Instrument Method	: TPHD.MTH
Report Created on	: 27 Sep 95 06:21 PM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
Multiplier	: 0.4963	ISTD Amount	:



Data File Name	: D:\HPCH\1\DATA\S092695\031R0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 31
Sample Name	: 509357-3	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 27 Sep 95 06:23 PM	Instrument Method	: TPHD.MTH
Report Created on	: 27 Sep 95 07:03 PM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
Multiplier	: 0.4916	ISTD Amount	:



Data File Name	: D:\HPCH\1\DATA\S092995A\010F0301.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 10
Sample Name	: 509357A-4	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 3
Acquired on	: 29 Sep 95 10:35 PM	Instrument Method	: TPHD.MTH
Report Created on	: 02 Oct 95 12:14 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: D:\HPCH\1\DATA\S092995A\011F0301.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 11
Sample Name	: 509357A-5	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 3
Acquired on	: 29 Sep 95 11:17 PM	Instrument Method	: TPHD.MTH
Report Created on	: 02 Oct 95 12:17 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

October 23, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

GeoEngineers
OCT 26 1995
Routing
File

Attention: Pat Sullivan

RE: JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Oct. 09, 1995. For your reference, these analyses have been assigned our NCA # P510144.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

NORTH CREEK ANALYTICAL
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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510144
Matrix: soil
Sampled: 10/09/95
Received: 10/09/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
31	P510144-1	Diesel/Related	180	25	10/09/95	10/09/95
		Heavy oil/Related	260	50		
32	P510144-2	Diesel/Related	590 *[1]	130	10/09/95	10/09/95
		Heavy oil/Related	1900	250		
33	P510144-3	Diesel/Related	ND	25	10/09/95	10/09/95
		Heavy oil/Related	ND	50		
34	P510144-4	Diesel/Related	ND	25	10/09/95	10/09/95
		Heavy oil/Related	ND	50		
35	P510144-5	Diesel/Related	ND	25	10/09/95	10/10/95
		Heavy oil/Related	ND	50		
36	P510144-6	Diesel/Related	86	25	10/09/95	10/10/95
		Heavy oil/Related	130	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P510144
Received: 10/09/1995

Sample Name	Analyte	Result	Control Limits
WTPH-D Extended per Washington State DOE			
31	1-Chlorooctadecane	100	50-150
32	1-Chlorooctadecane	117	50-150
33	1-Chlorooctadecane	104	50-150
34	1-Chlorooctadecane	96	50-150
35	1-Chlorooctadecane	89	50-150
36	1-Chlorooctadecane	97	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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COMMENTS

Client:	GeoEngineers, Inc.	NCA Number:	P510144
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	10/09/1995

1. Detected hydrocarbons in the diesel range appear to be due to overlap of heavy/oil range hydrocarbons.

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October 23, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P510144.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc. **NCA Project #:** P510144
Project: UNOCAL #0046, BINGEN, WA **Received:** 10/09/95

METHOD BLANK
Batch # FX95027b
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	10/09/95	
Date Analyzed	10/09/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	85	50-150

DUPLICATE
Batch # FX95027b **Duplicate ID P510144-1**
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	150	120	23	00

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc. **NCA Project #:** P510144
Project: UNOCAL #0046, BINGEN, WA **Received:** 10/09/95

LABORATORY CONTROL SAMPLE
Batch # FX95027a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	100	83	50-150

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP #0046
Site Address:
City, State, ZIP: BINGEN, WA
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ☒ Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GEO ENGINEERS Project Number: 161-181-P62
Address: 7504 SW BRIDGEPORT RD
PTLD, OR 97224
Phone: 503/624 6274 Fax: 6205940
Project Manager: PAT SULLIVAN
Sample Collection by: RFK

Chain of Custody Record #:

Quality Assurance Data Level:
A: Standard Summary
B: Standard + Chromatograms

Labdratory Turnaround Days: 10 | 5 | 3 | 2 | ☒ 1

o Oregon ☒ Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel (WTPH-D EXT.)	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)					NCA SAMPLE NUMBER
1. 31	10/9/95 1200	S	1					X															P510144-1
2. 32	1500		1					X															2
3. 33	1505		1					X															3
4. 34	1510		1					X															4
5. 35	1515		1					X															5
6. 36	1520	↓	1					X															6
7.																							
8.																							
9.																							
10.																							

17.3

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GEO	10/9/95 1745	[signature]	NCA	10/9/95 1745
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back

Firm: Date:

Page 1 of 1
Rev. 2.2, 11/94

Comments: 24 HR T.A.T.!

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

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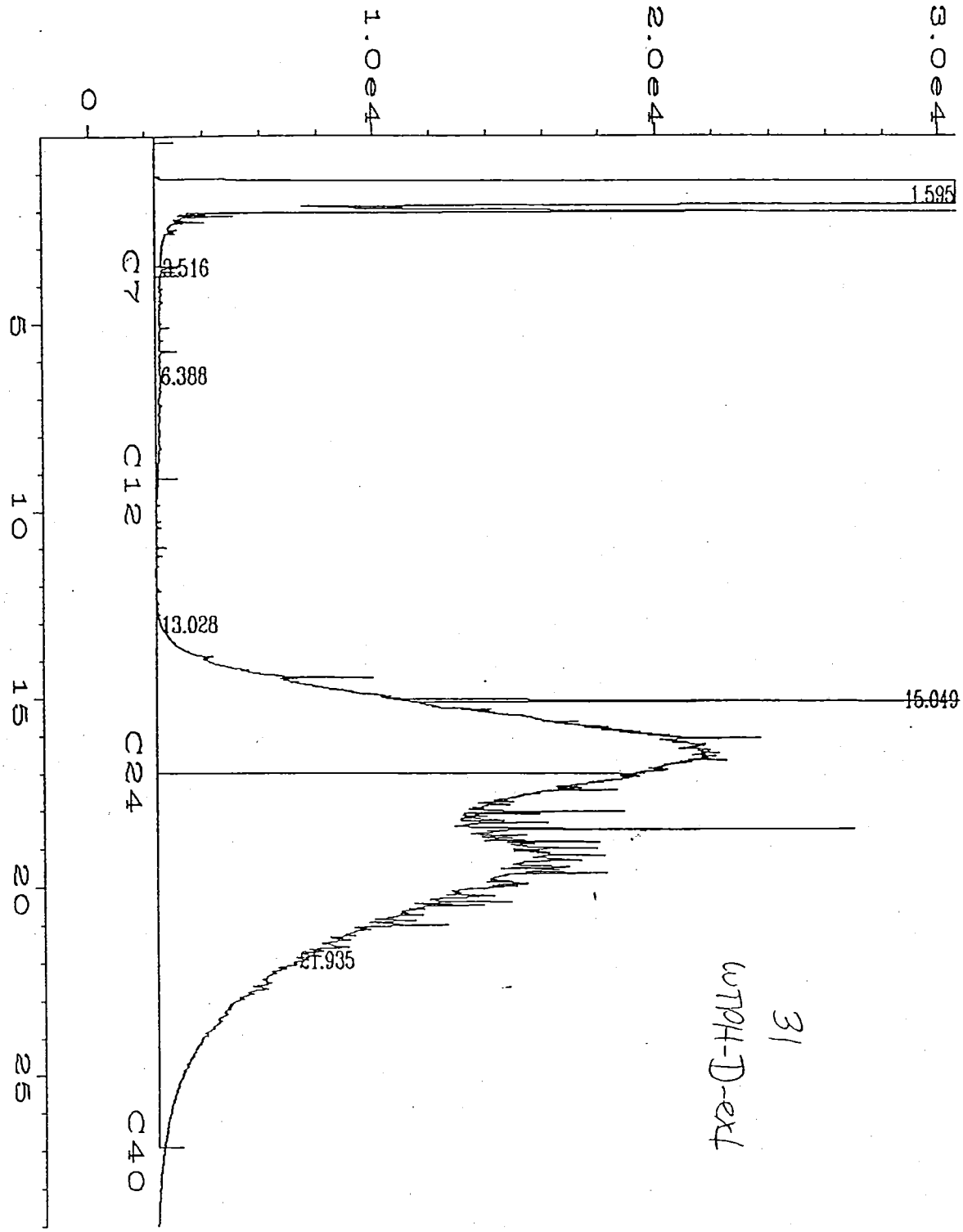

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Operator : LQN
Instrument : DUALFID2
Sample Name : 510144-1
Run Time Bar Code:
Acquired on : 09 Oct 95 09:00 PM
Report Created on: 10 Oct 95 05:55 PM
Last Recalib on : 19 AUG 95 06:21 PM
Multiplier : 1

Page Number : 1
Vial Number : 33
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHDR.MTH
Sample Amount : 0
ISTD Amount :

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510186
Received: 10/11/95

LABORATORY CONTROL SAMPLE
Batch # FX95028a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	140	117	50-150

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 0046
Site Address: 216 E. Sprague
City, State, ZIP: Bingen, WA 98605
Site Release Number:
Unocal Manager: Kipp Eckert
CERT INFO: (check one) o Evaluation ~~o Remediation~~
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers, Inc. Project Number: 1661-181-P02
Address: 7504 SW Bridgeport Rd.
Portland, OR 97224
Phone: 503/624-9274 Fax: 6205940
Project Manager: Pat Sullivan
Sample Collection by: RFK

Chain of Custody Record #:

Quality Assurance Data Level: ~~A~~ B
A: Standard Summary
B: Standard + Chromatograms
Laboratory Turnaround Days: 10 5 3 2 ~~1~~

o Oregon o Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: ~~Total~~ or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 49	10/11/95 0900	S	1						X										PS10186-1
2. 50	0920		1						X										2
3. 51	0930		1						X										3
4. 52	0940		1						X										4
5. 53	0950		1						X										5
6. 54	1000		1						X										6
7. 55	1010		1						X										7
8. 56	1130		1						X										8
9. 57	1140		1						X										9
10. 58	1200	W	1						X										10

8.6

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GE-PO	10/11/95 1725	[signature]	NCA	10/11/95 1725
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back
Firm: Date:

Page 1 of 2
v. 2.2, 11/94

Comments: 24-HR T.A.T.!

Distribution: White - Laboratory Yellow - Consultant Photocopy

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 0046
Site Address: 216 E. STUBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ~~o Remediation~~
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers, Inc. Project Number: 1161-181-P62
Address: 7504 SW BRIDGEPORT RD
PTLD, OR 97224
Phone: 503/624 9274 Fax: 620 5940
Project Manager: PAT SULLIVAN
Sample Collection by: RFK

Chain of Custody Record #:

Quality Assurance Data Level: [X] A [B] B
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | 2 | [X]

o Oregon (o) Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 59	10/11/95 1240	S	1						X										P510186-11
2. 60	1250		1						X										12
3. 61	1300		1						X										13
4. 62	1310		1						X										14
5.																			
6.																			
7.																			
8.																			
9.																			
10.																			

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GEI-PD	10/11/95 1725	Kevin L. Starkey	DOH	10/11/95 1725
2.					
3.					

Final Report Approval

Were all requested results provided? yes | no Define
Were results within requested turnaround? yes | no "No"
Final Approval Signature: on back

Firm: Date:

Page 2 of 2
Rev. 2.2, 11/94

Comments: 24-HR. T.A.T.!

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

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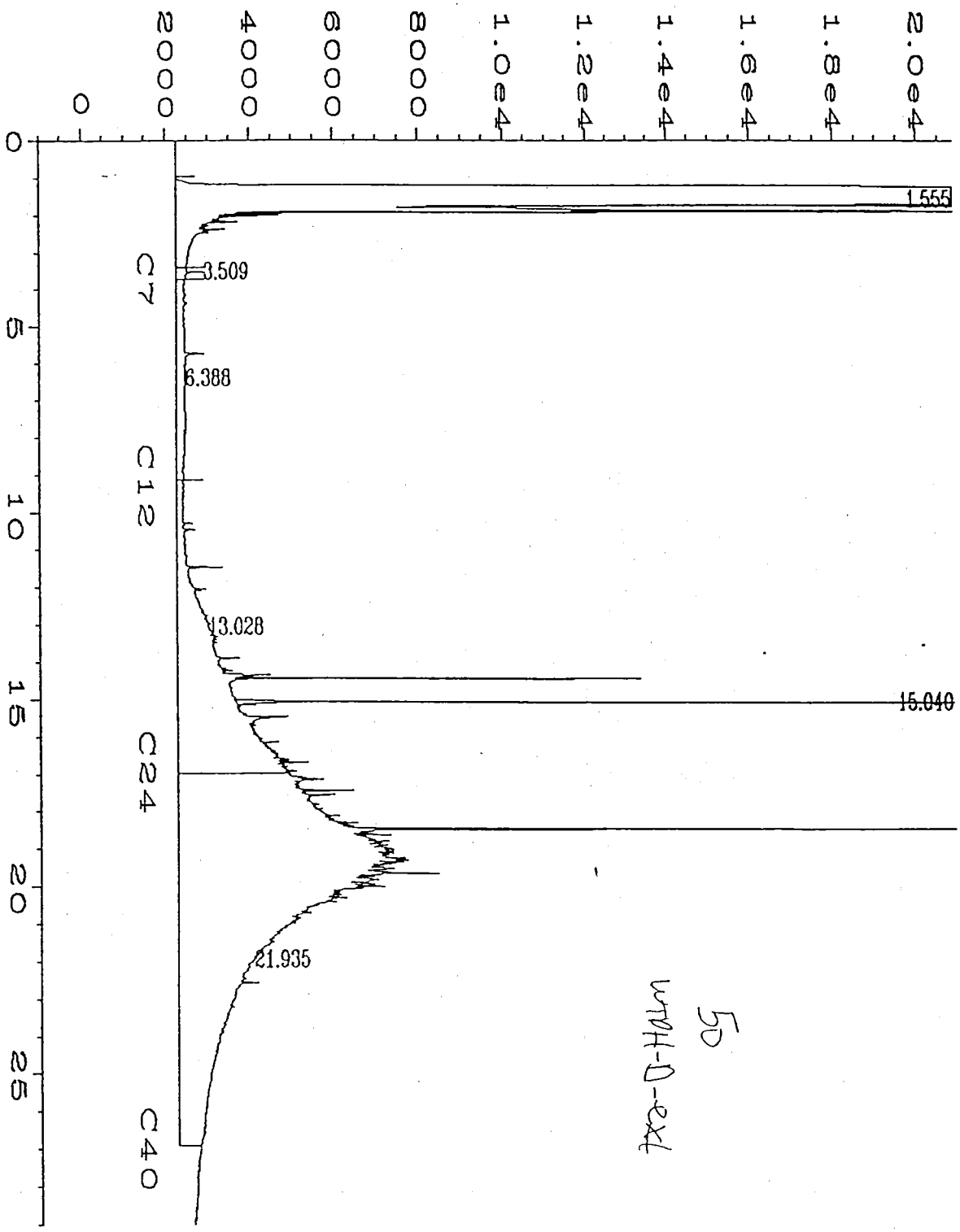

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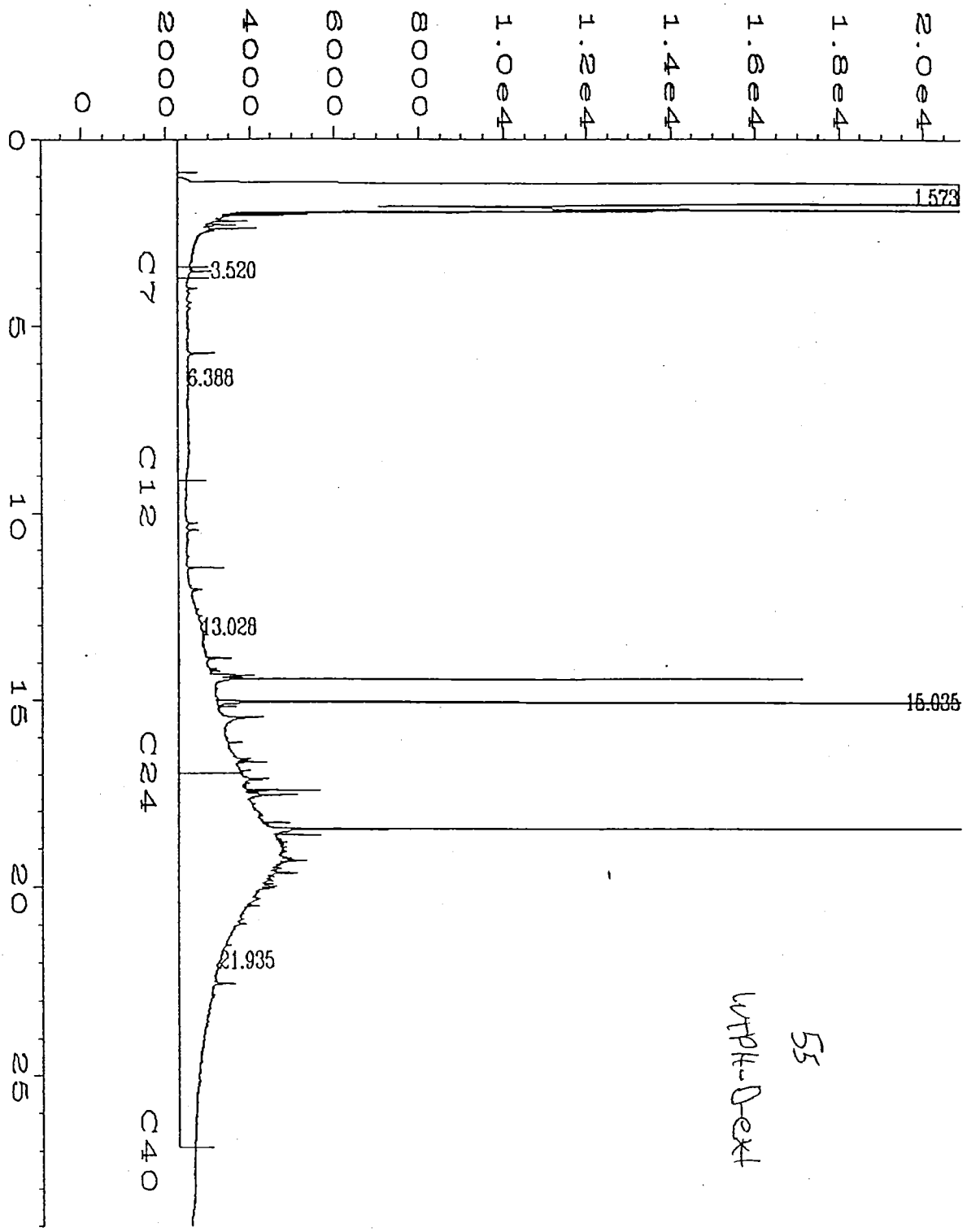
Instrument	: DUALFID2	Vial Number	: 31
Sample Name	: 510186-2	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 11 Oct 95 10:11 PM	Instrument Method	: TPHD.MTH
Report Created on	: 12 Oct 95 12:59 PM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



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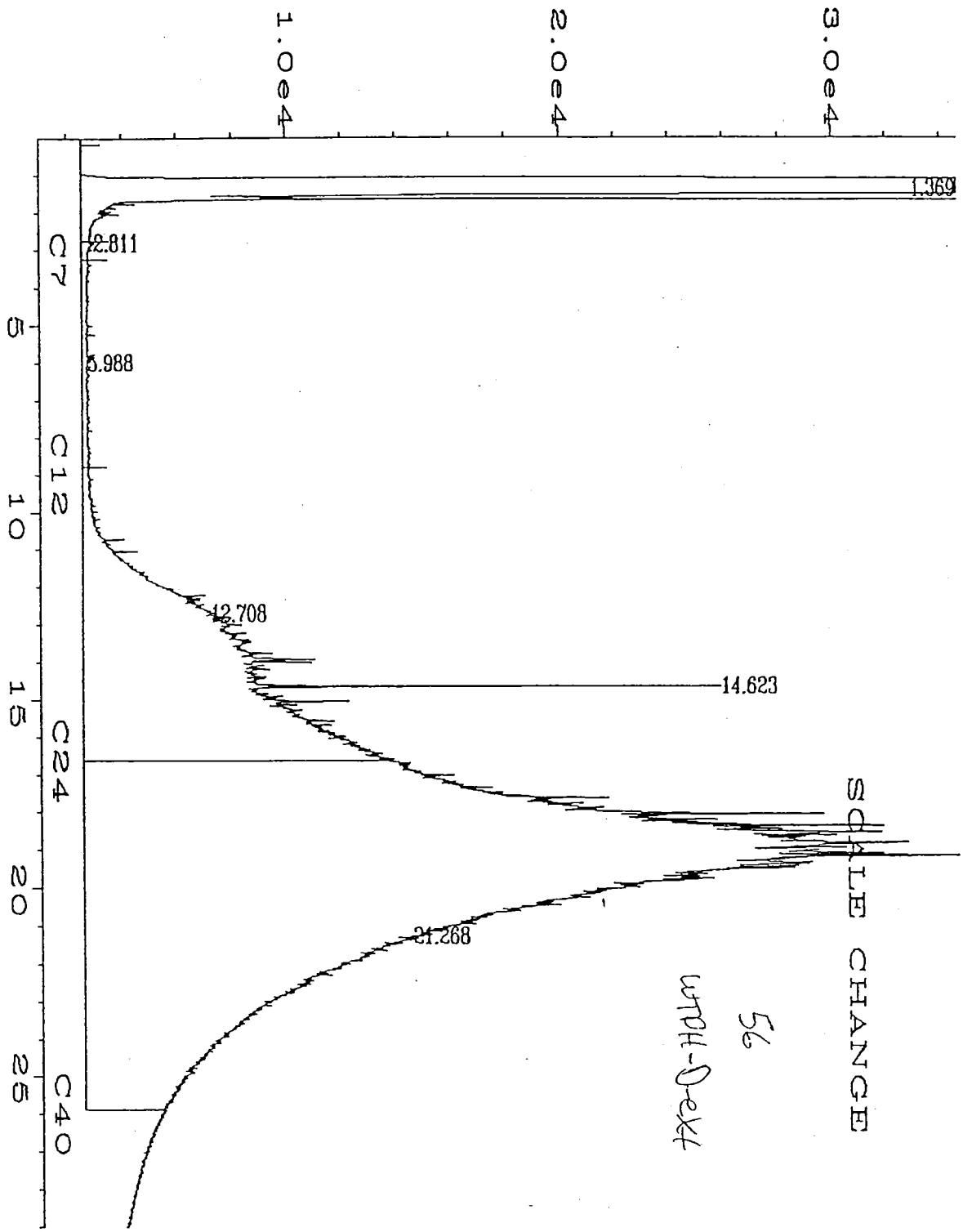
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 36
Sample Name	: 510186-7	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 12 Oct 95 01:35 AM	Instrument Method	: TPHD.MTH
Report Created on	: 12 Oct 95 02:16 AM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
Multiplier	: 0.4978	ISTD Amount	:



Data File Name : D:\HPCH\1\DATA\S101195\005F0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 510186-8 x5
Run Time Bar Code:
Acquired on : 11 Oct 95 09:30 PM
Report Created on: 12 Oct 95 12:57 PM
Last Recalib on : 31 AUG 95 01:40 PM
Multiplier : 1

Page Number : 1
Vial Number : 5
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHD.MTH
Sample Amount : 0
ISTD Amount :

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October 23, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

RE: JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Oct. 16, 1995. For your reference, these analyses have been assigned our NCA # P510242.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510242
Matrix: soil
Sampled: 10/16/95
Received: 10/16/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
63	P510242-1	Diesel/Related	170	25	10/16/95	10/17/95
		Heavy oil/Related	ND	50		
64	P510242-2	Diesel/Related	3800	250	10/16/95	10/17/95
		Heavy oil/Related	12000	500		
65	P510242-3	Diesel/Related	190	130	10/16/95	10/17/95
		Heavy oil/Related	750	250		
66	P510242-4	Diesel/Related	1600	130	10/16/95	10/17/95
		Heavy oil/Related	4200	250		
67	P510242-5	Diesel/Related	86	25	10/16/95	10/17/95
		Heavy oil/Related	120	50		
68	P510242-6	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	110	50		
69	P510242-7	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	200	50		
70	P510242-8	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	ND	50		
71	P510242-9	Diesel/Related	ND	25	10/16/95	10/16/95
		Heavy oil/Related	ND	50		
72	P510242-10	Diesel/Related	ND	25	10/16/95	10/16/95
		Heavy oil/Related	ND	50		
73	P510242-11	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	ND	50		
74	P510242-12	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	ND	50		
75	P510242-13	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	ND	50		
76	P510242-14	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510242
Matrix: soil
Sampled: 10/16/95
Received: 10/16/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
77	P510242-15	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	ND	50		
78	P510242-16	Diesel/Related	ND	25	10/16/95	10/17/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P510242
Received: 10/16/1995

Sample Name	Analyte	Result	Control Limits
WTPH-D Extended per Washington State DOE			
63	1-Chlorooctadecane	80	50-150
64	1-Chlorooctadecane	97	50-150
65	1-Chlorooctadecane	64	50-150
66	1-Chlorooctadecane	80	50-150
67	1-Chlorooctadecane	72	50-150
68	1-Chlorooctadecane	72	50-150
69	1-Chlorooctadecane	80	50-150
70	1-Chlorooctadecane	89	50-150
71	1-Chlorooctadecane	79	50-150
72	1-Chlorooctadecane	84	50-150
73	1-Chlorooctadecane	88	50-150
74	1-Chlorooctadecane	86	50-150
75	1-Chlorooctadecane	88	50-150
76	1-Chlorooctadecane	85	50-150
77	1-Chlorooctadecane	84	50-150
78	1-Chlorooctadecane	89	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

NORTH CREEK ANALYTICAL

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

October 23, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P510242.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{(\text{Measured Concentration})}{(\text{Actual Concentration})} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{(\text{Result of Test 1} - \text{Result of Test 2})}{(\text{Result of Test 1} + \text{Result of Test 2})/2} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P510242
Received: 10/16/95

METHOD BLANK
Batch # FX95029a
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	10/16/95	
Date Analyzed	10/16/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	84	50-150

DUPLICATE
Batch # FX95029a
Duplicate ID P510242-8
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

DUPLICATE
Batch # FX95029y
Duplicate ID P510242-12
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client:	GeoEngineers, Inc.	**NCA Project #:**	P510242
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	10/16/95

LABORATORY CONTROL SAMPLE
Batch # FX95029a
Results in mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	110	92	50-150

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 00446
Site Address: 217 E. STUBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ~~x~~ Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoENGINEERS, INC. Project Number: 161-181-P02
Address: 7504 SW BRIDGEPORT RD.
PTLD, OR 97224
Phone: 503/624 9274 Fax: 620 5940
Project Manager: PAT SULLIVAN
Sample Collection by: RJK

Chain of Custody Record #:

Quality Assurance Data Level: A B
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | 2 | X

o Oregon (X) Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 63	10/16/95 1030	S	1						X										P510242-1
2. 64	1145		1						X										2
3. 65	1200		1						X										3
4. 66	1215		1						X										4
5. 67	1230		1						X										5
6. 68	1245		1						X										6
7. 69	1300		1						X										7
8. 70	1310		1						X										8
9. 71	1320		1						X										9
10. 72	1330		1						X										10

18.3

	Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1.	[signature]	GEI-PD	10/16/95 1610	[signature]	NCA	10/16/95 1610
2.						
3.						

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No" on back
Final Approval Signature:
Firm: Date:

Page 1 of 2
Rev. 2.2, 11/94

Comments:

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 00446
Site Address: 217 E. STUBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ~~o Remediation~~
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GEO ENGINEERS, INC. Project Number: 161-181-P62
Address: 7504 SW BRIDGEPORT RD.
PTLD, OR 97224
Phone: 503/624 9274 Fax: 620 5940
Project Manager: PAT SULLIVAN
Sample Collection by: RPK

Chain of Custody Record #:

Quality Assurance Data Level: [X] A [ ] B
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | 2 | [X] 1

o Oregon ~~o~~ Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 73	10/16/95 1340	S	1						X										PS10242-11
2. 74	1410		1						X										12
3. 75	1420		1						X										13
4. 76	1430		1						X										14
5. 77	1440		1						X										15
6. 78	1450		1						X										16
7.																			75
8.																			
9.																			
10.																			

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GEO-PD	10/16/95 1600	[signature]	NCA	10/16/95 18:10
2.					
3.					

Final Report Approval

Were all requested results provided? yes | no Define
Were results within requested turnaround? yes | no "No"
Final Approval Signature: on back

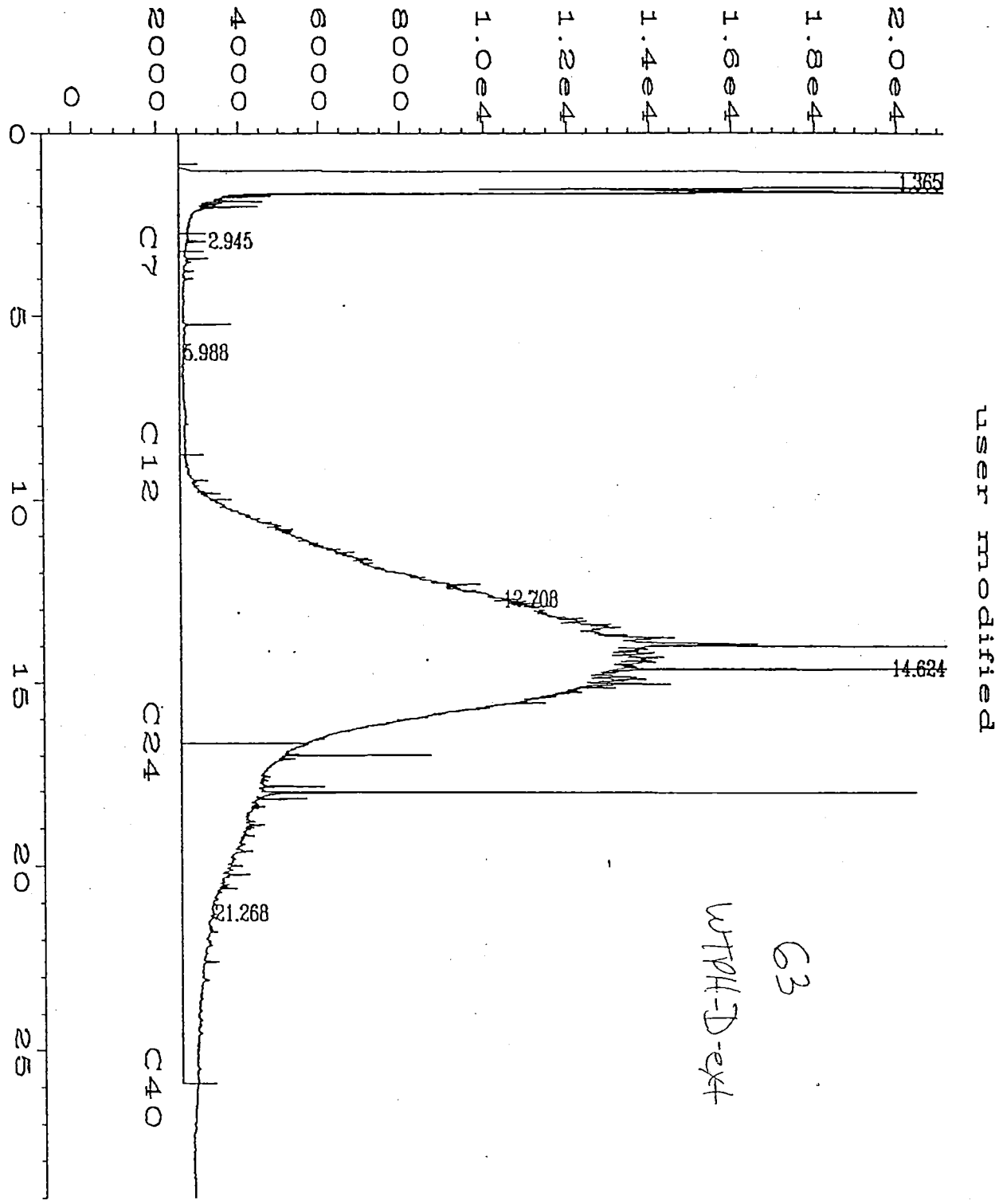
Firm: Date:

Page 2 of 2
v. 2.2, 11/94

Comments:

Distribution: White - Laboratory Yellow - Consultant Photocop. ocal

172



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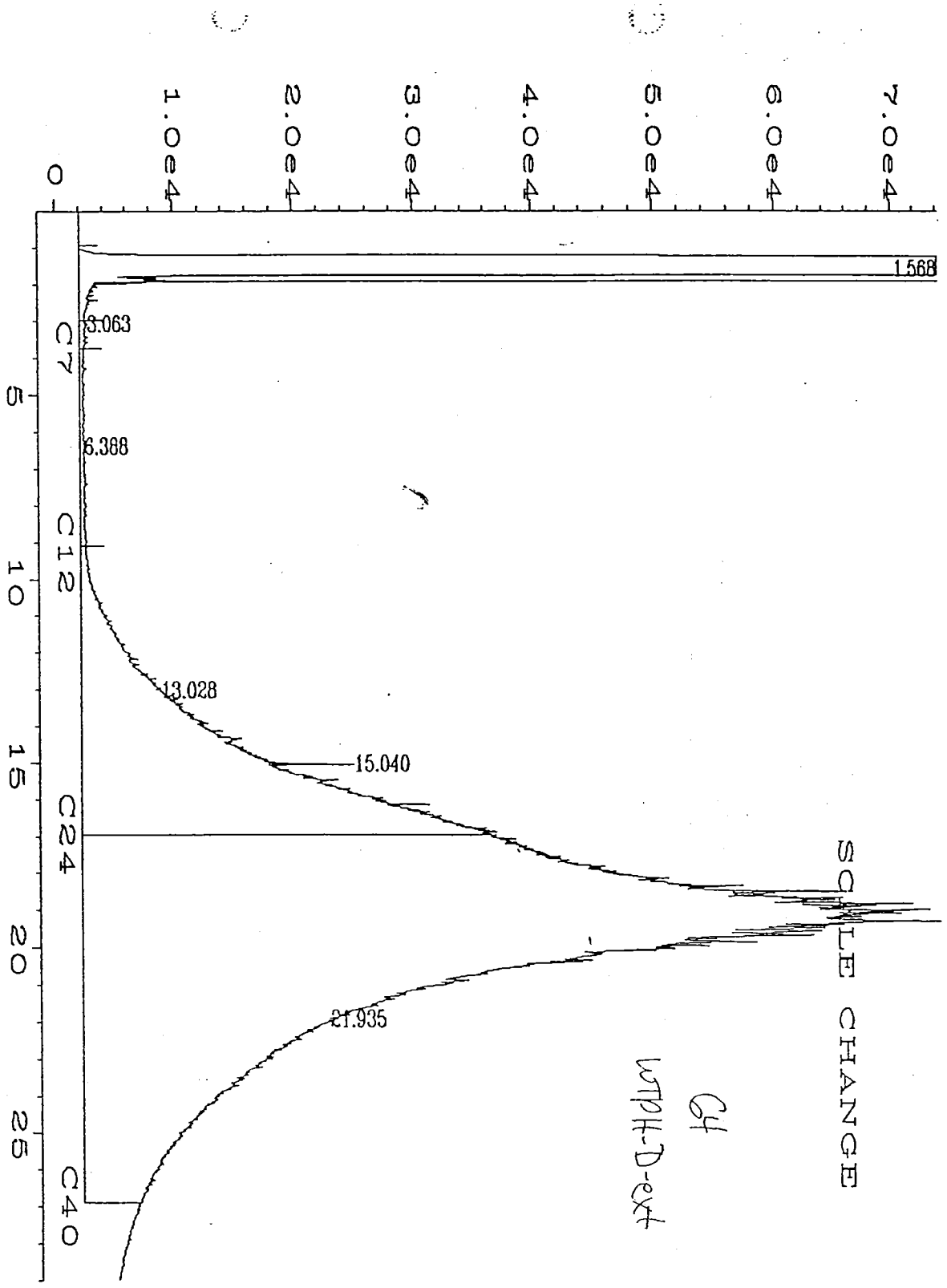
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 6
Sample Name	: 510242-1	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 17 Oct 95 10:29 AM	Instrument Method	: TPHD.MTH
Report Created on	: 17 Oct 95 11:07 AM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 0.4975	ISTD Amount	:



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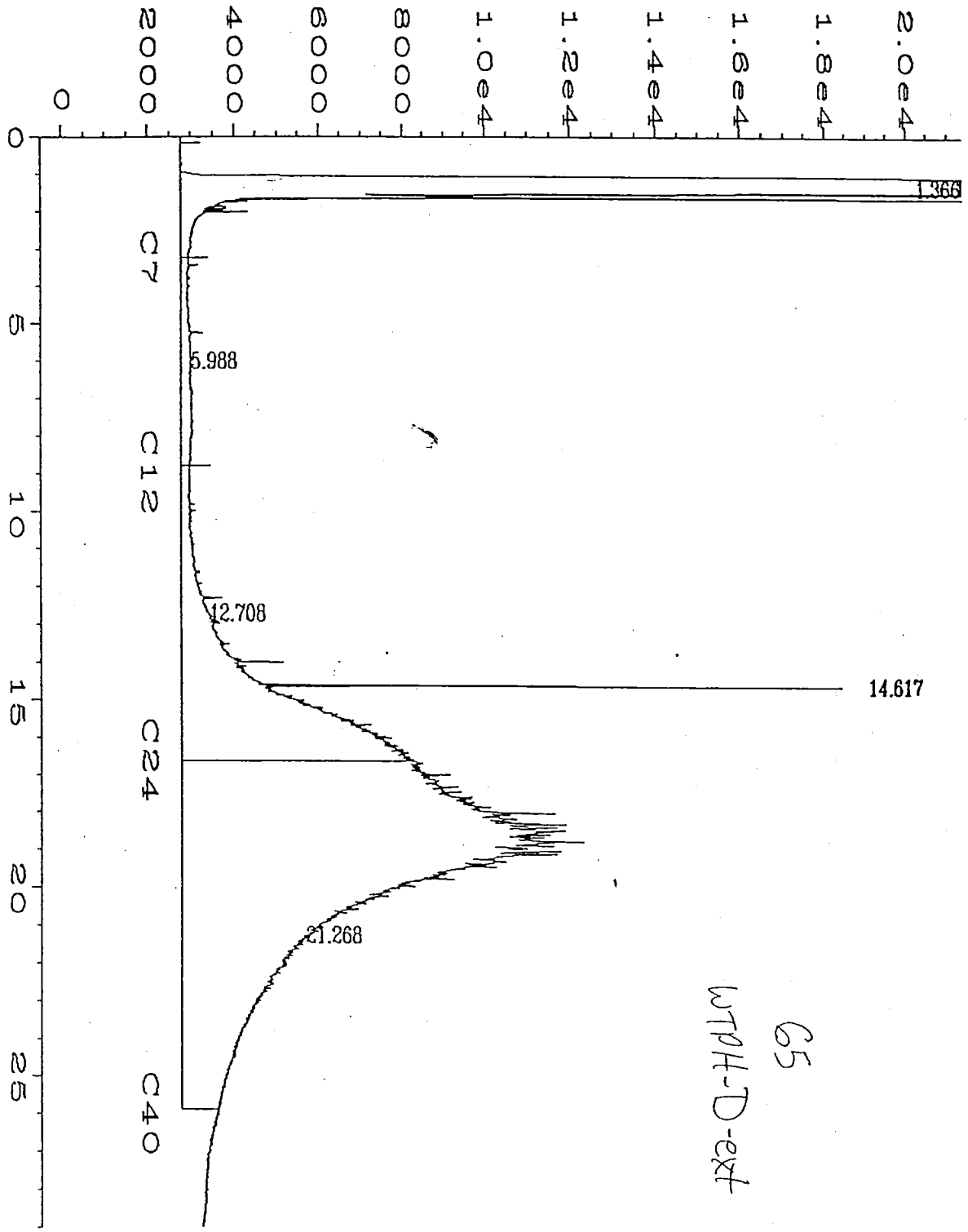
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 38
Sample Name	: 510142-2 x10	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 2
Acquired on	: 17 Oct 95 03:32 PM	Instrument Method	: TPHD.MTH
Report Created on	: 17 Oct 95 04:28 PM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

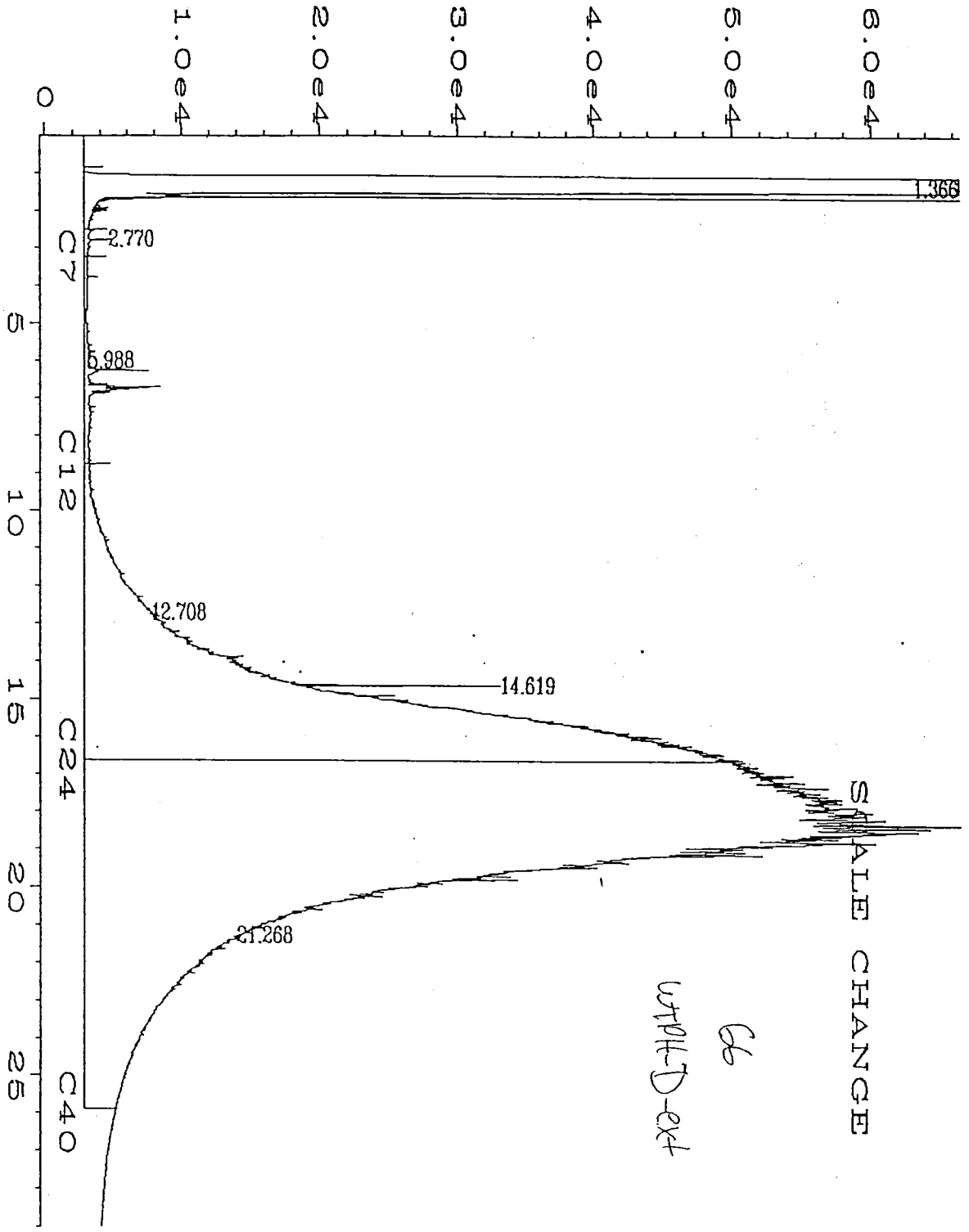


user modified

65
with D-ext

Data File Name : D:\HPCH\1\DATA\S101695A\007F0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 510~~142~~-3 x5
Run Time Bar Code: 242
Acquired on : 17 Oct 95 11:08 AM
Report Created on: 17 Oct 95 04:18 PM
Last Recalib on : 31 AUG 95 01:40 PM
Multiplier : 1

Page Number : 1
Vial Number : 7
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHD.MTH
Sample Amount : 0
ISTD Amount :



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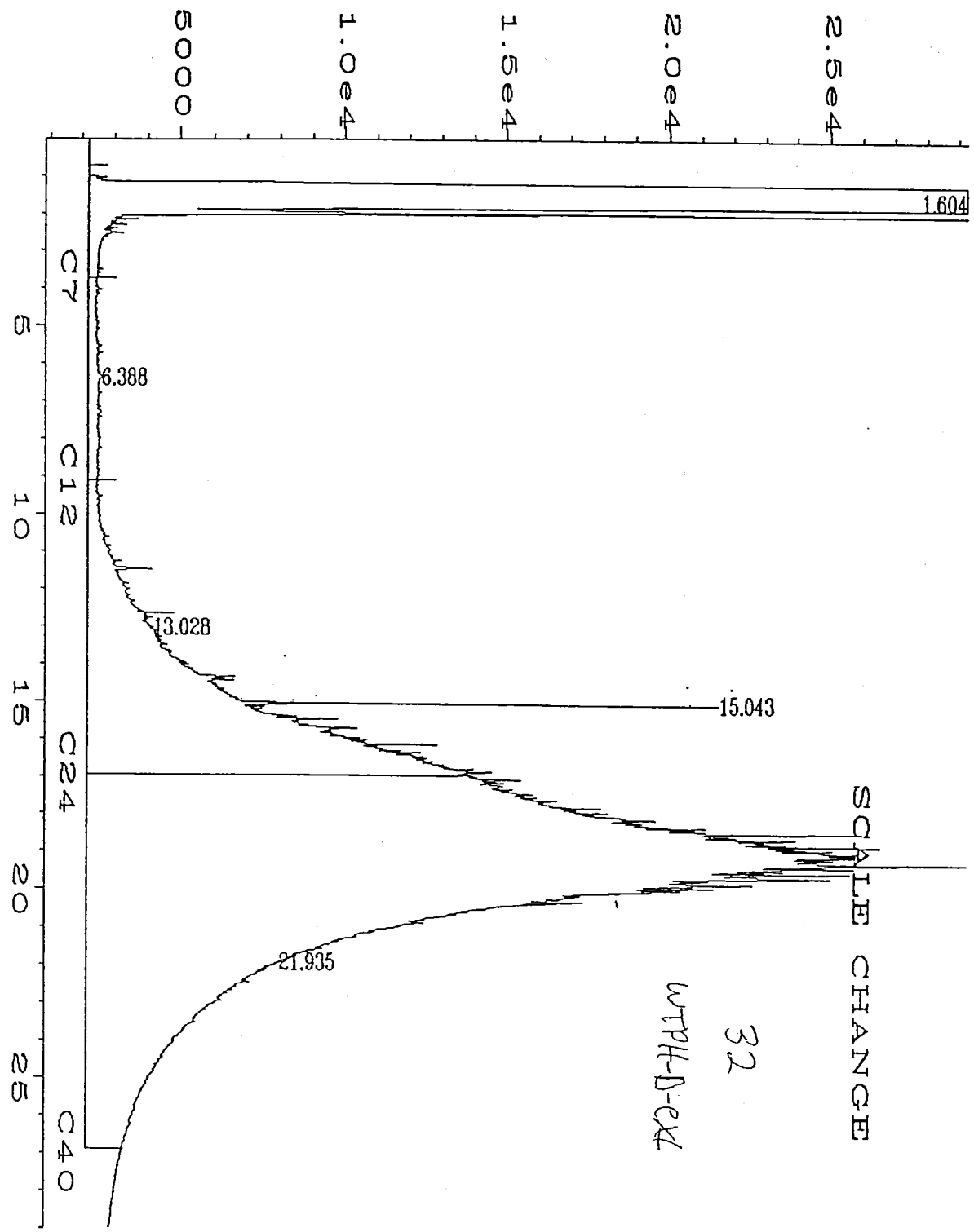
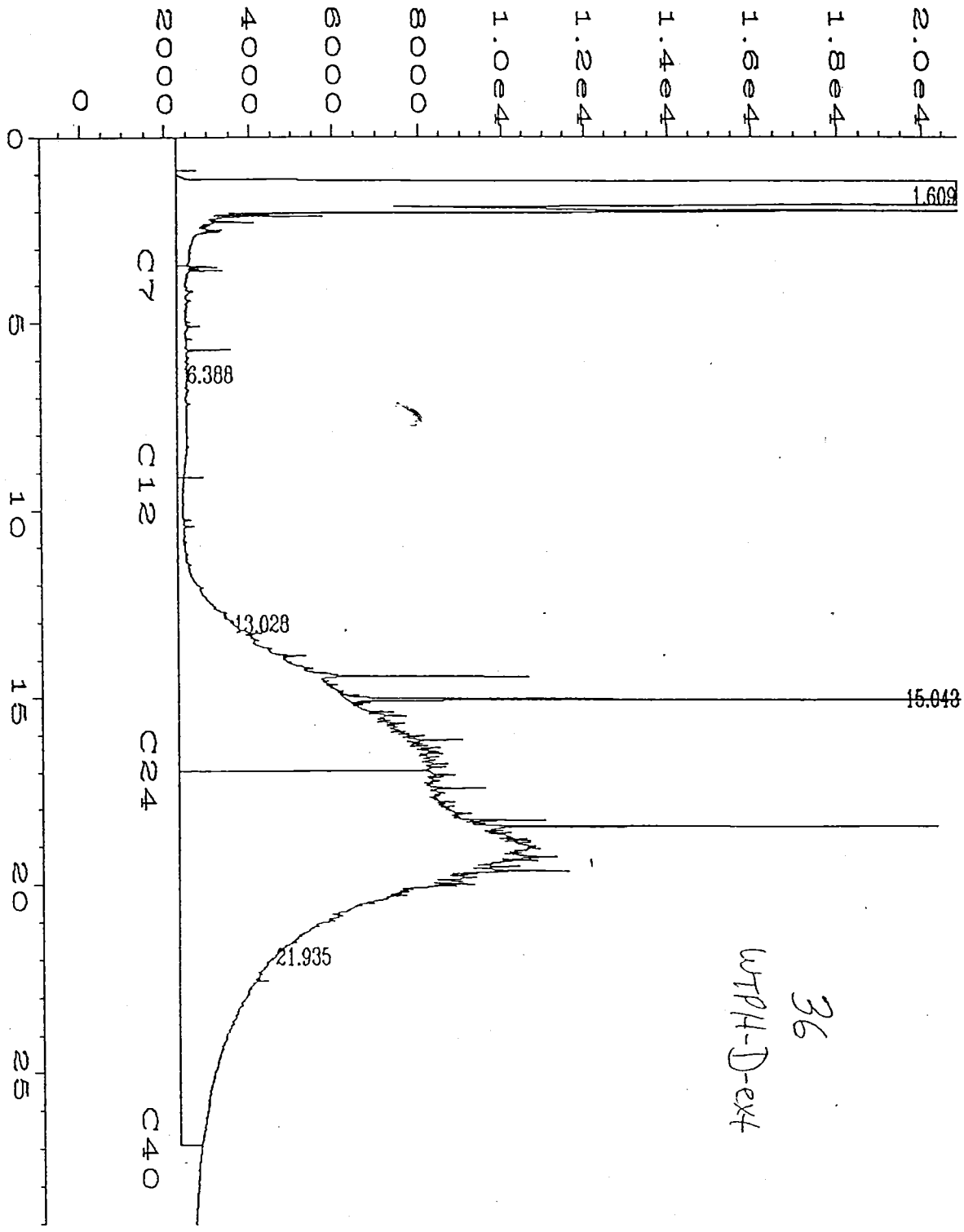
Operator : LQN
Instrument : DUALFID2
Sample Name : 510~~D42~~242-4 x5
Run Time Bar Code:
Acquired on : 17 Oct 95 12:08 PM
Report Created on: 17 Oct 95 04:32 PM
Last Recalib on : 31 AUG 95 01:40 PM
Multiplier : 1

Page Number : 1
Vial Number : 8
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHD.MTH
Sample Amount : 0
ISTD Amount :



Data File Name : D:\HPCH\1\DATA\S100995B\035R0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 510144-2 x5
Run Time Bar Code:
Acquired on : 09 Oct 95 10:22 PM
Report Created on: 10 Oct 95 06:05 PM
Last Recalib on : 19 AUG 95 06:21 PM
Multiplier : 1

Page Number : 1
Vial Number : 35
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHDR.MTH
Sample Amount : 0
ISTD Amount :



Data File Name	: D:\HPCH\1\DATA\S100995B\039R0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 39
Sample Name	: 510144-6	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 10 Oct 95 01:05 AM	Instrument Method	: TPHD.MTH
Report Created on	: 10 Oct 95 01:45 AM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
Multiplier	: 0.4946	ISTD Amount	:

NORTH CREEK ANALYTICAL

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October 16, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

RE: JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Oct. 10, 1995. For your reference, these analyses have been assigned our NCA # P510165.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510165
Matrix: soil
Sampled: 10/10/95
Received: 10/10/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
37	P510165-1	Diesel/Related	ND	25	10/10/95	10/10/95
		Heavy oil/Related	ND	50		
38	P510165-2	Diesel/Related	3300	25	10/10/95	10/10/95
		Heavy oil/Related	100 *[1]	50		
39	P510165-3	Diesel/Related	6000	250	10/10/95	10/11/95
		Heavy oil/Related	ND	500		
40	P510165-4	Diesel/Related	2400	25	10/10/95	10/11/95
		Heavy oil/Related	98 *[1]	50		
46	P510165-5	Diesel/Related	2800	500	10/10/95	10/11/95
		Heavy oil/Related	3600	1000		
47	P510165-6	Diesel/Related	26000	500	10/10/95	10/11/95
		Heavy oil/Related	16000	1000		
48	P510165-7	Diesel/Related	2600	500	10/10/95	10/11/95
		Heavy oil/Related	1800	1000		
41	P510165-8	Diesel/Related	ND	25	10/10/95	10/11/95
		Heavy oil/Related	ND	50		
42	P510165-9	Diesel/Related	ND	25	10/10/95	10/11/95
		Heavy oil/Related	ND	50		
43	P510165-10	Diesel/Related	ND	25	10/10/95	10/11/95
		Heavy oil/Related	ND	50		
44	P510165-11	Diesel/Related	ND	25	10/10/95	10/11/95
		Heavy oil/Related	ND	50		
45	P510165-12	Diesel/Related	ND	25	10/10/95	10/11/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P510165
Received: 10/10/1995

Sample Name	Analyte	Result	Control Limits
WTPH-D Extended per Washington State DOE			
37	1-Chlorooctadecane	74	50-150
38	1-Chlorooctadecane	75	50-150
39	1-Chlorooctadecane	81	50-150
40	1-Chlorooctadecane	68	50-150
46	1-Chlorooctadecane	– *2	50-150
47	1-Chlorooctadecane	– *2	50-150
48	1-Chlorooctadecane	110	50-150
41	1-Chlorooctadecane	74	50-150
42	1-Chlorooctadecane	75	50-150
43	1-Chlorooctadecane	81	50-150
44	1-Chlorooctadecane	87	50-150
45	1-Chlorooctadecane	80	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

NORTH CREEK ANALYTICAL
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COMMENTS

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P510165
Received: 10/10/1995

1. Detected hydrocarbons in the heavy/oil range appear to be due to overlap of diesel range hydrocarbons.

2. Unable to calculate surrogate recovery due to high analyte concentration.

NORTH CREEK ANALYTICAL

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October 16, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P510165.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

NORTH CREEK ANALYTICAL
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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc. **NCA Project #:** P510165
Project: UNOCAL #0046, BINGEN, WA **Received:** 10/10/95

METHOD BLANK
Batch # FX95028a
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	10/10/95	
Date Analyzed	10/10/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	89	50-150

DUPLICATE
Batch # FX95028a **Duplicate ID P510165-5**
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	2,200	1,800	20	50

DUPLICATE
Batch # FX95028y **Duplicate ID P510165-9**
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

NORTH CREEK ANALYTICAL
18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-9508 (206) 481-9200 • FAX 485-2992
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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510165
Received: 10/10/95

LABORATORY CONTROL SAMPLE
Batch # FX95028a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	140	117	50-150

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 485-2992
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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 00476
Site Address: 217 E. STOBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ☒ Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GEO ENGINEERS, INC. Project Number: 161-181-P102
Address: 7504 SW BRIDGEPORT RD
PORTLAND, OR
Phone: 503/624 9274 Fax: 6205940
Project Manager: PAT SULLIVAN
Sample Collection by: RFC

Chain of Custody Record #:

Quality Assurance Data Level: ☒ A ☐ B
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | 2 | ☒ 1

o Oregon ☒ Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 37	10/10/95 0945	S	1						X										PS10/65-1
2. 38	1000		1						X										2
3. 39	1010		1						X										3
4. 40	1020		1						X										4
5. 46	1350		1						X										5
6. 47	1400		1						X										6
7. 48	1410		1						X										7
8. 41	1420		1						X										8
9. 42	1430		1						X										9
10. 43	1440		1						X										10

11.9

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1.	GEI-PM	10/10/95 1650		NCA	10.10.95 1650
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back
Firm: Date:

Page 1 of 2
Rev. 2.2, 11/94

Comments: 24 HR T.A.T.!

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

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NORTH CREEK ANALYTICAL

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 0046
Site Address: 217 E. STUBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: RIPP ECKERT
CERT INFO: (check one) o Evaluation ~~o Remediation~~
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers, Inc. Project Number: 161-181-P62
Address: 7504 SW BRIDGEPORT RD.
PORTLAND, OR 97224
Phone: 503/624 9274 Fax: 6205940
Project Manager: PAT SULLIVAN
Sample Collection by: RFK

Chain of Custody Record #:

Quality Assurance Data Level: [X] A [B] B
A: Standard Summary
B: Standard + Chromatograms
Laboratory Turnaround Days: 10 | 5 | 3 | 2 | [X]

o Oregon (X) Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 44	10/10/95 1450	S	1						X										PS10165-11
2. 45	" 1500	"	1						X										12
3.																			
4.																			
5.																			
6.																			
7.																			
8.																			
9.																			
10.																			

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GeoEng-PDX	10/10/95 1650	[signature]	NCA	10/16/95 1650
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No" on back
Final Approval Signature:
Firm: Date:

Page 2 of 2
v. 2.2, 11/94

Comments: 24 HR T.A.T. !

Distribution: White - Laboratory Yellow - Consultant Photocopy cal

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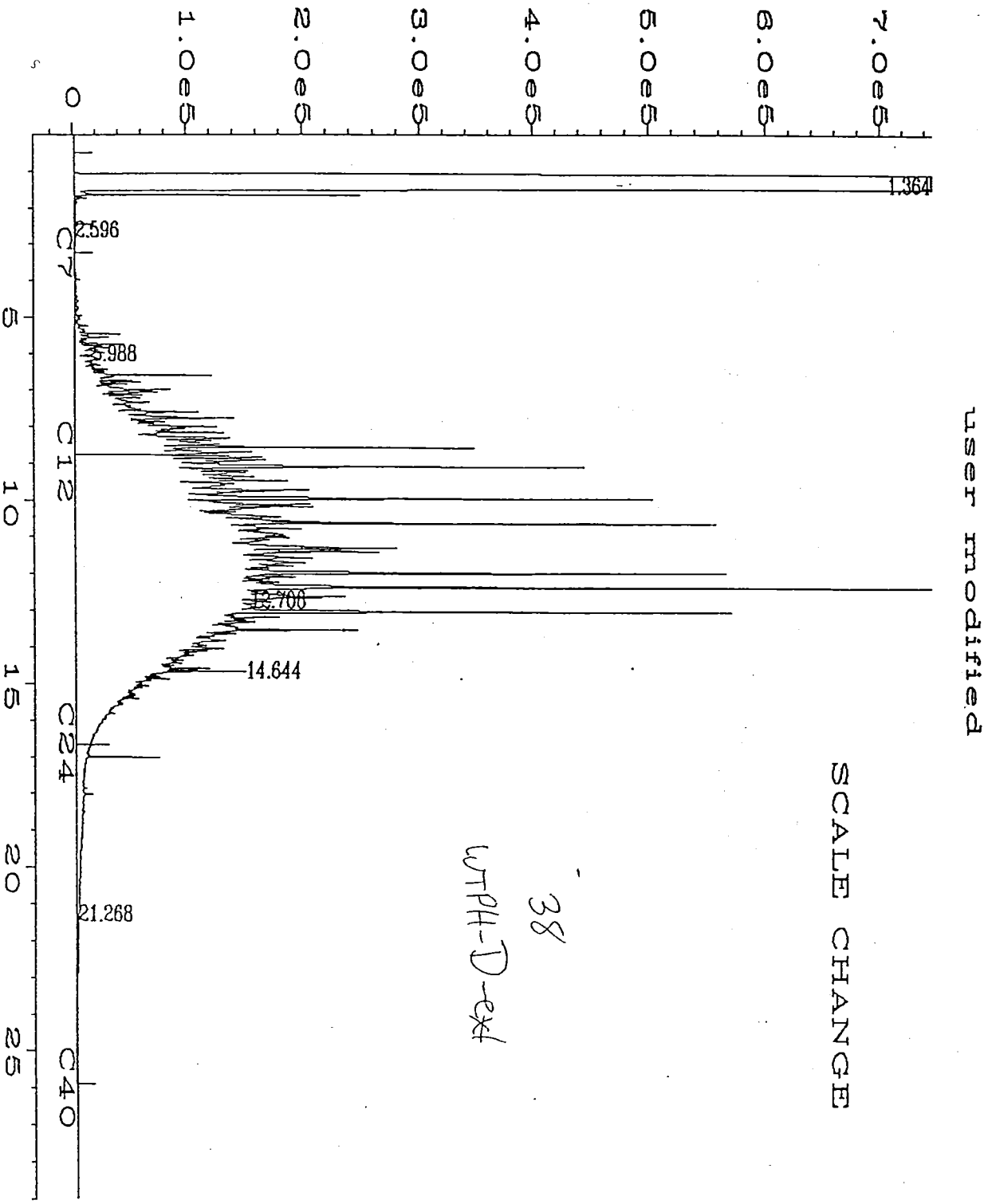

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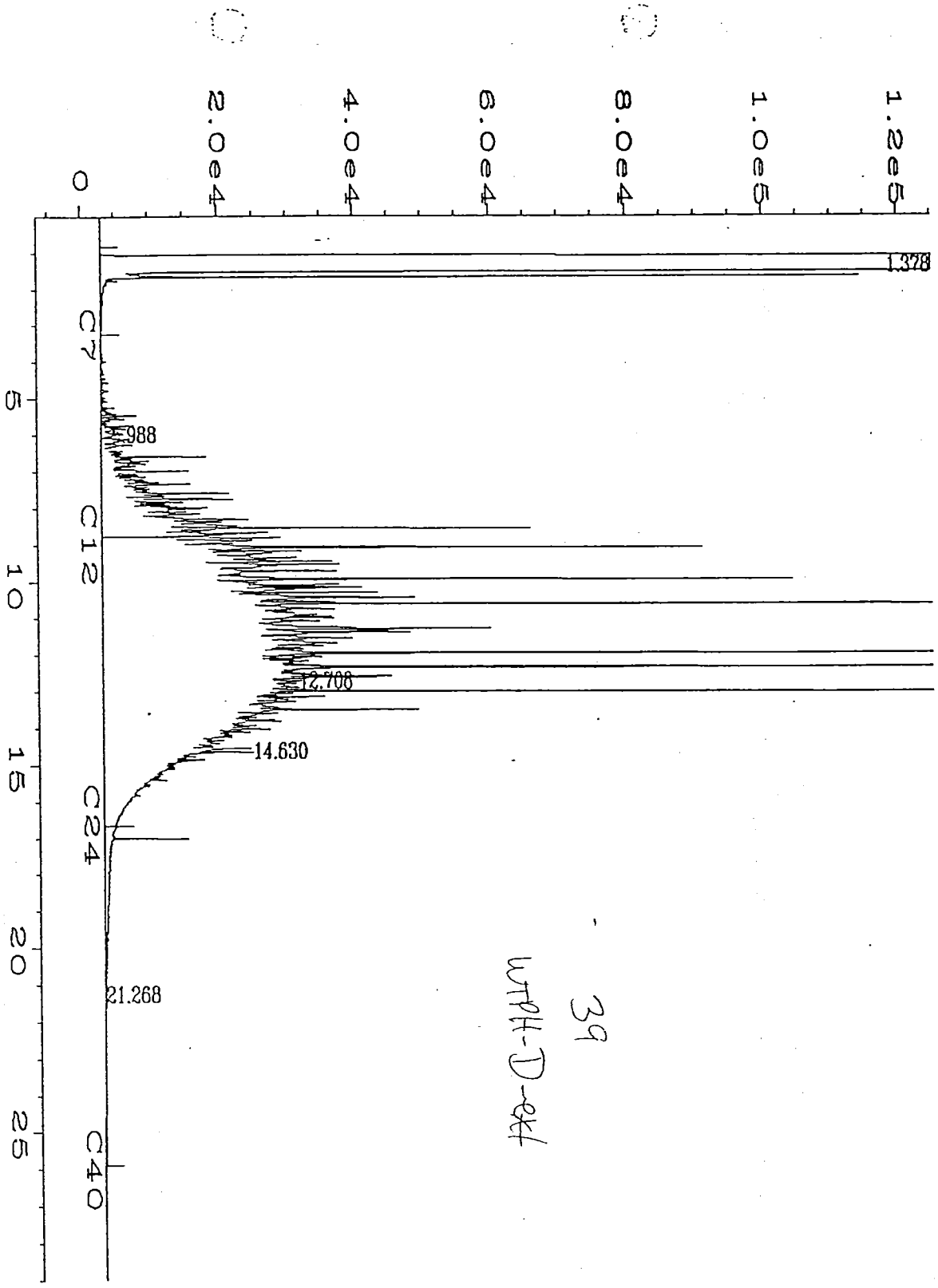
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 6
Sample Name	: 510165-2	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 10 Oct 95 10:47 PM	Instrument Method	: TPHD.MTH
Report Created on	: 11 Oct 95 12:03 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



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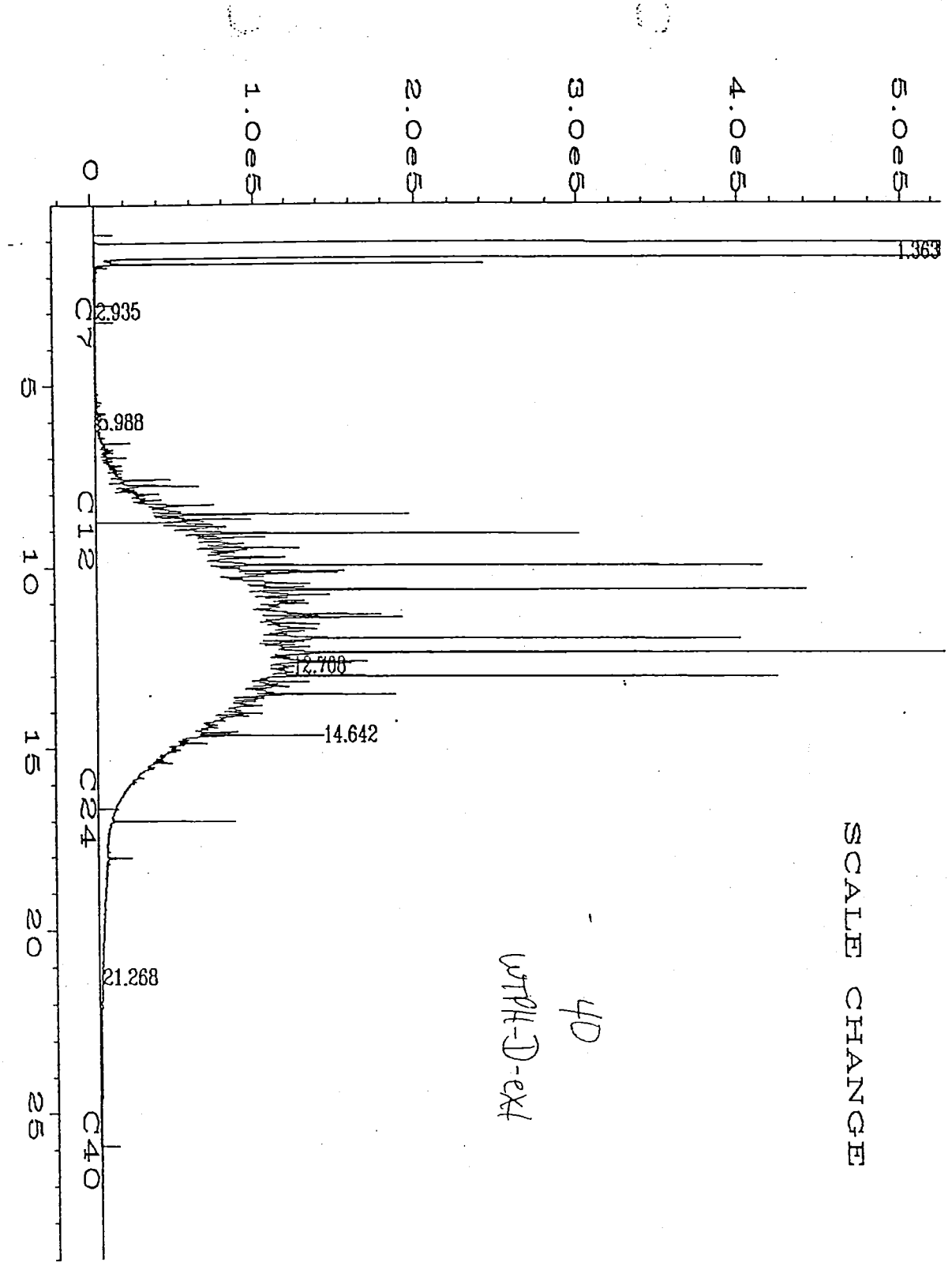
WTPH-D-8X1

Data File Name : D:\HPCH\1\DATA\S101095A\015F0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 510165-3 x10
Run Time Bar Code:
Acquired on : 11 Oct 95 11:50 AM
Report Created on: 11 Oct 95 12:44 PM
Last Recalib on : 31 AUG 95 01:40 PM
Multiplier : 1

Page Number : 1
Vial Number : 15
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHD.MTH
Sample Amount : 0
ISTD Amount :



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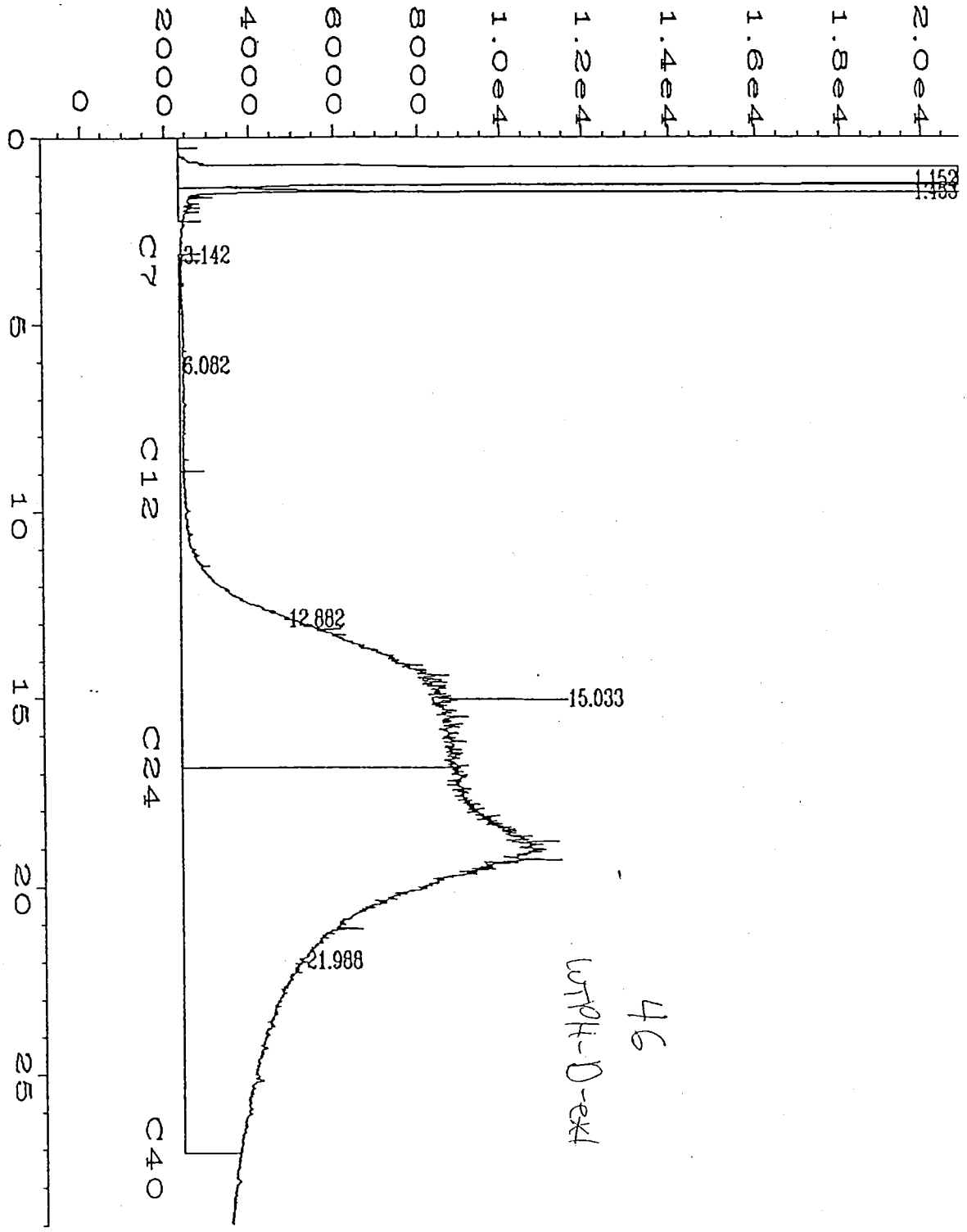
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 8
Sample Name	: 510165-4	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 11 Oct 95 00:09 AM	Instrument Method:	TPHD.MTH
Report Created on:	11 Oct 95 12:04 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



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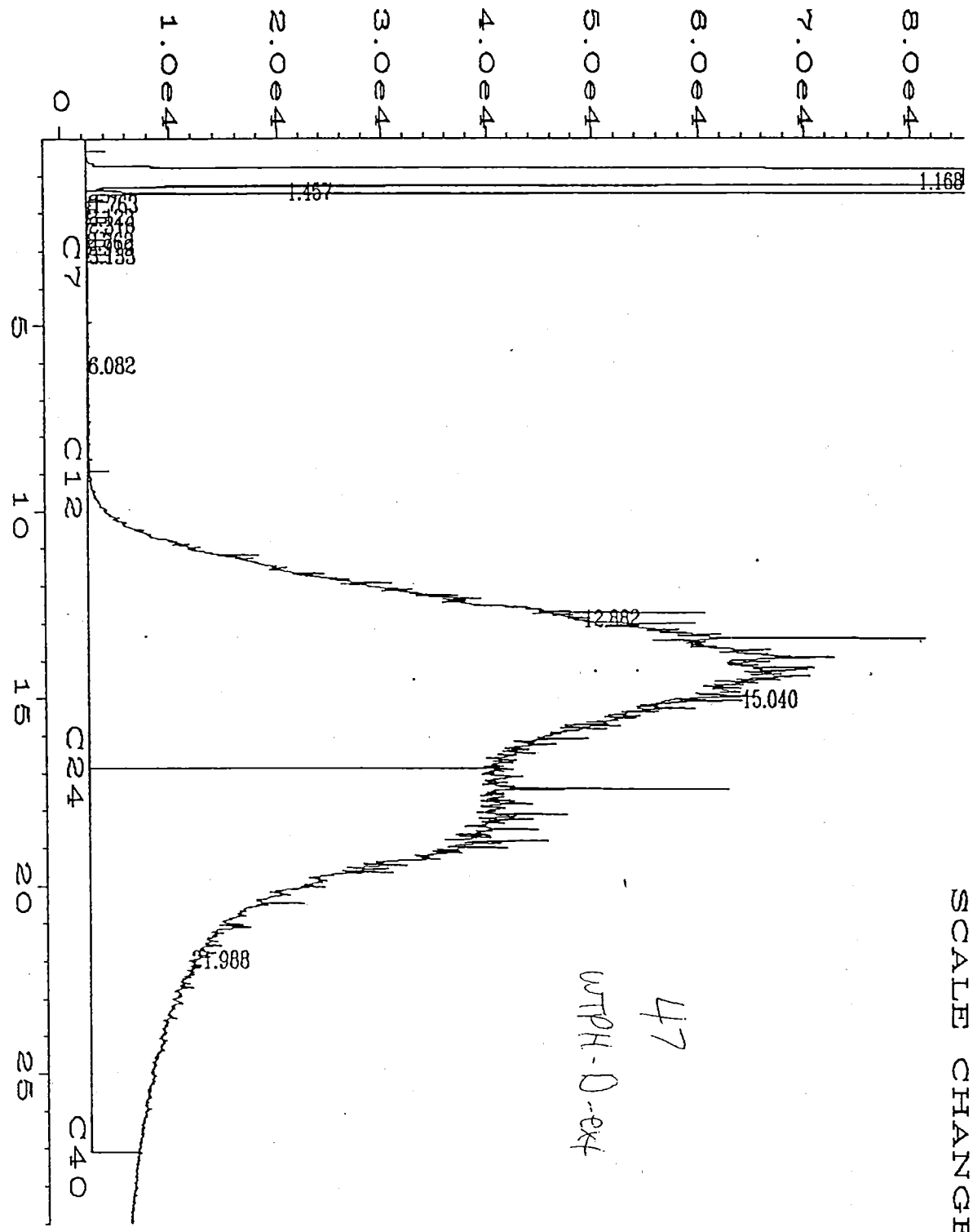
WTPH-D-ext

Data File Name	: D:\HPCHEM\1\DATA\S101095B\013F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID1	Vial Number	: 13
Sample Name	: 510165-5 x20	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 10 Oct 95 11:36 PM	Instrument Method:	TPHD.MTH
Report Created on:	11 Oct 95 00:16 AM	Analysis Method	: TPHD.MTH
Last Recalib on	: 22 AUG 95 05:29 PM	Sample Amount	: 0
Multiplier	: 9.804	ISTD Amount	:



WTPH-D-EXT

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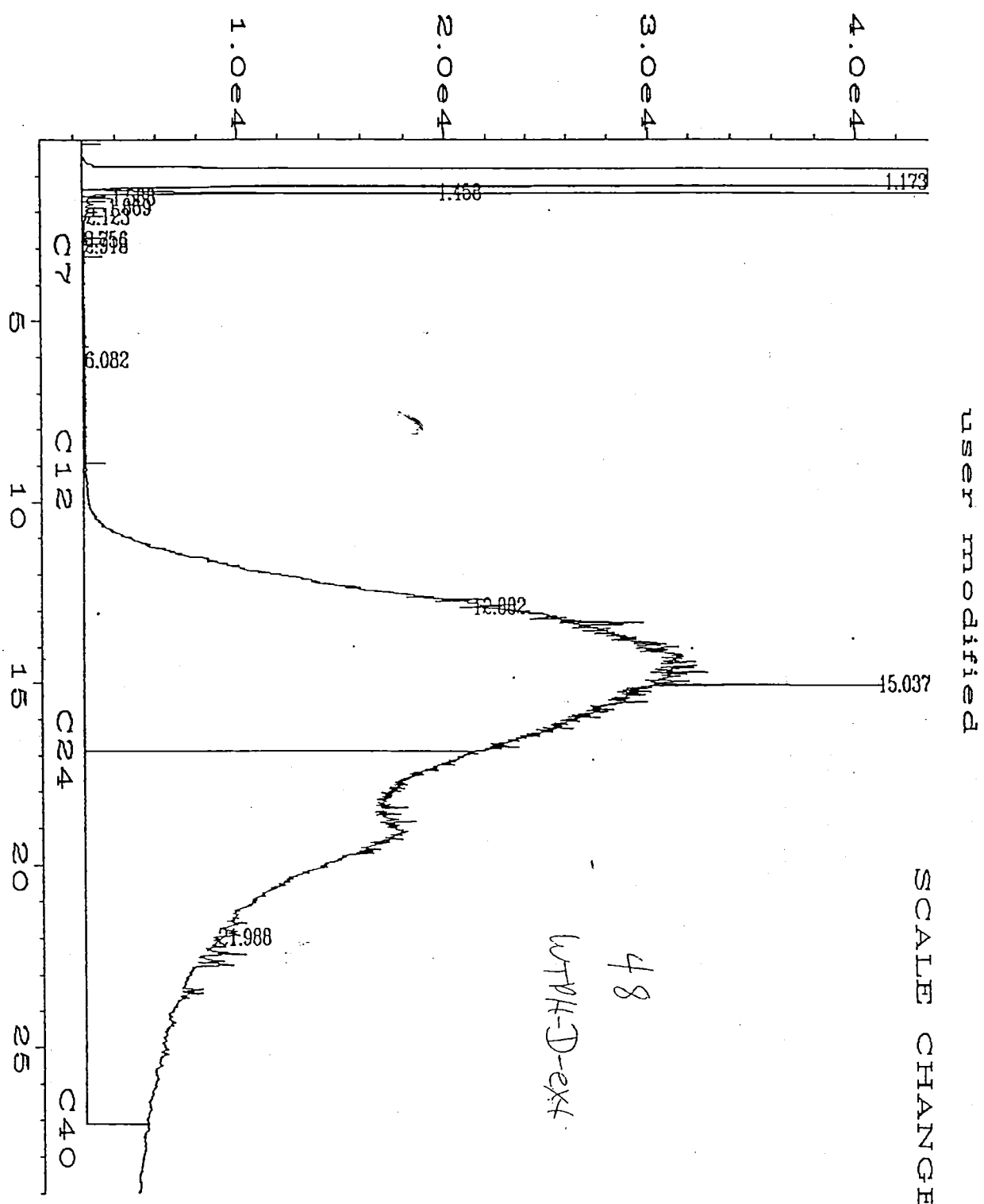
Data File Name	: D:\HPCHEM\1\DATA\S101095B\015F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID1	Vial Number	: 15
Sample Name	: 510165-6 x20	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 11 Oct 95 00:58 AM	Instrument Method	: TPHD.MTH
Report Created on	: 11 Oct 95 11:09 AM	Analysis Method	: TPHD.MTH
Last Recalib on	: 22 AUG 95 05:29 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name : D:\HPCHEM\1\DATA\S101095B\016F0101.D
Operator : LQN
Instrument : DUALFID1
Sample Name : 510165-7 x5
Run Time Bar Code:
Acquired on : 11 Oct 95 01:39 AM
Report Created on: 11 Oct 95 11:10 AM
Last Recalib on : 22 AUG 95 05:29 PM
Multiplier : 1

Page Number : 1
Vial Number : 16
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHD.MTH
Sample Amount : 0
ISTD Amount :

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October 23, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

RE: JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Oct. 11, 1995. For your reference, these analyses have been assigned our NCA # P510186.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510186
Matrix: soil
Sampled: 10/11/95
Received: 10/11/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
49	P510186-1	Diesel/Related	ND	25	10/11/95	10/11/95
		Heavy oil/Related	ND	50		
50	P510186-2	Diesel/Related	41	25	10/11/95	10/11/95
		Heavy oil/Related	82	50		
51	P510186-3	Diesel/Related	ND	25	10/11/95	10/11/95
		Heavy oil/Related	ND	50		
52	P510186-4	Diesel/Related	ND	25	10/11/95	10/11/95
		Heavy oil/Related	ND	50		
53	P510186-5	Diesel/Related	ND	25	10/11/95	10/12/95
		Heavy oil/Related	ND	50		
54	P510186-6	Diesel/Related	ND	25	10/11/95	10/12/95
		Heavy oil/Related	ND	50		
55	P510186-7	Diesel/Related	31 *[1]	25	10/11/95	10/12/95
		Heavy oil/Related	ND	50		
56	P510186-8	Diesel/Related	600	130	10/11/95	10/11/95
		Heavy oil/Related	2500	250		
57	P510186-9	Diesel/Related	ND	25	10/11/95	10/11/95
		Heavy oil/Related	ND	50		
58	P510186-10	Diesel/Related	ND	25	10/11/95	10/11/95
		Heavy oil/Related	ND	50		
59	P510186-11	Diesel/Related	ND	25	10/11/95	10/11/95
		Heavy oil/Related	ND	50		
60	P510186-12	Diesel/Related	ND	25	10/11/95	10/12/95
		Heavy oil/Related	ND	50		
61	P510186-13	Diesel/Related	ND	25	10/11/95	10/12/95
		Heavy oil/Related	ND	50		
62	P510186-14	Diesel/Related	ND	25	10/11/95	10/12/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P510186
Received: 10/11/1995

Sample Name	Analyte	Result	Control Limits
WTPH-D Extended per Washington State DOE			
49	1-Chlorooctadecane	82	50-150
50	1-Chlorooctadecane	86	50-150
51	1-Chlorooctadecane	82	50-150
52	1-Chlorooctadecane	89	50-150
53	1-Chlorooctadecane	90	50-150
54	1-Chlorooctadecane	91	50-150
55	1-Chlorooctadecane	96	50-150
56	1-Chlorooctadecane	70	50-150
57	1-Chlorooctadecane	86	50-150
58	1-Chlorooctadecane	88	50-150
59	1-Chlorooctadecane	85	50-150
60	1-Chlorooctadecane	90	50-150
61	1-Chlorooctadecane	86	50-150
62	1-Chlorooctadecane	91	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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COMMENTS

Client:	GeoEngineers, Inc.	NCA Number:	P510186
Project:	UNOCAL #0046, BINGEN, WA	**Received:**	10/11/1995

1. Detected hydrocarbons in the diesel range appear to be due to overlap of heavy/oil range hydrocarbons.

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October 23, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P510186.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

NORTH CREEK ANALYTICAL
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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510186
Received: 10/11/95

METHOD BLANK
Batch # FX95027c
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	10/11/95	
Date Analyzed	10/11/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	86	50-150

METHOD BLANK
Batch # FX95028b
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	10/11/95	
Date Analyzed	10/11/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	85	50-150

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P510186
Received: 10/11/95

DUPLICATE
Batch # FX95027b
Results In mg/kg (ppm)
Duplicate ID P510144-1

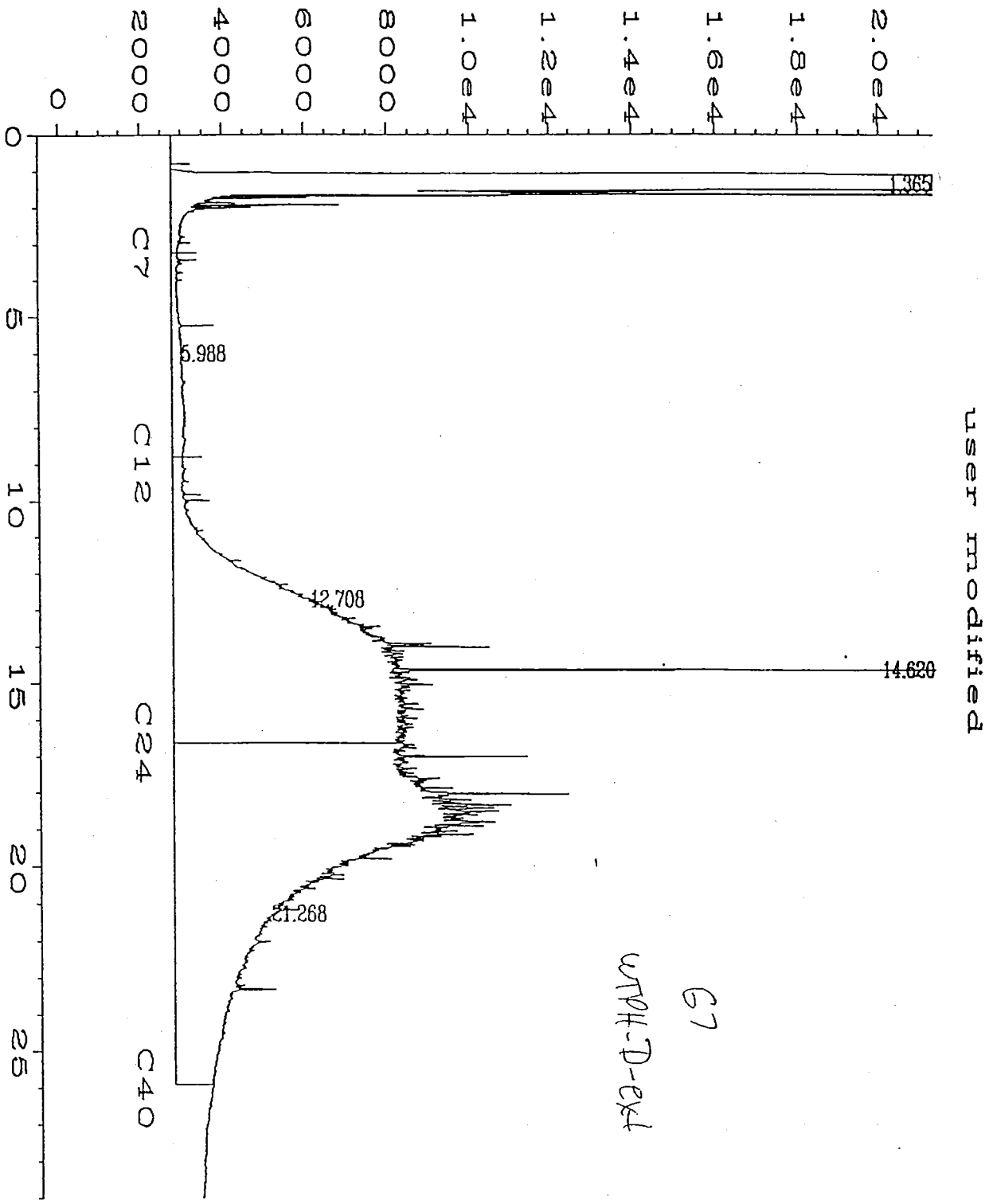
Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	150	120	23	00

DUPLICATE
Batch # FX95028y
Results In mg/kg (ppm)
Duplicate ID P510165-9

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

LABORATORY CONTROL SAMPLE
Batch # FX95027a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	100	83	50-150



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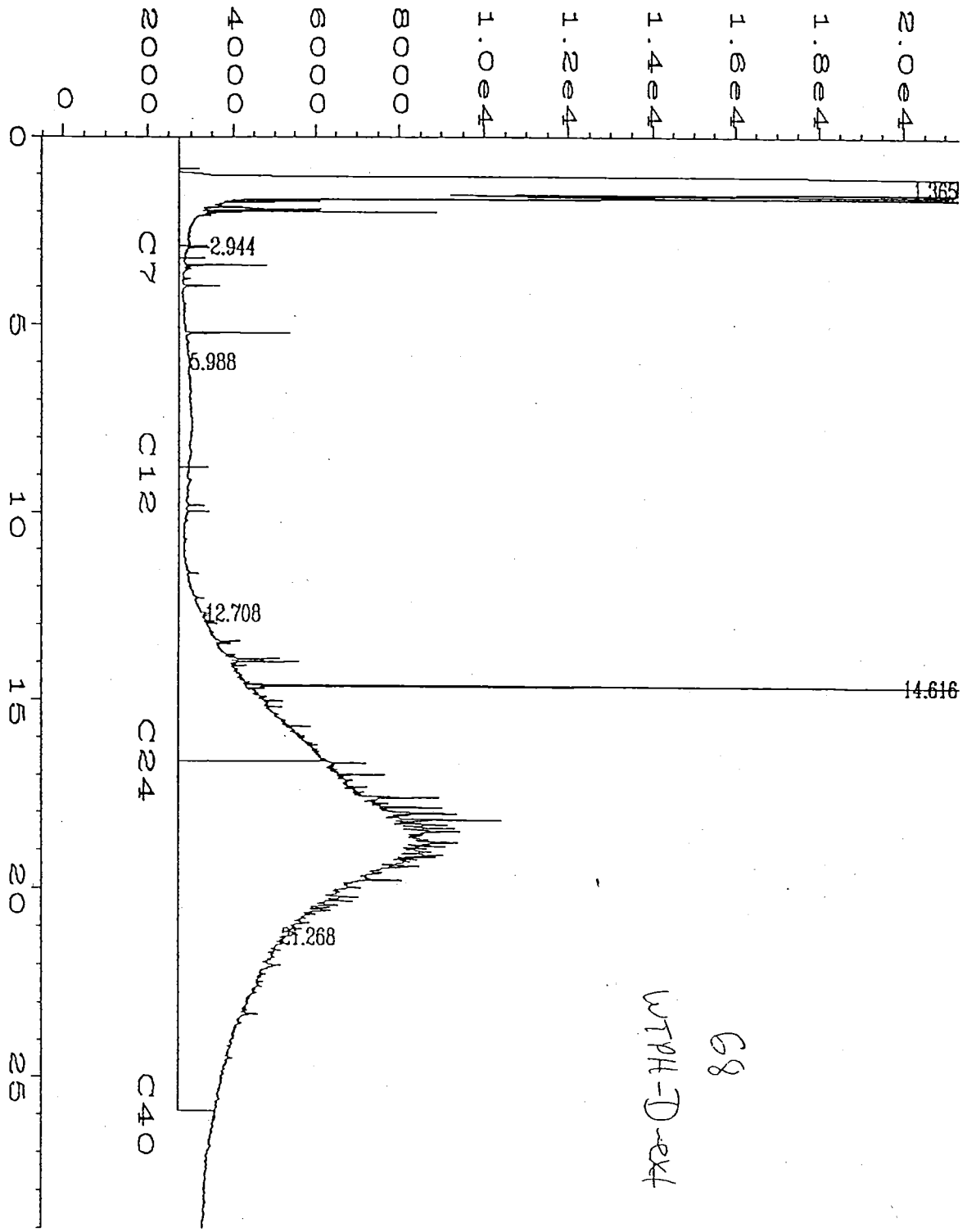
Instrument	: DUALFID2	Vial Number	: 9
Sample Name	: 510142-5	Injection Number	: 1
Run Time Bar Code:	242	Sequence Line	: 1
Acquired on	: 17 Oct 95 01:31 PM	Instrument Method:	TPHD.MTH
Report Created on:	17 Oct 95 02:09 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 0.4924	ISTD Amount	:



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with D-ext

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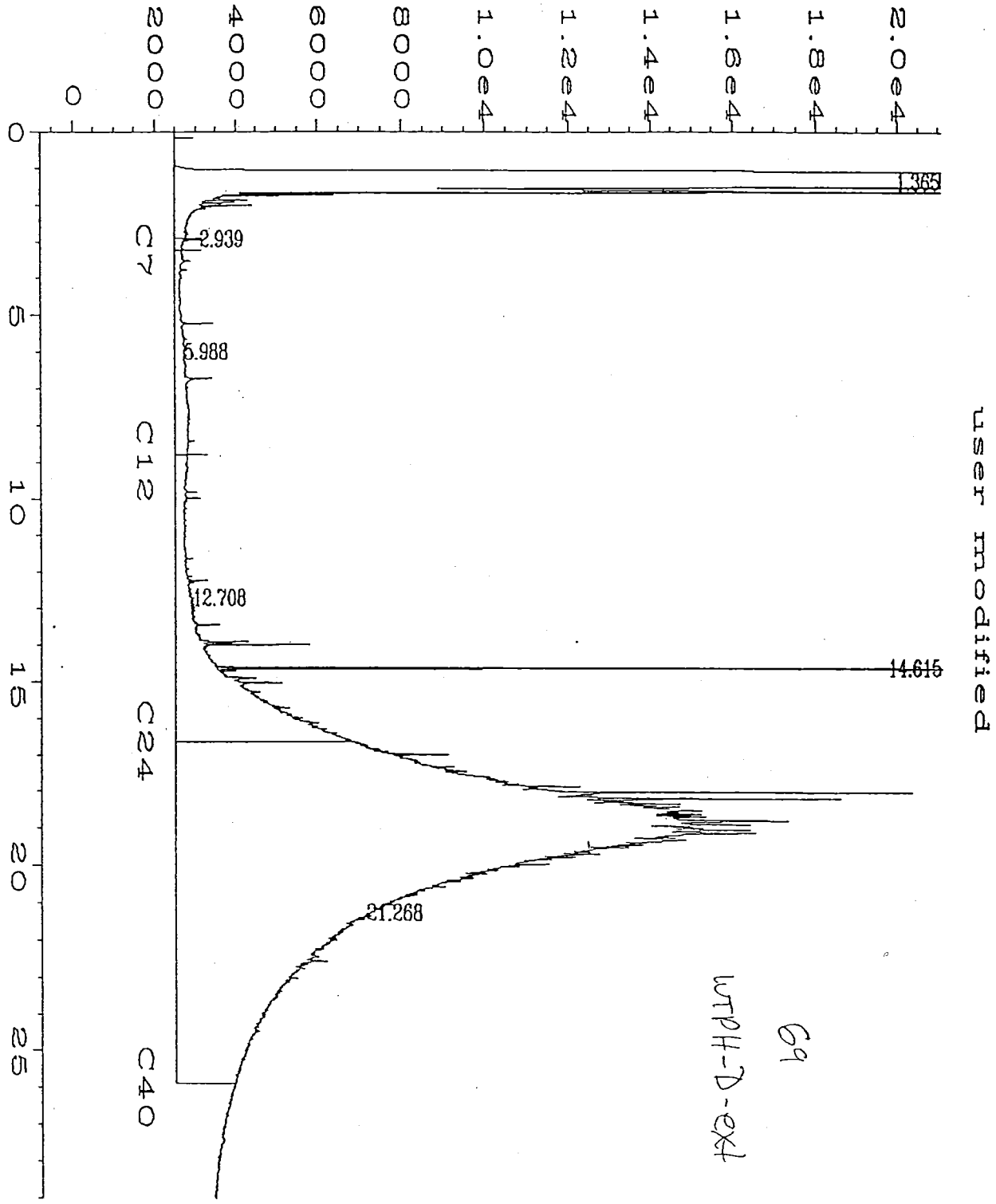
Data File Name : D:\HPCH\1\DATA\S101695a\010F0101.D
Operator : LQN
Instrument : DUALFID2
Sample Name : 510142-6
Run Time Bar Code: 242
Acquired on : 17 Oct 95 02:10 PM
Report Created on: 17 Oct 95 02:49 PM
Last Recalib on : 31 AUG 95 01:40 PM
Multiplier : 0.4931

Page Number : 1
Vial Number : 10
Injection Number : 1
Sequence Line : 1
Instrument Method: TPHD.MTH
Analysis Method : TPHD.MTH
Sample Amount : 0
ISTD Amount :



Data File Name	: D:\HPCH\1\DATA\S101695A\011F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 11
Sample Name	: 510142-7	Injection Number	: 1
Run Time Bar Code:	242	Sequence Line	: 1
Acquired on	: 17 Oct 95 02:51 PM	Instrument Method	: TPHD.MTH
Report Created on	: 17 Oct 95 04:20 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

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GeoEngineers

OCT 26 1995

Routing

File

October 23, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

RE: JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Oct. 17, 1995. For your reference, these analyses have been assigned our NCA # P510266.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510266
Matrix: soil
Sampled: 10/17/95
Received: 10/17/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
79	P510266-1	Diesel/Related	ND	25	10/17/95	10/17/95
		Heavy oil/Related	69	50		
80	P510266-2	Diesel/Related	ND	25	10/17/95	10/17/95
		Heavy oil/Related	ND	50		
81	P510266-3	Diesel/Related	ND	25	10/17/95	10/18/95
		Heavy oil/Related	ND	50		
82	P510266-4	Diesel/Related	ND	25	10/17/95	10/18/95
		Heavy oil/Related	ND	50		
83	P510266-5	Diesel/Related	ND	25	10/17/95	10/18/95
		Heavy oil/Related	ND	50		
84	P510266-6	Diesel/Related	ND	25	10/17/95	10/18/95
		Heavy oil/Related	ND	50		
85	P510266-7	Diesel/Related	ND	25	10/17/95	10/17/95
		Heavy oil/Related	ND	50		
86	P510266-8	Diesel/Related	140	25	10/17/95	10/17/95
		Heavy oil/Related	ND	50		
87	P510266-9	Diesel/Related	ND	25	10/17/95	10/17/95
		Heavy oil/Related	ND	50		
88	P510266-10	Diesel/Related	ND	25	10/17/95	10/17/95
		Heavy oil/Related	ND	50		
89	P510266-11	Diesel/Related	ND	25	10/17/95	10/17/95
		Heavy oil/Related	ND	50		
90	P510266-12	Diesel/Related	ND	25	10/17/95	10/18/95
		Heavy oil/Related	ND	50		
91	P510266-13	Diesel/Related	ND	25	10/17/95	10/18/95
		Heavy oil/Related	ND	50		
92	P510266-14	Diesel/Related	ND	25	10/17/95	10/18/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510266
Matrix: soil
Sampled: 10/17/95
Received: 10/17/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
93	P510266-15	Diesel/Related	ND	25	10/17/95	10/18/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P510266
Received: 10/17/1995

Sample Name	Analyte	Result	Control Limits
WTPH-D Extended per Washington State DOE			
79	1-Chlorooctadecane	92	50-150
80	1-Chlorooctadecane	92	50-150
81	1-Chlorooctadecane	96	50-150
82	1-Chlorooctadecane	92	50-150
83	1-Chlorooctadecane	98	50-150
84	1-Chlorooctadecane	96	50-150
85	1-Chlorooctadecane	87	50-150
86	1-Chlorooctadecane	87	50-150
87	1-Chlorooctadecane	91	50-150
88	1-Chlorooctadecane	89	50-150
89	1-Chlorooctadecane	91	50-150
90	1-Chlorooctadecane	91	50-150
91	1-Chlorooctadecane	78	50-150
92	1-Chlorooctadecane	84	50-150
93	1-Chlorooctadecane	89	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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October 23, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P510266.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{\text{(Measured Concentration)}}{\text{(Actual Concentration)}} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{\text{(Result of Test 1 - Result of Test 2)}}{\text{(Result of Test 1 + Result of Test 2)/2}} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

NORTH CREEK ANALYTICAL
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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P510266
Received: 10/17/95

METHOD BLANK
Batch # FX95030a
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	10/17/95	
Date Analyzed	10/17/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	90	50-150

DUPLICATE
Batch # FX95030a
Results In mg/kg (ppm)
Duplicate ID P510266-1

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

DUPLICATE
Batch # FX95030y
Results In mg/kg (ppm)
Duplicate ID P510266-2

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

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BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc. **NCA Project #:** P510266
Project: UNOCAL #0046, BINGEN, WA **Received:** 10/17/95

LABORATORY CONTROL SAMPLE
Batch # FX95030a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	120	100	50-150

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 0046
Site Address: 217 E. STUBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ~~o Remediation~~
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GEO ENGINEERS, INC. Project Number: 161-181-P02
Address: 7504 SW BRIDGEPORT RD.
PTLD, OR 97224
Phone: 503/624 9274 Fax: 620 5940
Project Manager: PAT SULLIVAN
Sample Collection by: RFK

Chain of Custody Record #:

Quality Assurance Data Level:
A: Standard Summary
B: Standard + Chromatograms
Laboratory Turnaround Days: 10 | 5 | 3 | 2 | X

o Oregon (X) Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 79	10/17/95 0900	S	1						X										PS102660
2. 80	0910		1						X										
3. 81	0920		1						X										
4. 82	0930		1						X										
5. 83	0940		1						X										
6. 84	0950		1						X										
7. 85	1220		1						X										
8. 86	1230		1						X										
9. 87	1240		1						X										
10. 88	1250		1						X										

12.3°

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GEI-PD	10/17/95 1555	Sara McClurg	NCA	10-17-95/1555
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back
Firm: Date:

Page 1 of 2

Comments:

Rev. 2.2, 11/94

Distribution: White - Laboratory Yellow - Consultant Photoco nocal

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UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: BP 0046
Site Address: 217 E. STEBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ~~o Remediation~~
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers, Inc. Project Number: 161-181-P102
Address: 7504 SW Bridgeport Rd.
Portland, OR 97224
Phone: 503/624 9274 Fax: 620 5940
Project Manager: PAT SULLIVAN
Sample Collection by: RFK

Chain of Custody Record #:

Quality Assurance Data Level: [X] A [ ] B
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 | 5 | 3 | 2 | [X]

o Oregon ~~o~~ Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 89	10/17/95 1300	S	1						X										PS102606 - 11
2. 90	1310	"	1						X										12
3. 91	1320	"	1						X										13
4. 92	1330	"	1						X										14
5. 93	" 1340	"	1		-				X										15
6.																			X
7.																			
8.																			
9.																			
10.																			

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GEI-PO	10/17/95 1555	Sara McClary	NCA	10-17-95/1557
2.					
3.					

Final Report Approval

Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back

Firm: Date:

Page 2 of 2
Rev. 2.2, 11/94

Comments:

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

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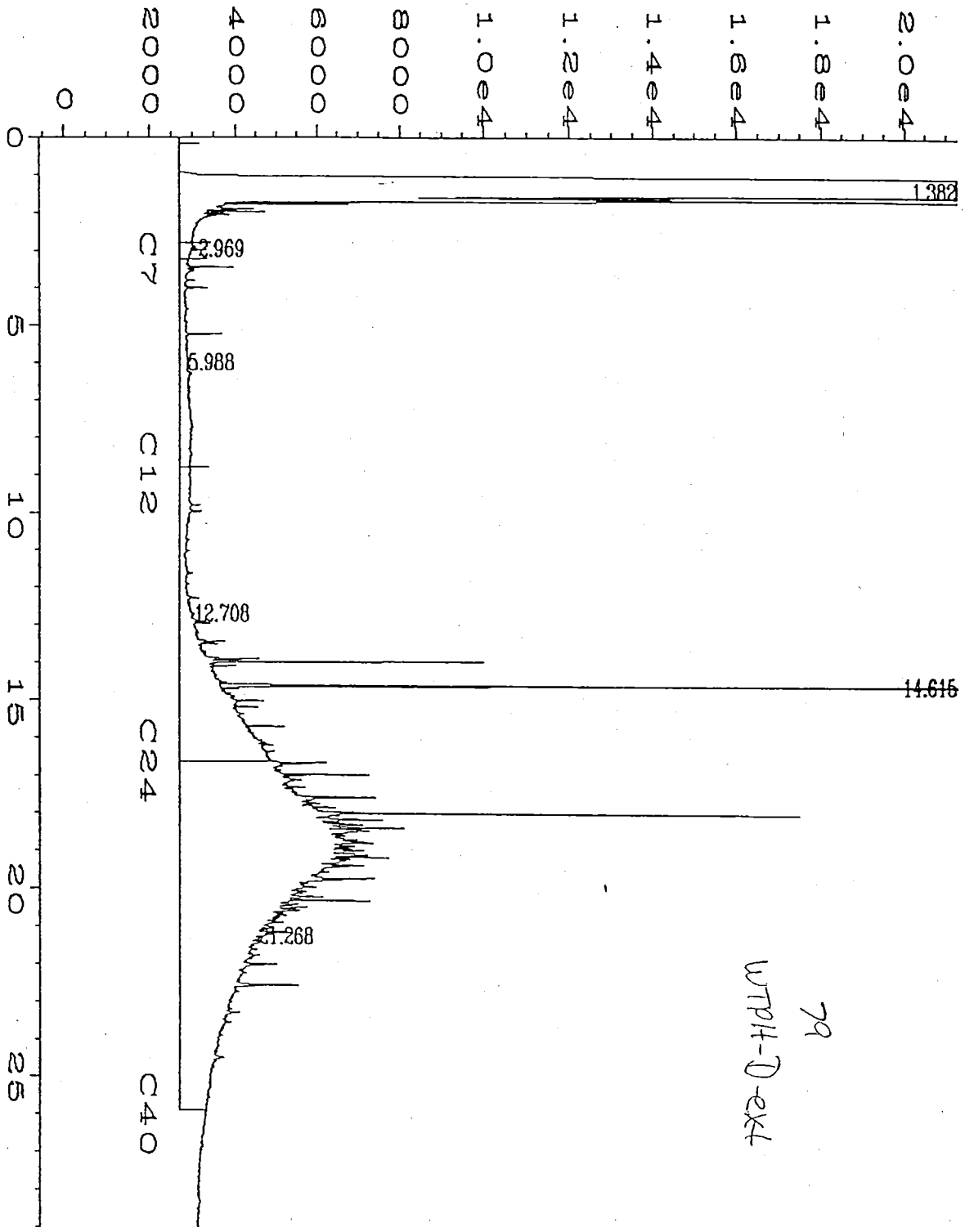

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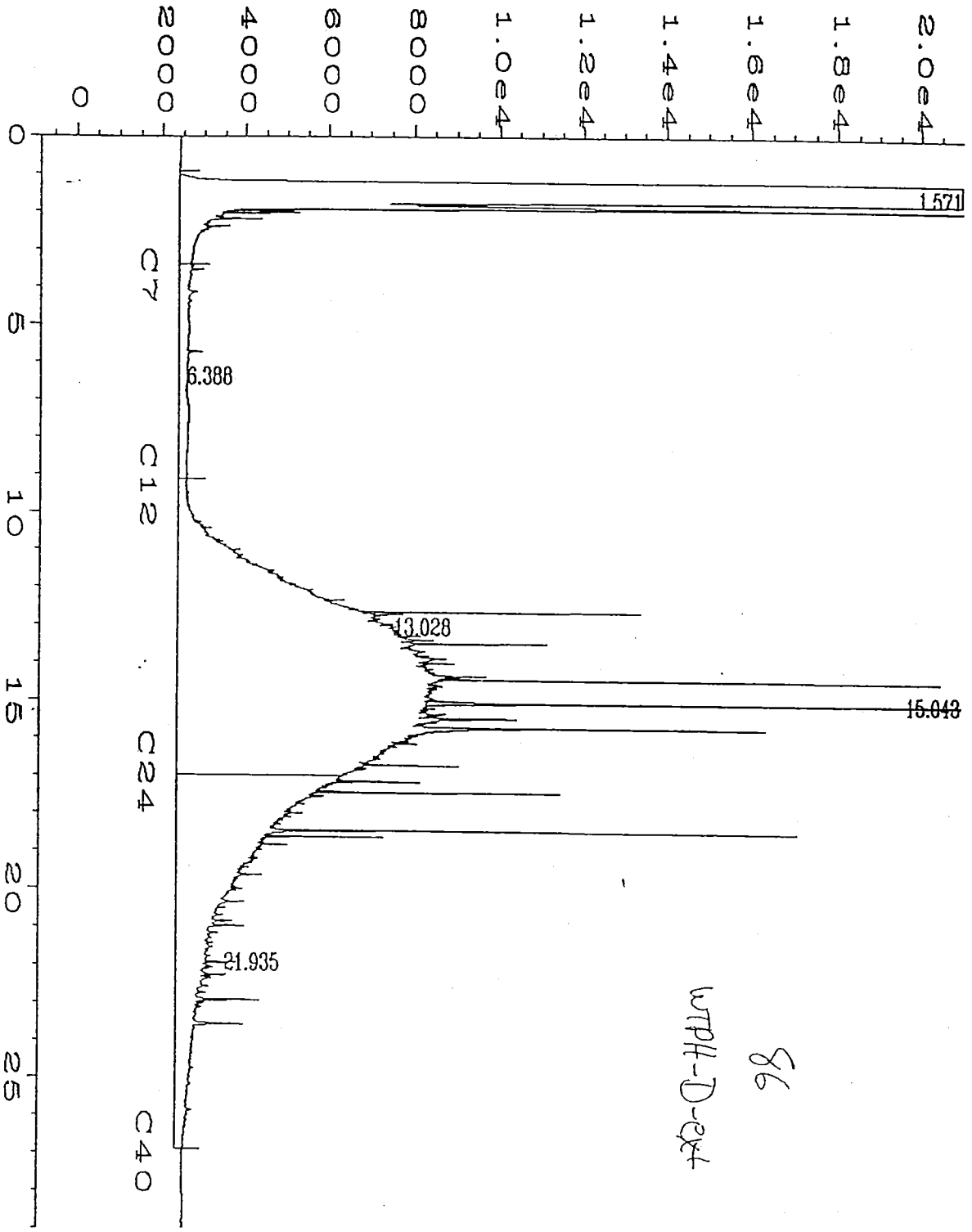
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 6
Sample Name	: 510266-1	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 2
Acquired on	: 17 Oct 95 10:01 PM	Instrument Method	: TPHD.MTH
Report Created on	: 18 Oct 95 11:46 AM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



user modified

96
with D-24

ata File Name	: D:\HPCH\1\DATA\S101695B\030R0201.D		
perator	: LQN	Page Number	: 1
:nstrument	: DUALFID2	Vial Number	: 30
'ample Name	: 510266-8	Injection Number	: 1
un Time Bar Code:		Sequence Line	: 2
cquired on	: 17 Oct 95 09:01 PM	Instrument Method	: TPHD.MTH
eport Created on	: 18 Oct 95 11:50 AM	Analysis Method	: TPHDR.MTH
ast Recalib on	: 19 AUG 95 06:21 PM	Sample Amount	: 0
ltiplier	: 1	ISTD Amount	:

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October 24, 1995

GeoEngineers
OCT 27 1995
Routing
File

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

RE: JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

Enclosed are test results for your samples received in this lab on Oct. 19, 1995. For your reference, these analyses have been assigned our NCA # P510319.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

This report will be accompanied by a separate Quality Control Data Report, unless omitted by client request.

Please call if you have any questions.

Respectfully,

Philip Nerenberg
Laboratory Manager

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510319
Matrix: soil
Sampled: 10/19/95
Received: 10/19/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
94	P510319-1	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
95	P510319-2	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
96	P510319-3	Diesel/Related	75	25	10/19/95	10/19/95
		Heavy oil/Related	100	50		
97	P510319-4	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
98	P510319-5	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
99	P510319-6	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
100	P510319-7	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
101	P510319-8	Diesel/Related	44	25	10/19/95	10/19/95
		Heavy oil/Related	69	50		
102	P510319-9	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
103	P510319-10	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
104	P510319-11	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
105	P510319-12	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
106	P510319-13	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
107	P510319-14	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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WTPH-D Extended per Washington State DOE
Results In mg/kg (ppm)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Project #: P510319
Matrix: soil
Sampled: 10/19/95
Received: 10/19/95

Client ID	Lab ID	Analyte	Results	MRL	Date Prepared	Date Analyzed
108	P510319-15	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
109	P510319-16	Diesel/Related	ND	25	10/19/95	10/19/95
		Heavy oil/Related	ND	50		
110	P510319-17	Diesel/Related	ND	25	10/19/95	10/20/95
		Heavy oil/Related	ND	50		
111	P510319-18	Diesel/Related	630	25	10/19/95	10/20/95
		Heavy oil/Related	220	50		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

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SURROGATE RECOVERIES (%)

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA

NCA Number: P510319
Received: 10/19/1995

Sample Name	Analyte	Result	Control Limits
WTPH-D Extended per Washington State DOE			
94	1-Chlorooctadecane	93	50-150
95	1-Chlorooctadecane	92	50-150
96	1-Chlorooctadecane	92	50-150
97	1-Chlorooctadecane	98	50-150
98	1-Chlorooctadecane	89	50-150
99	1-Chlorooctadecane	97	50-150
100	1-Chlorooctadecane	101	50-150
101	1-Chlorooctadecane	104	50-150
102	1-Chlorooctadecane	98	50-150
103	1-Chlorooctadecane	90	50-150
104	1-Chlorooctadecane	85	50-150
105	1-Chlorooctadecane	89	50-150
106	1-Chlorooctadecane	88	50-150
107	1-Chlorooctadecane	89	50-150
108	1-Chlorooctadecane	80	50-150
109	1-Chlorooctadecane	93	50-150
110	1-Chlorooctadecane	92	50-150
111	1-Chlorooctadecane	96	50-150

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

NORTH CREEK ANALYTICAL

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October 24, 1995

GeoEngineers, Inc.
7504 S.W. Bridgeport Road
Portland, OR 97224

Attention: Pat Sullivan

Re: Quality Control Data
JOB # 161-181-P62
P.O.#
PROJECT - UNOCAL #0046, BINGEN, WA

NCA project number P510319.

Note: Surrogate Recoveries are included in the final report.

QUALITY CONTROL DEFINITIONS

METHOD BLANK RESULTS

The method blank is an analyte-free matrix which is carried through the same analytical process as the samples. It is used to document contamination that may result from the analytical process.

SURROGATE STANDARD

A surrogate standard (i.e., a chemical compound not expected to occur in an environmental sample) is added to each sample, blank, and matrix spike sample just prior to extraction or processing. The recovery of the surrogate standard is used to monitor for unusual matrix effects, gross sample processing errors, etc. Surrogate recovery is evaluated for acceptance by determining whether the measured concentration falls within accepted limits.

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

Accuracy is measured by percent recovery as in:

$$\% \text{ Recovery} = \frac{(\text{Measured Concentration})}{(\text{Actual Concentration})} \times 100$$

Precision is measured using duplicate tests by relative percent difference.

$$\text{RPD} = \frac{(\text{Result of Test 1} - \text{Result of Test 2})}{(\text{Result of Test 1} + \text{Result of Test 2})/2} \times 100$$

If you should have any questions concerning this report, please contact me.

Sincerely,

Philip Nerenberg
Laboratory Manager

NORTH CREEK ANALYTICAL
18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-9508 (206) 481-9200 • FAX 485-2992
East 11115 Montgomery, Suite B • Spokane, WA 99206-4776 (509) 924-9200 • FAX 924-9290
9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

BATCH QUALITY CONTROL RESULTS
WTPH-D Extended per Washington State DOE

Client: GeoEngineers, Inc.
Project: UNOCAL #0046, BINGEN, WA
NCA Project #: P510319
Received: 10/19/95

METHOD BLANK
Batch # FX95031a
Results In mg/kg (ppm)

Compound	Result	MRL
Diesel/Related	ND	25
Heavy oil/Related	ND	50
Date Prepared	10/19/95	
Date Analyzed	10/19/95	

Surrogate Recovery (%)	Result	Control Limit
1-Chlorooctadecane	94	50-150

DUPLICATE
Batch # FX95031a
Duplicate ID P510319-1
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

DUPLICATE
Batch # FX95031y
Duplicate ID P510319-13
Results In mg/kg (ppm)

Compound	Sample Conc	Dup Conc	RPD	QC Limit RPD
Diesel/Related	ND	ND	0	50

LABORATORY CONTROL SAMPLE
Batch # FX95031a
Results In mg/kg (ppm)

Compound	True	Found	% Rec	QC Limit % Rec
Diesel/Related	120	140	117	50-150

NORTH CREEK ANALYTICAL
18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 485-2992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT PS10319

UNOCAL INFORMATION

Facility Number: BP 0046
Site Address: 217 E. STUBEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ~~o Remediation~~
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers, Inc. Project Number: 161-181-P62
Address: 7504 SW Bridgeport Rd.
Portland, OR 97224
Phone: 503/624-9274 Fax: 620-5940
Project Manager: PAT SULLIVAN
Sample Collection by: RFK

Chain of Custody Record #:

Quality Assurance Data Level:
A: Standard Summary
B: Standard + Chromatograms
Laboratory Turnaround Days: 10 | 5 | 3 | 2 | X

o Oregon (o Washington) Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 94	10/19/95 1140	S	1						X										PS10319-1
2. 95	1150		1						X										2
3. 96	1210		1						X										3
4. 97	1220		1						X										4
5. 98	1230		1						X										5
6. 99	1240		1						X										6
7. 100	1250		1						X										7
8. 101	1300		1						X										8
9. 102	1310		1						X										9
10. 103	1320		1						X										10

16:8

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1.	GEI-PD	10/19/95 5:01		NCA	10/19/95 5:05
2.					
3.					

Final Report Approval
Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back
Firm: Date:

Page 1 of 2
Rev. 2.2, 11/94

Comments:

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

199

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 485-2992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

PS10319

UNOCAL INFORMATION

Facility Number: BP 0046
Site Address: 217 E. STEVEN
City, State, ZIP: BINGEN, WA 98605
Site Release Number:
Unocal Manager: KIPP ECKERT
CERT INFO: (check one) o Evaluation ~~o Remediation~~
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers, Inc. Project Number: 161-181-P62
Address: 7504 SW BRIDGEPORT RD.
PTLD. OR 97224
Phone: 503/624 9274 Fax: 6205940
Project Manager: PAT SULLIVAN
Sample Collection by: RAK

Chain of Custody Record #:

Quality Assurance Data Level: A B
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: 10 5 3 2 1

o Oregon x Washington Hydrocarbon Methods

SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1. 104	10/19/95 1330	S	1						X										PS10319-11
2. 105	1340		1						X										12
3. 106	1430		1						X										13
4. 107	1440		1						X										14
5. 108	1515		1						X										15
6. 109	1525		1						X										16
7. 110	1535		1						X										17
8. 111	1545		1						X										18
9.																			
10.																			

200

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. [signature]	GeoEng-PD	10/19/95 5:15 PM	[signature]	NCA	10/19/95 5:15
2.					
3.					

Final Report Approval

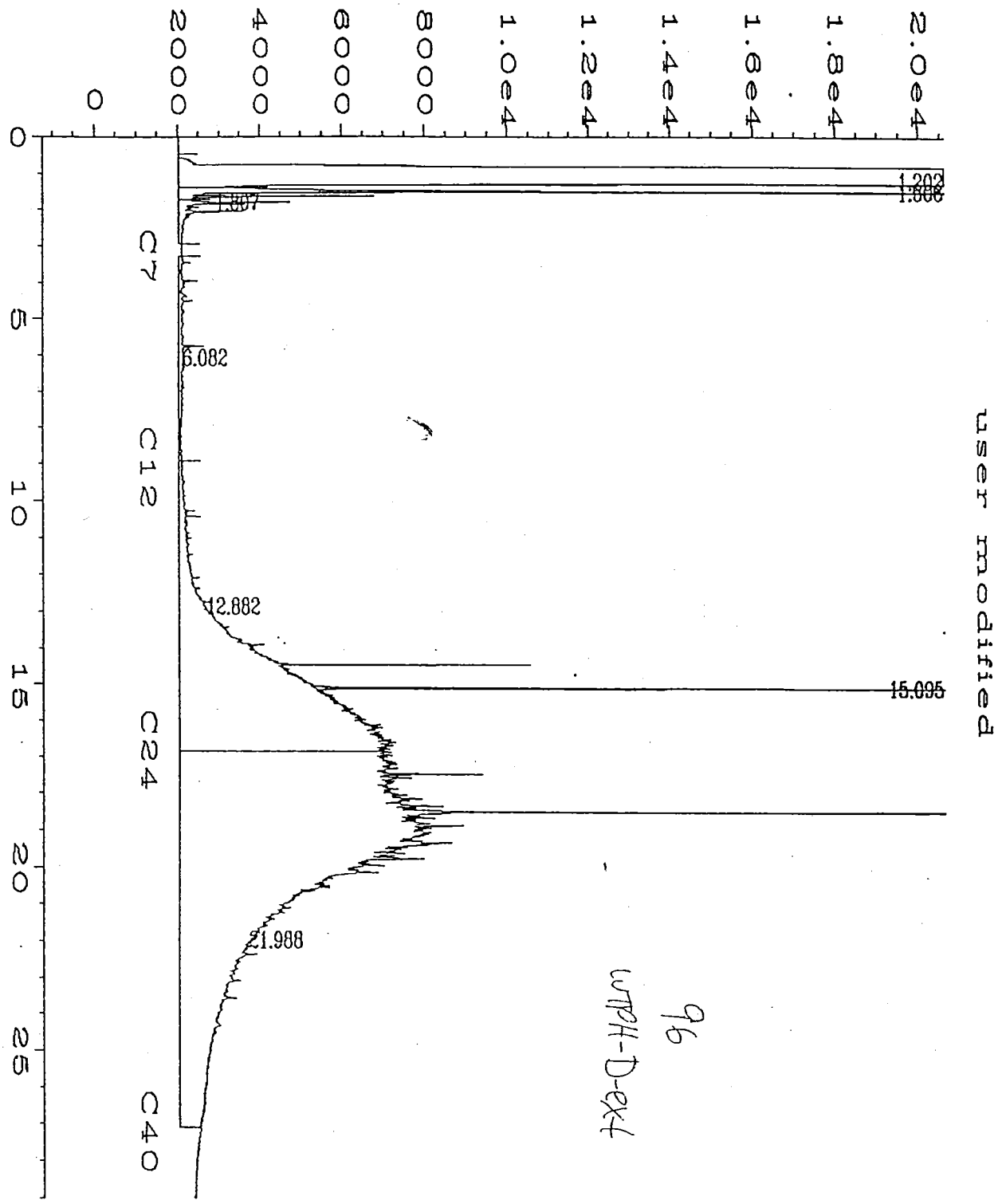
Were all requested results provided? yes no Define
Were results within requested turnaround? yes no "No"
Final Approval Signature: on back
Firm: Date:

Page 2 of 2

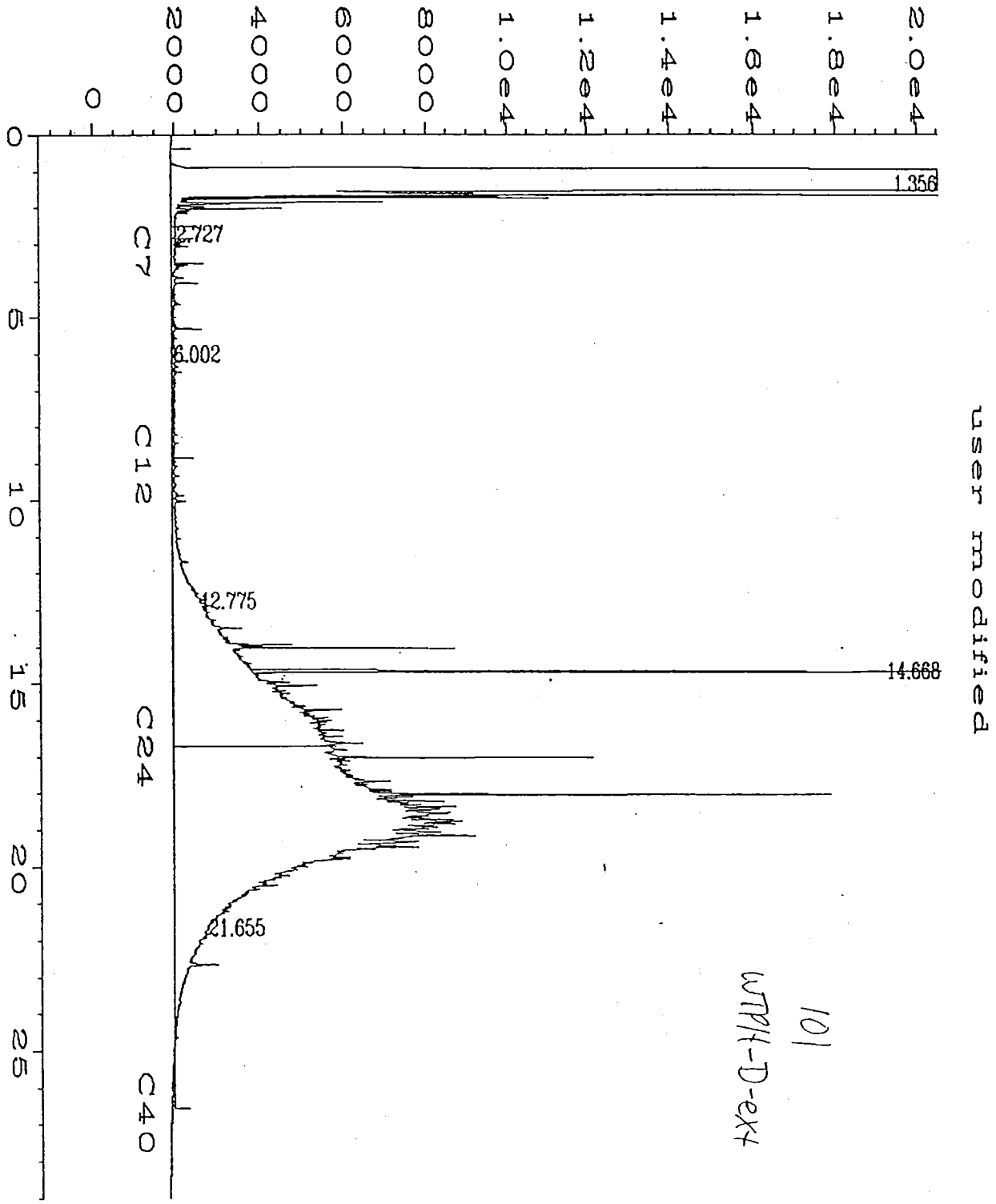
Comments:

Distribution: White - Laboratory Yellow - Consultant Photocopy cal

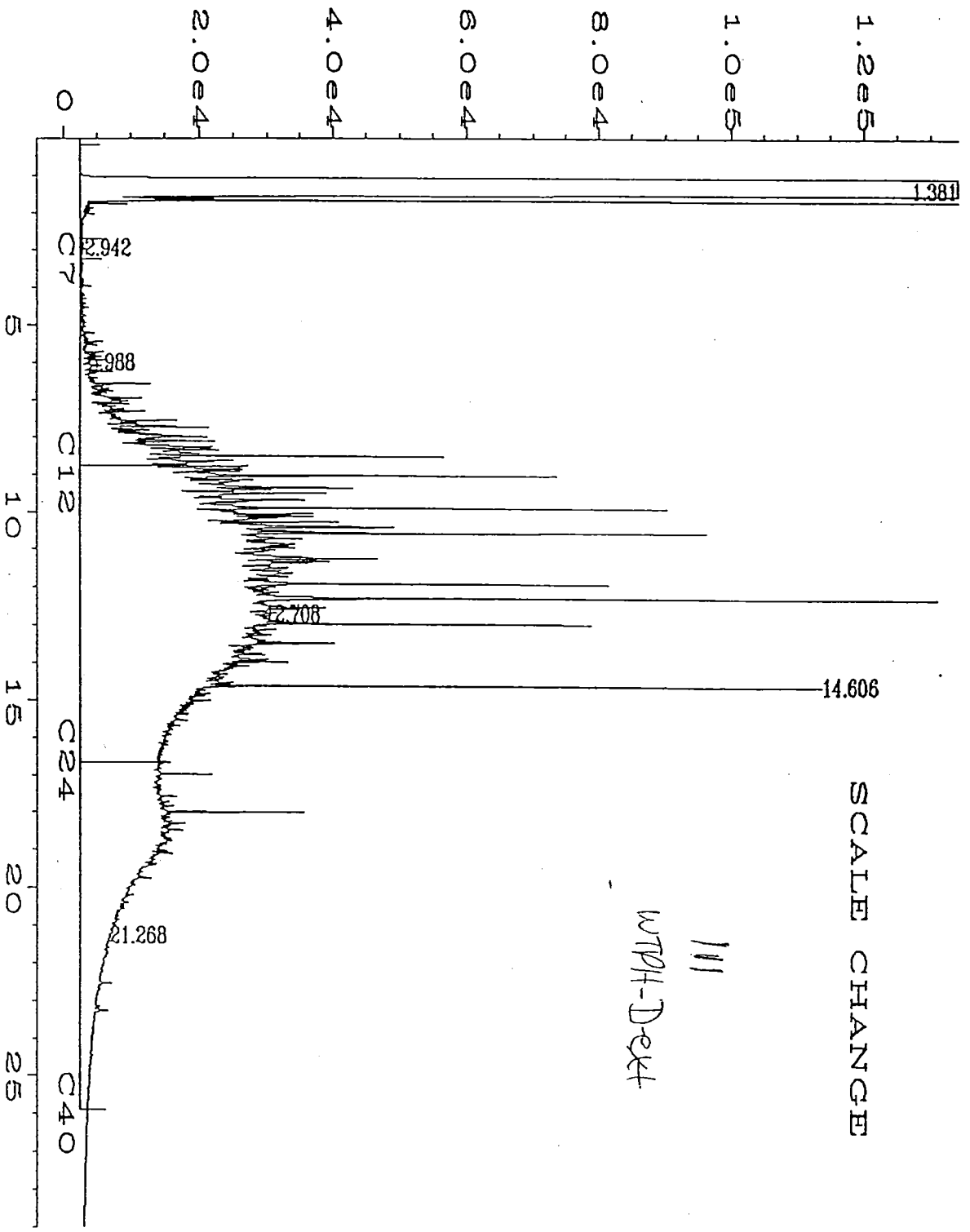
2.2, 11/94



Data File Name	: D:\HPCHEM\1\DATA\S101995A\009F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID1	Vial Number	: 9
Sample Name	: 510319-3	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 Oct 95 11:52 PM	Instrument Method	: TPHD.MTH
Report Created on	: 20 Oct 95 00:31 AM	Analysis Method	: TPHD.MTH
Last Recalib on	: 22 AUG 95 05:29 PM	Sample Amount	: 0
Multiplier	: 0.4985	ISTD Amount	:



Data File Name	: D:\HPCHEM\1\DATA\S101995A\033R0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID1	Vial Number	: 33
Sample Name	: 510319-8	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 Oct 95 11:12 PM	Instrument Method	: TPHD.MTH
Report Created on	: 19 Oct 95 11:51 PM	Analysis Method	: TPHDR.MTH
Last Recalib on	: 28 OCT 94 09:52 AM	Sample Amount	: 0
Multiplier	: 0.4965	ISTD Amount	:



Data File Name	: D:\HPCH\1\DATA\S101995B\017F0101.D		
Operator	: LQN	Page Number	: 1
Instrument	: DUALFID2	Vial Number	: 17
Sample Name	: 510319-18 RE	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 20 Oct 95 12:41 PM	Instrument Method:	TPHD.MTH
Report Created on:	20 Oct 95 01:30 PM	Analysis Method	: TPHD.MTH
Last Recalib on	: 31 AUG 95 01:40 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

APPENDIX C

Woodland, WA 98674
EPA # WAD 980986012

(503) 286-8352
1-800-367-8894

Cust. I.D. _____
Call Back 365

Generator PEMCO Name — Misty Contact — Date

439 N Columbia Rd Box Address — City — State — Zip — Phone

Billing Address: PEMCO

Consigned To: Fuel Processors
Destination: Hoo N Seattle
Via Carrier: ORRCO
Driver: Chris Truck No.: 7397 Miles Run:

Payment Terms
CK# P.O.#
Load Ticket #

Gallons	Description	Weight	Rate Per Gallon	Rate Per Hour	Charge Paid
	Combustible Liquid NOS NA 1993 III				
1320	Emulsified Fuel Oil				
	Transferring For Recycling				
	Total Tanker Weight Tes				

Customer warrants that the waste petroleum products being transferred by the above collector do not contain any contaminants including, without limitation pesticides, chlorinated solvents at concentrations greater than 1000 PPM, PCB's at greater concentrations greater than 2 PPM (or 50 PPM with Manifest of any other material classified as hazardous waste by 40 CFR part 261, Subparts C and D (implementing the Federal Resource Conservation and Recover Act) or by any equivalent State hazardous waste or hazardous substance classification program. Should laboratory tests find this waste product not i compliance with 40 CFR Part 261, customer (generator) agrees to pay for all disposal costs incurred.

Signed X _____ Date 10-15-95

OIL RE-REFINING CO., INC.

No. 41436

701 Bozarth
P.O. Box 1407
Woodland, WA 98674
EPA # WAD 980986012

24 Hour Emergency
(503) 286-8352
1-800-367-8894

Cust. I.D. 2297
Call Back 365

Generator PEMCO Name — Misty Contact — Date 10-16-95

439 N Columbia Rd OR 97611 Address — City — State — Zip — 2832151 Phone

Billing Address: PEMCO

Consigned To: Fuel Processors
Destination: Hoo N Seattle
Via Carrier: ORRCO
Driver: Chris Truck No.: 7397 Miles Run:

Payment Terms
CK# P.O.#
Load Ticket # 1

Gallons	Description	Weight	Rate Per Gallon	Rate Per Hour	Charge Paid
	Combustible Liquid NOS NA 1993 III				
705	Emulsified Water Oil		40		
	Transferring For Recycling				
	Total Tanker Weight Tes				

Customer warrants that the waste petroleum products being transferred by the above collector do not contain any contaminants including, without limitation, pesticides, chlorinated solvents at concentrations greater than 1000 PPM, PCB's at greater concentrations greater than 2 PPM (or 50 PPM with Manifest), or any other material classified as hazardous waste by 40 CFR part 261, Subparts C and D (implementing the Federal Resource Conservation and Recovery Act) or by any equivalent State hazardous waste or hazardous substance classification program. Should laboratory tests find this waste product not in compliance with 40 CFR Part 261, customer (generator) agrees to pay for all disposal costs incurred.

REGIONAL DISPOSAL COMPANY
RECAP OF WEIGHT TICKETS

TICKET #	DATE	TRUCK#	GROSS	TARE	NET POUNDS	NET TONS	TYPE	CONTAINER
207423	10/09/95	0000042	89820	36920	52900	26.450	PCS	
207424	10/09/95	040	87900	38940	48960	24.480	PCS	
207425	10/09/95	438ABC0	89820	39100	50720	25.360	PCS	
207426	10/09/95	0056	73380	32500	40880	20.440	PCS	
207427	10/09/95	000057	90980	34940	56040	28.020	PCS	
207472	10/09/95	438ABC0	90020	39000	51020	25.510	PCS	
207473	10/09/95	0000042	87600	36580	51020	25.510	PCS	
207474	10/09/95	040	92080	38760	53320	26.660	PCS	
207475	10/09/95	0056	76980	32300	44680	22.340	PCS	
207476	10/09/95	000057	92500	34700	57800	28.900	PCS	
207554	10/10/95	0056	69540	32540	37000	18.500	PCS	
207556	10/10/95	000057	85680	35020	50660	25.330	PCS	
207567	10/10/95	0000042	84340	36440	47900	23.950	PCS	
207568	10/10/95	040	84360	38560	45740	22.870	PCS	
207603	10/10/95	438ABC0	86180	39140	47040	23.520	PCS	
207636	10/10/95	000057	94940	34780	60160	30.080	PCS	
207637	10/10/95	0056	73380	32320	41060	20.530	PCS	
207639	10/10/95	040	92840	38140	54700	27.350	PCS	
207640	10/10/95	0000042	84260	36160	48100	24.050	PCS	
207680	10/10/95	040	88140	39620	48520	24.260	PCS	
207681	10/10/95	0000042	89940	36980	52960	26.480	PCS	
207833	10/11/95	040	96700	39400	57300	28.650	PCS	
207858	10/11/95	438ABC0	90120	40480	49640	24.820	PCS	
207861	10/11/95	0000042	99920	36960	62960	31.480	PCS	
207897	10/11/95	040	102160	39360	62800	31.400	PCS	
207942	10/11/95	438ABC0	103400	40540	62860	31.430	PCS	
207945	10/11/95	0000042	102320	36380	65940	32.970	PCS	
211355	10/30/95	040	95060	39540	55520	27.760	PCS	
211381	10/30/95	0000042	90080	36980	53100	26.550	PCS	
211408	10/30/95	438ABC0	90800	37860	52940	26.470	PCS	
211447	10/30/95	040	90620	39160	51460	25.730	PCS	
211448	10/30/95	0000042	93260	36700	56560	28.280	PCS	
211449	10/30/95	438ABC0	104700	37920	66780	33.390	PCS	
211451	10/30/95	040	99320	38780	60540	30.270	PCS	
211452	10/30/95	0000042	93120	36580	56540	28.270	PCS	
211454	10/30/95	438ABC0	99980	37480	62500	31.250	PCS	
211456	10/30/95	040	92500	38540	53960	26.980	PCS	
211457	10/30/95	0000042	92860	36300	56560	28.280	PCS	
REPORT TOTALS:					2029140	1014.570		

APPENDIX D

PEMCO

To: MR. PAT SULLIVAN
Company: GRD ENGINEERS
Phone:
Fax: 620 5940

From: John M. Schedler
Company: PEMCO
Phone: 503-283-2151
Fax: 503-283-6388

Date: 1-29-96

Pages including this cover page: 8

Comments:

BIMEN SURFACE SAMPLES UNDER STOCKPILES

LET ME KNOW IF YOU NEED ANYTHING ELSE

IF MARKED, A HARD COPY WILL BE SENT VIA US MAIL ____

PEMCO
437 N. Columbia Blvd.
P.O. Box 11569
Portland, OR 97211

Office (503) 283-2151
FAX (503) 283-6388

PEMCO

437 N. COLUMBIA BLVD.
P.O. BOX 11569
PORTLAND, OR 97217
(503) 283-2151

5/16/18

CHAIN OF CUSTODY

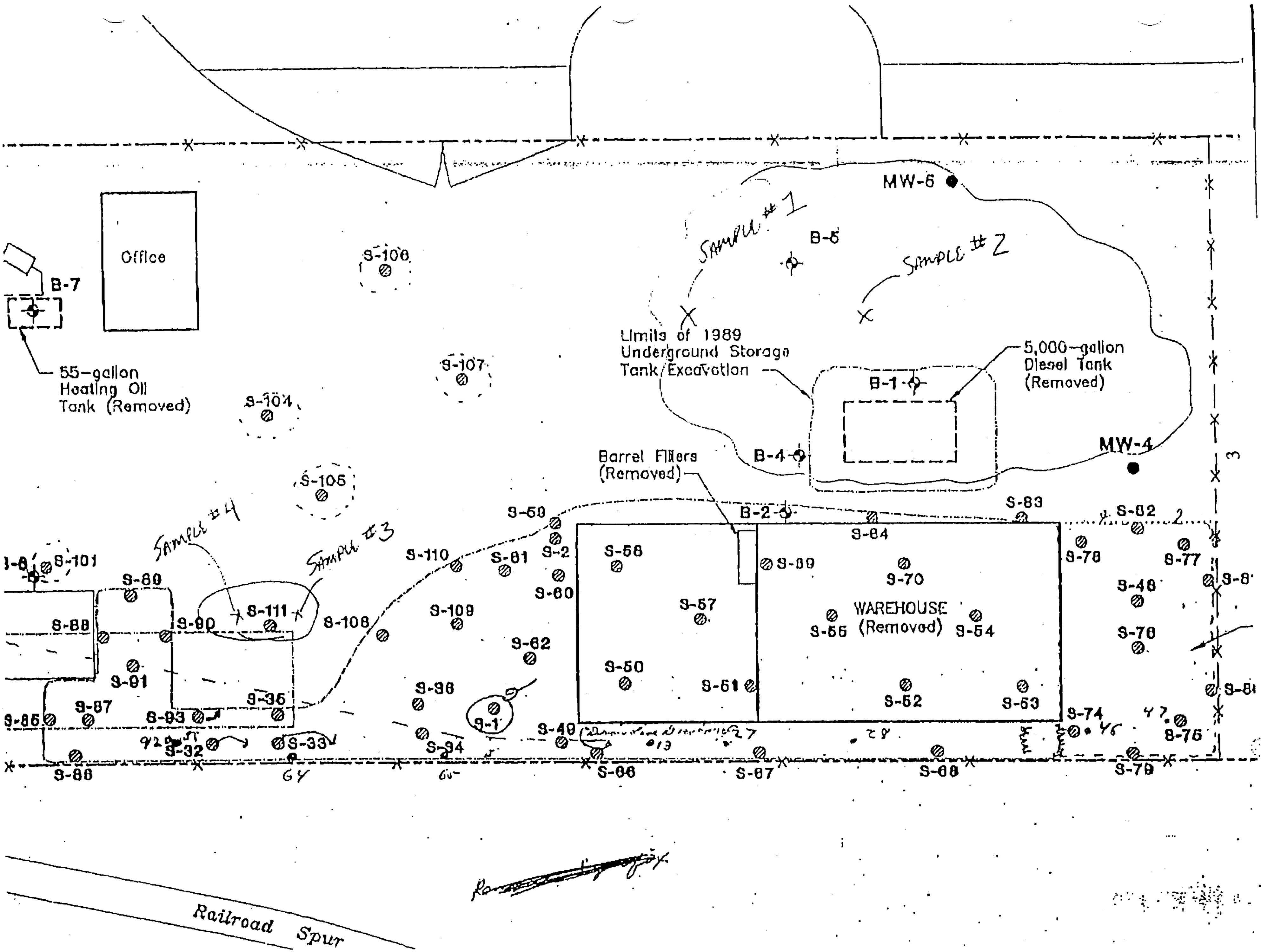
PROJ. NO.	PROJECT NAME:	SAMPLER
6904	Unocal - Bingen	MK
	ADDRESS: Bingen, WA	

SAMPLE NUMBER	DATE	TIME	SOIL	WATER	PRODUCT	SLUDGE	ICED	SAMPLE LOCATION TANK SIZE TANK PRODUCT	DEPTH	WTPH-HCID	WTPH-G	WTPH-Diesel	TPH(418.1M)	EPA 418.1	BTEX 602/8020	PAH (8310)	Total Pb (7421)	EDB & EDC (8010)	TCLP(8 met)	TCLP(3 met)	PCB's 608/8080	Chlor. Solv. 601/8010	VOC's 8240	EPA 8015 Mod	Flashpt (1010)	TOX		
#1	11/14/95	3:00	X				X	Large Stockpile West End	0-6"	X																	
#2	11/14/95	3:10	X				X	Large Stockpile East End	0-6"	X																	
#3	11/14/95	3:20	X				X	Small Stockpile East End	0-6"	X																	
#4	11/14/95	3:25	X				X	Small Stockpile West End	0-6"	X																	

Relinquished by:	Date	Time	Received by:
Michael R. Kluber	11/14	3:00	Bill Stanton
Bill Stanton			Robert Carpenter
Relinquished by:	11/17	1335	

RUSH: YES (NO)

LAB #


Office
B-7
55-gallon Heating Oil Tank (Removed)
S-106
S-107
S-104
S-105
B-6
S-101
S-89
S-88
S-90
S-111
S-108
S-110
S-109
S-91
S-87
S-85
S-86
S-93
S-36
S-32
S-33
S-98
S-94
S-1
S-62
S-59
S-61
S-2
S-60
S-49
S-66
S-67
S-68
S-79
SAMPLE #4
SAMPLE #3
SAMPLE #1
SAMPLE #2
MW-6
B-5
Limits of 1989 Underground Storage Tank Excavation
5,000-gallon Diesel Tank (Removed)
B-1
B-4
MW-4
Barrel Fillers (Removed)
B-2
S-83
S-82
S-64
S-58
S-57
S-50
S-51
S-69
S-70
WAREHOUSE (Removed)
S-55
S-54
S-52
S-53
S-78
S-77
S-48
S-76
S-74
S-75
Railroad Spur

Analytical Technologies, Inc.
17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 511618

December 4, 1995

Bill Knutson
Pemco
437 N. Columbia Blvd.
P.O. Box 11569
Portland, OR 97211

Project Name/Number: Unocal - Bingen / 6904

Attention: Bill Knutson

On November 17, 1995, Analytical Technologies, Inc. received four soil samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	PEMCO	ATI I.D.:	511618
PROJECT #:	6904		
PROJECT NAME:	Unocal- Bingen	MATRIX:	SOIL

ATI #	CLIENT DESCRIPTION	DATE SAMPLED
511618-1	# 1	11/14/95
511618-2	# 2	11/14/95
511618-3	# 3	11/14/95
511618-4	# 4	11/14/95

----------TOTALS----------

MATRIX	# SAMPLES
SOIL	4

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SUMMARY RESULTS

TEST:	TPH-HCID (WASHINGTON)	ATI I.D.:	511618
CLIENT:	PEMCO	DATE SAMPLED:	11/14/95
PROJECT #:	6904	DATE RECEIVED:	11/17/95
PROJECT NAME:	Unocal- Bingen	DATE EXTRACTED:	11/21/95
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

RESULTS CORRECTED FOR MOISTURE CONTENT

ATI ID	CLIENT ID	DATE ANALYZED	GASOLINE C7 - C12	DIESEL C12 - C24	> C24	SURROGATE (62% - 143%)
511618-0	Method Blank	11/27/95	Less Than 20 mg/Kg	Less Than 50 mg/Kg	Less Than 100 mg/Kg	118%
511618-1	# 1	11/27/95	Less Than 23 mg/Kg	Less Than 57 mg/Kg	Less Than 110 mg/Kg	114%
511618-2	# 2	11/27/95	Less Than 23 mg/Kg	Less Than 57 mg/Kg	Less Than 110 mg/Kg	113%
511618-3	# 3	11/27/95	Less Than 22 mg/Kg	Less Than 56mg/Kg	Less Than 110 mg/Kg	112%
511618-4	# 4	11/28/95	Less Than 22 mg/Kg	Less Than 56mg/Kg	Less Than 110 mg/Kg	115%

Analyst: 12/4/95
Reviewer: 12/4/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

		ATI ACCESSION:	511618
TEST:	TPH-HCID (Washington)	QC SAMPLE:	Method Blank
CLIENT:	PEMCO	DATE EXTRACTED:	11/21/95
PROJECT #:	6904	DATE ANALYZED:	11/27/95
PROJECT NAME:	Unocal - Bingen	DILUTION FACTOR:	1
SAMPLE MATRIX:	SOIL	UNITS:	mg/kg

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	<	50	50	56	112	47	94	17
SURROGATES:								
1-CHLOROOCTANE (62% - 143%)				97%		102%		
O-TERPHENYL (62% - 143%)				97%		102%		

CONTROL LIMITS

	% REC	RPD
Diesel	69-128	20

Analyst: [signature]

Reviewer: [signature] 11/6/95

Analytical Technologies, Inc.

ANALYTICAL SCHEDULE

CLIENT:	PEMCO	ATI I.D.:	511618
PROJECT #:	6904		
PROJECT NAME:	Unocal- Bingen		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
Hydrocarbon Identification	GC/FID	OR TPH-HCID	PLD

PLD = ATI - Portland
R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract