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PHASE II SUBSURFACE INVESTIGATION FOR A METAL RECYCLING YARD OAKLAND CALIFORNIA

Prepared for:
Custom Alloy Scrap Sales. Inc.
2730 Peralta Street
Oakland, California

CF

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INTRODUCTION

This report describes the Phase II work performed by MacKinnon Environmental Consulting for Custom Alloy Scrap Sales, Inc. (CASS) in Oakland, California. CASS is a metal scrapyard which recycles aluminum and iron. It occupies the block located between Peralta and Poplar St. and 28th and 26th Streets in Oakland (Figure 1). The largest portion of the recycling yard is devoted to aluminum products and is covered with concrete. The smaller ("ITP") yard recycles iron and is located in the southwest corner of the property (see Figure 2).

BACKGROUND

Two underground tanks were removed in April, 1990. These included a small gasoline tank under the sidewalk on 28th near Peralta and a large (10,000 gallon) diesel tank located in the south side of the aluminum yard.

Analysis of the soil samples from the pits indicated fuel contamination exceeded 100 parts per million (ppm). A preliminary (Phase I) investigation of the subsurface was thus performed in May, 1990. Three monitoring wells were installed and five soil borings were drilled and sampled near the diesel pit as part of Phase I.

The Phase I report ("Preliminary Subsurface Investigation For A Metal Recycling Yard in Oakland," June, 1990) concluded that diesel contamination had impacted the ground water in the ITP and south yards and required remediation. Further drilling and sampling were recommended (Phase II) to estimate the extent of diesel contamination and obtain additional data regarding the hydrogeology.

Only one of the four samples from the north ("gasoline") pit exceeded 100ppm. The pit was re-excavated and sampled as described in our letter-report of September 14, 1990. Unfortunately, low levels of contamination were discovered near the water table and diesel appeared unexpectedly in the laboratory chromatograph. Thus, a well was also recommended near this pit as part of the Phase II work.

SCOPE OF WORK

Three additional monitoring wells and six soil borings were drilled to satisfy the above objectives. Figure 2 gives well and boring locations. Soil samples were collected from the monitoring wells and soil borings and the wells were sampled for ground water analysis. The Phase II field work was carried out in July and October, 1990. Efforts concentrated on the south end of the site where contamination is high, however, a well was also installed near the north fuel pit. Elementary remedial measures were initiated in both the north pit and diesel-ITP areas.

The wells were surveyed by a licensed surveyor (Plate 1 in pocket) and water levels were measured in 4 monitoring wells in order to estimate the flow direction. Wells with free product were not used for this purpose as discussed later. In addition, fuel leak and toxic cases on record at the Regional Water Quality Control Board (RWB) were checked for further information regarding contamination problems near the site.

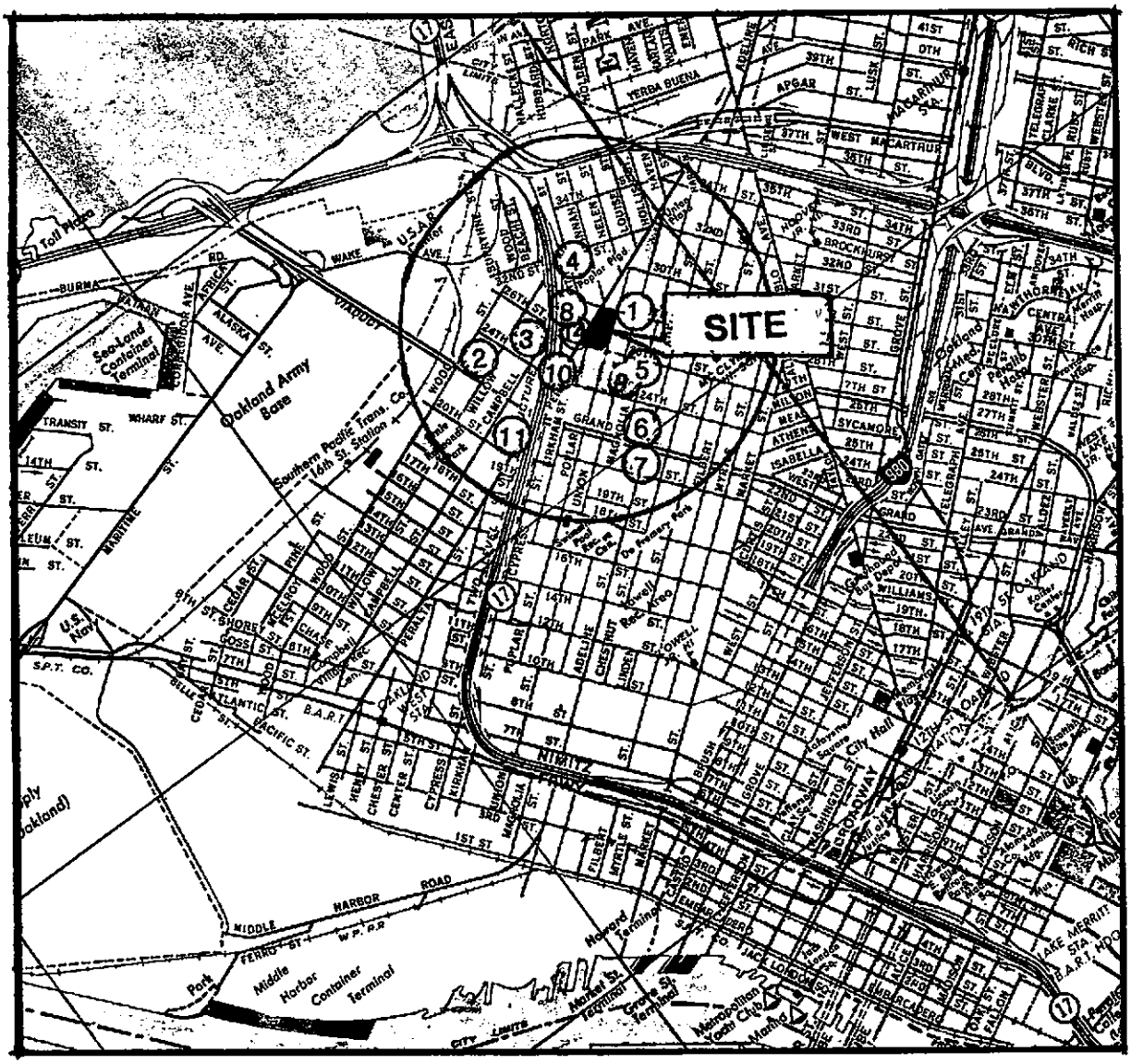

FIGURE 1
SITE LOCATION MAP SHOWING SUBSURFACE CONTAMINATION SITES WITHIN 1/2-MILE RADIUS OF SITE

. arc outlines radius of 1/2-mile
circled numbers denote fuel leak cases, Table 5

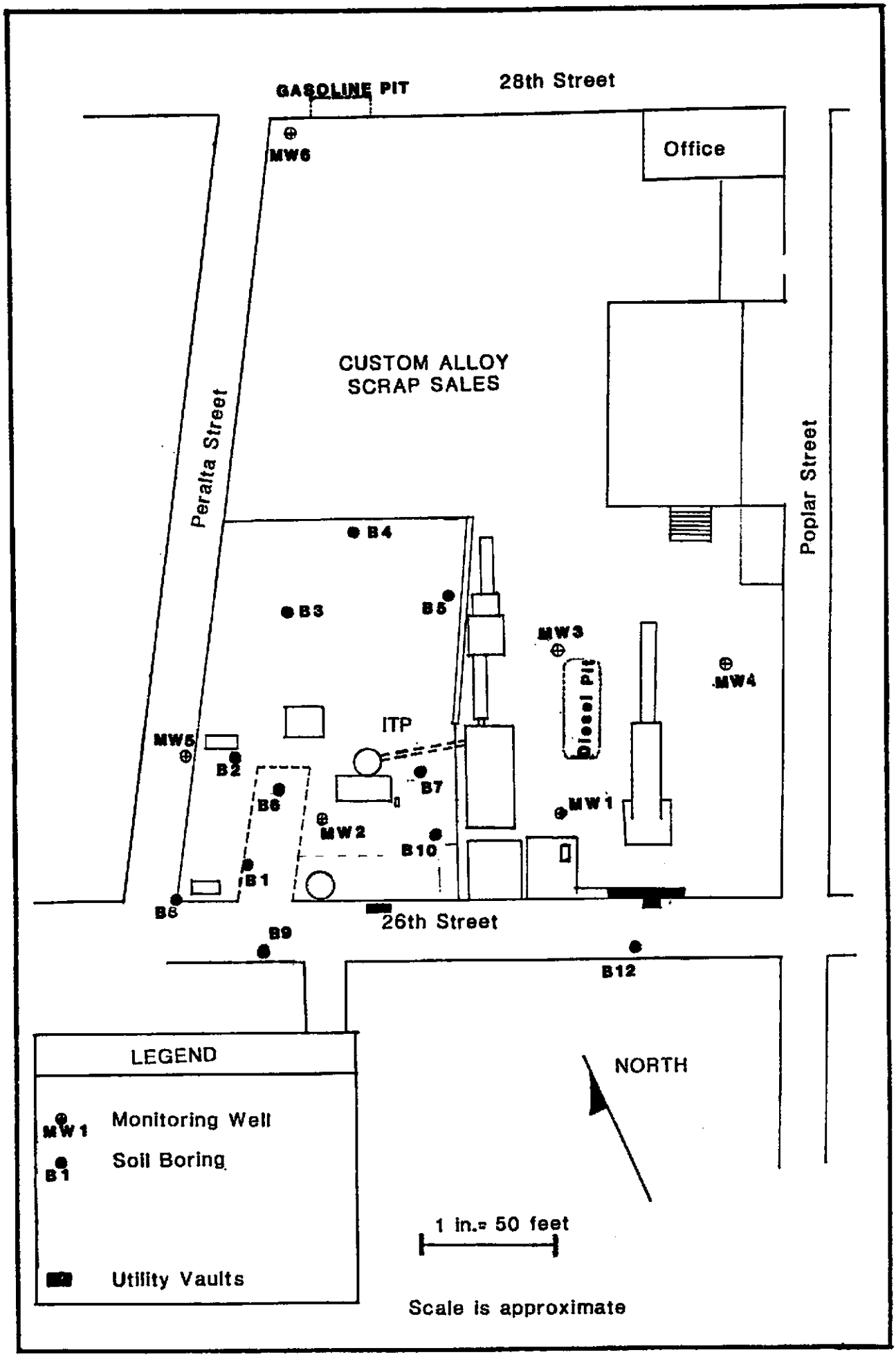

FIGURE: 2 Location of Boreholes and Monitoring Wells

DRILLING AND WELL CONSTRUCTION

The monitoring wells (MW4, MW5 and MW6) were drilled with hollow stem augers using a B61 rig. Soil cuttings generated during drilling were placed in 55-gallon drums, labeled and stored on site.

Wells were located with regard to anticipated contamination, but locations are somewhat constrained by pre-existing structures. Figure 2 shows the location of the wells in relation to the site. MW4 is on the southeast side of the site between the diesel pit and Poplar Street, MW5 was located in Peralta Street near the ITP yard and MW6 was drilled approximately 14 feet southwest of the former fuel pit in the north end of the yard.

Four-inch diameter, threaded PVC casing was used in well construction. The casing was capped at both ends and a Christy box was installed at the surface. Locks were attached to preclude tampering. Well construction is described below and details are shown on the boring logs in Appendix A.

The monitoring wells were bored to a depth just over 18 feet below ground level. Each well was constructed with ten feet of .02-inch slotted casing and a 6-inch silt trap was added at the bottom. The slotted interval begins 7.5 to 8 feet below grade and extends to a depth of 17.5 to 18 feet. Blank casing was installed above the screened interval to the surface. The annular space between the borehole and the well casing was packed with #3 Monterey sand from the bottom of the well to two feet above the screened interval. An 18-inch bentonite plug was set above the sand pack and the remaining annular space was sealed to the surface with cement. The Christy box itself was set in a concrete-cement mix to minimize cracking and add strength at the surface.

The six soil borings were drilled to the approximate depth of the water table (10-11 feet) and sampled. The borings were backfilled with cuttings and bentonite chips and compacted. The borings in the street were also sealed at the surface with approximately 18 inches of cement. Two borings originally proposed in the north end of the ITP yard were not drilled or sampled due to lack of access during the three days the drill rig was on site. (A large crane had broken down and blocked the entrance to this area.) Three additional borings (B6, B7 and B10) were instead bored in the vicinity of MW2 where free product had accumulated.

SAMPLING

Soil

A sample was collected for analyses at the estimated depth of the water table from each of the soil borings. At least two soil samples were collected in each of the three monitoring well borings: one at five feet and a second just above the water table (approximate depth of 10 feet). The five foot samples from the well borings were screened visually in the field for lithology and evidence of contamination; if no odor or other signs were detected the sample was discarded.

Additional samples were collected for lithologic purposes as seemed appropriate. One to four samples were collected per boring. The area near the top of the water table or capillary zone (approximately 9 to 12 feet) was continuously sampled in most of the borings. The purpose of these samples was: 1) to investigate a sand lens that had been found at this depth previously and; 2) to test for soil and ground water contamination that may have migrated along the water table.

Soil samples were collected in 2 x 6-inch brass liners using a modified California split-spoon sampler driven by a 140-pound hammer. The sampler was fitted with three clean, brass liners and one of the soil samples (commonly the lowermost brass liner) was selected for analysis. The open sample ends were then covered with aluminum foil, capped and placed on ice for delivery to the laboratory.

Brass liners were scrubbed on site in water with a trisodium phosphatic (TSP) detergent and then double rinsed. The sampler was also cleaned in a TSP solution following each sampling and steam cleaned between each hole.

Ground Water

On Oct. 22, 1990 the three new wells were developed using an air lift bladder pump. Three to seven well volumes were removed per well until the water was clear of fine material. Development and purge water was stored in separate drums on site and labeled.

In MW1, over 18 inches of floating product was measured with a clear acrylic bailer and in MW2, 32 inches of product was found in the bailer. It should be noted that the actual thickness of product in the soil will be substantially less (35-55%) than the thickness of product accumulated in the well. The free product in MW2 was anticipated, however water from MW1 had originally been tested as free from contamination. (Several weeks after well installation however, a sheen was noted on top of the water in MW1).

Water from wells MW1 and MW2 was not sampled because of the floating product. Samples of the ground water were taken from MW4 and MW6 within 2-3 hours of development. MW3 was purged and sampled at the same time. MW5 however was not sampled until several days later because the sampler felt he had contaminated his bailer and was unable to decontaminate adequately. MW5 was purged of over four well volumes prior to sampling. Prior to development, a sheen was detected in MW4.

Sampling equipment was carefully decontaminated before initial use and between each well. Ground water samples were withdrawn from the wells by a teflon bailer which had been steam cleaned before arriving at the site. The bailer was scrubbed before each use with a TSP solution and a bottle brush. It was then rinsed with clean tap water, rinsed with reagent grade methanol and finally, double rinsed with distilled water. A new rope was tied to the end of the bailer and every effort was made to keep the rope above the water in the well.

Ground water was transferred, with minimal agitation, into glass bottles certified clean by the laboratory doing the analysis. The bottles for volatile organic analyses were checked to ensure that air bubbles were not present. Sample containers were immediately sealed, labeled and placed on ice. All samples were delivered under chain-of custody procedures.

REMEDIAL MEASURES

Elementary remedial measures were initiated in both the north pit and diesel-ITP areas. The north pit was overexcavated in an attempt to remove the bulk of the contamination and free product was removed from a well in the south yard.

North Pit

The north pit was re-excavated and sampled on July 20, 1990. The contaminated soil within the pit was removed and then the soil below the pit was excavated to a depth of over ten feet below grade. (Note: grade is approximately 18 inches lower here than in the yard). The soil at this depth consisted of a wet, tan clay. No or very faint odor was noted in the samples brought from the bottom of the pit at this stage by the backhoe. Four soil samples were collected from each end of the pit: two bottom samples and two sidewalls. Water began seeping into the hole left by the backhoe bucket at 11 feet and excavation was ended. The pit was backfilled with clean fill and compacted by the contractor.

Analytical results were all very low or not detectable for gasoline although BTEX results were elevated. The chromatogram and levels of xylene and ethylbenzene (more commonly associated with diesel than gasoline) suggested diesel might be present.

Analysis of the soil pile showed that diesel was present at an elevated concentration although aeration has lowered gasoline and BTEX to very low or ND levels. Lead appeared to be below levels of concern (500mg/kg TTLC and 500 ug/l STLC). The overexcavation and analytical results were described in greater detail in our letter-report of September 14, 1990.

South Yard

In the south yard, free product was bailed on two occasions and pumped recently from MW2. In July, MW2 was bailed and four full bailers, 2" x 36", were removed before water appeared. Precautions were taken to keep the bailer above the water-product interface. The bailer was lowered into the well over fifty times without completely clearing the well but removing two to six inches of product per bail. Approximately 14 gallons, primarily of product, were removed. Thirty minutes after bailing the water(-product) level had not recovered: it was 1.5 feet below initial levels (8' below top of casing).

In August, MW2 was again bailed for approximately 3/4 hour. Over seven gallons of product were removed. Three full bailers of product

were removed before water was bailed with product. Initial water(-product) level of 9.4 feet was lowered to a depth of 11.8 feet in 45 minutes - a total of 2.4 feet. After bailing was stopped the well recovered 1 foot within 15 minutes, .5 feet in next 15 minutes but only .1 feet for each of the next two 15-minute intervals. One hour and 15 minutes after bailing was discontinued the well had recovered 1.7' i.e. to a level of 10 feet below the top of the well casing.

Recently the well was pumped using an above ground bilge pump and clear hose. The hose was lowered two feet into the product and began pumping air and water within approximately one minute. The pump was shut-off for 15 minutes and the process was repeated. Less than three gallons of product were removed and after 30 minutes the well had not recharged sufficiently to resume pumping. The data above is being used to design a more efficient product removal system.

HYDROGEOLOGY

Geologic Setting (summarized from the Phase I report)

Sediments deposited in the Oakland area in Quaternary (Pleistocene to recent) times include both shallow marine and continental deposits. The youngest, surficial deposit is known as "Bay Mud" and is present in areas adjacent to the Bay. Bay Mud is generally composed of unconsolidated, olive gray, blue gray, or black silty clay. It is typically plastic and varies from soft to stiff. Organic remains such as shells and peat are often found. Permeability is generally low except where lenses of sand occur.

In the Oakland area, several other sedimentary units are noted by Radbruch & Case (1967). Sandy artificial fill, of varying composition, is common along the margins of the Bay. Franciscan bedrock has been documented (Woodward-Clyde, 1987) underlying the sediments at Clay and 12th Streets less than 1.5 miles southeast of the site. The Franciscan Formation is a complex assemblage of deformed and altered sediments and volcanic rocks which commonly form bedrock in the San Francisco Bay region.

Site Geology

The geologic materials found during drilling consist dominantly of fine grained sediments which generally fall into the category of Bay Mud. The percentage of sand and gravel is considerably less, but not insignificant, because it may play a role in the distribution of contamination at the site (see below and "Discussion" section).

A black, silty clay is present below the fill beginning at 2 to 4 feet and extends to a depth of 6 to 8 feet. Underlying the black clay is a second silty clay which is distinctly blue-green in color and often contains fine sand.

A gravelly sand layer was found within the blue-green clay in 7 of the 14 borings logged on or near the site. This sand layer is an important lithologic unit as it may be controlling the movement of ground water and fuel contamination. The sand varies in thickness

from less than six inches to over five feet in MW4 (see log Appendix B). An attempt was made to determine if this sand is laterally continuous by collecting lithologic samples at similar depths (9 to 12 feet) in other borings. The cross-sections (Figure 3) were constructed to graphically estimate the extent of sand across the site.

In the boring logs where no sand body was noted, sand is often disseminated within the clays below approximately six feet; the percentage of sand, and occasionally gravel, in the clayey matrix appears to increase below 10 feet. MW6 was continuous logged between 9 and 14 feet without encountering a sand dominant lithology although in the diesel pit, 13 feet away, a coarse sand layer up to 10-inches thick had previously been noted. This suggests the sand occurs not as a continuous layer but as lenses or elongate (and possibly sinuous) channels (refer to Figure 3).

Below the sand (or below the blue-green clay where sand does not occur) lies a third clay, generally yellow brown in color. The yellow-brown clay commonly contains minor amounts of sand and is found at depths varying from 11 to 15 feet below grade.

Ground Water at the Site

Ground water levels were estimated to be 10 to 12 feet below ground surface during drilling. Water levels were measured with an electric sounder prior to well development on October 22, 1990. MW3, MW4, MW5 and MW6 were measured again on October 30 after wells had stabilized. (MW1 and MW2 were not used for water levels due to the free product accumulating in these wells).

The three new wells were surveyed for distances and elevations (Plate 1 in pocket) on October 26 by a California licensed surveyor. (The remaining wells had been surveyed following installation last May.) The measured water levels and conversions to elevations are given in Table 1 below.

Table 1

WATER LEVEL DEPTHS AND ELEVATIONS FOR CASS

WELL	GRD	Date TOC Elev.	5-18-90 Depth	Elev.	6-20-90 Depth	Elev.
MW1	5.82	5.64	10.80	-5.16	10.2	-4.56
MW2	4.66	4.19	9.59	-5.40	-----	
MW3	6.38	5.84	11.08	-5.24	10.3	-4.46
		Date	10-30-90			
MW3	6.38	5.84	11.46	-5.62		
MW4	5.66	5.40	10.46	-5.06		
MW5	4.17	3.82	9.92	-6.10		
MW6	6.36	6.06	10.38	-4.32		

GRD = Ground surface
TOC = top of casing

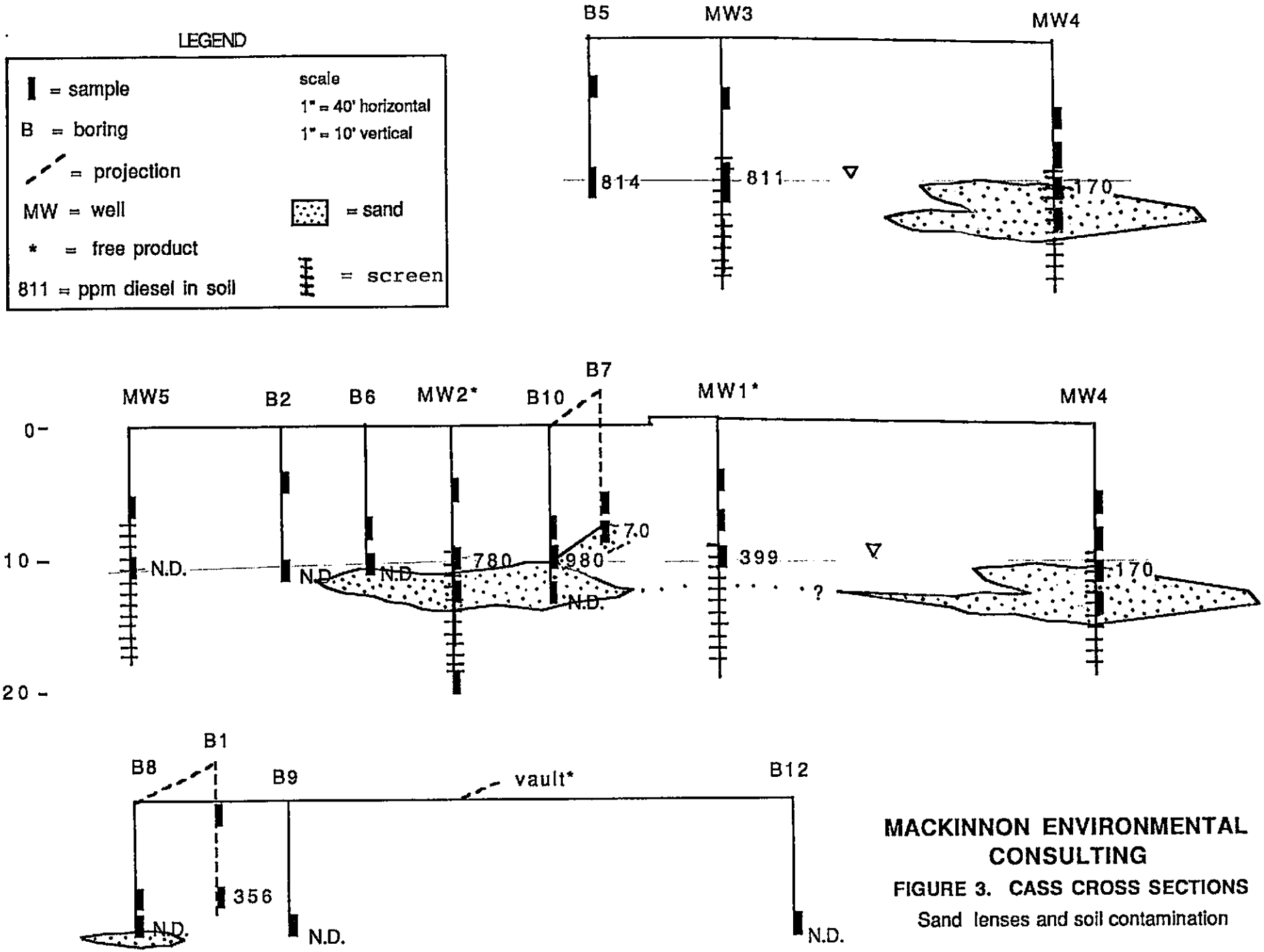

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FIGURE 3. CASS CROSS SECTIONS

Sand lenses and soil contamination

Before installation of the new wells, the flow direction was estimated to be westerly or northwesterly towards San Francisco Bay; accurate calculations were not possible however because the free product in MW2 rendered that well questionable for calculating flow. The ground water flow direction based on the October data appears to be to the west-southwest. Common methods for deriving this information however assume an isotropic media i.e. homogenous geology.

Flow lines refract as they approach a geologic contact in a heterogeneous media (such as the clay and sand at the site) due to permeability contrasts. Ground water flow may use bodies of high permeability (sand and gravel) as conduits. This appears to be a likely explanation for the pattern of contamination at the site. Ground water flows through the clay, but may change course as it intersects areas of higher permeability and follow the sand bodies.

Other studies in the area list variable local flow directions, perhaps due to the reasons outlined above. Other factors to be considered include seasonal and/or tidal variations in the water table and flows.

The ground water gradient is low; it averages less than .005 feet (.05 inches) vertically per foot horizontally. The hydraulic conductivity is estimated from lithology tables at .01 cm/second for the sand with gravel to 10^{-8} for clays. Using these values gives a rough velocity estimation of 50 feet/year for sands but only .00005 feet/year through clays.

RESULTS OF ANALYSES

Soil and water samples were sent to Superior Analytical Laboratory, Martinez, California. This laboratory is certified by the state of California for drinking water and hazardous waste testing and analysis. Chain-of-custody documentation followed all samples to the lab. Laboratory reports for the recent results shown in Tables 2, 3, and 4 are attached in Appendix B.

Samples were analyzed following procedures developed and verified by the Environmental Protection Agency (EPA) or the California Department of Health Services (DHS). All soil samples were analyzed for total petroleum hydrocarbons as diesel by DHS Method (modified EPA 8015). Soil and ground water samples collected near the north ("gasoline") pit were also analyzed for gasoline. All ground water samples and selected soil were analyzed for:

- total petroleum hydrocarbons as diesel
- benzene, toluene, ethylbenzene,and xylene (BTEX)
- petroleum hydrocarbons as oil and grease
- metals (lead, zinc, chromium and cadmium)
- total petroleum hydrocarbons as gasoline.

Soils

Soil samples were analyzed from three new three monitoring wells and six soil borings. The latest results are shown in Tables 2 and 3 below along with previous results from Phase I testing.

TABLE 2: SOIL SAMPLES ANALYTICAL RESULTS FOR FUELS

Boring or Well/ Depth	Diesel	Benzene	Toluene	Ethylbnzn.	Xylenes	Gasoline
MW1/5'	ND	NA	NA	NA	NA	
MW1/7'	ND	NA	NA	NA	NA	
MW1/11'	399	ND	ND	ND	ND	
MW2/5'	ND	NA	NA	NA	NA	
MW2/10'	780	ND	ND	ND	.015	
MW3/5'	ND	NA	NA	NA	NA	
MW3/11'	811	ND	ND	ND	.053	
MW4/10	170	NA	NA	NA	NA	
MW5/10	ND	ND	ND	ND	ND	
MW6/10	210	ND	.066	.04	.086	14
B1/11'	356	NA	NA	NA	NA	
B2/11'	ND	NA	NA	NA	NA	
B5/11'	814	NA	NA	NA	NA	
B6/10'	ND	ND	ND	ND	ND	
B7/10'	70	NA	NA	NA	NA	
B8/10'	ND	NA	NA	NA	NA	
B9/10	ND	ND	.006	ND	.004	
B10/9.5	980	NA	NA	NA	NA	ND
B10/12	ND	NA	NA	NA	NA	
B12/10	ND	ND	.004	ND	ND	

TABLE 3

Boring/ Depth	W.Oil	Lead	Zinc	Copper	Cadmium	Chromium
MW1/5'	18,400	NA	NA	NA	NA	NA
MW1/7'	ND	NA	NA	NA	NA	NA
B1/4'	70	ND	27	14	NA	NA
B2/4'	ND	<20	22	13	NA	NA
B3/3.5'	2890	240	560	22	NA	NA
B4/3.5	99	15	31	18	NA	NA
B5/4'	2410	42	52	19	NA	NA
B10/12'	ND	10	33	NA	ND	21

a) results are expressed in milligrams per kilograms (mg/kg). Mg/kg is equivalent to parts per million (ppm).
b) BTEX results have been converted to mg/kg from micrograms per kilograms (ug/kg).

c) ND = not detected
NA = not analyzed

Soil contamination at concentrations of 300 to 800 ppm diesel was found at depths of 10 to 11 feet in the Phase I investigation. This is the approximate depth to ground water and suggests diesel is migrating along the surface of the water table. Similarly Phase II soil sample results from approximately 10 feet support this conclusion; contamination was found between 10-11 feet but generally not above or below this depth. Diesel was not found above this depth in the four samples from the monitoring wells taken last May; no odors or signs of contamination were noted in shallow samples collected recently except in the piping area (B7 and B10 on Figure 2). Likewise no odors were detected below approximately 12 foot depths. B10 sampled at 12.5 feet confirms diesel was non-detectable, however 980mg/kg was detected at 9.5 feet in the same boring.

No diesel was detected in the four borings on 26th or Peralta Streets. Nor was diesel or BTEX detected in B6 in the ITP yard approximately 25 feet northwest of the free product found in MW2. Contamination was not detected in B2 which lies between B6 and MW5. Trace levels of toluene were detected in B9 and B12 in 26th Street; B12 also contained a trace level of xylene.

Both gasoline and diesel were detected from the boring of MW6 located near the north "gasoline" pit. Gasoline was present at lower levels (14mg/kg) than diesel (210 mg/kg) in the soil sample. BTEX components were also present with the exception of benzene. One sample (B10-9.5) was tested for gasoline in the ITP yard; none was detected however this sample was contaminated with diesel.

Low levels of copper, zinc and/or lead were previously found in five shallow soil samples in the ITP yard. B10-12 also contained low levels of lead, zinc and chromium. In all cases the metals are below total threshold limit concentrations (TTLC's).

Ground Water

All ground water samples in the diesel pit area were analyzed as follows:

EPA 8020/5030 - Benzene, toluene, ethylbenzene,and xylene (BTEX)
EPA SM5520F - petroleum hydrocarbons as oil and grease
EPA SW846 - metals (lead, zinc, chromium and cadmium)
EPA 8015 - Total petroleum hydrocarbons as diesel
EPA 5030/8015 - Total petroleum hydrocarbons as gasoline.

The analytical results are shown in the Table 4 below. Results are in micrograms per liter (ug/L) which is equivalent to ppb.

TABLE 4
RESULTS FOR GROUND WATER SAMPLES

Well	Gasoline	Diesel	Benzn	Toluene	Ethylbnzn	Xylenes	Oil & Grease
Previous Results							
MW1	ND	ND	0.4	ND	1.0	0.7	
MW3	ND	ND	1.8	ND	0.5	ND	
Duplicate MW3	NA	NA	1.8	ND	0.5	ND	
Current Results							
MW3	ND	270	0.9	ND	ND	1.6	ND
MW4	ND	350	0.3	ND	ND	0.4	ND
MW5	ND	ND	ND	ND	ND	ND	ND
MW6	220	800	4.9	4.6	0.9	4.8	ND

	Nickel	Chromium	Lead	Zinc	Cadmium
MW3	ND	ND	ND	ND	NA
MW4	ND	ND	ND	ND	NA
MW5	ND	NA	ND	ND	ND

a) Results are expressed in milligrams per kilogram (mg/kg). Mg/kg is equivalent to parts per million (ppm).
b) BTEX results have been converted to mg/kg from micrograms per kilogram (ug/kg).
c) ND = Not detected NA = Not analyzed

Relatively high levels of diesel were detected in wells in the diesel-ITP area except for MW5. No fuel contaminants were detected in water from MW5. Casoline and waste oil were not detected in any wells in this area. Previously, BTEX components were detected in MW1 and MW3 but diesel was non-detectable at that time. MW1 now contains free product.

The free product found in MW2 was previously tested for polychlorinated biphenyls (PCBs) and other compounds as well as diesel. No compounds, other than diesel were detected.

MW6 located in the north end of the site near the "gasoline" pit shows diesel as well as gasoline and BTEX. MW6 was not tested for metals; it should be tested for lead in subsequent analyses due to the presence of gasoline. Metals were not detected in MW3, MW4 nor MW5.

DISCUSSION

Benzene and toluene are generally very low or absent as components of diesel and are more commonly associated with gasoline. Xylene however, is associated with diesel. Thus soils contaminated with diesel tested as expected: BTE was generally missing but low levels of xylene were detected in several samples. Xylene, and BTEX in general, are volatile fractions of fuels and can move ahead of the main plume. B9 is the only "downgradient" sample showing a trace of xylene (and toluene) which may or may not be related to the release of diesel at this site.

B6, only 25 feet north-northwest of free product in MW2, showed no sign of BTEX even though it appears to be connected by a sand layer. BTEX analyses may not be helpful in predicting plume movement at this site.

It is somewhat difficult to generalize about the distribution of contamination at the site. MW2, situated near the diesel fuel lines, filled with almost three feet of free product after installation. B10, 25 feet east of MW2, also shows high levels of contamination. Soil samples from other nearby borings (notably B2 and B6) however were found to contain minimal or non detectable levels of contamination. Another example of this unpredictability is the diesel found in MW4. This well was expected to be clean as it is located over 95 feet from the diesel pit in an assumed upgradient direction.

The sand present in many of the wells and borings may be acting as a control on the movement of ground water and fuel contamination. The log for MW4 indicates a large body of saturated sand and gravel over 4 feet thick. The overlying unit in this well contains large amounts of sand and gravel mixed with clay as well. Logs for MW2 and B10 also contain a sand lens or bed which occurs at the water table. The sand in the latter logs do not appear to correlate with the sand in MW4 however because sand was not encountered in MW1 or MW3 which lie in between (see Figure 3). It is possible however that the sand in MW4 is linked to a sand unit in the diesel pit itself. Another explanation for the contamination in this "upgradient" well could be a second possible source flowing onto the site.

The sand bodies appear to be the most likely reason for a pattern of contamination which does not always follow an expected ground water flow direction. Other mitigating factors to be considered along with the geology are tidal or seasonal variation in flows. During a high water table or high tides, fuel may float above the sand-conduit system and flows would revert to a more standard regime.

The presence or absence of sand in the wells may also influence flow calculations. For example using MW4, with its thick sand unit, yields a slightly more westerly flow than when using only wells which contain little or no sand. Shallow wet soils in MW5 may indicate a possible sewer leakage which could also affect water levels.

REVIEW OF UNDERGROUND FUEL LEAK CASES

MacKinnon Environmental Consulting reviewed nearby subsurface investigations on file at the Oakland office of the Regional Water Quality Control Board (RWQCB) for Phase I. A number of soil and ground water contamination problems were found to exist in the nearby area. Within a 1/2 mile radius of the Peralta Street site are 15 reported releases. The locations of these releases are shown by number on Figure 1; the sites corresponding to these numbers are listed in Table 5, Appendix C.

Site specific flows directions are reported for only two of these sites and varied from northwest to southerly flows. In most of the cases it can be assumed ground water is flowing away from the CASS site, the case is closed or is limited at present to soil contamination.

Nonetheless several releases are of possible concern either because they appear to be upgradient or located very nearby. Of these Plute (#1) is only 1.5 blocks upgradient and reports diesel contamination in soil and ground water. Another case, Toland (#14) appears to be across Peralta Street from CASS. No further information has become available at the RWQCB on either of these cases in the last five months.

CONCLUSIONS

The main sources of contamination at the property, two underground tanks, have been removed. Records indicate that the small tank on the north side of the property contained gasoline and the large tank on the south side contained diesel. Diesel has been found however in soil and ground water samples from the north pit and boring as well as slightly lower levels of gasoline.

North Pit

The north pit was overexcavated in an attempt to remove the bulk of the contamination. MW6 was installed as close as possible to the pit and fuel contamination (primarily diesel) was found in the ground water.

In this area we have the difficulty of being unable to locate a well within at least 60 feet of the problem due to the intense network of known underground and above ground utilities in Peralta and 28th Streets. The only drill site option in Peralta is the center of the street (southwest of 28th Street), which is objectionable to the City of Oakland and all concerned for safety reasons, both during construction and later access to sample, purge or measure water levels. It may be possible to move farther west on 28th Street but at this distance the complexity of predicting contaminant movement renders drilling a somewhat "hit or miss" endeavor.

ITP and South Yards

The major problem at the site appears to be the free product present in MW2 and MW1. This is a priority for clean-up. Tests confirm the product falls within the diesel range of hydrocarbons. The contamination is probably derived from the diesel tank itself or pipe leakage - or both. Free product appeared initially in MW2 indicating that the piping might be the main culprit. This is supported by indications of contamination at shallow depths in this area not present elsewhere. Contamination in MW4 as well as MW1 and MW3 suggests the tank may have leaked also.

The diesel plume has been fairly well defined to the west and south, but contamination to the north and east was unexpected. The distribution of contamination does not lend itself to a smooth line following the direction of ground water flow. The flow direction based on the October data is to the west-southwest, however the pattern of contamination also has an easterly (MW4) and possibly

northerly (B5?) component. Thus the situation appears fairly complex rendering accurate plume prediction/definition exceedingly difficult.

Ground water flow refracts when it hits a material of different permeability. Thus the sand body at the site may over-ride the flow regime and behave as a conduit. Contamination can then migrate in the direction(s) the sand extends. The sand is located at the present water table interface; thus a rise in water levels, seasonally (or tidally), may lessen the impact of this system as the water level rises into the overlying clays. Estimates for gradient and flow velocities indicate that flow through the sand is capable of moving up to 50 ft/yr however flow through the clay is practically negligible (.00005 ft/yr) i.e. the clay limits the migration of contamination.

RECOMMENDATIONS

Due to contamination in both the north and southeast areas of the yard, further work is warranted. Further investigation "upgradient" of MW4 would be useful and an additional boring in the ITP area near B5 would help delineate the plume. Nonetheless the cost of the investigation has begun to exceed the benefit from the data received and my client is reluctant at present to continue drilling. MEC thus suggests that funds be channeled into remedial measures and continued sampling but further drilling be postponed.

The uncertainty of predicting contaminant movement may be alleviated by further monitoring of water levels as described below. Consideration should be given to the location of this site in an industrial area with numerous contamination cases nearby. Back-ground levels are assumed to be high and the water table in this area is essentially non-potable and lies within Bay Mud.

Considering the complicating factors above we propose:

1. Measuring water levels every 5-8 weeks over a period of one year to gather data on seasonal fluctuations in flow

2. Monitoring of water levels several times per day for a number of days to gather data on tidal influences on flow

3. Sampling of wells in 6 weeks and monitoring of the thickness of free product in MW1 and MW2. To be repeated quarterly. Ground water shall be tested for diesel, gasoline and BTEX. Metals will be dropped, pending county approval, as none were detected in the recent sampling. MW6 however should be analyzed for lead due to the presence of gasoline.

4. MW6 will be pumped to remove several additional well volumes and then monitored over the next six months to see if contamination levels decrease as a result of the recent excavation of the contaminated soil.

5. Shallow soil samples will be obtained in the piping area and tested for diesel and BTEX. These samples can probably be collected using a hand auger or, if trenching is an option collected during backhoe operations.

6. Shallow soil samples will be obtained around MW1 and tested for waste oil when concrete is broken.

7. Pumping of free product should be continued on an interim basis in MW2 and, if feasible, MW1 until a more permanent system is operational.

8. Contaminated soils generated at the site should be treated, either by bioremediation or by other methods suggested by CASS's remediation contractor, KTW & Associates.

9. Water and free product removed from the wells will be removed from the site and treated by Evergreen Oil.

Other Work

A hazardous materials inventory has been compiled for CASS by a certified industrial hygienist. This inventory can be submitted shortly. An employee training program is being prepared and training is scheduled for December. These two items are designed to comply with the business plan requirements of the California Health and Safety Code.

A remediation plan is being drafted by KTW & Associates. It should be submitted to Alameda County in December. A work schedule was submitted in October.

A copy of this report will be submitted to Lester Feldman of the RWB and Cil Wistar of ACDH for their review.

******

WARRANTY

MacKinnon Environmental Consulting warrants all services to be of high professional quality. No other warranty, either expressed or implied, as to quality or result to be achieved as a consequence of this work, is made.

LIMITATIONS

This report provides an assessment of the potential problems noted and represents a professional opinion. All reports and recommendations are based upon conditions and information made available to MacKinnon Environmental to date. Liability is not assumed in cases where the client or other parties involved have failed to disclose known environmental information. No responsibility is assumed for the control or correction of conditions or practices existing at the premises of the client. Data available from future subsurface exploration may modify the conclusions and recommendations of this report.

REFERENCES

Helley, E.J., et al., 1979: Flatland Deposits of the San Francisco Bay Region, California, U.S. Geological Survey Prof. Paper 943.

Jenkins, O. (editor), 1951: Geologic Guidebook of San Francisco Bay Counties, Bull 154 CDMG.

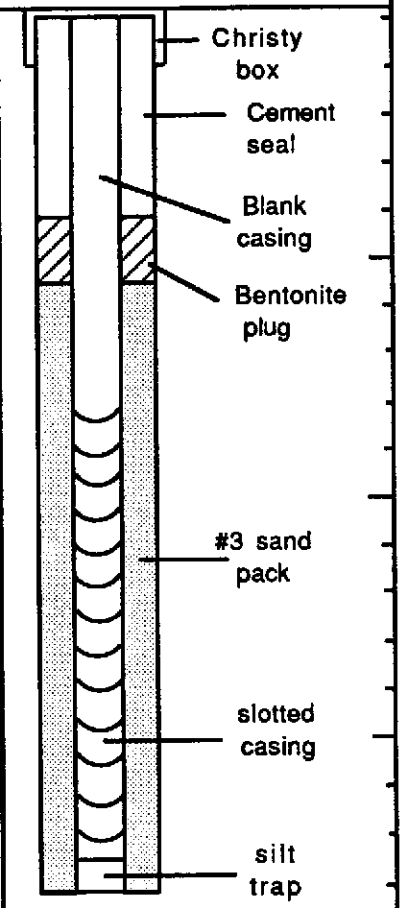
Radbruch, D.H., and Case, J.E., 1967: Preliminary Geologic Map & Engineering Geology Information, Oakland and Vicinity, California, USGS, Open File Report.

Woodward-Clyde Consultants and Kaplan, McLaughlin, Diaz, 1987: Subsurface Investigation and Technical Reports, Oakland Federal Building

BORING LOG

PROJECT NO: 5900K	PROJECT NAME: CASS	BORING NO: MW-4
LOCATION: East of large bailer and diesel pit (towards Poplar St.)		DATE: 10-16-90
GEOLOGIST: Scott Kinderwater		Page 1 of 1
GROUND WATER DEPTH: approx. 10'		DRILLER: Kvilhaug
DRILLING METHOD: Hollow stem auger, 11"		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	UCSC/Lithology	Graphic Symbol
0				approx. 6" concrete		
				rubble, large gravels, silt and clay	FILL	
5			3-8-12	black SILTY CLAY; organic material, moist	OL	
			12-25-28	green CLAYEY COARSE SAND with 30% gravel; moist; no odor	SC	
10			25-45-50	green coarse SAND with 30% gravel; saturated; HC odor	SW	
			8-6-15	yellow brown, coarse SAND with 30% gravel; saturated; HC odor		
15				yellow brown, very fine SANDY CLAY; wet; no odor	CL	
				T.D. 18.8'		
20						



screen interval is from 7.5 to 17.5 feet

REMARKS

⊠ = sample analyzed

hole plugged from 18-18.8 feet with bentonite chips

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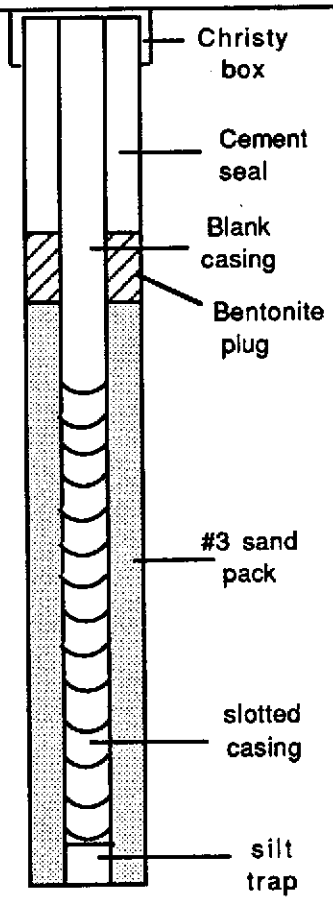
BORING LOG

PROJECT NO: 5900K	PROJECT NAME: CASS	BORING NO: MW-5
LOCATION: 70' north of corner, Peralta and 26th		DATE: 10-15-90
GEOLOGIST: Scott Kinderwater		Page 1 of 1
GROUND WATER DEPTH: approx. 12'		DRILLER: Kvilhaug
DRILLING METHODS: 11" Hollow stem auger		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	UCSC/Lithology	Graphic Symbol
0				18" asphalt	FILL	
				black fill		
				black SILTY CLAY (Bay Mud) with organic material; soft; moist;	OL	
5			1-1-2	saturated at 5'; no odor		
				grey-green, SILTY CLAY; moist;	CL	
10	⊠		6-12-15			
				yellow brown, very fine, SANDY CLAY; moist; roots.		
15				red brown, very fine, SANDY SILTY CLAY; moist		
				T.D. 18'		
20						

WELL CONSTRUCTION



screen interval is from 7.5 to 17.5 feet.

REMARKS

⊠ = sample analyzed

screen is higher at this location due to lower surface elevation

soil saturated at 5 feet - possible sewer leak

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BORING LOG

PROJECT NO: CAS-5900	PROJECT NAME: CASS	BORING NO: MW-6
LOCATION: ~14' w-sw of gasoline pit		DATE: 10-16-90
GEOLOGIST: Cinda C. MacKinnon, R.G. (#4316)		Page 1 of 1
GROUND WATER DEPTH: >10'		DRILLER: Kvilhaug
DRILLING METHOD: Hollow stem auger, 11"		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	USCS/Lithology	Graphic Symbol	WELL CONSTRUCTION
0				5" concrete			Christy box
				gravel and dark brown silt and clay	FILL		Cement seal
							Blank casing
5			5-10-15	black SILTY CLAY; organic material, moist no odor	OL		Bentonite plug
			8-14-20	grey-green SILTY CLAY, with minor fine sand; moist; HC odor			
10	⊠		7-8-10		CL		#3 sand pack
			6-12-15	yellow brown SILTY CLAY; wet; no odor			slotted casing
15				T.D. 18.5'			silt trap
20							

REMARKS

⊠ = sample analyzed

no sand found in samples or cuttings except mixed in clay between 8-11'

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BORING LOG

PROJECT NO: 5900K	PROJECT NAME: CASS	BORING NO: B-6
LOCATION: ITP yard, between MW2 and B2		DATE: 10-17-90
GEOLOGIST: Scott Kinderwater		Page 1 of 1
GROUND WATER DEPTH: 10.5 feet		DRILLER: Kvilhaug
DRILLING METHODS : Hollow stem auger, 8"		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	USCS	Graphic Symbol	WELL CONSTRUCTION
0				black soil, metal cuttings and rubble; moist	Fill		
				black SILTY CLAY with minor peat; dry	OL		
5			10-20-30	grey green, very fine SANDY CLAY; moist; no odor; orange mottles	CL		
			10-10-22	grey green, CLAYEY (fine) SAND moist; no odor	SC		
10	⊠		18-25-38	grey green , coarse SAND with 40% gravel; wet; no odor — 11.5'	SW		
15							
20							

REMARKS

⊠ = sample analyzed

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BORING LOG

PROJECT NO: 5900K	PROJECT NAME: CASS	BORING NO: B-7
LOCATION: SW ITP yard, under conveyor belt		DATE:10-17-90
GEOLOGIST: Scott Kinderwater		Page 1 of 1
GROUND WATER DEPTH: approx. 12 feet		DRILLER: Kvilhaug
DRILLING METHODS : Hollow stem auger, 8"		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	USCS	Graphic Symbol	WELL CONSTRUCTION
0				dark brown fill	Fill		
				black SILTY CLAY with minor peat; moist; HC odor at 4'	OL		
5			5-12-18	grey green, very fine SANDY CLAY; moist; slight HC odor	CL		
10	☒		5-7-12	grey green, very fine SAND; wet at 11'; slight HC odor	SP		
			5-10-15	13'			
15							
20							

REMARKS

☒ = sample analyzed

Borehole was backfilled with soil and bentonite chips and compacted.

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BORING LOG

PROJECT NO: 5900K	PROJECT NAME: CASS	BORING NO: B-8
LOCATION: outside property wall, corner of Peralta and 26th		DATE: 10-17-90
GEOLOGIST: Scott Kinderwater		Page 1 of 1
GROUND WATER DEPTH: ~ 10.5'		DRILLER: Kvilhaug
DRILLING METHODS : Hollow stem auger, 8"		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	USCS	Graphic Symbol	WELL CONSTRUCTION
0				new concrete			
				Fill	Fill		
				old concrete			
5				black SILTY CLAY with minor peat; moist	OL		
			3-6-12	grey green, very fine SANDY CLAY; moist; no odor; orange mottles; rootlets	CL		
			3-8-15	grey green, very fine SANDY CLAY with 20% gravel; moist; no odor			
10				reddish brown COARSE SAND with 30% gravel; wet	SW		
			5-15-18	11.5'			
15							
20							

REMARKS

⊠ = sample analyzed

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BORING LOG

PROJECT NO: 5900K	PROJECT NAME: CASS	BORING NO: B-9
LOCATION: 40' east of corner of Peralta and 26th		DATE: 10-15-90
GEOLOGIST: Scott Kinderwater		Page 1 of 1
GROUND WATER DEPTH: ~9.5', BGS		DRILLER: Kvilhaug
DRILLING METHODS : Hollow stem auger, 8"		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	USCS	Graphic Symbol	WELL CONSTRUCTION
0				4" asphalt 12" concrete	Fill		
5				black SILTY CLAY with minor peat; soft; moist	OL		
				grey green, very fine SANDY CLAY; soft; moist			
10	⊠		3- 5- 10	yellow grey, very fine SANDY CLAY; 10% gravel; saturated; orange mottles	CL		
				grey, fine SANDY CLAY, 30% gravel; saturated; orange mottles			
15							
20							

REMARKS

⊠ = sample analyzed

no odor or indication of contamination

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BORING LOG

PROJECT NO: 5900K	PROJECT NAME: CASS	BORING NO: B-10
LOCATION: ITP yard equidistant between MW2 and MW1		DATE: 10-17-90
GEOLOGIST: Scott Kinderwater		Page 1 of 1
GROUND WATER DEPTH: 12'-13'		DRILLER: Kvilhaug
DRILLING METHODS : Hollow stem auger, 8"		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	USCS	Graphic Symbol	WELL CONSTRUCTION
0				black fill	Fill		
5			3-5	black SILTY CLAY with minor peat; moist; HC odor ?	OL		
			12	grey green, very fine SANDY CLAY; moist; no odor; slight orange mottling	CL		
10	☒		7-14	grey green, very fine SANDY CLAY; grading to CLAYEY FINE SAND; moist; odor			
			14	grey green CLAYEY FINE SAND; moist; HC odor; 10% gravel; orange mottles	SC		
	☒		6-18	reddish brown, coarse SAND; wet; HC odor	SW		
			22	13.5'			
15							
20							

REMARKS

☒ = sample analyzed

left hole open for 1.5 hours to see if free product flowed in.

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BORING LOG

PROJECT NO: 5900K	PROJECT NAME: CASS	BORING NO: B-12
LOCATION: middle 26th street, south side		DATE: 10-15-90
GEOLOGIST: Cinda C. MacKinnon, R.G. (#4316)		Page 1 of 1
GROUND WATER DEPTH: ~9.5'		DRILLER: Kvilhaug
DRILLING METHODS: Hollow stem auger, 8"		

DEPTH	SAMPLE	RECOVERY	BLOWS	DESCRIPTION	USCS	Graphic Symbol	WELL CONSTRUCTION
0				2" asphalt/ 8" concrete			
				black organic SILTY CLAY; moist; no odor	OL		
5				grey green, SILTY CLAY; moist; slightly plastic	CL		
				light yellow brown, CLAY and SAND, with small gravel; wet; no odor	SC		
10	⊠		5-10-12	grey-green, SILTY CLAY , with red sandy mottling	CL		
15							
20							

REMARKS

⊠ = sample analyzed

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DOHS #319
DOHS #220

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 81750
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS

DATE RECEIVED:10/23/90
DATE REPORTED:10/30/90

ANALYSIS FOR Nickel , CHROMIUM, LEAD & ZINC
by EPA SW-846 Methods 7520, 7190, 7420, 7950 Respectively

LAB #	Sample Identification	Concentration(mg/L) Nickel	Chromium	Lead	Zinc
3	MW-4	ND<0.5	ND<0.1	ND<0.5	ND<0.01
4	MW-3	ND<0.5	ND<0.1	ND<0.5	ND<0.01

mg/L - parts per million (ppm)

Method Detection Limit for Nickel in Water: 0.5 mg/L
Method Detection Limit for Chromium in Water: 0.1 mg/L
Method Detection Limit for Lead in Water: 0.5 mg/L
Method Detection Limit for Zinc in Water: 0.01 mg/L

QAQC Summary: MS/MSD Average Recovery : 90%
Duplicate RPD : 0

Richard Srna, Ph.D.

Dorena Srna for

Laboratory Manager

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DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81750
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS

DATE RECEIVED: 10/23/90
DATE REPORTED: 10/30/90

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS by Modified EPA SW-846 Method 8015

LAB #	Sample Identification	Concentration (mg/L) Diesel Range
2	MW-6	0.80
3	MW-4	0.35
4	MW-3	0.27

mg/L - parts per million (ppm)

Method Detection Limit for Diesel in Water: 0.05 mg/L

QAQC Summary:

Daily Standard run at 200mg/L: RPD Gasoline =1
RPD Diesel = 4
MS/MSD Average Recovery =129 %: Duplicate RPD =0

Richard Srna, Ph.D.

Dorena Srna for
Laboratory Manager

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CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81750
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS

DATE RECEIVED: 10/23/90
DATE REPORTED: 10/30/90

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/L) Benzene	Toluene	Ethyl Benzene	Xylenes
2	MW-6	4.9	4.6	0.9	4.8
3	MW-4	0.3	ND<0.3	ND<0.3	0.4
4	MW-3	0.9	ND<0.3	ND<0.3	1.6

ug/L - parts per billion (ppb)

Method Detection Limit in Water: 0.3 ug/L

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 102 %: Duplicate RPD = <3

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Laboratory Manager

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CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81750
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS

DATE RECEIVED: 10/23/90
DATE REPORTED: 10/30/90

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 5030 and 8015

LAB #	Sample Identification	Concentration (mg/L) Gasoline Range
2	MW-6	0.22
3	MW-4	ND<0.05
4	MW-3	ND<0.05

mg/L - parts per million (ppm)

Method Detection Limit for Gasoline in Water: 0.05 mg/L

QAQC Summary:

Daily Standard run at 2mg/L: RPD Gasoline = 1
MS/MSD Average Recovery = 108%: Duplicate RPD = 5

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Laboratory Manager

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CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81787
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: MW-5

DATE RECEIVED: 10/26/90
DATE REPORTED: 11/02/90

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/L) Benzene	Toluene	Ethyl Benzene	Xylenes
1	MW-5	ND<0.3	ND<0.3	ND<0.3	ND<0.3

ug/L - parts per billion (ppb)

Method Detection Limit in Water: 0.3 ug/L

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 98 %: Duplicate RPD = 1

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CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81787
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: MW-5

DATE RECEIVED:10/26/90
DATE REPORTED:11/02/90

ANALYSIS FOR TOTAL OIL AND GREASE
by Standard Method 5520F

LAB #	Sample Identification	Concentration(mg/L) Oil & Grease
1	MW-5	ND<5

mg/L - parts per million (ppm)

Method Detection Limit for Oil and Grease in Water: 5mg/L

QAQC Summary: Duplicate RPD : 0

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C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 81787
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: MW-5

DATE RECEIVED: 10/26/90
DATE REPORTED: 11/02/90

ANALYSIS FOR CADMIUM, NICKEL , LEAD & ZINC
by EPA SW-846 Methods 7130, 7520, 7420, 7950 Respectively

LAB #	Sample Identification	Concentration (mg/L) Cadmium	NICKEL	Lead	Zinc
1	MW-5	ND<0.01	ND<0.5	ND<0.5	ND<0.01

mg/L - parts per million (ppm)

Method Detection Limit for Cadmium in Water: 0.01 mg/L
Method Detection Limit for Nickel in Water: 0.5 mg/L
Method Detection Limit for Lead in Water: 0.5 mg/L
Method Detection Limit for Zinc in Water: 0.01 mg/L

QAQC Summary: MS/MSD Average Recovery :95 %
Duplicate RPD : 0

Richard Srna, Ph.D.

Robert Wren for
Laboratory Manager

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CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81787
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: MW-5

DATE RECEIVED: 10/26/90
DATE REPORTED: 11/02/90

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

LAB #	Sample Identification	Concentration (mg/L) Diesel Range
1	MW-5	ND<0.05*

mg/L - parts per million (ppm)

* Not a typical diesel pattern.

Method Detection Limit for Diesel in Water: 0.05 mg/L

QAQC Summary:

Daily Standard run at 200mg/L: RPD Gasoline = NA
RPD Diesel = 8
MS/MSD Average Recovery =110 %: Duplicate RPD = 6

Richard Srna, Ph.D.

Laboratory Manager

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DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81717
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS FOR MC

DATE RECEIVED:10/18/90
DATE REPORTED:10/25/90

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/Kg) Benzene	Toluene	Ethyl Benzene	Xylenes
1	B6-10.5	ND<3	ND<3	ND<3	ND<3

ug/kg - parts per billion (ppb)

Method Detection Limit in Soil: 3 ug/Kg

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 90%: Duplicate RPD = <4

Richard Srna, Ph.D.

Laboratory Manager

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DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

Phase II

LABORATORY NO.: 81717
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS/MACKINNON

DATE RECEIVED: 10/17/90
DATE REPORTED: 10/24/90

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

LAB #	Sample Identification	Concentration(mg/kg) Diesel Range
1	B6-10.5	ND<10
2	B10-12.5	ND<10
4	B7-10	70
5	B8-10.5	ND<10

Method Detection Limit for Diesel in Soil: 10 mg/Kg

QAQC Summary:

Daily Standard run at 200mg/L:
RPD Diesel = 13
MS/MSD Average Recovery = 97%: Duplicate RPD = 2

Richard Srna, Ph.D.

Dorena Srna fa

Laboratory Manager

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C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 81768
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASSOCT15-17

DATE RECEIVED: 10/25/90
DATE REPORTED: 11/01/90

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/Kg) Benzene	Toluene	Ethyl Benzene	Xylenes
1	B9-10(81704-1)	ND<3	6	ND<3	4
2	B12-10 (81704-2)	ND<3	4	ND<3	ND<3

ug/kg - parts per billion (ppb)

Method Detection Limit in Soil: 3 ug/Kg

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 101%: Duplicate RPD = <2

Richard Srna, Ph.D.

Laboratory Manager

OUTSTANDING QUALITY AND SERVICE

SUPERIOR ANALYTICAL LABORATORIES, INC.

825 ARNOLD, STE. 114 • MARTINEZ, CALIFORNIA 94553 • (415) 229-1512

DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81814
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS FOR MC

DATE RECEIVED: 10/29/90
DATE REPORTED: 11/01/90

Phase II

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

LAB #	Sample Identification	Concentration (mg/Kg) Gasoline Range	Diesel Range
1	B10-9.5	ND<10	980

mg/kg - parts per million (ppm)

Method Detection Limit for Gasoline and Diesel in Soil: 10 mg/Kg

QAQC Summary:

Daily Standard run at 200mg/L: RPD Gasoline = 11
RPD Diesel = 2
MS/MSD Average Recovery = 88%: Duplicate RPD = 1

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DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81717
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS/MACKINNON

DATE RECEIVED: 10/17/90
DATE REPORTED: 10/24/90

ANALYSIS FOR CADMIUM, CHROMIUM, LEAD & ZINC
by EPA SW-846 Methods 7130, 7190, 7420, 7950 Respectively

LAB #	Sample Identification	Concentration(mg/Kg) Cadmium	Chromium	Lead	Zinc
2	B10-12.5	ND<0.2	21	10	33

mg/kg - parts per million (ppm)

Method Detection Limit for Cadmium in Soil: 0.2 mg/Kg
Method Detection Limit for Chromium in Soil: 2 mg/Kg
Method Detection Limit for Lead in Soil: 10 mg/Kg
Method Detection Limit for Zinc in Soil: 0.2 mg/Kg

QAQC Summary: MS/MSD Average Recovery : 107%
Duplicate RPD : 3

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DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81717
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASS/MACKINNON

DATE RECEIVED:10/17/90
DATE REPORTED:10/24/90

ANALYSIS FOR TOTAL OIL AND GREASE
by Standard Method 5520F

LAB #	Sample Identification	Concentration(mg/Kg) Oil & Grease
2	B10-12.5	ND<20

mg/kg - parts per million (ppm)

Method Detection Limit for Oil and Grease in Soil: 20mg/Kg

QAQC Summary: Duplicate RPD : 7

Richard Srna, Ph.D.

Dorena Srna for
Laboratory Manager

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DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81704
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASSOCT15-17
Phase II

DATE RECEIVED: 10/17/90
DATE REPORTED: 10/24/90

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 8015

LAB #	Sample Identification	Concentration (mg/Kg) Diesel Range
1	B9-10	ND<10
2	B12-10	ND<10
3	MW5-10	ND<10
5	MW4-101/2	170
6	MW6-10	210

mg/kg - parts per million (ppm)

Method Detection Limit for Diesel in Soil: 10 mg/Kg

QAQC Summary:

Daily Standard run at 200mg/L: RPD Gasoline = 13
RPD Diesel = 13
MS/MSD Average Recovery = 92%: Duplicate RPD = 2

Richard Srna, Ph.D.

Dorena Srna for
Laboratory Manager

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C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 81704
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASSOCT15-17

DATE RECEIVED:10/17/90
DATE REPORTED:10/24/90

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/Kg) Benzene	Toluene	Ethyl Benzene	Xylenes
3	MW5-10	ND<3	ND<3	ND<3	ND<3

ug/kg - parts per billion (ppb)

Method Detection Limit in Soil: 3 ug/Kg

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 99%: Duplicate RPD = <5

Richard Srna, Ph.D.

Dorena Srna for
Laboratory Manager

SUPERIOR ANALYTICAL LABORATORIES, INC.
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DOHS #319
DOHS #220

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 81704
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASSOCT15-17

DATE RECEIVED: 10/17/90
DATE REPORTED: 10/24/90

ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

LAB #	Sample Identification	Concentration(ug/Kg) Benzene	Toluene	Ethyl Benzene	Xylenes
6	MW6-10	ND<3	66	40	86

ug/Kg - parts per billion (ppb)

Method Detection Limit in Soil: 3 ug/Kg

QAQC Summary:

Daily Standard run at 20ug/L: RPD = <15%
MS/MSD Average Recovery = 99 %: Duplicate RPD = <5

Richard Srna, Ph.D.

Laboratory Manager

SUPERIOR ANALYTICAL LABORATORIES, INC.

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DOHS #319
DOHS #220

C E R T I F I C A T E O F A N A L Y S I S

LABORATORY NO.: 81704
CLIENT: Mackinnon Environmental
CLIENT JOB NO.: CASSOCT15-17

DATE RECEIVED: 10/17/90
DATE REPORTED: 10/24/90

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
by Modified EPA SW-846 Method 5030 and 8015

LAB #	Sample Identification	Concentration (mg/Kg) Gasoline Range
6	MW6-10	14

mg/kg - parts per million (ppm)

Method Detection Limit for Gasoline in Soil: 1 mg/Kg

QAQC Summary:

Daily Standard run at 2mg/L: RPD Gasoline = 7
MS/MSD Average Recovery = 101%: Duplicate RPD = 17

Richard Srna, Ph.D.

Laboratory Manager

[redacted]

CHAIN-OF-CUSTODY RECORD

8177 R/A Control No. _____

C/C Control No. 031315

PROJECT NAME/NUMBER CASS for MacKINNON

LAB DESTINATION Superior

SAMPLE TEAM MEMBERS Kinderwater

CARRIER/WAYBILL NO. _____

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Analyses Condition on Receipt [redacted]	Disposal Record No.
B6-10½	TPH-diesel	10-17-90	soil	brass tube	add BTXE as per Cindy 10/24/90	
B10-12½	TPH-diesel, oil and grease priority pollutant metals	10-17-90	soil	b-t.		
B10-9½	hold	10-17-90	soil	b-t.		
B7-10	TPH-diesel	10-17-90	soil	b-t.		
B8-10½	TPH-diesel	10-17-90	soil	b-t.		

Special Instructions: hold sample B10-9½ (sample was taken at 9½ feet)

Possible Sample Hazards: _____

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: Kinderwater for MacKinnon 10/17/90 16:10

   Received By: Yank Stewart Express-it 10/17/90 1610

2. Relinquished By: Yank Stewart Express-it 10/17/90 1700

   Received By: Robin Paulsen 5:05pm 10/17/90

3. Relinquished By: _____

   Received by: _____

4. Relinquished By: N/A

   Received By: _____

WHITE - To accompany samples
YELLOW - Field copy

[redacted] 87704

Phase II

CHAIN-OF-CUSTODY RECORD

R/A Control No. _____

C/C Control No. 031314

PROJECT NAME/NUMBER CASS, Oct. 15-17

LAB DESTINATION Superior

SAMPLE TEAM MEMBERS MacKinnon, Kinderwater

CARRIER/WAYBILL NO. _____

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	~~Condition on Receipt~~ (~~Name and Date~~) ANALYSES	Disposal Record No.
~~B101~~						
B9-10	Soil Boring 9, 10 ft.	10-15-90 10:30 AM	Soil	brass tube	TPH-diesel	
B12-10	Soil Boring 12, 10 ft.	10-15-90 11:30 AM	Soil	br. t.	TPH-diesel	
MW5-10	MW5, 10 ft.	10-15-90 2:00 PM	Soil	br. t.	TPH-diesel, BTEX	
MW5	hold, 5ft. sample	10-15-90 1:30 PM	Soil	br. t.	hold until Nov. 5, 1990	
MW4-10½	MW4, 10½ ft. sample	10-16-90 2:00 PM	Soil	br. t.	TPH-diesel	
MW6-10	MW6, 10 ft. sample	10-16-90 10:00 A.M	Soil	br. t.	TPH-diesel TPH-gasoline and BTEX	
MW6-5	hold, 5 ft. sample	10-16-90 10:00 A.M	Soil	br-t.	hold until Nov. 5, 1990	

Special Instructions: two samples, marked "hold," do not sample until contact from MacKinnon

Possible Sample Hazards: gasoline, diesel

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: Jeff Kinderwater/MacKinnon/3:40 P.M 10-16-90

   Received By: Don Carson 10/16/90 1540

2. Relinquished By: _____ NA

   Received By: _____

3. Relinquished By: _____

   Received by: _____ NA

4. Relinquished By: _____

   Received By: Dorena Sina 10/17/90

WHITE - To accompany samples
YELLOW - Field copy

Chain of Custody Record

81765

Project No. Mac Kinnon - CASS
Project Name
Samplers A. Kinderwater
P.O. No.

81750

Superior Analytical Laboratory
825 Arnold Dr. Bay 2
Martinez, CA 94553
(415) 229-1512

Sample Number	Date	Time	Location	Matrix	Number of Containers	Sample Preservation	TPH as Gasoline	BTXE	TPH as Diesel	Oil & Grease	8010	8240	metals		
CHOW'S OFFICE	10-22-90	3:30P	CHOW'S OFFICE	SOIL	1				✓						
MW-6	10-22-90		MW-6	WATER	1	by the Lab	✓	✓							
MW-6	10-22-90		MW-6	WATER	1				✓	✓					
MW-4	10-22-90		MW-4	WATER	1	by the Lab	✓	✓							
MW-4	10-22-90		MW-4	WATER	1				✓						
MW-4	10-22-90		MW-4	WATER	1					✓			✓		Confirm Metals w/Mackinnon
MW-3	10-22-90		MW-3	WATER	1	by the Lab	✓	✓							
MW-3	10-22-90		MW-3	WATER	1				✓						
MW-3	10-22-90		MW-3	WATER	1					✓			✓		Confirm Metals w/ Mackinnon

Relinquished By (Signature)	Date/Time	Received By (Signature)	Date/Time
1. Scott Kinderwater	10-22-90 6:pm	1. [signature] #603	10/22/90 6:20 pm
2. [signature] #603	10-22-90 [illegible]	2. [signature]	10/23/90 1330
3.		3.	
4. NA		4. NA	

REMARKS:
40 ml bottles were pre-preserved by Superior Analytical.
MW-4 & MW-3 need metals analysis confirm with Cinda MacKinnon.

Chain of Custody Record

Project No. MacKinnon - CASS
Project Name MW-5
Samplers S. Underwater
P.O. No.

Superior Analytical Laboratory
825 Arnold Dr. Bay 2
Martinez, CA 94553
(415) 229-1512

Oct 26, 1990

Sample Number	Date	Time	Location	Matrix	Number of Containers	Sample Preservation	TPH as Gasoline	BTXE	TPH as Diesel	Oil & Grease	8010	8240	Zn, Ni, Pb, ~~Cr~~		
MW-5	10-26-90	11:30A	monitoring well 5	water	1	by the Lab	✓	✓							
MW-5	10-26-90	11:30	M.W. 5	water	1				✓						
MW-5	10-26-90	11:30	M.W. 5	water	1					✓			✓		
MW-5 rinse	10-26-90	11:30	~~MW~~ bailer rinse	Water										*	hold on ice at Lab for 2 weeks.

Relinquished By (Signature)	Date/Time	Received By (Signature)	Date/Time
1. Scott Underwater	10/26/90 3 PM	1. Rademacher	10/26/90 3:00
2.		2.	
3.		3.	
4.		4.	

REMARKS:
* Do not dispose of MW-5 rinse until you have checked w/Mackinnon. Please keep this sample refrigerated.

APPENDIX C

TABLE 5

SUBSURFACE CONTAMINATION CASES WITHIN 1/2 MILE OF SITE

Site	Location	Classification
1. Albert Plute	1229 28th St.	A3
2. Zellerbach	2230 Willow	A3
3. Pacific Supply	1735 24th St.	B3
4. E&R Auto Wreckers	3230 Ettie St.	B3
5. Collins Property	2452? Magnolia St.	B3
6. Ned Clyde Construction	2311 Adeline St.	B3
7. EBMUD	2130 Adeline	B3
8. Kalmar AC	2792 Cypress St.	B3
9. NW Venetian Blinds	1218 24th St.	Toxic
10. Kantor's Furniture	2525 Cypress St.	C
11. PG&E	2121 Peralta St.	C
12. Hang Lung	1960 Adeline	*
13. Aralex	958 28th St.	*
14. Toland & Sons	2635 Peralta	*
15. E-Z Est	2528 Adeline	Toxic*

A = ground water contamination
B = soil contamination C = no further action required
Toxic = chemicals other than fuels are involved
* = RWB staff could not locate file; no information available.

Fuel leak cases are classified A to C by the Regional Water Quality Control Board (RWQCB) according to soil and/or ground water impact. In addition they are priority ranked from 1 to 3 depending on the severity of the problem.

LARGE MAP REMOVED