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Earth and Environmental Technologies

*Environmental Site Assessment
Desimone Trust Property
South Park, Seattle, Washington*

*Prepared for
Desimone Trust and
Northwest Properties Development Corporation*

*December 18, 1991
J-3329*

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**ENVIRONMENTAL SITE ASSESSMENT
DESIMONE TRUST PROPERTY
SOUTH PARK, SEATTLE, WASHINGTON**

INTRODUCTION

This report presents the results of our Phase I and Phase II environmental site assessment for the Desimone Trust property in the South Park area of Seattle, Washington. It is prepared for the Desimone Trust and Northwest Properties Development Corporation. Proposed development of the site requires that the owners exercise due diligence in determining if previous activities at or near the site have adversely affected the soil and groundwater quality at the site. This report provides the information and data analysis to document the potential for environment releases on the property and risks associated with development of the property.

Site Description

The site consists of approximately 11 acres in the South Park area located north of South 96th Street between 8th Avenue South and 5th Avenue South. The property is divided into two parcels, A and B, with a gravel road between them, as shown on Figure 1. Located on the west side of the Duwamish River drainage basin, the majority of both parcels slopes to the southeast at a 4 to 8 percent grade. The northern third of parcel B slopes to the north at approximately a 6 percent grade. The property is currently not in use and is covered with blackberry bushes and other low vegetation. Several older trees and shrubs exist in the vicinity of the former residence/farm.

PHASE I ENVIRONMENTAL ASSESSMENT

Historical Use of the Property

The property has been used as farmland ever since it was homesteaded by the Desimone family in the early 1900s. Kroll's Atlas of Seattle indicates that in 1920 Parcel B was owned by Giuseppe Desimone while Parcel A is referred to only as one of Moore's 5-Acre Tracts. By 1950, Kroll's Atlas shows farm buildings and a residence on Parcel A,

although the property is still referred to as Tract 13 of Moore's 5-Acre Tracts.

Aerial photos suggest that the farm and residence changed slightly over time, with the addition and removal of several outbuildings, until 1988 when the site was considered for further development. The farm buildings and house were demolished in 1990. All that remains are some underground utilities, an underground storage tank (probably gasoline or diesel fuel) located in the vicinity of the former barn, and an underground storage tank which probably contained heating oil.

Mr. Louis Gagliardi was identified as the last person to actively farm the property and he reported that he raised vegetables commercially on the property from 1964 to 1988.

The site is downhill from light industrial facilities to the west (Gilmore Door and Aero-Lac) and southwest (Ace Galvanizing). Industrial properties are also located to the south (Allied Body Works, Sealand Transport, and Penberthy Electromelt), and east (Advance Electroplating, Ocean Pride Seafoods, and Pure Water Corps). On the north, Parcels A and B are bounded by residential property. A recycling transfer station, machine shop, winery, and some agricultural land are located to the northwest of Parcel B.

Ace Galvanizing and Advance Electroplating have both been investigated recently by the Washington State Department of Ecology (Ecology) for soil and groundwater contamination related to their work and waste disposal practices. Aerial photos and Kroll's Atlas of Seattle indicate that Advance Electroplating was present in 1950 while Ace Galvanizing does not appear until a 1965 aerial photo.

Regulatory File Review

Hart Crowser contacted EPA Region 10 and Ecology for regulatory file information related to the site. We reviewed the following lists from those agencies to determine whether the subject property or adjacent facilities are identified:

- ▶ EPA National Priority List (NPL) (August 1991) - List of "Superfund" sites;

- ▶ EPA Region 10 CERCLIS (November 1991) - List of sites currently being reviewed by the EPA;
- ▶ EPA Region 10 RCRA Notifiers List (April 1991) - List of generators, transporters, and disposers of hazardous wastes;
- ▶ Federal Facility Index System (FINDS) List for the State of Washington (September 1991) - List of facilities for which there are files at Ecology or EPA;
- ▶ Ecology's Affected Media and Contaminants (AMC) List (September 1991) - List of sites currently being investigated by Ecology;
- ▶ Ecology's Underground Storage Tank (UST) Registration (January 1991) - List of underground storage tanks registered in the State of Washington;
- ▶ Ecology's Leaking Underground Storage Tank (LUST) Site List (June 1991) - List of reported leaking USTs in Washington; and
- ▶ Ecology's Hazardous Sites List and Notice of Hazard Rankings (November 1991) - List of Washington State sites that are being cleaned up under the Model Toxics Control Act (MTCA).

The subject property was not found on any of these reviewed lists. Ace Galvanizing and Advance Electroplating were, however, noted on all of the lists with the exception of the Region 10 National Priority List and Proposed NPL. Site assessments were conducted on these sites by Ecology during the spring of 1991. We contacted Ecology and obtained copies of the reports to aid us in designing an appropriate scope of work for this property.

Environmental Concerns from Previous Studies

Geotechnical Study of Property

Rittenhouse-Zeman and Associates (RZA) conducted a site assessment of the Desimone property in 1988 for Coastal Trailer Repair, Inc., to address geotechnical conditions (foundation and earthwork considerations) for development of the property for the proposed

"Coastal Repair Facility (RZA, 1988)." As part of this investigation, soil samples from test pits were submitted to an analytical laboratory for environmental testing. A sample obtained from a test pit excavated near the center of Parcel B revealed the presence of elevated levels of total chlorinated halogens. Further testing revealed the presence of elevated concentrations of methylene chloride (17.8 ppm) and 1,1,1-trichloroethane (14.7 ppm). The cause for the detection of these compounds was unknown.

Advance Electroplating

An environmental site assessment of Advance Electroplating was completed for Ecology by Parametrix in July 1991 (Parametrix and SAIC, 1991a). Parametrix reported that elevated levels of heavy metals and volatile organic chemicals were measured in soil and groundwater samples collected at the site.

Workers from Advance Electroplating reported in 1977 that drums filled with plating sludges had been buried on the east edge of the Desimone property. Based on this information, Ecology hired SAIC in 1991 to perform a geophysical survey over a section of the site in an attempt to locate any buried drums. Parametrix and SAIC (1991a) performed two electromagnetic surveys and a manometer survey and detected a 150-foot-long, north-south trending anomaly approximately 60 feet from the property boundary. Further exploration was not accomplished to determine the nature of the anomaly. It was believed that the anomaly probably represented either buried drums or buried irrigation lines.

Ace Galvanizing

An environmental site assessment of Ace Galvanizing was performed for Ecology by Parametrix, Inc., in June 1991. Parametrix and SAIC (1991b) reports that heavy metals, zinc primarily, were detected in the soil and groundwater samples collected and analyzed. Total petroleum hydrocarbon (TPH) was measured in some of the soil samples analyzed with a maximum concentration of 31,000 mg/kg. In groundwater, dissolved zinc was reported at a concentration 1,420,000 ug/L, dissolved nickel at 5,600 ug/L, and dissolved cadmium was reported at a concentration of 126 ug/L. In addition to the heavy metals detected in the groundwater, methylene chloride was found at concentrations up to

16 $\mu\text{g/L}$. Of particular concern was the potential that groundwater beneath Ace Galvanizing may migrate toward the Desimone property.

Mr. Louis Gagliardi reported that thick black smoke from Ace Galvanizing used to blow over the Desimone property and there was some concern as to degradation of the soil quality in the farm fields. Mr. Gagliardi also stated that in 1975 or 1976 Ace Galvanizing collected soil samples from the fields for chemical analysis, but that he never learned the results. He reported that the thick smoke was no longer released from the facility after the testing.

WORK PLAN FOR PHASE II INVESTIGATION

The Phase II scope of work was designed to evaluate the soil and groundwater conditions at the site with an emphasis on investigating the areas of the site and the surrounding area described as potential problems by previous studies. The potential concerns with regard to soil and water quality that formed the basis for our scope of work included:

- ▶ Nature and extent of elevated concentrations of chlorinated solvents near the center of Parcel B;
- ▶ Site contamination due to past activities at Advance Electroplating;
- ▶ Potential for buried drums of plating wastes along the eastern boundary of the site; and
- ▶ Site contamination due to contaminant migration from Ace Galvanizing.

Our scope of work included soil borings, the installation of four monitoring wells, soil and groundwater sampling and analysis, and groundwater flow analyses. The specific locations and objectives of our field program included:

- ▶ Installing one monitoring well and drilling two soil borings near the location of RZA's test pit TP-8 to test soil and groundwater for methylene chloride, trichloroethane, and other associated volatile organic compounds;

- ▶ Installing two monitoring wells along the east edge of the property, next to Advance Electroplating, to evaluate soil and groundwater quality which may have been affected by past waste disposal practices either on the property or at Advance Electroplating;
- ▶ Excavating four test trenches in the area of the geophysical anomaly, detected by Ecology and SAIC, to verify the nature and extent of the anomaly;
- ▶ Installing one monitoring well in the southwest corner of the property to evaluate soil and groundwater quality which may be affected by activities at Ace Galvanizing; and
- ▶ Collecting soil samples from each boring and groundwater samples from each completed monitoring well for soil characterization and chemical analysis.

HYDROGEOLOGIC CONDITIONS

The site is located in the Duwamish River valley approximately 1.5 miles west-southwest of the river. The valley was carved during the Pleistocene by glaciers advancing south from British Columbia (Liesch et al., 1963). Sediments filled the valley as the glaciers retreated and later as the Duwamish reworked glacial deposits and carried soils toward Puget Sound. Relatively steep walls on uplands and a broad alluvial plain with local topographic highs characterize the valley in the vicinity of the site.

Complex meanders of the Duwamish River, flooding, and reworking of older glacial sediments have created sandy alluvial soils with discontinuous silt and clay layers. These soils have been mapped as Vashon Recessional Outwash (EES et al., 1991) and as Alluvium (Sweet Edwards and Harper Owes, 1985). The Vashon Recessional Outwash is described as well-sorted sand and gravel deposits. The description of alluvium, however, as chiefly sand and silt with some clay and peat, more closely describes the soils encountered during our explorations.

Shallow groundwater in the valley will generally flow from the uplands toward the river. Locally groundwater may flow in other directions preferentially through more permeable fill materials or in old river

channels that were filled during the rerouting of the Duwamish during the late 1800s and early 1900s. Groundwater in deeper aquifers (greater than 100 feet below ground surface) most likely flows parallel to the river.

Subsurface Soils

Soils beneath the property are described based on the drilling and soil sampling in two soil borings and four monitoring wells. Overall, the site soils consist of predominantly sand to silty sand with interbeds of silt. The material type and the relative density suggest these are alluvial soils of the Duwamish River. The location of the borings (B-1 and B-2) and the monitoring wells (MW-1 through MW-4) are shown on Figure 1.

Soils observed at the surface on the site during drilling consisted generally of medium dense, dry, brown, silty sand to a depth of 3 to 5 feet. In the boring for MW-2, in the southwest corner of the site, a very loose, dry, brown, medium sand was observed at the surface and extended to a depth of approximately 35 feet. Below the silty sand, the soils in borings, other than MW-2, varied considerably. For more detail, see the generalized geologic cross section on Figure 2 and the boring logs on Figures A-2 through A-7 in Appendix A.

In the boring for MW-1, a medium dense, damp, brown sand extended from a depth of 4 feet to a depth of 8.5 feet. A medium dense, damp, brown, slightly silty sand was observed between the depths of 8.5 and 9.5 feet. Below the depth of 9.5, feet a medium dense, brown, fine to medium sand extended to the total depth of the boring at 42 feet. Soils observed in boring B-2, located 50 feet to the northeast of MW-1, were nearly identical to those in MW-1.

In boring MW-2, a medium dense, damp, brown, fine to medium sand extends from the surface to a depth of 35 feet. Below the sand a medium dense, damp, brown, slightly silty sand was observed between the depths of 35 and 41 feet. Very stiff, wet, brown, slightly gravelly silt extended from 41 feet to approximately 41.5 feet, below which a medium dense, wet, brown, slightly silty sand extended to a depth of 45 feet. Silt was encountered at 45 feet below the ground surface.

In the borings for MW-3 and MW-4, the dry, brown, silty, sand extended to a depth of 4 feet below which a medium dense, damp,

brown sand extended to a depth of 10 feet. Between the depths of 10 and 15 feet, interbedded silt and sand layers of varying thicknesses were observed. A medium dense, wet, brown, slightly silty sand extended to the total depth of exploration of 20.5 feet.

Loose, dry, brown, slightly silty sand extended to a depth of 5.5 feet in boring B-1. Below 5.5 feet, several 1-foot-thick layers of stiff, brown, sandy silt were interbedded with loose to medium dense, brown sand. The interbedded soils extended from the depth of 5.5 feet to the total depth of exploration of 11.5 feet.

Groundwater Occurrence and Flow

Groundwater was encountered at a depth of 35 and 39 feet below ground surface on Parcel B, in wells MW-1 and MW-2, respectively. The depth to water is shallower on the eastern edge of Parcel A at a depth of approximately 12 feet, as measured in wells MW-3 and MW-4. Measurements of the groundwater gradient across the site indicate that groundwater flows almost directly east toward the Duwamish Waterway. The magnitude of the gradient increases from 0.004 ft/ft across Parcel B to 0.005 ft/ft across Parcel A. The gradient increases to 0.01 feet just east of Parcel A beneath the Advance Electroplating property. The increase in gradient may be related to the occurrence of finer grained soils in the vicinity of MW-3 and MW-4 and east of Parcel A.

Water levels measured at Ace Galvanizing southwest of the site suggest that groundwater flows from Ace Galvanizing toward the Desimone property. Groundwater was encountered at Ace approximately 20 feet higher in elevation than the groundwater encountered in MW-2, the closest Desimone well to the Ace property. The wells are approximately 200 feet apart. Comparison of geologic logs as presented on Figure 2 suggests that the Ace Galvanizing well may be screened in a zone of perched water above a silt bed. Water from this shallow perched zone likely flows downward toward the deeper aquifer encountered on the Desimone property. Although a horizontal flow direction cannot be determined from the available data, it is likely to follow an easterly direction similar to the deeper water table aquifer. A steep hydraulic gradient of 0.1 ft/ft occurs between the groundwater tapped by the Ace well and our well, MW-2.

GEOPHYSICAL ANOMALY IS IRRIGATION PIPE

Backhoe excavations performed under the supervision of Hart Crowser uncovered a 2-1/2-inch-diameter, rusted, metal irrigation pipe, along the eastern edge of Parcel A. The pipe corresponds in general to the location, shape, and size of the geophysical anomaly reported by Ecology in the Advance Electroplating site and assessment. No drums were encountered during the excavation. Figure 3 depicts the location of the geophysical anomaly, the pipe location, and our test trenches.

Soil in the test trenches was a dry, brown, silty sand loam with grasses to a depth of approximately 2 feet. A silty, fine sand with occasional gravel was observed from a depth of 2 feet to the total depth of exploration of 4 feet.

CHEMICAL ANALYSIS RESULTS

Soil and water samples collected at the property were analyzed for volatile organic compounds and heavy metals. Laboratory reports of analysis are presented in Appendix B and a summary table of results is presented in Table 1. Duplicate samples were collected for quality control and labeled with a "D" to differentiate them from the initial samples.

For a complete description of sampling methods, refer to Appendix A.

Soil Chemistry

Methylene chloride was measured as laboratory contamination in all the soil samples analyzed. It was the only volatile organic compound detected in the samples. Methylene chloride was measured in the sample blank at a concentration of 0.17 mg/kg. If the concentration of a compound in a sample is less than 5 times the concentration measured in the sample blank (85 mg/kg), the compound detected in the sample is considered to be laboratory contamination and flagged with the letter B. All of the soil samples analyzed were well below 5 times the laboratory blank.

Slightly elevated concentrations of zinc, cadmium, and mercury were measured in several samples collected from across the site. Zinc was

found in a soil sample collected just above the water table in the boring for MW-2 at a concentration of 498 mg/kg. Zinc, at a concentration of 68.3 mg/kg, which seems to be above background concentrations on the site, was measured in sample MW-1, S-1, taken at a depth of approximately 6 inches. Sample MW-1, S-1 also had concentrations of 3.3 mg/kg cadmium and 1.1 mg/kg mercury. Cadmium was measured at a concentration of 3.3 mg/kg in soil collected from a depth of 10.5 feet in the boring for MW-4.

Water Chemistry

Several volatile organics were measured in water samples collected from the on-site wells. Benzene and toluene were detected at the relatively low concentrations of 4 and 5 ug/L, respectively, in MW-2. Benzene was detected at 3 ug/L and toluene at 4 ug/L in the quality control duplicate from MW-2. Acetone and methylene chloride, common laboratory contaminants, were both measured in the sample blank at concentrations of 16 ug/L and 10 ug/L, respectively. For this reason the low concentrations of acetone and methylene chloride in samples collected from MW-3 and MW-4 are considered laboratory contamination and flagged with a B.

Dissolved metals were detected in all the water samples collected on the site. Zinc was the only metal detected in all the water samples with concentrations ranging from 132,000 ug/L in MW-2D to 60 ug/L in MW-4. Nickel and cadmium were measured in well MW-2 at concentrations of 320 ug/L (MW-2D) and 15 ug/L (MW-2D), respectively. Copper was detected in samples collected from MW-1, at a concentration of 20 ug/L, and MW-2, at a concentration of 90 ug/L.

MTCA SCREENING CRITERIA

The Model Toxics Control Act (MTCA; WAC 173-340-740) currently sets cleanup levels for remediation of soil and water contamination within the State of Washington. The MTCA defines several cleanup levels, Methods A, B, and C, each with differing requirements and applicability. Method A provides cleanup levels for screening residential and industrial sites. Method B defines cleanup levels based on detailed risk assessment calculations and comparisons with applicable state and federal laws. Method C provides conditional cleanup levels

when Method A or B levels are not achievable (e.g, due to technical infeasibility).

Due to the relatively clean nature of this site, we have used the MTCA Method A groundwater cleanup level for screening purposes. Several of the chemicals detected on site, however, have no Method A cleanup level (zinc for example). In those cases we have applied Method B criteria, which include an evaluation of the applicable regulatory requirements for groundwater protection. These requirements included the EPA's National Primary and Secondary Drinking Water Regulations, and Washington State's surface water protection criteria. Cleanup levels and exposure criteria for calculating MTCA Method B groundwater values are listed in Table 2.

Metals Detected in Soils

Concentrations of metals in the soils on site were generally below the MTCA Method A and B cleanup levels except for cadmium and mercury. A cadmium concentration of 3.3 mg/kg was noted in two soil samples, MW-1, S-1 (0 to 0.5 foot) and MW-4, S-4 (10.5-11 feet). These detections were only slightly above the MTCA cleanup level of 2 mg/kg. Based on the rest of the data collected on site it appears that average natural background concentrations on the property are in the range of 2.5 mg/kg. Cadmium slightly above background concentrations probably represents variation around the mean. As there is no history of cadmium usage or spills on this site it is unlikely that any action would be required.

Although mercury was detected at 1.1 mg/kg in the shallow soil at MW-1, it is not at a concentration requiring action. The MTCA regulations consider only 1 significant digit of the detected concentration. Thus the mercury data are essentially equivalent to the MTCA cleanup level of 1 mg/kg.

Metals Detected in Groundwater

Dissolved zinc and cadmium in groundwater sampled from MW-2 are above the Method B cleanup level, the federal drinking water Maximum Contaminant Level (MCL), and the chronic freshwater protection level. The concentration of zinc (132,000 ug/L) is two orders of magnitude over the MTCA Method B cleanup level of 3,200 ug/L and the MCL of

5,000 ug/L. Cadmium, at a concentration of 15 ug/L, is three times greater than the Method B cleanup level of 5 ug/L and the freshwater protection level of 4.3 ug/L. Nickel is at or below the Method B level of 320 ug/L but above the freshwater protection level of 27 ug/L. There is currently no MCL for nickel.

As there is no history of past usage of, or spillage of, the contaminants which were detected at concentrations above MTCA cleanup levels, it is not necessary to report this information to Ecology. The contamination is most likely coming from Ace Galvanizing and Ecology is already aware of their soil and groundwater problems. The first step in any effective cleanup of groundwater contamination on the Desimone property would be source control and remediation at the Ace Galvanizing property.

SUMMARY OF FINDINGS

No Volatile Organics Detected

The initial discovery of methylene chloride and 1,1,1-trichloroethane by RZA in the vicinity of test pit TP-8 was not confirmed by our soil sampling and testing. Methylene chloride was detected in the samples analyzed as a laboratory contaminant only. It is possible the previous detections during the RZA geotechnical investigation also resulted from laboratory contamination.

Low Levels of Metals in Soil

Slightly elevated concentrations of cadmium and mercury were measured in soil samples collected in MW-1, B-1, and B-2 but they probably reflect natural background conditions or applications of pesticides or fungicides in the past. Zinc concentrations in near-surface soils (MW-1, S-1) may represent air fall from the black smoke reported by Mr. Louis Gagliardi. The low levels of the detected metals should not present any human health or environmental risks from development of the property.

No Soil or Groundwater Contamination from Advance Electroplating

Soil and water samples collected from MW-3 and MW-4 on Parcel A indicate that Advance Electroplating has had no adverse impact on the environmental quality of the Desimone property. Concentrations of the metals in soil samples appear to be at background levels. Cadmium background levels appear to be slightly elevated on this property relative to other soils in the Puget Sound area. There is no evidence of a mechanism to uniformly spread cadmium throughout the soil column, from the surface to a depth of 41 feet.

No Buried Drums

No buried drums were found in the area where former employees of Advance Electroplating reported them to exist. Excavations through the geophysical anomaly reported by Parametrix in the site assessment report discovered a rusted, metal irrigation line.

Groundwater Contaminated Locally by Ace Galvanizing

Groundwater contamination reported at Ace Galvanizing appears to have impacted soil and groundwater quality in the southwest corner of the Desimone property. Zinc, nickel, and cadmium were detected in groundwater at MW-2 at concentrations above MTCA groundwater cleanup levels, and zinc was detected in the soil at a depth of 40 feet within the aquifer at the same location. These three metals are the same metals detected at very high concentrations in groundwater beneath the Ace Galvanizing property. These chemical data coupled with the strong hydraulic gradient between the groundwater tapped at Ace Galvanizing and that sampled beneath the southwest corner of the Desimone property indicate the metals contamination at Ace is migrating onto the Desimone property.

Metals contamination was not detected in other wells located on the Desimone property. With the exception of low levels of zinc, the other metals were not detected in monitoring wells MW-3 and MW-4 which are downgradient from MW-2 and Ace Galvanizing. It is not known whether the contamination has not yet reached this location or if substantial attenuation of the metal concentrations occurs between the west and the east areas of the property. Metals are readily adsorbed onto soil particles so it is possible the metals are attenuated within the

aquifer to below levels of concern before reaching the eastern property area. The high zinc levels detected in the aquifer soil at MW-2 indicate this soil adsorption phenomenon.

The pathways for potential impacts from these metals to human health or the environment is through the discharge of groundwater to surface water bodies or the use of the water for drinking purposes. Groundwaters from the site ultimately discharge to the Duwamish River which is approximately 1.5 miles from the site. The downgradient wells show no metals contamination so there should be no impacts on surface water from site discharges. It is unlikely the groundwater is used for water supply locally and nickel and zinc are not particularly hazardous to human health. Restriction of groundwater use on the property for drinking purposes is advised. This should not affect the planned development of the property for warehouse/distribution purposes.

RECOMMENDATIONS

Soil on the property appears to have no contamination requiring remediation or removal. The only significant contamination detected on the property during our assessment was found in the groundwater in southwest corner of the property at a depth of approximately 40 feet below ground surface. There does not appear to be any significant potential for impacts to human health or the environment from this contamination; however, it is advisable to attempt to limit any worsening of the problem. This concern should not affect the development plans for the property. We do, however, recommend the following:

- ▶ Provide this report to Ecology on a good neighbor basis to aid them in the cleanup and control of contamination at Ace Galvanizing;
- ▶ Maintain the monitoring wells on the site during any commercial development for the purpose of monitoring any changes that occur; and
- ▶ Contact Ace Galvanizing to inform them of impacts to your property and to indicate your interest in their plans for remediation on their property.

INFORMATION LIMITATIONS

Work for this project was performed, and this report prepared in accordance with generally accepted professional practices for the nature and condition of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of the Desimone Trust and Northwest Properties Development Corporation. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

It should be noted that Hart Crowser relied on verbal information provided by individuals indicated above. Hart Crowser can relay this information but cannot be responsible for its accuracy or completeness.

The state MTCA is currently one of the most complex and comprehensive sets of cleanup standards for land properties in the nation. As with any new regulation, it is not entirely clear how they will be interpreted and implemented in certain cases. For these reasons, we have selected likely MTCA cleanup levels for use in identifying potential problem areas on the site. As per our discussion, we used MTCA Method A levels except where no Method A criteria existed. In those cases we used Method B criteria and other applicable state and federal regulations.

The MTCA cleanup levels included in this report are used for screening and comparison purposes only and are based on our understanding of cleanup levels required by Ecology for similar projects. This comparison does not represent an interpretation of final MTCA cleanup standards for the site, since such standards are established by Ecology through a negotiation and public approval process. It should be understood that the MTCA Method B screening numbers were calculated using, to the best of our knowledge, the most current toxicity criteria available from EPA and Ecology. These criteria are continually being updated by EPA; and, as a result, the MTCA Method B levels used for screening purposes in this report may not be applicable for future use.

Any questions regarding our work and this report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the undersigned.

We trust that this report meets your needs.

Sincerely,

HART CROWSER, INC.



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Table 1 - Results of Chemical Analyses of Soil and Groundwater Samples

Soil Sample Number	MW-1, S-1	B-1, S-1	B-2, S-2	MW-2, S-7	MW-3, S-1	MW-4, S-4	MW-4, S-4D	TT-4	BLANK
Depth in Feet	0-0.5	2.5-4	5-6.5	40-41.5	3-4.5	10.5-11	10.5-11	1.6	NA
VOLATILE ORGANIC COMPOUNDS (Method 8010) in mg/kg									
Methylene Chloride	0.45 B	0.13 B	0.15 B	0.21 B	0.12 B	0.21 B	0.82 B	0.17 B	0.17
TOTAL METALS in mg/kg									
Arsenic	6.8	1.9	2.4	2.8	3.9	5.3	3.3	4.2	NA
Cadmium	3.3	2.1	2.1	2.1	2.4	3.3	2.4	2.7	NA
Chromium	32.1	27.8	25.9	21.9	29.3	29.4	23.1	25.6	NA
Copper	31	10.7	10.7	13.4	16.7	26.6	16.6	12.5	NA
Mercury	1.1	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Nickel	33	38.4	40.3	31.4	35.6	44.9	34.7	33.4	NA
Lead	20.8	3.1	3.7	3.6	9.3	4.6	3.7	6.5	NA
Zinc	68.3	29.3	23.4	498	55.2	45.3	30.9	32.3	NA

Well Number	MW-1	MW-2	MW-2D	MW-3	MW-4	BLANK
VOLATILE ORGANIC COMPOUNDS (Method 8240) in ug/L						
Acetone	10 U	10 U	10 U	10 U	12 B	16
Benzene	1 U	4	3	1 U	1 U	1 U
Methylene Chloride	5 U	5 U	5 U	3 JB	4 JB	10
Toluene	1 U	5	4	1 U	1 U	1 U
DISSOLVED METALS in ug/L						
Arsenic	2 U	2 U	2 U	2 U	2 U	---
Cadmium	5 U	14	15	5 U	5 U	---
Chromium	10 U	10 U	10 U	10 U	10 U	---
Copper	20	60	90	10 U	10 U	---
Mercury	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	---
Nickel	10 U	260	320	10 U	10 U	---
Lead	2 U	2 U	2 U	2 U	2 U	---
Zinc	100	106,000	132,000	100	60	---
FIELD PARAMETERS						
Temperature in degrees C	13	13	13	13	13	NA
pH	6.6	6.0	6.0	5.8	6.1	NA
Conductivity in umhos	260	940	940	200	200	NA

Notes:

- U Analyte of interest was not detected, at the detection limit indicated.
- J Value should be regarded as an estimate
- B Analyte of interest was detected in the method blank associated with the sample as well as in the sample itself.
- NA Not analyzed

Table 2 - Soil and Water Cleanup Levels

Soil Cleanup Levels	Applied Cleanup Level in mg/kg	MTCA Method	Method B Oral Reference Dose in mg/kg-day
VOLATILE ORGANIC COMPOUNDS			
Methylene Chloride	0.5	A	---
TOTAL METALS			
Arsenic	20	A	---
Cadmium	2	A	---
Chromium	100	A	---
Copper	2900	B	0.037
Mercury	1	A	---
Nickel	1600	B	0.02
Lead	250	A	---
Zinc	16000	B	0.2

Water Cleanup Levels	Applied Cleanup Level in ug/L	MTCA Method	Method B Oral Reference Dose in mg/kg-day	Drinking Water MCL in ug/L	EPA Freshwater Criteria* in ug/L
VOLATILE ORGANIC COMPOUNDS					
Benzene	5	A	---	5	---
Methylene Chloride	5	A	---	---	---
Toluene	40	A	---	---	---
DISSOLVED METALS					
Arsenic	5	A	---	50	NC
Cadmium	5	A	---	10	0.66
Chromium	50	A	---	100	NC
Copper	595	B	0.037	1000	6.5
Mercury	2	A	---	2	NC
Nickel	320	B	0.02	---	87.7
Lead	5	A	---	50	NC
Zinc	3200	B	0.2	5000	58.9

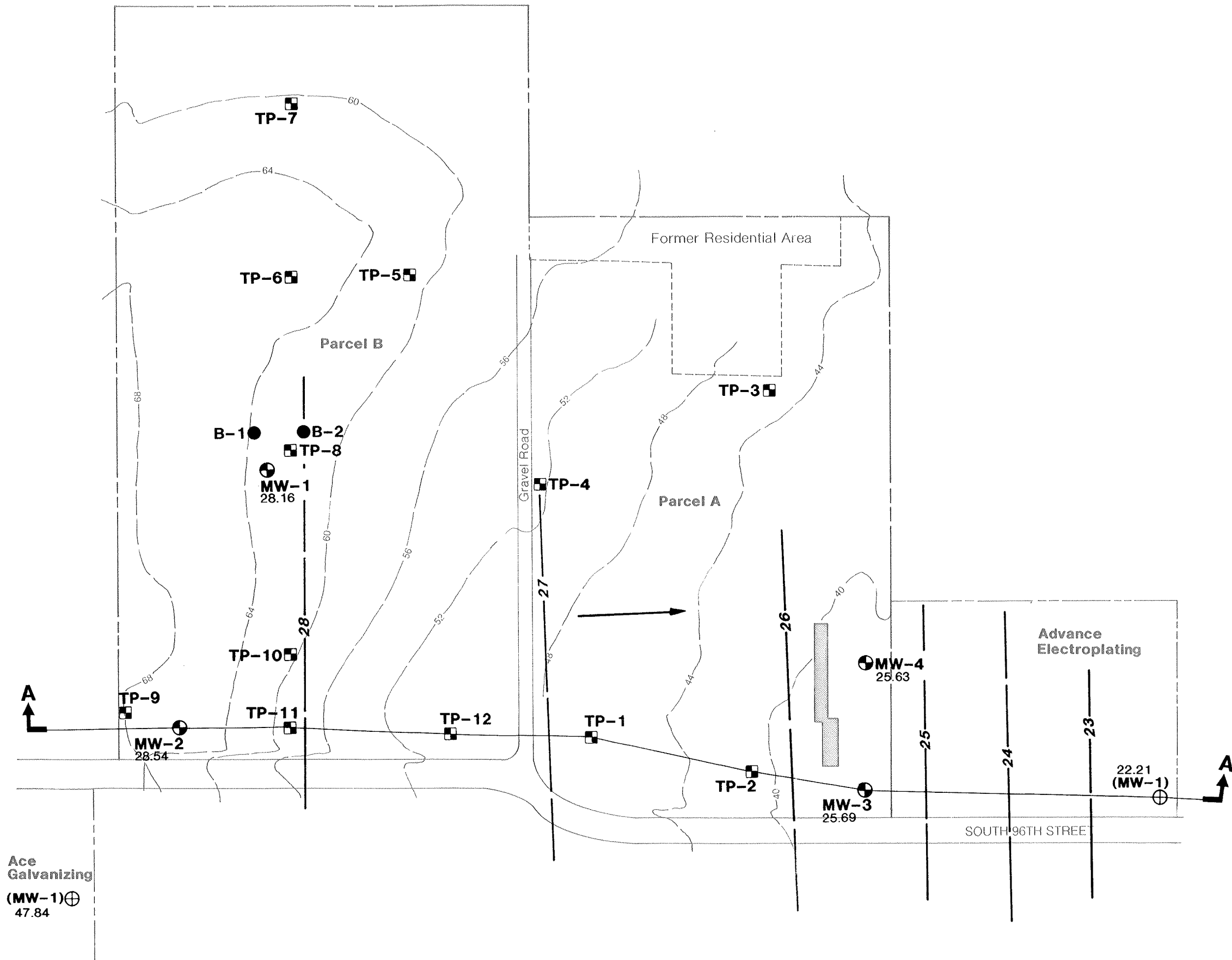
MTCA Method B values are based on the stated oral reference dose for a 16-kg child drinking groundwater. Toxicology data was current November 21, 1991.

--- Value does not exist.

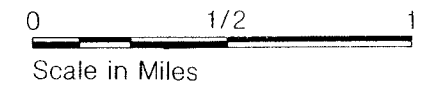
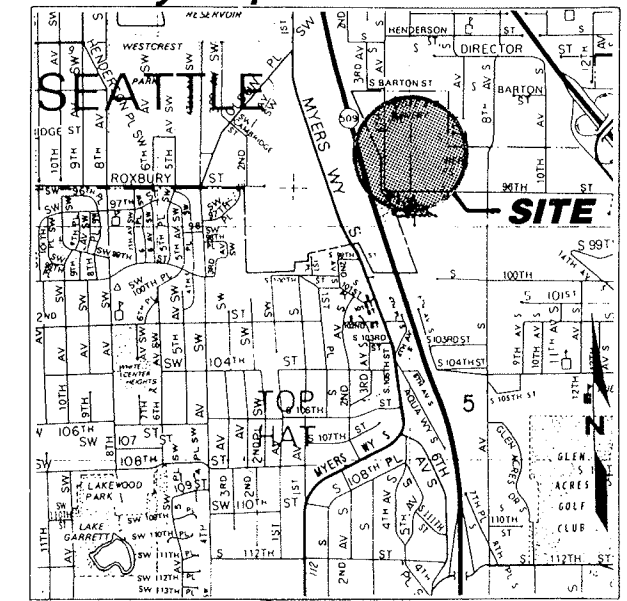
* Criteria are dependent on hardness of freshwater of concern. In this example a hardness of 50 mg/L was used.

NC Value was not calculated.

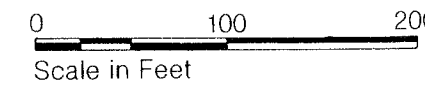
Site and Exploration Plan



Vicinity Map



- MW-1** ⊕ Monitoring Well Location and Location (Hart Crowser)
- MW-1** ⊕ Monitoring Well Location and Number (Parametrix and SAIC, 1991a, 1991b)
- B-1** ● Boring Location and Number (Hart Crowser)
- TP-1** □ Test Pit Location and Number (Rittenhouse-Zeman and Associates, 1988)
- 28.16 Groundwater Elevation in Feet
- AA** ↑ Cross Section Location and Designation
- Approximate Groundwater Flow Direction
- 23 - Groundwater Elevation Contour in Feet
- ▨ Zone of Geophysical Anomaly

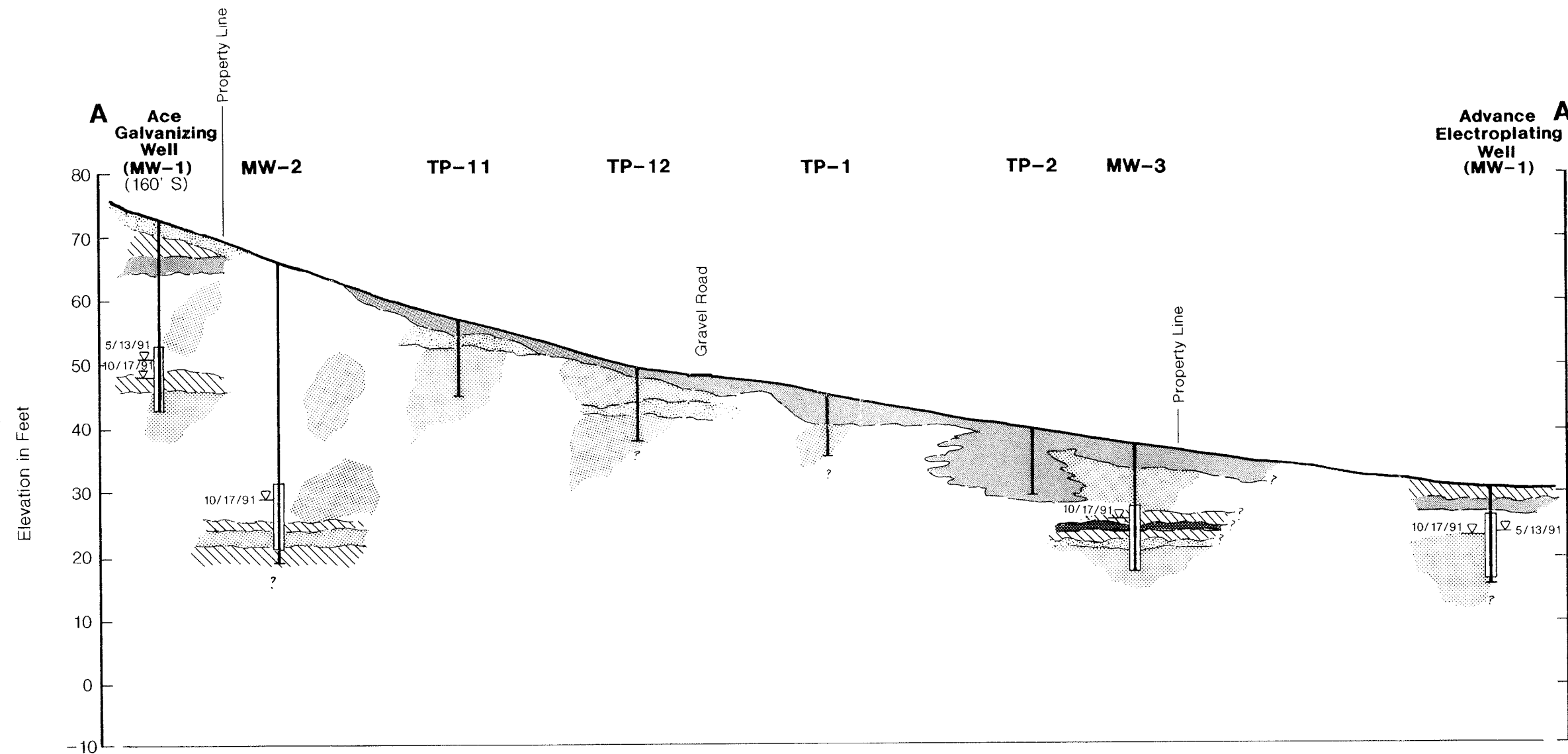





Ace Galvanizing
(MW-1) ⊕
47.84






HARTCROWSER
J-3329 10/91
Figure 1


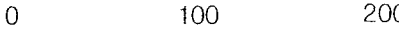
Note: Base map prepared from drawing provided by Northwest Engineering Company entitled "Topographic Survey for Coastal Trailer Repair Inc." dated December 01, 1988.

Generalized Geologic Cross Section A-A'



MW-2 Monitoring Well Number
TP-1 Test Pit Number
 (160' S) Offset Distance and Direction
 Exploration Location
 Groundwater Level
 Screened Interval

-  Very loose to medium dense, SAND and slightly silty SAND
-  Medium stiff to stiff, gray SILT and CLAY
-  Loose to medium dense, brown, silty SAND
-  Medium dense, to dense brown, gravelly SAND with a trace of Silt
-  Medium dense and medium stiff, brown-green interbedded SAND and SILT

Vertical Exaggeration x 5
 Vertical Scale in Feet


 Horizontal Scale in Feet

ATI I.D. # 9110-237

METALS ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : WATER

UNITS : mg/L

ELEMENT	MW-1 -1	MW-2 -2	MW-2D -3	MW-3 -4
ARSENIC	<0.002	<0.002	<0.002	<0.002
CADMIUM	<0.005	0.014	0.015	<0.005
CHROMIUM	<0.01	<0.01	<0.01	<0.01
COPPER	0.02	0.06	0.09	<0.01
LEAD	<0.002	<0.002	<0.002	<0.002
MERCURY	<0.0005	<0.0005	<0.0005	<0.0005
NICKEL	<0.01	0.26	0.32	<0.01
ZINC	0.10	106	132	0.10

ATI I.D. # 9110-237

METALS ANALYSIS
DATA SUMMARY
CONTINUEDCLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : WATER

UNITS : mg/L

ELEMENT	MW-4 -5	REAGENT BLANK
ARSENIC	<0.002	<0.002
CADMIUM	<0.005	<0.005
CHROMIUM	<0.01	<0.01
COPPER	<0.01	<0.01
LEAD	<0.002	<0.002
MERCURY	<0.0005	<0.0005
NICKEL	<0.01	<0.01
ZINC	0.06	<0.05

ATI I.D. # 9110-237

METALS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : WATER

UNITS : mg/L

ELEMENT	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
ARSENIC	110358-01	<0.002	<0.002	NC	1.9	2.0	95
CADMIUM	110305-01	<0.005	<0.005	NC	2.1	2.0	105
CHROMIUM	110305-01	<0.01	<0.01	NC	1.9	2.0	95
COPPER	110305-01	<0.01	<0.01	NC	2.0	2.0	100
LEAD	110305-01	<0.002	<0.002	NC	1.9	2.0	95
MERCURY	9110-237-2	<0.0005	<0.0005	NC	0.0050	.00050	100
MERCURY	110353-04	<0.0005	<0.0005	NC	0.0054	0.0050	108
NICKEL	110305-01	<0.01	<0.01	NC	2.1	2.0	105
ZINC	110305-01	<0.05	<0.05	NC	2.1	2.0	105

NC = Not Calculable.

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$



Chain of Custody LABORATORY NUMBER: 9110-237

PROJECT MANAGER: Bill Poplinski / LJI
 COMPANY: 1410 Fairview Ave E.
 ADDRESS: Hart Crowsar
Seattle WA 98109
 PHONE: 324-9530 SAMPLED BY: LJI

ANALYSIS REQUEST

SAMPLE DISPOSAL INSTRUCTIONS
 ATI Disposal @ \$5.00 each Return

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	8010	8020	8020	8240	8270	8310	8080	8080	8140	8150	WDOE	418.1	413.2	8015	TOC	TOX	%	EP	Priority	8080	8240	8270	8150	Metals	NUMBER OF CONTAINERS			
					Halogenated Volatiles	Aromatic Volatiles	BETX ONLY	GCMS Volatiles	GCMS BNA	HPLC PNA	Pesticides & PCB's	PCB's ONLY	Phosphate Pesticides	Herbicides	PAH/H (WAC 173)	(TPH)	Grease & Oil	(Modified)	9060	9020	Moisture	TOX Metals (8) EP EXT	Pollutant Metals (19)	TCPL ONLY						Dissolved Metals *		
MW-1	10-17-91	1000	Water	-1				2																							3	
MW-2	10-17-91	1045	}	2				2																							3	
MW-2D	10-17-91	1045		3				2																								3
MW-3	10-17-91	1230		4				2																								3
MW-4	10-17-91	1315		5				2																								3
try blank				6				2																								2

PROJECT INFORMATION		SAMPLE RECEIPT		RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.	
PROJECT NUMBER: <u>3329</u>	TOTAL NUMBER OF CONTAINERS: <u>17</u>	COC SEALS/INTACT? Y/N/NA <u>NA</u>		Signature: <u>William Poplinski</u>	Signature: _____	Signature: _____	
PROJECT NAME: <u>Desimone</u>	RECEIVED GOOD COND/COLD <u>Y/Y</u>	RECEIVED VIA: <u>TAXI</u>		Time: <u>10-10</u>	Time: _____	Time: _____	
PURCHASE ORDER NUMBER: _____	RECEIVED VIA: <u>TAXI</u>	RECEIVED VIA: <u>TAXI</u>		Printed Name: <u>William Poplinski</u>	Printed Name: _____	Printed Name: _____	
ONGOING PROJECT? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS		Company: _____		Company: _____	Company: _____	
TAT: (NORMAL) <input checked="" type="checkbox"/> 2WKS	(RUSH) <input type="checkbox"/> 24HR	<input type="checkbox"/> 48 HRS	<input type="checkbox"/> 72 HRS	<input type="checkbox"/> 1 WK	RECEIVED BY: 1.		
GREATER THAN 24 HR. NOTICE? YES <input type="checkbox"/> NO <input type="checkbox"/> (LAB USE ONLY)		RECEIVED BY: 2.		RECEIVED BY: 3.		RECEIVED BY: (LAB) 3.	
SPECIAL INSTRUCTIONS: <u>Metals As, Cd, Cr, Cu, Hg, Ni, Pb, Zn</u>		Signature: <u>Rozena Satuma</u>		Signature: _____	Signature: _____	Signature: _____	
		Time: <u>1000</u>		Time: _____	Time: _____	Time: _____	
		Printed Name: <u>ROZENA SATUMA</u>		Printed Name: _____	Printed Name: _____	Printed Name: _____	
		Date: <u>10/18/91</u>		Date: _____	Date: _____	Date: _____	
		Company: <u>ATI-WA</u>		Company: _____	Company: _____	Company: <u>Analytical Technologies, Inc.</u>	



Analytical Technologies, Inc.

560 Naches Avenue SW, Suite 101 Renton, WA 98055 (206)228-8335

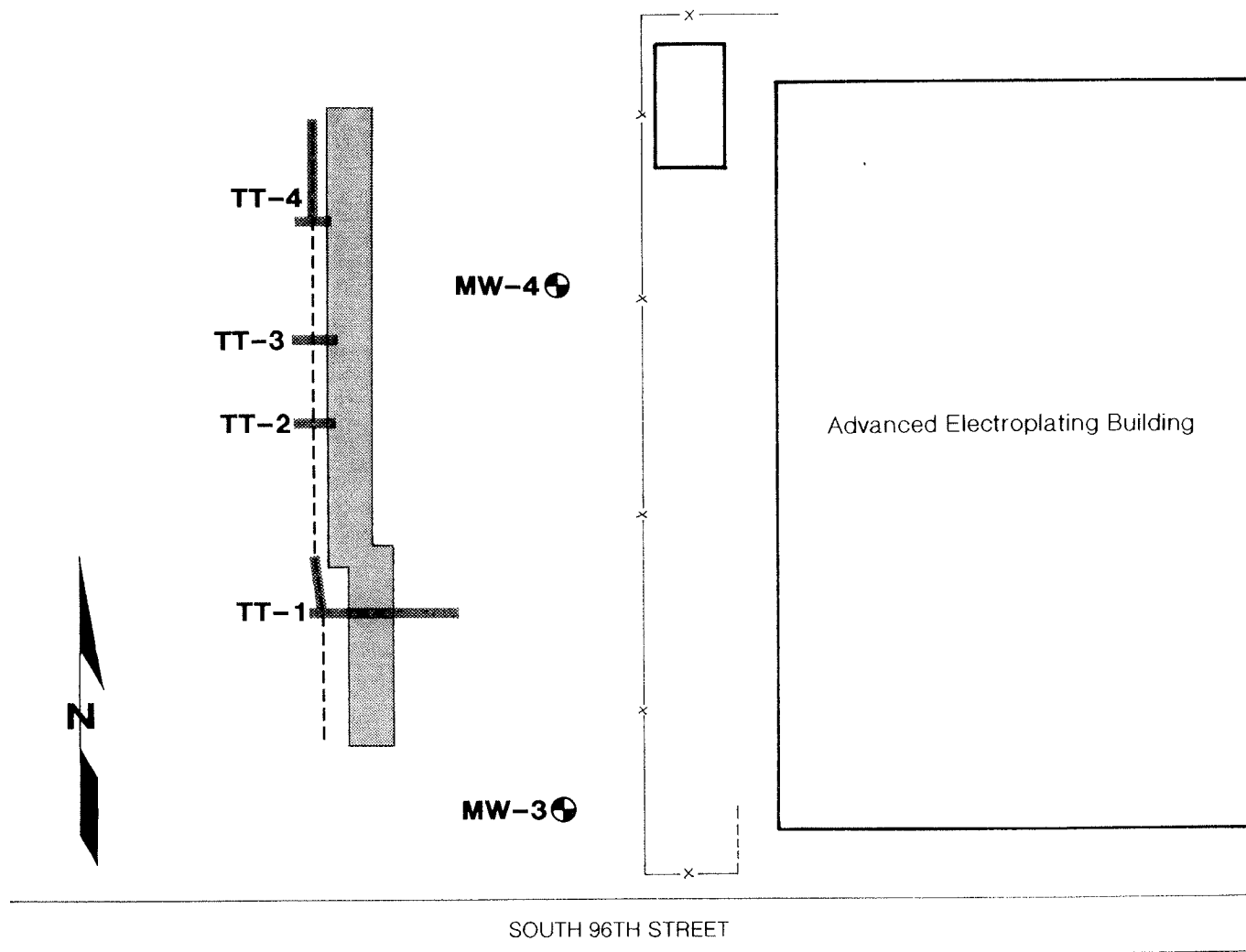
DATE 11/18/91 PAGE OF





Chain of Custody LABORATORY NUMBER: 11021

PROJECT MANAGER: <u>LEE CARFOLU</u>					ANALYSIS REQUEST																							
ANALYTICAL TECHNOLOGIES, INC. 560 NACHES AVE SW, SUITE 101 RENTON, WA 98055 (206) 228-8335					8240 GC/MS Volatiles	8270 GC/MS BNA's	8310 HPLC PNA's	8080 Pest/PCB's	PCB's only	8150 Herbicides	TOC 9060	TOX 9020	BOD	COD	CYANIDE	MBAS	NITRATE/NITRITE	PP METALS	EPTOX METALS	TCLP METALS	TCLP 8240 (ZHE)	TCLP 8270	TCLP 8150	TCLP 8080	PHENOLS, total	% MOISTURE	DISSOLVED METALS	NUMBER OF CONTAINERS
SAMPLE DISPOSAL INSTRUCTIONS																												
<input checked="" type="checkbox"/> ATI Disposal <input type="checkbox"/> Return																												
SAMPLE ID	DATE	TIME	MATRIX	LAB ID																								
01 9110 237 - 1	11/17/91	1000	WATER																									
02 { 2	{	1645	{																									
03 { 3	{	1645	{																									
04 { 4	{	1230	{																									
05 ↓ 5	↓	1315	↓																									

PROJECT INFORMATION		SAMPLE RECEIPT		RELINQUISHED BY: 1.		RELINQUISHED BY: 2.		RELINQUISHED BY: 3.	
ATI PROJ #: <u>9110-237</u>	TOTAL NUMBER OF CONTAINERS <u>5</u>	Signature: <u>[Signature]</u>	Time: <u>12</u>	Signature: <u>[Signature]</u>	Time: <u>[Time]</u>	Signature: <u>[Signature]</u>	Time: <u>[Time]</u>	Signature: <u>[Signature]</u>	Time: <u>[Time]</u>
ATI PROJ NAME: <u>HCI/DESIMUNE</u>	COC SEALS/INTACT? <u>Y/N/A</u>	Printed Name: <u>[Name]</u>	Date: <u>[Date]</u>	Printed Name: <u>[Name]</u>	Date: <u>[Date]</u>	Printed Name: <u>[Name]</u>	Date: <u>[Date]</u>	Printed Name: <u>[Name]</u>	Date: <u>[Date]</u>
CLIENT PROJ: <u>3329</u>	RECEIVED VIA: <u>FED EX</u>	Company: <u>ATI</u>	Company: <u>[Company]</u>	Company: <u>[Company]</u>	Company: <u>[Company]</u>	Company: <u>[Company]</u>	Company: <u>[Company]</u>	Company: <u>[Company]</u>	Company: <u>[Company]</u>
SPECIAL INSTRUCTIONS:				RECEIVED BY: 1.		RECEIVED BY: 2.		RECEIVED BY: (LAB) 3.	
VERBALS DUE: <u>11/1</u> HARDCOPY DUE: <u>11/7</u> PRICE: _____ DISC: _____ DIGESTION NEEDED? <u>YES, PLEASE!</u>				Signature: _____ Time: _____		Signature: _____ Time: _____		Signature: <u>[Signature]</u> <u>0920</u> Time: _____	
*As, Cd, Cr, Cu, Hg, Ni, Pb, Zn				Printed Name: _____ Date: _____		Printed Name: _____ Date: _____		Printed Name: <u>[Name]</u> Date: <u>[Date]</u>	
				Company: _____		Company: _____		Company: Analytical Technologies, Inc.	

Area of Geophysical Anomaly and Test Trench Exploration Plan



-  **TT-1** Test Trench Location and Number
-  **MW-3** Monitoring Well Location and Number
-  Location of 2-1/2-inch-diameter Metal Pipe
-  Zone of Geophysical Anomaly as Reported by Parametrix and SAIC (1991a).

0 40 80
Scale in Feet

Hart Crowser
J-3329

APPENDIX A
FIELD METHODS

APPENDIX A FIELD METHODS

The field work for this project was conducted between October 10 and 17, 1989, by Hart Crowser and its subconsultants. Hart Crowser's field representative for this project was William Peplinski. Holt Drilling, of Puyallup, Washington, under subcontract to Hart Crowser, completed the drilling and soil sampling activities. Soil samples were analyzed by Analytical Technologies, Inc. (ATI), of Renton, Washington. On-site Hart Crowser personnel and subcontractors had received OSHA-approved 40-hour health and safety training.

This appendix provides a description of the specific drilling and sampling procedures used during our work on the Desimone property in South Park, Washington. The exploration program included drilling two shallow borings, installing four monitoring wells, and collecting soil and groundwater samples for classification and chemical testing purposes. Boring and well locations are presented on Figure 1.

Hollow Stem-Auger Drilling

Four monitoring wells (MW-1, MW-2, MW-3, and MW-4) and two borings (B-1 and B-2), were drilled at locations across the site as shown on Figure 1. The maximum depth of exploration was 47 feet below ground surface. Standard hollow-stem auger drilling techniques were used. Only lubricants approved by Ecology were used on auger joints or associated tooling. Drilling was done under the observation of a Hart Crowser representative. Detailed field logs were prepared for each boring and well installation. Interpretive logs and as-built diagrams are presented on Figures A-2 through A-7.

Soil Sampling

Split-spoon soil samples were collected from the well borings at 2½-and-5-foot-depth intervals in the borings. Samples were collected using procedures based on the Standard Penetration Test as described in ASTM D 1587. A 3-inch outside diameter, 18-inch-long split-spoon sampler was driven into the soil a distance of 24 inches using a 140-pound hammer, free falling 30 inches. The number of blows required to drive the sample the last 12 inches is the Standard Penetration Resistance recorded at the respective depths on the boring

logs. This resistance, or blow counts, provides a measure of the relative density of granular soils and consistency of cohesive soils. Samples were recovered from the split-spoon and described using the soil classification system presented on Figure A-1.

For all samples, Hart Crowser transferred soil from the split-spoon sampler to three new jars using a stainless steel spoon. Two of the jars were sealed immediately, and held in a cooler with blue ice until delivered to the testing laboratory. The third jar was used for HNU headspace vapor testing, as explained below.

Equipment Decontamination

Drilling and sampling equipment were cleaned after the completion of each boring or sampling event to minimize the potential for cross contamination between soil borings or sampling intervals. The drilling auger sections were steam-cleaned after each boring. Split-spoon samplers were cleaned with Alconox and rinsed with distilled, deionized water between each sample run. Soil cuttings were barreled, labeled, and left on site. Based on the results of the soil and groundwater chemical sampling, the cuttings could be dumped on site and the barrels reused.

HNU Measurements

Sample jar headspace organic vapor measurements were made using an HNU photoionization detector to assess the possible presence of petroleum product in the soil samples collected from the split-spoon sampler. Soil was collected from the sampler in plastic jars (filled half full), and covered with aluminum foil prior to capping. HNU measurements were made after the jar samples had sat for 15 to 20 minutes, by pushing the probe through the foil cover. The HNU measurements were made using a 10.2 eV probe. The HNU was calibrated using a manufacturer supplied standard gas (isobutylene, equivalent to 34 ppm benzene) prior to making the measurements. HNU measurements are recorded on Figures A-2 through A-7.

Borehole Abandonment

Borings which were not completed as monitoring wells were sealed to prevent surface water infiltration. Bentonite chips were used to fill in boreholes and soil was placed over the surface.

Monitoring Well Installation

The monitoring wells were installed within the borings by inserting PVC screen and casing through the hollow-stem auger to the bottom of the drilled hole. The wells were 2 inches in diameter and included a 10-foot-long, 20-slot PVC screen set to straddle the water table. Silica sand was placed in the annular space from the bottom of the well screen to approximately three feet above the top of the screen as the auger was withdrawn to provide a filter pack. Medium-sized bentonite chips were added from the top of the sand to 1-1/2 feet below the ground surface and concrete was used to complete the surface seal. Each well was completed with a stickup, locking steel monument.

Water Level Measurements

Water level measurements were made in the newly installed monitoring wells and in two existing off-site wells to a measured accuracy of about 0.05 foot with an Olympic Model 150 Electric Well Probe and a decimally graduated tape measure. The probe was lowered down the well casing until water was encountered. The tip of the well probe was routinely rinsed with deionized water between wells in order to prevent chemical cross contamination. Water level measurements are recorded in Table A-1 below.

Groundwater Sampling

Prior to sampling, the wells were developed by removing ten casing volumes of water, from each well, using a stainless steel bailer. The water was stored in drums. After all the wells had been developed they were sampled for volatile organics and metals analysis. Three casing volumes of water were removed from the wells before water collected in the stainless steel bailer was poured into the sample bottles. The water sample was filtered through a 40 micron filter before being placed into the bottle for metals analysis. Temperature, pH, and electroconductivity were measured and recorded for each sample.

Measurements are presented in Table 1. Sample bottles were stored in a cooler prior to shipping them to the lab under chain of custody protocol.

Between each monitoring well, the stainless steel bailer was washed in an Alconox solution, rinsed with tap water and then rinsed with distilled, deionized water to minimize the potential of cross contamination. The nylon rope used on the bailer was dedicated to each well to minimize cross contamination.

Survey

The top of the PVC casing in all the new wells was surveyed on October 17, 1991, by Hart Crowser employees. Elevations of the monitoring wells were referenced to the elevation of a previously surveyed monitoring well on Ace Galvanizing's property and to elevations published on a topographical map prepared for Coastal Trailer Repair, Incorporated. The datum is from the Rainier Vista Sewer District.

Table A-1 Water Level Measurements

Well Number	Top of Casing Elevation in Feet	Date	Depth to Water in Feet	Water Table Elevation in Feet
MW-1	66.36	10/17	38.20	28.16
MW-2	68.63	10/17	40.09	28.54
MW-3	39.23	10/17	13.54	25.69
MW-4	40.47	10/17	14.84	25.63
Ace Galvanizing	72.31	10/17	24.42	47.89
Advance Electrographing	30.10	10/17	7.89	22.21

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:

Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Density		Consistency		
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptable moisture
Damp	Some perceptable moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptable moisture, probably above optimum








Minor Constituents

Estimated Percentage

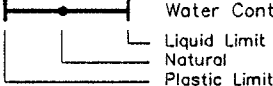
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

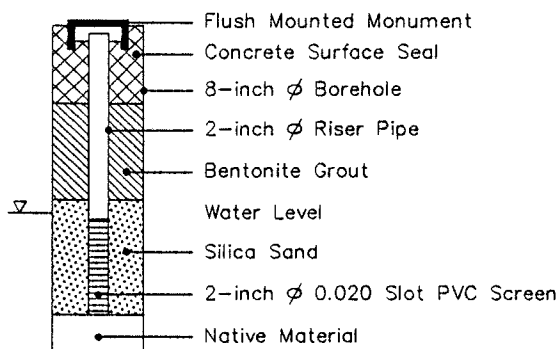
Sampling Test Symbols

BORING SAMPLES	TEST PIT SAMPLES
 Split Spoon	 Grab (Jar)
 Shelby Tube	 Bag
 Cuttings	 Shelby Tube
 Core Run	
* No Sample Recovery	
P Tube Pushed, Not Driven	

Test Symbols

GS	Grain Size Classification
CN	Consolidation
TUU	Triaxial Unconsolidated Undrained
TCU	Triaxial Consolidated Undrained
TCD	Triaxial Consolidated Drained
QU	QU
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits
	 Water Content in Percent Liquid Limit Natural Plastic Limit
HNU	Photoionization Reading

Groundwater Observations

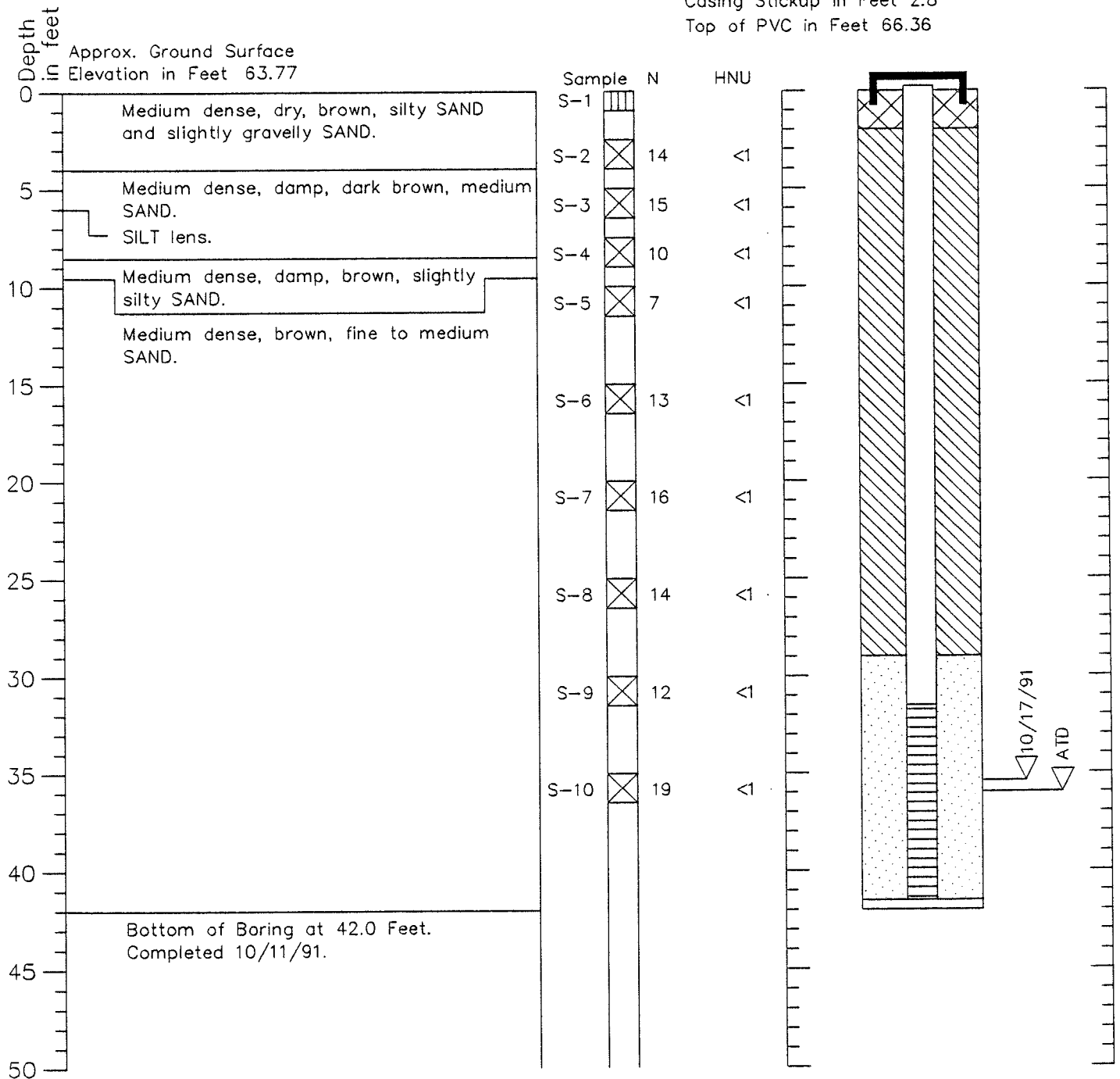


Boring Log and Construction Data for Monitoring Well MW-1

Geologic Log

Monitoring Well Design

Casing Stickup in Feet 2.8
Top of PVC in Feet 66.36



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



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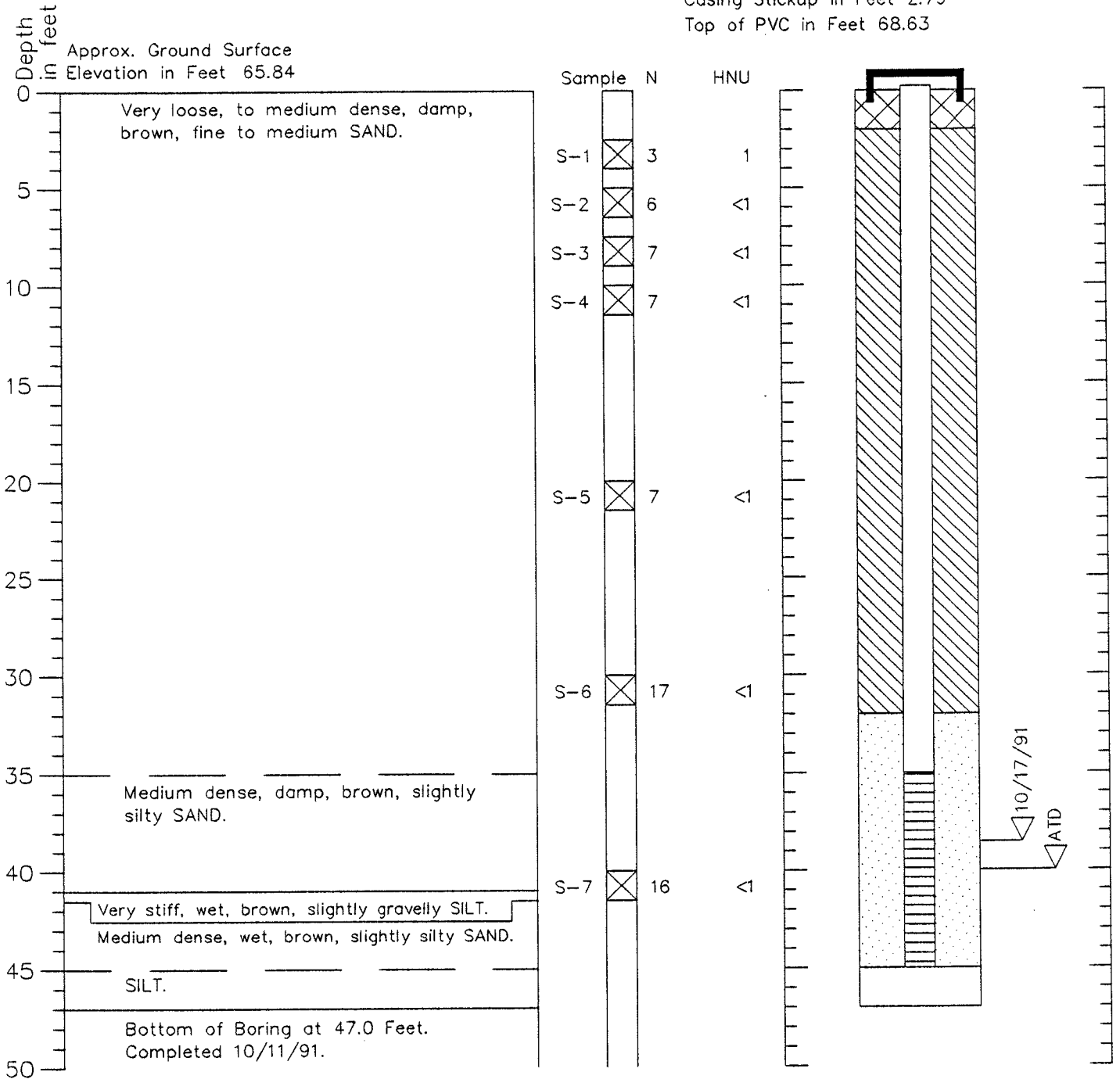
Figure A-2

Boring Log and Construction Data for Monitoring Well MW-2

Geologic Log

Monitoring Well Design

Casing Stickup in Feet 2.79
 Top of PVC in Feet 68.63



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

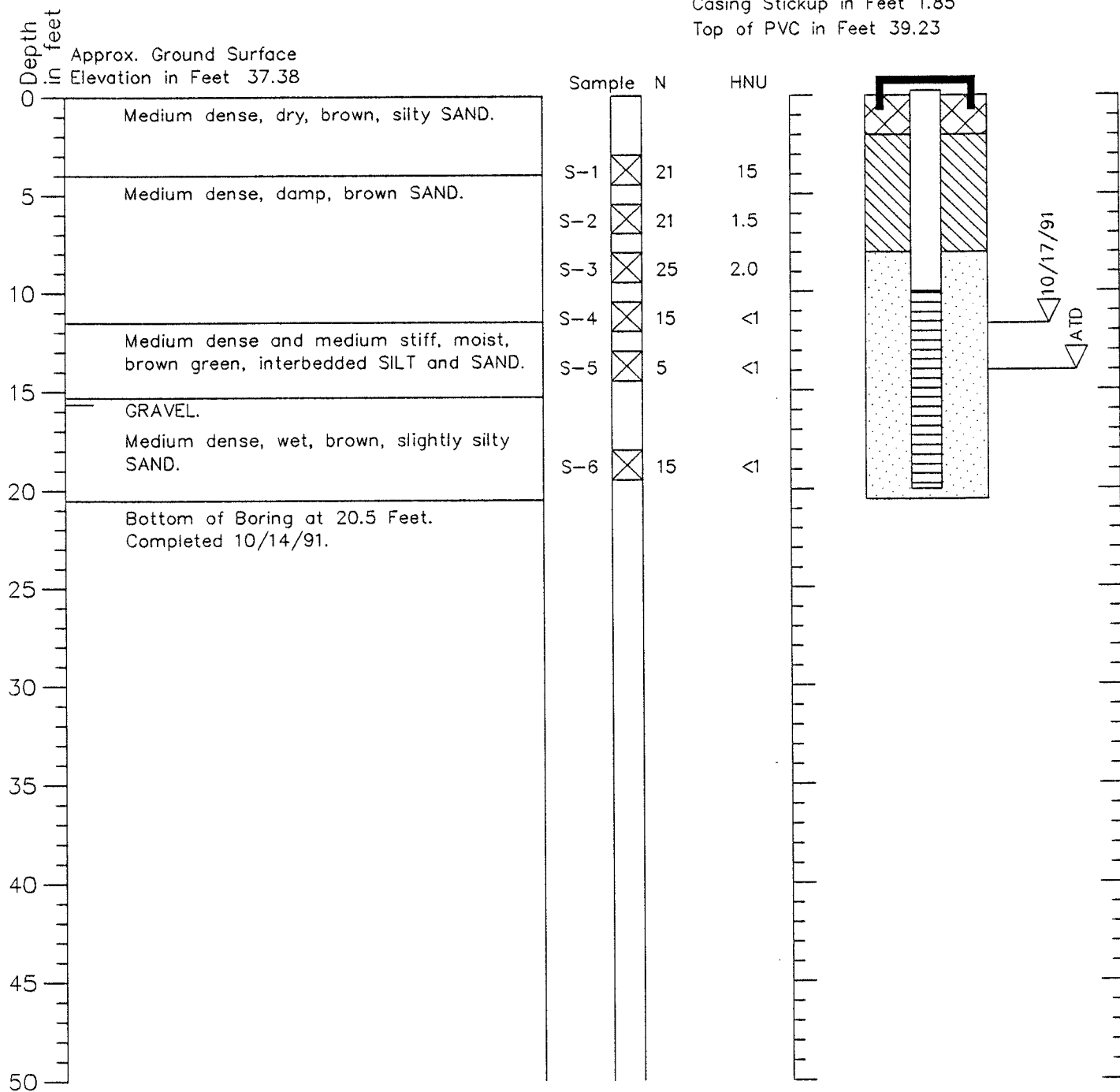
Figure A-3

Boring Log and Construction Data for Monitoring Well MW-3

Geologic Log

Monitoring Well Design

Casing Stickup in Feet 1.85
Top of PVC in Feet 39.23



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

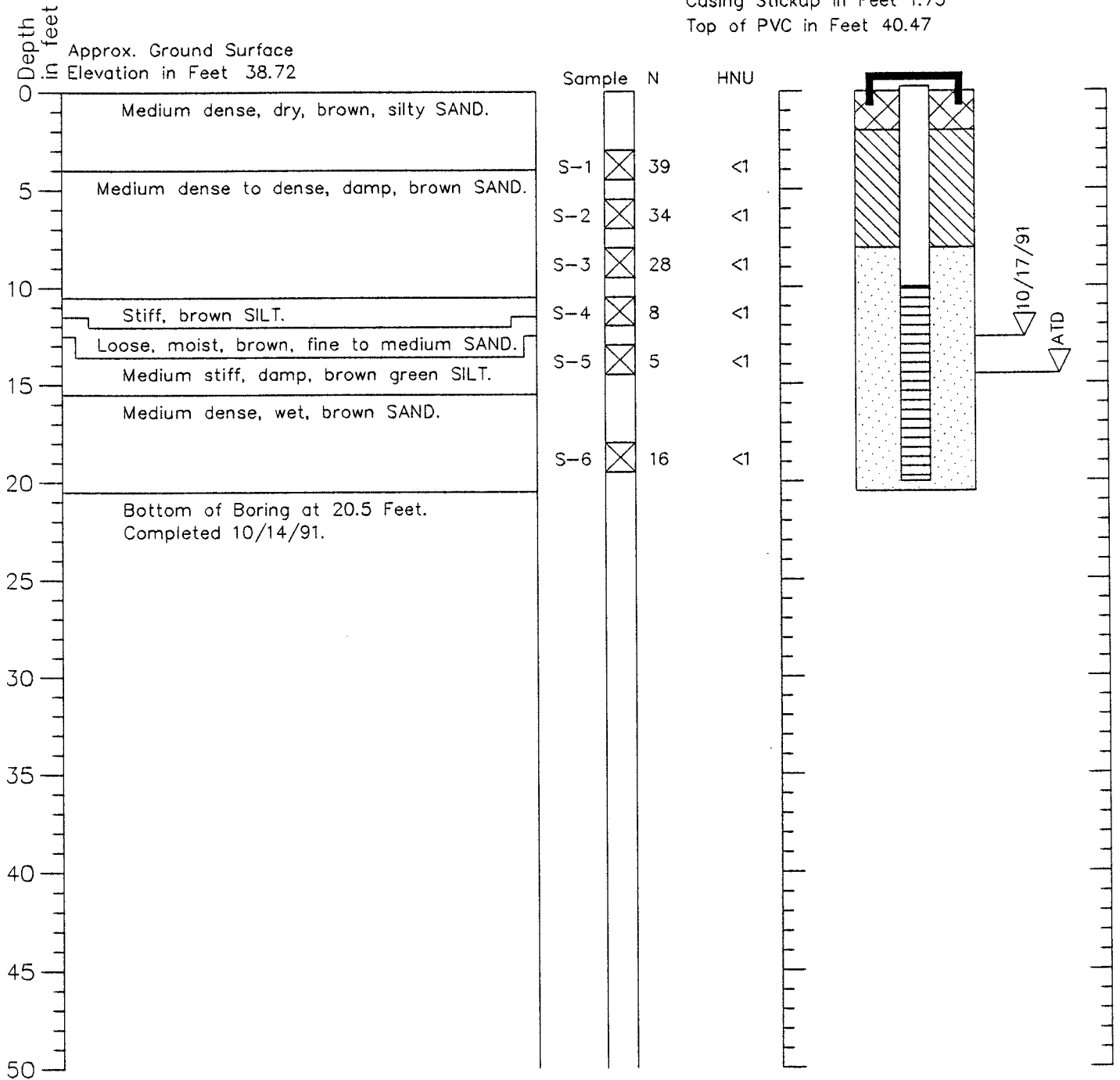
Figure A-4

Boring Log and Construction Data for Monitoring Well MW-4

Geologic Log

Monitoring Well Design

Casing Stickup in Feet 1.75
Top of PVC in Feet 40.47



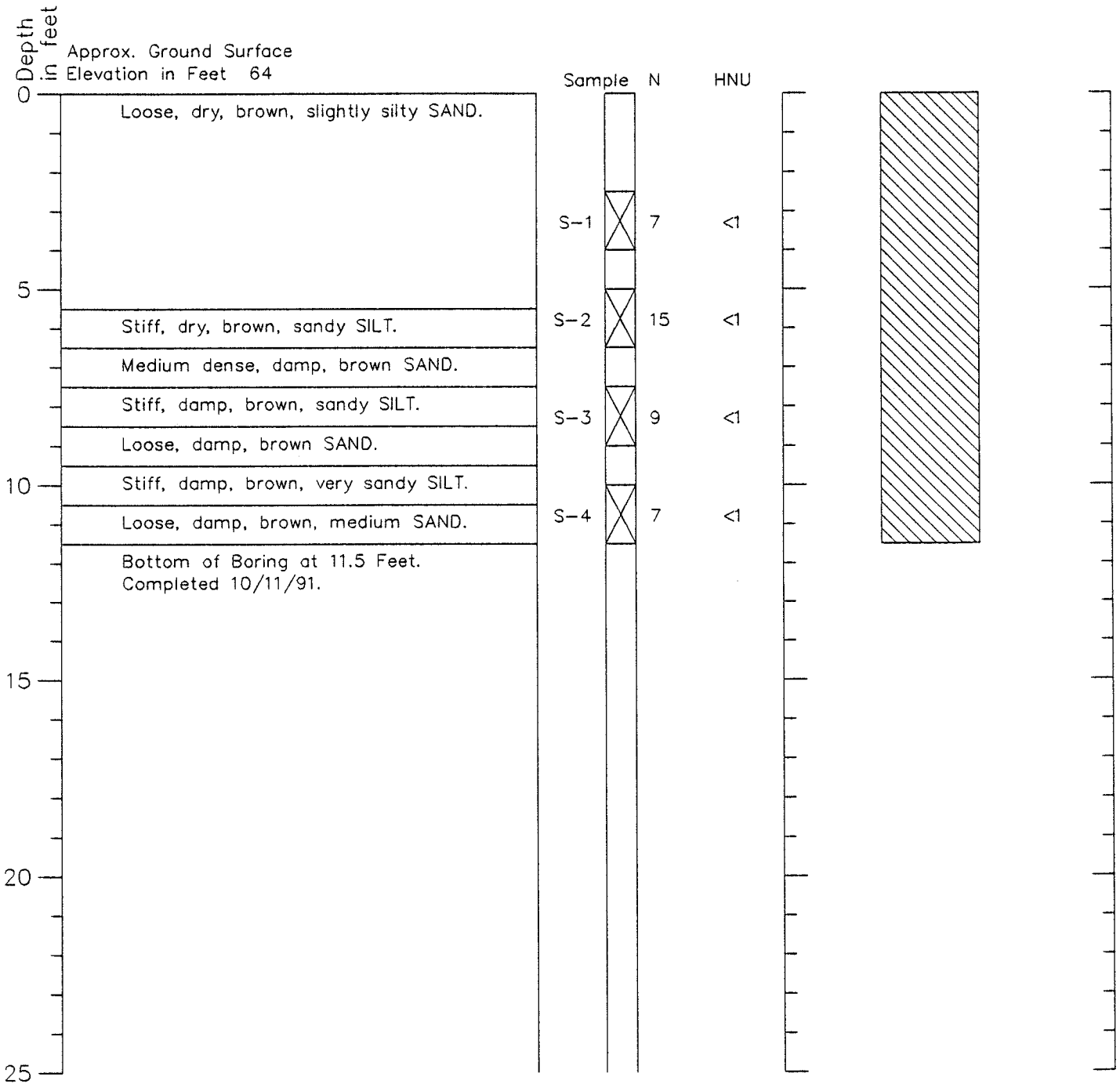
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Figure A-5

Boring Log B-1

Geologic Log

Grouted Boring



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.



HARTCROWSER

J-3329

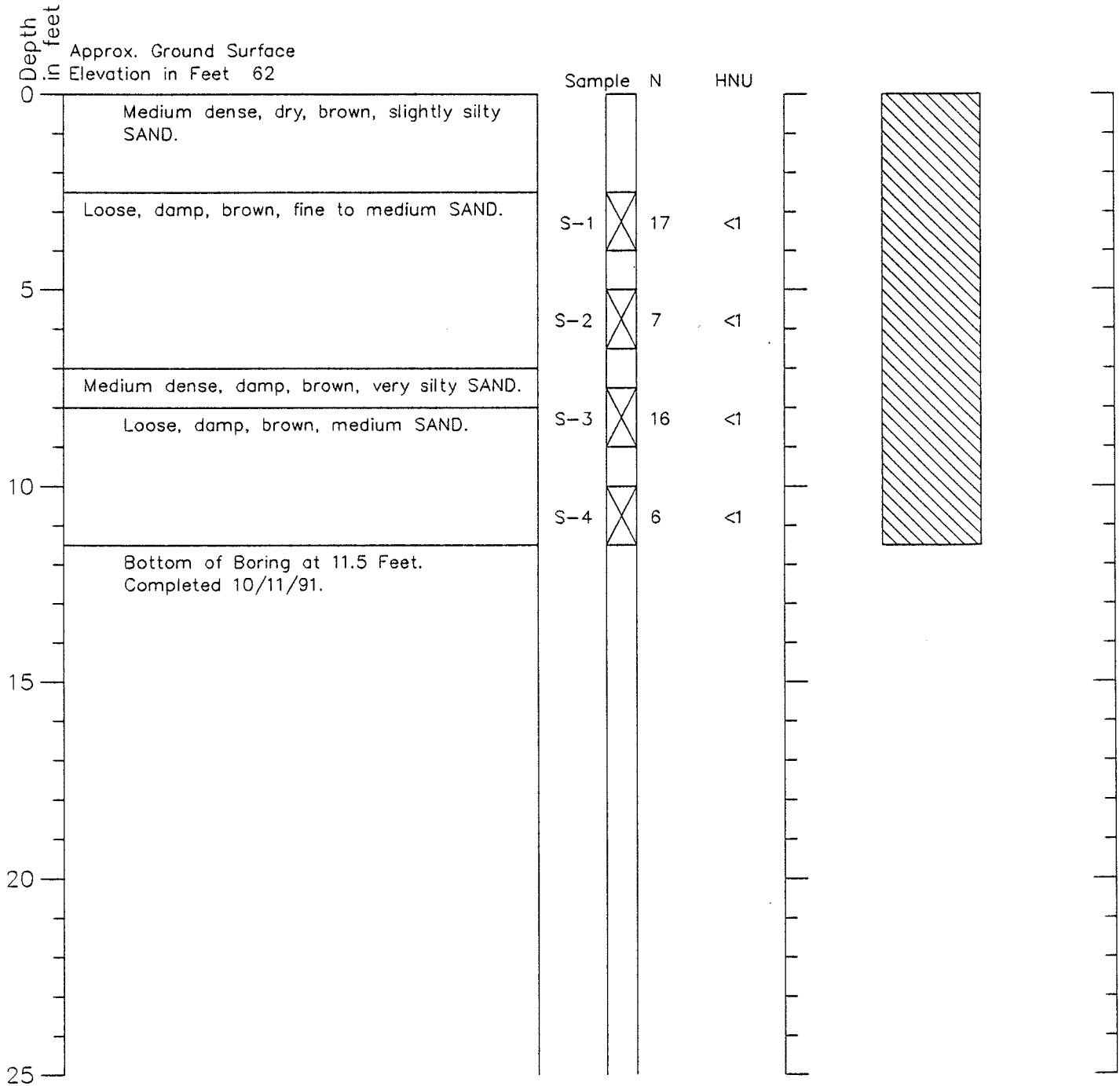
10/91

Figure A-6

Boring Log B-2

Geologic Log

Grouted Boring



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

APPENDIX B
QUALITY REVIEW OF ANALYTICAL RESULTS
AND CERTIFICATES OF ANALYSIS

**APPENDIX B
QUALITY REVIEW OF ANALYTICAL RESULTS
AND CERTIFICATES OF ANALYSIS**

Hart Crowser submitted eight soil samples to Analytical Technologies, Incorporated, on October 14, 1991. The soil samples were analyzed for halogenated volatiles (Method 8010) and total metals (600 and 7000 series analyses). Hart Crowser also submitted five water samples to ATI on October 18, 1991, to be analyzed for volatile organics (Method 8240) and dissolved metals (6000 and 7000 series analyses). The analysis results were reviewed for the following quality assurance parameters: holding times, Matrix Spike/Matrix Spike Duplicate (MS/MSD) precision and accuracy, duplicate precision, blank contamination, and surrogate recoveries.

SOIL SAMPLES

Volatile Organic Compounds

Methylene chloride was detected in both soil blanks at concentrations of 0.072 mg/kg and 0.17 mg/kg. All concentrations of methylene chloride measured in soil samples were less than 10 times the concentrations reported in the blanks associated with the samples. Reported soil sample concentrations are flagged with a B.

Metals

All samples were analyzed within holding times, and laboratory parameters were within control limits.

GROUNDWATER SAMPLES

Volatile Organic Compounds

Acetone and methylene chloride were found in the sample blank associated with the samples at concentrations of 16 $\mu\text{g/L}$ and 10 $\mu\text{g/L}$, respectively. Therefore concentrations of acetone and methylene chloride detected in MW-3 and MW-4 less than 10 times these concentrations were flagged with a B. Concentrations of methylene

Hart Crowser
J-3329

**CERTIFICATES OF ANALYSIS
ANALYTICAL TECHNOLOGIES, INC.**

chloride in MW-3 and MW-4 were also flagged as estimates (J) as they were below the sample detection limit but above the method detection limit.

Metals

All samples were analyzed within holding times, and laboratory parameters were within control limits.



Analytical **Technologies, Inc.**

560 Naches Avenue, S.W., Suite 101, Renton, WA 98055. (206) 228-8335

ATI I.D. # 9110-198

November 11, 1991

Hart Crowser, Inc.
1910 Fairview Ave. E.
Seattle, WA 98102-3699

Attention : Bill Peplinski

Project Number : 3329

Project Name : Desimone

On October 14, 1991, Analytical Technologies, Inc., received eight soil samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Emily C. Carrioli
Senior Project Manager

Frederick W. Grothkopp
Laboratory Manager

FWG/hal/hbb

ATI I.D. # 9110-198

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
 PROJECT # : 3329
 PROJECT NAME : DESIMONE

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9110-198-1	MW-1 S-1	10/11/91	SOIL
9110-198-2	B-1 S-1	10/11/91	SOIL
9110-198-3	B-2 S-2	10/11/91	SOIL
9110-198-4	MW-2 S-7	10/11/91	SOIL
9110-198-5	MW-3 S-1	10/14/91	SOIL
9110-198-6	MW-4 S-4	10/14/91	SOIL
9110-198-7	MW-4 S-4D	10/14/91	SOIL
9110-198-8	TT-4	10/14/91	SOIL

=====

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	8

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 SCHEDULE

CLIENT : HART CROWSER, INC.
 PROJECT # : 3329
 PROJECT NAME : DESIMONE

ANALYSIS	TECHNIQUE	REFERENCE	LAB
PURGEABLE HALOCARBONS	GC/ELCD	EPA 8010	R
ARSENIC	AA/GF	EPA 7060	SD
CADMIUM	ICAP	EPA 6010	SD
CHROMIUM	ICAP	EPA 6010	SD
COPPER	ICAP	EPA 6010	SD
LEAD	ICAP	EPA 6010	SD
MERCURY	AA/CV	EPA 7471	SD
NICKEL	ICAP	EPA 6010	SD
ZINC	ICAP	EPA 6010	SD
MOISTURE	GRAVIMETRIC	CLP SOW ILM01.0	R
MOISTURE	GRAVIMETRIC	METHOD 7-2.2	SD

R = ATI - Renton
 SD = ATI - San Diego
 PHX = ATI - Phoenix
 PNR = ATI - Pensacola
 FC = ATI - Fort Collins
 SUB = Subcontract

ATI I.D. # 9110-198

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: N/A
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/16/91
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/18/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROETHANE	<0.025
1,3-DICHLOROETHANE	<0.025
1,4-DICHLOROETHANE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.072 J
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	101
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J = Estimated value.

ATI I.D. # 9110-198

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: N/A
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/25/91
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/28/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

----- COMPOUNDS -----	RESULTS -----
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.17
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	123
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J = Estimated value.

ATI I.D. # 9110-198-1

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/11/91
PROJECT #	: 3329	DATE RECEIVED	: 10/14/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/16/91
CLIENT I.D.	: MW-1 S-1	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.45 B
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE

59

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-198-2

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/11/91
PROJECT #	: 3329	DATE RECEIVED	: 10/14/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/16/91
CLIENT I.D.	: B-1 S-1	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.13 B
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE

65

B = Analyte is found in the associated blank as well as the sample.



ATI I.D. # 9110-198-3

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/11/91
PROJECT #	: 3329	DATE RECEIVED	: 10/14/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/16/91
CLIENT I.D.	: B-2 S-2	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.15 B
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE 63

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-198-4

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/11/91
PROJECT #	: 3329	DATE RECEIVED	: 10/14/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/16/91
CLIENT I.D.	: MW-2 S-7	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.21 B
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE

64

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-198-5

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/14/91
PROJECT #	: 3329	DATE RECEIVED	: 10/14/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/16/91
CLIENT I.D.	: MW-3 S-1	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROENZENE	<0.025
1,3-DICHLOROENZENE	<0.025
1,4-DICHLOROENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.12 B
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE

65

B = Analyte is found in the associated blank as well as the sample.



ATI I.D. # 9110-198-6

 VOLATILE ORGANICS ANALYSIS
 DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/14/91
PROJECT #	: 3329	DATE RECEIVED	: 10/14/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/16/91
CLIENT I.D.	: MW-4 S-4	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.21 B
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE

63

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-198-7

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC.	DATE SAMPLED : 10/14/91
PROJECT # : 3329	DATE RECEIVED : 10/14/91
PROJECT NAME : DESIMONE	DATE EXTRACTED : 10/25/91
CLIENT I.D. : MW-4 S-4D	DATE ANALYZED : 10/28/91
SAMPLE MATRIX : SOIL	UNITS : mg/Kg
EPA METHOD : 8010	DILUTION FACTOR : 1
RESULTS BASED ON DRY WEIGHT	

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.82 B
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	95
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B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-198-8

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/14/91
PROJECT #	: 3329	DATE RECEIVED	: 10/14/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: 10/16/91
CLIENT I.D.	: TT-4	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8010	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BROMODICHLOROMETHANE	<0.010
BROMOFORM	<0.010
BROMOMETHANE	<0.050
CARBON TETRACHLORIDE	<0.010
CHLOROBENZENE	<0.025
CHLOROETHANE	<0.050
CHLOROFORM	<0.010
CHLOROMETHANE	<0.10
1,2-DIBROMOETHANE (EDB)	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
DIBROMOCHLOROMETHANE	<0.010
1,1-DICHLOROETHANE	<0.010
1,2-DICHLOROETHANE (EDC)	<0.010
1,1-DICHLOROETHENE	<0.010
CIS-1,2-DICHLOROETHENE	<0.010
TRANS-1,2-DICHLOROETHENE	<0.010
1,2-DICHLOROPROPANE	<0.010
CIS-1,3-DICHLOROPROPENE	<0.010
TRANS-1,3-DICHLOROPROPENE	<0.010
METHYLENE CHLORIDE	0.17 B
1,1,2,2-TETRACHLOROETHANE	<0.010
TETRACHLOROETHENE	<0.010
1,1,1-TRICHLOROETHANE	<0.010
1,1,2-TRICHLOROETHANE	<0.010
TRICHLOROETHENE	<0.010
TRICHLOROFLUOROMETHANE	<0.025
VINYL CHLORIDE	<0.050

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	74
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B = Analyte is found in the associated blank as well as the sample.

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.	SAMPLE I.D. # : 9110-182-2
PROJECT # : 3329	DATE EXTRACTED : 10/14/91
PROJECT NAME : DESIMONE	DATE ANALYZED : 10/18/91
EPA METHOD : 8010	UNITS : mg/Kg
SAMPLE MATRIX : SOIL	

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
CHLOROBENZENE	<0.025	0.400	0.465	116	0.458	115	2
1,1-DICHLOROETHENE	<0.010	0.400	0.425	106	0.394	99	8
TRICHLOROETHENE	<0.010	0.400	0.488	122	0.462	116	5

$$\% \text{Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Duplicate Result})|}{\text{Average Result}} \times 100$$

ATI I.D. # 9110-198

METALS ANALYSIS

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : SOIL

ELEMENT	DATE PREPARED	DATE ANALYZED
ARSENIC	10/22/91	10/25/91
CADMIUM	10/22/91	10/28/91
CHROMIUM	10/22/91	10/28/91
COPPER	10/22/91	10/28/91
LEAD	10/22/91	10/28/91
MERCURY	10/22/91	10/25/91
NICKEL	10/22/91	10/28/91
ZINC	10/22/91	10/28/91

ATI I.D. # 9110-198

METALS ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : SOIL
UNITS : mg/Kg

ELEMENT	MW-1 S-1 -1	B-1 S-1 -2	B-2 S-2 -3	MW-2 S-7 -4	MW-3 S-1 -5
ARSENIC	6.8	1.9	2.4	2.8	3.9
CADMIUM	3.3	2.1	2.1	2.1	2.4
CHROMIUM	32.1	27.8	25.9	21.9	29.3
COPPER	31.0	10.7	10.7	13.4	16.7
LEAD	20.8	3.1	3.7	3.6	9.3
MERCURY	1.1	<0.25	<0.25	<0.25	<0.25
NICKEL	33.0	38.4	40.3	31.4	35.6
ZINC	68.3	29.3	23.4	498	55.2

ATI I.D. # 9110-198

METALS ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : SOIL
UNITS : mg/Kg

ELEMENT	MW-4 S-4 -6	MW-4 S-4D -7	TT-4 -8	REAGENT BLANK
ARSENIC	5.3	3.3	4.2	<1.0
CADMIUM	3.3	2.4	2.7	<0.5
CHROMIUM	29.4	23.1	25.6	<0.5
COPPER	26.6	16.6	12.5	<1.0
LEAD	4.6	3.7	6.5	<1.5
MERCURY	<0.25	<0.25	<0.25	<0.25
NICKEL	44.9	34.7	33.4	<1.0
ZINC	45.3	30.9	32.3	2.3

ATI I.D. # 9110-198

METALS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : SOIL
UNITS : mg/Kg

ELEMENT	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
ARSENIC	9110-198-2	1.9	1.9	0	45.3	47.8	91
CADMIUM	9110-198-2	2.1	2.0	5	50.1	47.8	100
CHROMIUM	9110-198-2	27.8	28.1	1	70.9	47.8	90
COPPER	9110-198-2	10.7	10.6	1	59.0	47.8	101
LEAD	9110-198-2	3.1	2.0	43	51.1	47.8	100
MERCURY	9110-198-5	<0.25	<0.25	NC	2.7	2.5	108
NICKEL	9110-198-2	38.4	37.5	2	84.6	47.8	97
ZINC	9110-198-2	29.3	28.8	2	77.5	47.8	101

NC = Not Calculable.

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

ATI I.D. # 9110-198

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : SOIL

PARAMETER	DATE ANALYZED
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MOISTURE	10/18/91
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MOISTURE *	10/17/91
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* Analyzed at ATI San Diego, CA, laboratory.

ATI I.D. # 9110-198

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : SOIL

UNITS : %

ATI I.D. #	CLIENT I.D.	MOISTURE	MOISTURE *
9110-198-1	MW-1 S-1	5.8	5.1
9110-198-2	B-1 S-1	3.6	4.4
9110-198-3	B-2 S-2	10	7.4
9110-198-4	MW-2 S-7	23	21.0
9110-198-5	MW-3 S-1	6.8	5.3
9110-198-6	MW-4 S-4	13	28.4
9110-198-7	MW-4 S-4D	24	21.1
9110-198-8	TT-4	6.3	6.2

* Analyzed at ATI San Diego, CA, laboratory.

ATI I.D. # 9110-198

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : SOIL

UNITS : %

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
MOISTURE	9110-198-8	6.3	6.2	2	N/A	N/A	N/A
MOISTURE *	9110-198-2	4.4	4.4	0	N/A	N/A	N/A

* Analyzed at ATI San Diego, CA, laboratory.

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$



560 Naches Avenue SW, Suite 101 Renton, WA 98055 (206)228 8335

Chain of Custody LABORATORY NUMBER: 110263

PROJECT MANAGER: <u>LEE CARFOLU</u>					ANALYSIS REQUEST																															
ANALYTICAL TECHNOLOGIES, INC. 560 NACHES AVE SW, SUITE 101 RENTON, WA 98055 (206) 228-8335					8240 GC/MS Volatiles	8270 GC/MS BNA's	8310 HPLC PNA's	8080 Pest/PCB's	PCB's only	8150 Herbicides	TOC 9060	TOX 9020	BOD	COD	CYANIDE	MBAS	NITRATE/NITRITE	PP METALS	EPTOX METALS	TCLP METALS	TCLP 8240 (ZHE)	TCLP 8270	TCLP 8150	TCLP 8080	PHENOLS, total	% MOISTURE	As	Cd	Cu	Hg	Ni	Pb	Zn	NUMBER OF CONTAINERS		
SAMPLE DISPOSAL INSTRUCTIONS <input checked="" type="checkbox"/> ATI Disposal <input type="checkbox"/> Return																																				
	SAMPLE ID	DATE	TIME	MATRIX	LAB ID																															
01	S110-158-1	10-11-91																																		
02	2																																			
03	3																																			
04	4																																			
05	5	10-11-91																																		
06	6																																			
07	7																																			
08	8																																			
	9																																			

PROJECT INFORMATION		SAMPLE RECEIPT		RELINQUISHED BY: 1.		RELINQUISHED BY: 2.		RELINQUISHED BY: 3.	
ATI PROJ #: <u>S110-158</u>		TOTAL NUMBER OF CONTAINERS <u>8</u>		Signature: <u>[Signature]</u> Time: <u>4:00pm</u>		Signature: _____ Time: _____		Signature: _____ Time: _____	
ATI PROJ NAME: <u>HCI</u>		COC SEALS/INTACT? <u>Y/N/A</u>		Printed Name: _____ Date: _____		Printed Name: _____ Date: _____		Printed Name: _____ Date: _____	
CLIENT PROJ: <u>3329</u>		RECEIVED GOOD COND/COLD <u>Y</u>		V. PENINICIA <u>10/15/91</u>		Company: <u>ATI-LWA</u>		Company: _____	
RECEIVED VIA: <u>FX</u>		SPECIAL INSTRUCTIONS:		RECEIVED BY: 1.		RECEIVED BY: 2.		RECEIVED BY: (LAB) 3.	
VERBALS DUE: <u>10/25</u>		HARDCOPY DUE: <u>11/1</u>		Signature: _____ Time: _____		Signature: _____ Time: _____		Signature: <u>[Signature]</u> Time: <u>10:35</u>	
PRICE: <u>List</u> DISC: _____		DIGESTION NEEDED? <u>Yes</u>		Printed Name: _____ Date: _____		Printed Name: _____ Date: _____		Printed Name: <u>Michael Halloran</u> Date: <u>10/16/91</u>	
				Company: _____		Company: _____		Analytical Technologies, Inc.	



Analytical **Technologies, Inc.**

560 Naches Avenue, S.W., Suite 101, Renton, WA 98055. (206) 228-8335

ATI I.D. # 9110-237

November 8, 1991

Hart Crowser, Inc.
1910 Fairview Ave. E.
Seattle, WA 98102-3699

Attention : Bill Peplinski

Project Number : 3329

Project Name : Desimone

On October 18, 1991, Analytical Technologies, Inc., received six water samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Emily C. Caffioli
Senior Project Manager

Frederick W. Grothkopp
Laboratory Manager

FWG/hal/ew

ATI I.D. # 9110-237

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
 PROJECT # : 3329
 PROJECT NAME : DESIMONE

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9110-237-1	MW-1	10/17/91	WATER
9110-237-2	MW-2	10/17/91	WATER
9110-237-3	MW-2D	10/17/91	WATER
9110-237-4	MW-3	10/17/91	WATER
9110-237-5	MW-4	10/17/91	WATER
9110-237-6	TRIP BLANK	N/A	WATER

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----- TOTALS -----

MATRIX	# SAMPLES
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WATER	6

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 SCHEDULE

CLIENT : HART CROWSER, INC.
 PROJECT # : 3329
 PROJECT NAME : DESIMONE

ANALYSIS	TECHNIQUE	REFERENCE	LAB
VOLATILE ORGANIC COMPOUNDS	GCMS	EPA 8240	R
ARSENIC	AA/GF	EPA 7060	SD
CADMIUM	ICAP	EPA 6010	SD
CHROMIUM	ICAP	EPA 6010	SD
COPPER	ICAP	EPA 6010	SD
LEAD	AA/GF	EPA 7421	SD
MERCURY	AA/COLD VAPOR	EPA 7471	SD
NICKEL	ICAP	EPA 6010	SD
ZINC	ICAP	EPA 6010	SD

R = ATI - Renton
 SD = ATI - San Diego
 PHX = ATI - Phoenix
 PNR = ATI - Pensacola
 FC = ATI - Fort Collins
 SUB = Subcontract

ATI I.D. # 9110-237

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: N/A
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
ACETONE	<10
BENZENE	<1
BROMODICHLOROMETHANE	<1
BROMOFORM	<5
BROMOMETHANE	<10
2-BUTANONE (MEK)	<10
CARBON DISULFIDE	<1
CARBON TETRACHLORIDE	<1
CHLOROBENZENE	<1
CHLOROETHANE	<1
CHLOROFORM	<1
CHLOROMETHANE	<10
DIBROMOCHLOROMETHANE	<1
1,1-DICHLOROETHANE	<1
1,2-DICHLOROETHANE	<1
1,1-DICHLOROETHENE	<1
1,2-DICHLOROETHENE (TOTAL)	<1
1,2-DICHLOROPROPANE	<1
CIS-1,3-DICHLOROPROPENE	<1
TRANS-1,3-DICHLOROPROPENE	<1
ETHYLBENZENE	<1
2-HEXANONE (MBK)	<10
4-METHYL-2-PENTANONE (MIBK)	<10
METHYLENE CHLORIDE	3 J
STYRENE	<1
1,1,2,2-TETRACHLOROETHANE	<1
TETRACHLOROETHENE	<1
TOLUENE	<1
1,1,1-TRICHLOROETHANE	<1
1,1,2-TRICHLOROETHANE	<1
TRICHLOROETHENE	<1
VINYL ACETATE	<10
VINYL CHLORIDE	<1
TOTAL XYLENES	<1
SURROGATE PERCENT RECOVERIES	
1,2-DICHLOROETHANE-D4	106
TOLUENE-D8	104
BROMOFLUOROBENZENE	106

J = Estimated value.

ATI I.D. # 9110-237

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: N/A
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE		252	8.0

ATI I.D. # 9110-237

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: N/A
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
ACETONE	14
BENZENE	<1
BROMODICHLOROMETHANE	<1
BROMOFORM	<5
BROMOMETHANE	<10
2-BUTANONE (MEK)	<10
CARBON DISULFIDE	<1
CARBON TETRACHLORIDE	<1
CHLOROBENZENE	<1
CHLOROETHANE	<1
CHLOROFORM	<1
CHLOROMETHANE	<10
DIBROMOCHLOROMETHANE	<1
1,1-DICHLOROETHANE	<1
1,2-DICHLOROETHANE	<1
1,1-DICHLOROETHENE	<1
1,2-DICHLOROETHENE (TOTAL)	<1
1,2-DICHLOROPROPANE	<1
CIS-1,3-DICHLOROPROPENE	<1
TRANS-1,3-DICHLOROPROPENE	<1
ETHYLBENZENE	<1
2-HEXANONE (MBK)	<10
4-METHYL-2-PENTANONE (MIBK)	<10
METHYLENE CHLORIDE	5 J
STYRENE	<1
1,1,2,2-TETRACHLOROETHANE	<1
TETRACHLOROETHENE	<1
TOLUENE	<1
1,1,1-TRICHLOROETHANE	<1
1,1,2-TRICHLOROETHANE	<1
TRICHLOROETHENE	<1
VINYL ACETATE	<10
VINYL CHLORIDE	<1
TOTAL XYLENES	<1
SURROGATE PERCENT RECOVERIES	
1,2-DICHLOROETHANE-D4	103
TOLUENE-D8	102
BROMOFLUOROBENZENE	99

J = Estimated value.

ATI I.D. # 9110-237

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: N/A
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE		248	8.0

ATI I.D. # 9110-237

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: N/A
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/22/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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ACETONE	17
BENZENE	<1
BROMODICHLOROMETHANE	<1
BROMOFORM	<5
BROMOMETHANE	<10
2-BUTANONE (MEK)	<10
CARBON DISULFIDE	<1
CARBON TETRACHLORIDE	<1
CHLOROBENZENE	<1
CHLOROETHANE	<1
CHLOROFORM	<1
CHLOROMETHANE	<10
DIBROMOCHLOROMETHANE	<1
1,1-DICHLOROETHANE	<1
1,2-DICHLOROETHANE	<1
1,1-DICHLOROETHENE	<1
1,2-DICHLOROETHENE (TOTAL)	<1
1,2-DICHLOROPROPANE	<1
CIS-1,3-DICHLOROPROPENE	<1
TRANS-1,3-DICHLOROPROPENE	<1
ETHYLBENZENE	<1
2-HEXANONE (MBK)	<10
4-METHYL-2-PENTANONE (MIBK)	<10
METHYLENE CHLORIDE	10
STYRENE	<1
1,1,2,2-TETRACHLOROETHANE	<1
TETRACHLOROETHENE	<1
TOLUENE	<1
1,1,1-TRICHLOROETHANE	<1
1,1,2-TRICHLOROETHANE	<1
TRICHLOROETHENE	<1
VINYL ACETATE	<10
VINYL CHLORIDE	<1
TOTAL XYLENES	<1

SURROGATE PERCENT RECOVERIES

1,2-DICHLOROETHANE-D4	100
TOLUENE-D8	98
BROMOFLUOROBENZENE	97

ATI I.D. # 9110-237

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: N/A
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/22/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE		258	7.0
UNKNOWN		1295	12

ATI I.D. # 9110-237-1

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-1	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
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ACETONE	<10
BENZENE	<1
BROMODICHLOROMETHANE	<1
BROMOFORM	<5
BROMOMETHANE	<10
2-BUTANONE (MEK)	<10
CARBON DISULFIDE	<1
CARBON TETRACHLORIDE	<1
CHLOROBENZENE	<1
CHLOROETHANE	<1
CHLOROFORM	<1
CHLOROMETHANE	<10
DIBROMOCHLOROMETHANE	<1
1,1-DICHLOROETHANE	<1
1,2-DICHLOROETHANE	<1
1,1-DICHLOROETHENE	<1
1,2-DICHLOROETHENE (TOTAL)	<1
1,2-DICHLOROPROPANE	<1
CIS-1,3-DICHLOROPROPENE	<1
TRANS-1,3-DICHLOROPROPENE	<1
ETHYLBENZENE	<1
2-HEXANONE (MBK)	<10
4-METHYL-2-PENTANONE (MIBK)	<10
METHYLENE CHLORIDE	<5
STYRENE	<1
1,1,2,2-TETRACHLOROETHANE	<1
TETRACHLOROETHENE	<1
TOLUENE	<1
1,1,1-TRICHLOROETHANE	<1
1,1,2-TRICHLOROETHANE	<1
TRICHLOROETHENE	<1
VINYL ACETATE	<10
VINYL CHLORIDE	<1
TOTAL XYLENES	<1

SURROGATE PERCENT RECOVERIES

1,2-DICHLOROETHANE-D4	106
TOLUENE-D8	101
BROMOFLUOROBENZENE	103

ATI I.D. # 9110-237-1

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-1	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE	B	253	8.0

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237-2

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-2	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS RESULTS

ACETONE	<10	
BENZENE		4
BROMODICHLOROMETHANE	<1	
BROMOFORM	<5	
BROMOMETHANE	<10	
2-BUTANONE (MEK)	<10	
CARBON DISULFIDE	<1	
CARBON TETRACHLORIDE	<1	
CHLOROBENZENE	<1	
CHLOROETHANE	<1	
CHLOROFORM	<1	
CHLOROMETHANE	<10	
DIBROMOCHLOROMETHANE	<1	
1,1-DICHLOROETHANE	<1	
1,2-DICHLOROETHANE	<1	
1,1-DICHLOROETHENE	<1	
1,2-DICHLOROETHENE (TOTAL)	<1	
1,2-DICHLOROPROPANE	<1	
CIS-1,3-DICHLOROPROPENE	<1	
TRANS-1,3-DICHLOROPROPENE	<1	
ETHYLBENZENE	<1	
2-HEXANONE (MBK)	<10	
4-METHYL-2-PENTANONE (MIBK)	<10	
METHYLENE CHLORIDE	<5	
STYRENE	<1	
1,1,2,2-TETRACHLOROETHANE	<1	
TETRACHLOROETHENE	<1	
TOLUENE		5
1,1,1-TRICHLOROETHANE	<1	
1,1,2-TRICHLOROETHANE	<1	
TRICHLOROETHENE	<1	
VINYL ACETATE	<10	
VINYL CHLORIDE	<1	
TOTAL XYLENES	<1	

SURROGATE PERCENT RECOVERIES

1,2-DICHLOROETHANE-D4	98
TOLUENE-D8	94
BROMOFLUOROBENZENE	97

ATI I.D. # 9110-237-2

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-2	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE	B	251	7.0

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237-3

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-2D	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS RESULTS

ACETONE	<10	
BENZENE		3
BROMODICHLOROMETHANE	<1	
BROMOFORM	<5	
BROMOMETHANE	<10	
2-BUTANONE (MEK)	<10	
CARBON DISULFIDE	<1	
CARBON TETRACHLORIDE	<1	
CHLOROBENZENE	<1	
CHLOROETHANE	<1	
CHLOROFORM	<1	
CHLOROMETHANE	<10	
DIBROMOCHLOROMETHANE	<1	
1,1-DICHLOROETHANE	<1	
1,2-DICHLOROETHANE	<1	
1,1-DICHLOROETHENE	<1	
1,2-DICHLOROETHENE (TOTAL)	<1	
1,2-DICHLOROPROPANE	<1	
CIS-1,3-DICHLOROPROPENE	<1	
TRANS-1,3-DICHLOROPROPENE	<1	
ETHYLBENZENE	<1	
2-HEXANONE (MBK)	<10	
4-METHYL-2-PENTANONE (MIBK)	<10	
METHYLENE CHLORIDE	<5	
STYRENE	<1	
1,1,2,2-TETRACHLOROETHANE	<1	
TETRACHLOROETHENE	<1	
TOLUENE		4
1,1,1-TRICHLOROETHANE	<1	
1,1,2-TRICHLOROETHANE	<1	
TRICHLOROETHENE	<1	
VINYL ACETATE	<10	
VINYL CHLORIDE	<1	
TOTAL XYLENES	<1	

SURROGATE PERCENT RECOVERIES

1,2-DICHLOROETHANE-D4	108
TOLUENE-D8	103
BROMOFLUOROBENZENE	106

ATI I.D. # 9110-237-3

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-2D	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE	B	252	7.0

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237-4

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-3	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
ACETONE	<10
BENZENE	<1
BROMODICHLOROMETHANE	<1
BROMOFORM	<5
BROMOMETHANE	<10
2-BUTANONE (MEK)	<10
CARBON DISULFIDE	<1
CARBON TETRACHLORIDE	<1
CHLOROBENZENE	<1
CHLOROETHANE	<1
CHLOROFORM	<1
CHLOROMETHANE	<10
DIBROMOCHLOROMETHANE	<1
1,1-DICHLOROETHANE	<1
1,2-DICHLOROETHANE	<1
1,1-DICHLOROETHENE	<1
1,2-DICHLOROETHENE (TOTAL)	<1
1,2-DICHLOROPROPANE	<1
CIS-1,3-DICHLOROPROPENE	<1
TRANS-1,3-DICHLOROPROPENE	<1
ETHYLBENZENE	<1
2-HEXANONE (MBK)	<10
4-METHYL-2-PENTANONE (MIBK)	<10
METHYLENE CHLORIDE	3 JB
STYRENE	<1
1,1,2,2-TETRACHLOROETHANE	<1
TETRACHLOROETHENE	<1
TOLUENE	<1
1,1,1-TRICHLOROETHANE	<1
1,1,2-TRICHLOROETHANE	<1
TRICHLOROETHENE	<1
VINYL ACETATE	<10
VINYL CHLORIDE	<1
TOTAL XYLENES	<1
SURROGATE PERCENT RECOVERIES	
1,2-DICHLOROETHANE-D4	106
TOLUENE-D8	101
BROMOFLUOROBENZENE	104

J = Estimated value.

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237-4

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-3	DATE ANALYZED	: 10/19/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE	B	252	8.0

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237-5

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-4	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
ACETONE	12 B
BENZENE	<1
BROMODICHLOROMETHANE	<1
BROMOFORM	<5
BROMOMETHANE	<10
2-BUTANONE (MEK)	<10
CARBON DISULFIDE	<1
CARBON TETRACHLORIDE	<1
CHLOROBENZENE	<1
CHLOROETHANE	<1
CHLOROFORM	<1
CHLOROMETHANE	<10
DIBROMOCHLOROMETHANE	<1
1,1-DICHLOROETHANE	<1
1,2-DICHLOROETHANE	<1
1,1-DICHLOROETHENE	<1
1,2-DICHLOROETHENE (TOTAL)	<1
1,2-DICHLOROPROPANE	<1
CIS-1,3-DICHLOROPROPENE	<1
TRANS-1,3-DICHLOROPROPENE	<1
ETHYLBENZENE	<1
2-HEXANONE (MBK)	<10
4-METHYL-2-PENTANONE (MIBK)	<10
METHYLENE CHLORIDE	4 JB
STYRENE	<1
1,1,2,2-TETRACHLOROETHANE	<1
TETRACHLOROETHENE	<1
TOLUENE	<1
1,1,1-TRICHLOROETHANE	<1
1,1,2-TRICHLOROETHANE	<1
TRICHLOROETHENE	<1
VINYL ACETATE	<10
VINYL CHLORIDE	<1
TOTAL XYLENES	<1
SURROGATE PERCENT RECOVERIES	
1,2-DICHLOROETHANE-D4	106
TOLUENE-D8	101
BROMOFLUOROBENZENE	99

J = Estimated value.

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237-5

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 10/17/91
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-4	DATE ANALYZED	: 10/20/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE	B	248	8.0

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237-6

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: TRIP BLANK	DATE ANALYZED	: 10/22/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
ACETONE	<10
BENZENE	<1
BROMODICHLOROMETHANE	<1
BROMOFORM	<5
BROMOMETHANE	<10
2-BUTANONE (MEK)	<10
CARBON DISULFIDE	<1
CARBON TETRACHLORIDE	<1
CHLOROBENZENE	<1
CHLOROETHANE	<1
CHLOROFORM	<1
CHLOROMETHANE	<10
DIBROMOCHLOROMETHANE	<1
1,1-DICHLOROETHANE	<1
1,2-DICHLOROETHANE	<1
1,1-DICHLOROETHENE	<1
1,2-DICHLOROETHENE (TOTAL)	<1
1,2-DICHLOROPROPANE	<1
CIS-1,3-DICHLOROPROPENE	<1
TRANS-1,3-DICHLOROPROPENE	<1
ETHYLBENZENE	<1
2-HEXANONE (MBK)	<10
4-METHYL-2-PENTANONE (MIBK)	<10
METHYLENE CHLORIDE	51 B
STYRENE	<1
1,1,2,2-TETRACHLOROETHANE	<1
TETRACHLOROETHENE	<1
TOLUENE	<1
1,1,1-TRICHLOROETHANE	<1
1,1,2-TRICHLOROETHANE	<1
TRICHLOROETHENE	<1
VINYL ACETATE	<10
VINYL CHLORIDE	<1
TOTAL XYLENES	<1
SURROGATE PERCENT RECOVERIES	
1,2-DICHLOROETHANE-D4	107
TOLUENE-D8	103
BROMOFUOROBENZENE	102

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237-6

VOLATILE ORGANICS ANALYSIS
TENTATIVELY IDENTIFIED COMPOUNDS

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 3329	DATE RECEIVED	: 10/18/91
PROJECT NAME	: DESIMONE	DATE EXTRACTED	: N/A
CLIENT I.D.	: TRIP BLANK	DATE ANALYZED	: 10/22/91
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8240	DILUTION FACTOR	: 1

COMPOUND	FLAG	SCAN	RESULTS
HEXANE	B	251	8.0

B = Analyte is found in the associated blank as well as the sample.

ATI I.D. # 9110-237

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.	SAMPLE I.D. # : 9110-237-1
PROJECT # : 3329	DATE EXTRACTED : N/A
PROJECT NAME : DESIMONE	DATE ANALYZED : 10/19/91
EPA METHOD : 8240	UNITS : ug/L
SAMPLE MATRIX : WATER	

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT*	% REC.	DUP. SPIKED SAMPLE*	DUP. % REC.	RPD
1,1-DICHLOROETHENE	<1.0	50.0	47.3	95	44.5	89	6
TRICHLOROETHENE	<1.0	50.0	45.1	90	43.6	87	3
BENZENE	<1.0	50.0	47.4	95	45.3	91	5
TOLUENE	<1.0	50.0	46.5	93	45.7	91	2
CHLOROBENZENE	<1.0	50.0	46.7	93	45.7	91	2

* MS and MSD analyzed on 10/20/91.

$$\% \text{Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Duplicate Result})|}{\text{Average Result}} \times 100$$

ATI I.D. # 9110-237

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.	SAMPLE I.D. # : BLANK SPIKE
PROJECT # : 3329	DATE EXTRACTED : N/A
PROJECT NAME : DESIMONE	DATE ANALYZED : 10/20/91
EPA METHOD : 8240	UNITS : ug/L
SAMPLE MATRIX : WATER	

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
1,1-DICHLOROETHENE	<1.0	50.0	45.6	91	N/A	N/A	N/A
TRICHLOROETHENE	<1.0	50.0	45.5	91	N/A	N/A	N/A
BENZENE	<1.0	50.0	47.3	95	N/A	N/A	N/A
TOLUENE	<1.0	50.0	47.2	94	N/A	N/A	N/A
CHLOROBENZENE	<1.0	50.0	47.2	94	N/A	N/A	N/A

$$\% \text{Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Duplicate Result})|}{\text{Average Result}} \times 100$$

ATI I.D. # 9110-237

METALS ANALYSIS

CLIENT : HART CROWSER, INC.
PROJECT # : 3329
PROJECT NAME : DESIMONE

MATRIX : WATER

ELEMENT	DATE PREPARED	DATE ANALYZED
ARSENIC	10/23/91	10/28/91
CADMIUM	10/23/91	10/30/91
CHROMIUM	10/23/91	10/30/91
COPPER	10/23/91	10/30/91
LEAD	10/23/91	10/28/91
MERCURY	10/23/91	10/29/91
NICKEL	10/23/91	10/30/91
ZINC	10/23/91	10/30/91