RZA AGRA, Inc.
(formerly Rittenhouse Zeman & Associates, Inc.)
Engineering & Environmental Services

11335 NE 122nd Way
Suite 100
Kirkland, WA 98034-6918
(206) 820-4669
FAX (206) 821-3914

22 May 1992

W-7764

Perteet Engineering
2828 Colby Avenue, #410
Everett, Washington 98201

Attention: Mr. Rich Perteet, P.E.

Subject: Subsurface Exploration and Geotechnical Engineering Report
McCollum Park - Park and Ride Lot
Everett, Washington

Gentlemen:

We are pleased to present herein a copy of the above referenced report. This report presents the results of our subsurface exploration, laboratory testing, and engineering analyses. Authorization to proceed with the study was provided in our subconsultant agreement with you dated 11 February 1992. This study has been completed in general accordance with our proposal letter dated 26 August 1992.

We appreciate this opportunity to be of service. If you have any questions regarding this report or other aspects of the project, please call.

Respectfully submitted,

RZA AGRA, Inc.

James S. Dransfield, P.E.
Associate

Subsurface Exploration and Geotechnical Engineering Report

McCollum Park Park & Ride Lot

Everett, Washington

Prepared for

Perteet Engineering, Inc.

Snohomish County Public Works

Everett Community Transit

Prepared by

RZA AGRA, INC.

11335 NE 122nd Way, Suite 100

Kirkland, Washington 98034

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SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING REPORT **W-7764**

MCCOLLUM PARK - PARK AND RIDE LOT

EVERETT, WASHINGTON

1.0 SUMMARY

The proposed project is considered feasible from a geotechnical standpoint. A summary of major elements of the project follows:

- Our subsurface explorations confirm that refuse underlies nearly all areas to be developed. The refuse has decomposed only slightly since closure of the landfill in the 1970's and continued long term settlement is expected.
- Support of the pavement for bus and moderate auto traffic as well as additional fills and lightly loaded footings will require subgrade improvement. We have considered several alternatives for precompressing the refuse in advance of construction to minimize long term differential settlements, and consider preloading of areas to be paved with a "rolling surcharge" to be the best approach when considering environmental safety and construction safety, as well as combined construction and maintenance costs. Grade changes across the site should be gradual so that long term settlement occurs as broad gentle warping rather than sharp discontinuous breaks.
- Regrading to improve drainage, paving the site, and installation of a continuous low permeable soil cover will reduce leachate production onsite by reducing infiltration of surface water. Site development will also reduce the venting of landfill gases, however the gases may be forced to flow laterally as a result. We have therefore provided a recommended gas management system for the site, which will remove collected landfill gas from beneath areas to be developed and completely burn the gas at a remote part of the site prior to discharge.
- In our opinion, the proposed McCollum Park - Park and Ride lot is consistent with the Master Plan for development of McCollum Park. The proposed park and ride lot development will improve the environmental conditions at this former landfill site by reducing the potential for leachate production and improving control of gas migration. The proposed development capping of the site is also consistent with Washington Department of Ecology (WDOE) Model Toxics Control Act (MTCA) goals of "isolating" pollutants from contact with the environment. The need for any further remedial actions at this time such as diversion of groundwater upgradient of the landfill or treatment of groundwater downgradient of the landfill are not indicated.

This summary is presented for introductory purposes and should be used in conjunction with the full text of this report. The project description, site conditions, and our detailed design recommendations are presented in the text of this report. The exploration procedures and logs are presented in Appendix A. Laboratory test procedures and results are presented in Appendix B and on the exploration logs where appropriate. Analytical test results are attached as Appendix C, and a description of the Gas Management System is presented in Appendix D.

2.0 PROJECT DESCRIPTION

The McCollum Park - Park and Ride lot is to be located within the McCollum Park site, roughly 1/4 mile east of I-5 at the 128th Street SW interchange, in Everett, Washington (see Location Map, Figure 1). The project is to consist of an asphalt-paved 450 stall park and ride lot, a perimeter road within the park and bus lanes along 128th Street SE. A reinforced concrete pavement is being considered at the main bus stop area. As part of the project, the 128th Street SE/Dumas Road intersection and portions of Dumas Road south of the intersection are to be realigned. Ancillary features include lighting, covered walkways and waiting shelters, and an employee restroom. Inside the perimeter road, the site may be developed in the future for park use as a grass playfield for soccer and softball. The proposed and existing site layout are shown on Figure 2.

Construction of the paved Park & Ride lot is to be accomplished by filling above existing grade. Grades are to be raised by about 3 to 7 feet, averaging about 4 feet above existing ground levels. Surface flow off the parking and drives will be carried to an open drainage swale on the outer perimeter of the site.

3.0 PURPOSE AND SCOPE OF WORK

The purpose of this study was to establish site and subsurface conditions, from which conclusions and recommendations could be made regarding site preparation, settlement estimates, landfill gas management, site grading and drainage, pavement design and foundation design. This report has been prepared for the use of Perteet Engineering, Snohomish County Department of Public Works, Everett Community Transit, and their agents, for specific application to this project in accordance with generally accepted geotechnical and environmental practice.

Our scope of work has consisted of review of available documents, reports and historical aerial photographs of the site, advancing a total of 13 borings (completed as gas probes), followed by monitoring/sampling these 13 borings and 4 onsite monitoring wells previously installed by others.

4.0 SITE HISTORY / BACKGROUND

We understand the property was acquired by Snohomish County for a gravel pit in 1929. Based on our review of aerial photographs and other available records, the site was developed and operated as a gravel pit from about the 1930's through 1947. From about 1947 through roughly 1968, the site served as a city dump for Everett (known as Emander Landfill). Aerial photos show the municipal waste filling was substantially completed by 1967, with a soil cover installed. In 1969, the property was reportedly turned over to the Snohomish County Parks and Recreation Department. Also in 1969 a swimming pool, locker and restroom building, caretaker residence, picnic shelters, parking facilities, trails, playground areas and playfields were constructed onsite. The park site has received fill at various times up to about two to three years ago to reestablish grades and to construct playfields.

Gas vents/flares were installed around the site in the 1970's for control of methane. Snohomish County Parks has been responsible for monitoring the gas vents/flames. According to the site caretaker/ranger, they light the flares occasionally, but have never seen them remain lit for more than 1 to 2 hours. Our review of the records has not found "as built" drawings of the gas vent/flare system. The flares in the vicinity of the swimming pool were reportedly installed initially in the mid 1970's. In 1985, four methane gas vents were installed along 128th Street SE. The park ranger recalls that each flare may be the site of a screened casing extending down into the refuse, and that the flares are interconnected by a single run of shallow perforated pipe. Snohomish County Health District records show that gas has been a continual problem around the perimeter of the former landfill, with readings of 40% to 65% gas in air (by volume) common around the site perimeter and the swimming pool. These measurements were made by the Health District with a field instrument monitoring the existing vents as well as temporarily installed bar probes. We would assume methane comprises a significant portion of the gas measurement. Methane is an asphyxiant and explosion hazard and would pose a serious risk, especially within enclosed structures.

The north edge of the landfill extends below the eastbound lane of 128th Street SE and settlement of the roadway in the area has been a continual issue since construction of this widened, realigned section of road in 1978. RZA advanced a total of nine borings during studies in 1985 (see Appendix E) and 1986 to determine the thickness and extent of refuse below the roadway and to provide design recommendations for roadway rehabilitation. The road was upgraded in late 1987 by installation of a polymer grid subbase reinforcement below a fairly thick asphalt pavement section. Settlement surveys of the reinforced pavement section atop the landfill measured total settlements of 2 to 8 inches over a 5 year time period, for refuse thicknesses ranging from about 6 to 20 feet. The base reinforcement has evidently prevented cracking of the asphalt pavement, which still appears to be performing adequately. The paved roadways within the park,

apparently last surfaced in about 1986, display irregular settlement, with "alligatoring", "bird baths", and visible differential settlement, on the order of a few inches across roughly 5 to 10 feet. No other actual settlement survey data was found during our literature review.

The park Master Plan, completed in 1990, included a test pit study across the landfill by Earth Consultants Inc. (ECI, 1989). ECI advanced 10 backhoe test pits across the site, and reported refuse thicknesses to be roughly 5 to 10 feet, but as great as 15 feet or more toward the northeast. Four groundwater monitoring wells were also installed by Pacific Testing Laboratories, Inc. (PTL, 1990) in support of the park Master Plan study, three within the landfill and one downgradient to the southwest. Monitoring well BH-2-B, at the southeast end of the site, encountered refuse to 19 feet below grade. Monitoring well BH-1-A, located at the northwest end of the site encountered a 2 foot soil cover underlain by 21 feet of refuse. As will be discussed subsequently, our current borings disclosed combined thicknesses of soil cover and refuse as great as 23.5 feet.

Three of the PTL wells have been drilled through the refuse, and screened within the soil below the landfill. We would recommend these three wells be abandoned in accordance with WDOE guidelines, so that the risk of contamination of the underlying aquifer is minimized. Gas probes drilled for this current study should also be properly abandoned as part of site development.

Groundwater samples were obtained by others from each of the monitoring wells in 1990, and were analyzed for total dissolved solids, pH, BTX compounds, and EP toxicity metals. The parameter results were reported to be below 1990 regulated limits. However, the detection limits used for some of the tests were higher than currently adopted State and Federal levels.

5.0 SITE CONDITIONS

The site conditions were evaluated for this study in February 1992. We have also relied on subsurface information contained in previous reports by others, as well as as-built construction plans and historical aerial photographs.

A site plan showing the approximate location of all known borings and test pits is presented as Figure 2. Figure 2 also presents the inferred extent of refuse across the site. Our interpretation of the extent of refuse along the southern property boundary was augmented by a magnetometer survey performed by our firm under a separate contract with Snohomish County. Subsurface profiles across the site (Figures 3, 4, 5, 6 and 7) indicate the thickness and distribution of soil cover, refuse and groundwater levels. Figures 8 and

9 are contour maps of the inferred thickness of refuse and soil cover, respectively. Logs of the explorations are presented in Appendix A.

5.1 Surface Conditions

Our observations of site conditions were made in February of 1992. The topography across most of the site was gently sloping, interrupted by a few berms at random locations up to about 6 feet high, descending toward low lying wet areas along Dumas Road on the east and North Creek on the west. Vegetative cover consisted of mixed sparse grass cover and low-lying shrubs outside the developed grass playfields and lawns of the park. Tall fir trees were present at the extreme southeast corner of the site and along North Creek to the west, and a thick stand of cottonwood trees was noted south of the site.

At the time of our field work, the eastern about one third of the site contained low areas with shallow standing water. A drainage ditch was present along the south side of 128th Street SE on the north, with North Creek on the west.

5.2 Subsurface Conditions

The subsurface conditions were characterized by advancing thirteen hollow stem auger borings. We also relied on borings, test pits, and monitoring wells installed for previous studies (see Appendix E).

5.2.1 Surficial Soils

The subsurface explorations disclosed a variety of soil types as surficial cover atop the refuse. The cover soils ranged from a fairly clean fine to medium sand to a silty gravelly sand (glacial till). Grain size results and permeability testing on these cover soils are presented in Appendix B. The thickness of these cover soils ranged from 2 to 6 feet in our explorations. Based on our visual observations, the soil cover may be absent in some areas, or landfill debris has become mixed with cover soils due to previous site activities. Previous explorations by PTL and ECI disclosed areas where the cover soils were as thin as 4 to 6 inches.

As discussed previously, the landfill has received fill cover soils on various occasions, for the purpose of refuse cover, establishment of playfield surfaces, and for site regrading. The record of site filling activities is sparse. Figure 2 shows the approximate distribution of four general surface soil types we have identified, as follows:

Glacial till fill: An undated aerial photo provided to us by Parks and Recreation shows a fill pushed out across an about 150 foot (east-west) by 180 foot (north-south) area to the southwest of the 128th St/Dumas

Road intersection. Based on available subsurface data, this fill appears to be a gray-brown, silty gravelly sand derived from typical glacial till deposits in the Everett area. Sample S-3, obtained from the surface near gas probe GP-7 typifies this material. A permeability coefficient of 5.8 x 10^{-4} cm/sec was measured, however, based on our experience, the permeability of this material is generally lower.

Brown, gravelly, silty sand fill: This soil material was most abundant across the site in our explorations of the soil cover and in previous studies. This material was apparently used to establish the initial cover after refuse filling was completed. Its origin is not known, but likely was less suitable soil generated onsite from gravel mining operations. We measured the permeability of this material to be fairly low, ranging from 1.4 to 1.5 x 10^{-6} cm/sec.

Clean sand fill: A fairly clean sand fill was encountered in the southeast corner of the landfill site (see sample S-4 collected near GP-10 on the grain size plots). This sample had a measured permeability of 1.3 x 10^{-3} cm/sec., which would be classified as a moderately well drained soil.

Playfield fill: Sample S-5, collected near gas probe GP-3, was a dark brown, silty sand, with trace amounts of gravel. We suspect this soil was imported as a topsoil/ playfield surfacing, and would generally be found in the existing playfield areas in the north-central portion of the site. This material had a measured permeability of 1.1 x 10^{-5} cm/sec.

5.2.2 Refuse / Fill Soils

Our subsurface explorations disclosed refuse thicknesses to range from about 5 feet to 19 feet, below cover soils ranging from 2 to 6 feet. In a few areas, we encountered fill soils without refuse at depth, as great as about 3.5 feet thick. The maximum combined thickness of cover soil, refuse and underlying fill was 23.5 feet, as encountered in gas probe GP-3 located in the north-central portion of the site. This is slightly greater than previously reported by ECI for this area. The general distribution of refuse thicknesses agreed with the interpretation of ECI (deepest in a band along the northeast edge of the site). Our additional borings indicate this deep band continues southward (see Figure 8), where the depth to the base of the refuse was 19 to 22 feet (see GP-7 through GP-9), also encountered by PTL in their monitoring well BH-2B.

The refuse encountered in our borings was a typical municipal solid waste material from that time period, including plastic, paper, glass, wood, metal, wire, and concrete. The state of decomposition was classified as "some to moderate", with much of the refuse appearing fairly new, newspaper readable to barely legible, and wood fragments intact. At the extreme southeastern and southwestern margins of the landfill, the refuse

was generally composed of 0 to 25% soil, while in the remainder of the site, our borings encountered refuse which consisted of 50 to 75% soil. The refuse was typically classified as wet. In some areas, groundwater was encountered within the refuse at depth during drilling. At GP-9, the refuse was saturated between 8 and 19 feet below grade.

5.2.3 Native Soils

Our subsurface explorations encountered dense to very dense, silty, gravelly sands below the refuse. In two borings, about three feet of reworked fill soils were encountered below the refuse and above the native soils. The site is shown on published geological maps of the area to consist of Vashon age Recessional outwash sand and gravel deposits above glacial till. The native materials retrieved from the bottom of our borings generally possessed the high relative density of glacial till, but were generally much cleaner than typical till soils we have observed in the vicinity. We would anticipate the glacial till is present at greater depths.

5.2.4 Groundwater Conditions

Groundwater was generally encountered at depth in most of the borings during drilling. The groundwater levels measured during drilling or subsequent monitoring/ sampling are presented on the attached boring logs, and on the cross sections, Figures 3 through 7. The groundwater table in the vicinity is apparently perched atop less permeable glacial till deposits at depth. Locally, the groundwater gradient is directed toward southward-flowing North Creek to the west of the site. Groundwater levels were generally 15 to 20 feet below grade during our studies, but varied locally depending on site topography. Groundwater levels may vary seasonally depending on rainfall, irrigation, site use and other factors. We understand that North Creek is dry at the park during some portions of the year, indicating groundwater levels sometimes drop below the bed of the creek. Groundwater may also occur at random depths and locations within the fill soils across the site.

6.0 ENVIRONMENTAL SAMPLING AND ANALYSES

Our subsurface exploration program was performed in Level B protective gear based on previous contamination encountered at the site. Samples of air, groundwater and soil were obtained during and after our gas probes were installed to provide a "screening level" evaluation of the distribution and types of contaminants which may be present on the site. The results are summarized in Appendix C. During drilling, samples were analyzed for organic vapors by the headspace method. The result of the organic vapor meter readings are presented on the boring logs in Appendix A.

Soil Samples: Soil samples were obtained at gas probe GP-9, where the highest combustible gas concentrations were encountered, and where the most obvious discolored, odoriferous soils were encountered. Sample S-4 from GP-9 was a heavily oil soaked black soil, which was submitted for analysis. We also submitted sample S-6 from GP-9, which was the native soil material at depth. Soil sample GP-4/S-1 was a surface soil, in an area where moderately high organic vapor readings were noted in the underlying refuse samples.

Groundwater Samples: Groundwater samples were obtained from the four monitoring wells previously installed on site by PTL. The wells were purged by removing at least 3 well volumes of water prior to sampling, using disposable PVC bailers. The results are presented in Appendix C.

Air Samples: On the basis of field screening, samples were obtained from the 10 wells with the highest organic vapor readings. The analytes detected are listed in Appendix C.

On March 10, 1992 RZA AGRA conducted sampling of the gases from ten of the newly installed monitoring wells at the McCollum Park Landfill. The samples were extracted using a 4 liter per minute pump into 3 liter TEDLAR bags. The sampling bags were completely wrapped to avoid exposure to light as some of the suspected pollutants found in landfill gas are light sensitive, i.e. vinyl chloride. The 10 samples were immediately submitted to an independent lab for analysis. Table C3 summarizes the analytes, wells tested and results of the sampling.

The results of the sampling were then modeled using the EPA air pollution dispersion model SCREEN to predict the expected worst case ambient concentration of the pollutants should the landfill cover layer be completely removed, allowing the discharge of the pollutants found during the investigation. Table C4 summarizes the results of the modeling and compares the expected ambient concentration to the Washington Administrative Code Acceptable Source Impact Levels (ASIL's) of Hazardous Air Pollutants (WAC 173-460). Figure C1 illustrates the expected maximum concentration of the class A carcinogen Benzene from exposed landfill gas emissions. Figure C2 illustrates the location of the expected maximum concentration based on the air pollution dispersion modeling analysis.

In general our testing of the soil, groundwater and air disclosed chemical compounds typical of a municipal solid waste landfill. The exception to this was the black liquid encountered in GP-9. Based on testing, this appears to be derived from a heavy petroleum "bunker" oil. A similar material was apparently encountered by ECI in their test pits TP-5 and TP-6, as well as PTL well BH-2. The four explorations are within a circular

area roughly 150 to 200 feet in diameter, located in the vicinity of the former corral area at the south end of the site. Air photos of the site from 1955 and our subsurface profile show this to be a deep area of the former gravel pit. Anecdotal information suggests that septic tanks, bilge water pumped from ships calling at the Port of Everett and other liquids were disposed of at the site.

The gas probe sampling and organic vapor monitoring indicate that the expected ambient impact from the Hazardous Air Pollutants should the landfill cover be removed are well below the regulatory limits imposed. It is also evident from Figure C2 that the point of maximum ambient impact from the pollutants falls within the "fenceline" of the landfill, not adversely impacting the surrounding inhabited areas. However, the monitoring does indicate potential hazards to workers near where excavations are made through the landfill cover, and appropriate health and safety protection is advised. As will be described in Section 7.3, a gas management system is recommended to protect on site Park/Park and Ride Lot users from exposure to landfill gas.

7.0 DESIGN CONSIDERATIONS

Based on our studies, the proposed project appears feasible from a geotechnical standpoint. Settlement will be the primary concern for design of foundations and pavement on this site. Isolation of the refuse and management of gases beneath areas to be developed will be the primary environmental considerations for design. Our detailed conclusions and recommendations are presented in the following sections of this report.

7.1 Settlement Estimates

In 1987, 128th Street SE was reconstructed and overlain to repair the severe differential settlements which had occurred since original construction of the roadway across the former landfill in 1978. In this location, the refuse was found in previous borings to range from roughly 5 to 20 feet in thickness, overlain by 3 to 8 feet of fill. Net filling as part of the road reconstruction after overexcavation was about 1 to 2 feet. Settlement plates were installed within the reinforced pavement section. Settlements of 2 to 8 inches have occurred in the 5 years since construction, with fairly constant rates occurring in the last 3 years. This valuable settlement data is generally consistent with the rate of secondary settlement associated with organic fill. We have included as Figure 10 a chart depicting estimated settlements for various thicknesses of refuse and new fill heights. In addition to these values, we estimate elastic and short term settlements will occur (within about 1 month of filling) ranging from about 1 to 3 feet, depending on refuse thickness and height of new fill. The settlement estimates of Figure 10 represent "worst case" conditions (based on available

data), assuming no site subgrade preparation occurs in advance of construction. Subgrade preparation techniques to reduce these potential settlements will be discussed in the next section of this report.

Differential settlements will be difficult to estimate precisely. The degree of differential settlement will depend to a large extent on subgrade preparation methods. Differential settlement will be influenced by the presence of non-biodegradable portions of the refuse which are "resistant" to long term settlement. The most severe potential for differential settlement will be where pavements or other structures span between non-filled areas and areas underlain by refuse, as may be expected in the vicinity of Dumas Road improvements. In such areas, differential settlements may approach total settlements.

7.2 Subgrade Preparation

We understand that site grading will consist almost entirely of filling, so that handling of and exposure to the underlying refuse is minimized. We have considered three main alternatives for subgrade preparation. Each of these is discussed below. While effective at reducing settlements, we have not considered overexcavation alternatives (total or partial) to be viable options, due to the cost, safety, and environmental considerations involved in solid waste handling. These alternatives could be considered further if desired.

Table 1 is presented following the text of this report. Table 1 provides a comparison of the three main alternatives for subgrade preparation, considering estimated initial and long term settlement, construction timing, and cost. A more detailed discussion of each of these alternatives follows.

Compensating Fill Section: Large dynamic rollers could be used (such as a CAT 825 or equal) in advance of filling as a means of "proofrolling" the site to precompress the upper layers and to disclose any voids. By itself, this method would not remove all of the predicted initial settlements, and would likely not contribute to any reduction in the predicted settlement of Figure 10, but would serve to reduce the risk of abrupt differential settlement. Once proofrolling with heavy compaction is completed it would be possible to construct fills to design grades, and overbuild the fill based on our predicted near-term settlement (1 to 3 feet). With this approach, all of the long term settlements predicted in Figure 10 would be anticipated to occur after paving. There is some additional risk that the actual primary settlement realized and the time required to complete the primary settlement may vary and as a result all primary settlement may not occur prior to paving. For this reason, this approach should only be considered if 6 months or more is available to adjust grade, to correct fill heights where excessive settlement occurs, and where the total settlements predicted in Figure 10 can be accommodated. We would anticipate the need for regrading of the fills 1 to 2 times prior to utility installation and paving with this approach.

This first alternative would have the lowest initial cost and shortest construction time. However long term pavement performance is predicted to be the worst with this approach, since no attempt would be made to reduce the risk of differential settlement. If the need for periodic pavement repair or removal coupled with regrading is acceptable, it should be recognized that pavement removal and regrading may be hampered by the presence of geogrid reinforcement in the subbase (as proposed subsequently).

Rolling Surcharge: A more positive means of assuring that all primary settlement has occurred prior to site paving is to place a substantially deeper surcharge fill (on the order of 12 feet) over the ground. Unless a cheap source of fill was available in close proximity, it would likely not be cost effective to surcharge the entire site all at once. A rolling surcharge on the other hand would consist of a limited volume of fill placed over a smaller part of the site (such as about 50,000 square feet or more), leaving the fill in place until primary settlement had occurred (roughly one to two months). The fill could then be moved to the adjacent portion of the site, and this process repeated across the site. We anticipate near term settlements of about 2 to 3 feet on the average. This would be monitored during construction using settlement plates (see Section 8.2). Sufficient fill to match design subgrade elevation (i.e., below the reinforced pavement section) could be left at each part of the site as the rolling surcharge proceeds. This method would be certain to eliminate the primary compression of the materials. Furthermore, this method has the potential advantage of eliminating a significant portion of the long term settlement presented in Figure 10. Removing the preload fill to a lighter final load has the effect of advancing the time that it would take the lighter load to reach the same amount of settlement.

We have developed recommended preload heights assuming long term settlements (20 years) would be limited to 2 inches or less. In reality, the actual settlement performance of the refuse due to organic decomposition is difficult to predict, given variations in moisture content, existing refuse density, and the actual composition of the refuse. Given these uncertainties, we recommend based on engineering judgement that grades be adjusted so that surface drainage will still perform properly after differential

settlements of up to 1/2 to 1 foot. Our recommended preload heights and predicted near term settlements are as follows:

Net Fill Required (Above Existing Grades)	Recommended Surcharge Height (Feet)	Estimated Settlement During Preloading
2 Feet	8	1-2 feet
4 Feet	12	2-3 feet
6 Feet	14	3-4 feet

The fill used to preload the site could also be used to construct final site grades. Since subgrade preparation may occur in the winter and high quality fill is needed for construction of the pavement section, it would be most expedient to utilize a clean pit run type fill for this application. We would recommend use of a Gravel Borrow (WSDOT 9-03-14), modified so that not more than 5 percent by weight passes the U.S. No 200 sieve. A siltier fill material would be acceptable for use as a rolling surcharge (but may become unsuitable for use as site fill if exposed to excessive moisture, as discussed). If the siltier fill could be protected from moisture, it could be placed and compacted below topsoil and drainage layers on playfields, beneath the reinforced pavement section, or beneath other areas not to receive pavement.

Deep Dynamic Compaction Another way of precompressing the refuse to remove the near-term settlement, and a portion of the predicted long term settlement would be by deep dynamic compaction. This method consists of dropping a large weight (roughly 10 to 20 tons) from height (roughly 10 to 20 feet) on a regular grid pattern across the site. The size of the weight, height of drop, and spacing of the grid pattern depends on the thickness and composition of the surface fill and refuse. Based on an average soil type characterized as a semi-pervious fill and the depth to the water table, we would anticipate this method could achieve densification to about 10 feet below grade on this site using a conventional crawler-mounted crane. We would anticipate the need to drop a 15 ton weight from a height of 20 feet, on a 10 foot grid spacing at this site. Based on correlation with dynamic compaction records from landfills of similar age, we would estimate vertical compression of about 15 percent, which would average about 2 feet on this site.

Of the alternatives considered, this method would likely be the most effective at minimizing differential settlement. The dynamic impact would have the effect of collapsing any voids within the upper portions of the refuse. However, this method does not impose the net loadings required by site grading in advance of construction, and long term settlements under the new loading is expected.

The actual long term settlements of sites treated by deep dynamic compaction is not well documented. The deep dynamic compaction method is best suited to fully decomposed landfill deposits, typically 40 years old or more (Lukas, 1986).

After raising grades back to their current level by backfilling, we would expect settlement as predicted by Figure 10 to be somewhat reduced for additional fill above this level. We would anticipate long term settlements would be greater than expected by application of a rolling surcharge, preload, on the order of 1 foot or more. The estimated cost of deep dynamic compaction treatment is on the order of $1 per square foot.

A potential disadvantage of deep dynamic compaction is that some exposure to refuse or gas from refuse may occur during the process. A minimum 3 foot soil cover is recommended to minimize exposure (and to reduce the risk that the dropped weight does not become stuck in the fill). Another concern is that dynamic impact might spark a subterranean fire. The risk of igniting a fire will reportedly decrease as the landfill ages, as the oxygen is displaced by methane: We would consider the risk of fires low especially if compaction is performed in the wintertime, but still not impossible.

Recommended Alternative Table 1, presented after the text of this report, compares these three main alternatives in terms of estimated settlement, time to complete, and estimated construction cost. On the basis of predicted settlement, we have also presented our estimate of the long term maintenance tasks related to each alternative. Although most expensive in terms of initial costs, we would recommend the rolling surcharge alternative when considering environmental safety during construction and the desire to keep maintenance tasks (and costs) to a minimum.

7.3 Gas Management System

As can be seen in the results of air testing presented in Appendix C, several compounds are present in a gaseous state that could potentially be emitted from the landfill. The data presented in Appendix C represent concentrations of the worst case conditions measured onsite, when the soil cover is completely removed. These include class A carcinogens, skin irritants, odoriferous and flammable gasses. Site development will alter the surface of the former landfill and impede uniform venting across the site as modelled in Figure C2. The actual pattern of gas migration after paving and otherwise capping the site will depend on many factors, including the as-built configuration of existing venting systems, buried active or inactive utilities, fluctuating groundwater levels, the distribution of potentially degradable waste, and the distribution of permeable layers of soil and refuse.

The data presented in Appendix C indicate that as a result of air dispersion, occupants of surrounding properties would not be exposed to harmful levels of these compounds, even if the entire existing cover were to be removed. However, because of the unknown variables discussed above, there is a risk that Park/Park & Ride Lot site users could be exposed to localized or intermittent releases of elevated levels of landfill gas. For this reason, we recommend that a gas management system be included in site development. Three methods for gas management are discussed.

Passive Trench Venting

Gas being emitted from the landfill could be allowed to escape via gravel-filled trenches. These would extend from the ground surface down into the existing soil cover layer, to provide a "path of least resistance" for available gas. These would represent the least expensive of the methods described. The potential disadvantage is that although emissions would be somewhat dispersed, discharge would still occur at ground level on the site. This passive method would not be appropriate for enclosed spaces such as restrooms or bus shelters, in any case.

Passive Riser Pipes

The gas being emitted from the landfill could be managed by a system of subsurface conduits (gravel filled trenches with or without piping and capped with less permeable soil) which vent through riser pipes. The height of the pipe discharge and the location of the pipes could be designed to reduce the risk of exposure to the public. The emissions from the riser pipes could be improved by fitting each pipe with a carbon canister filter. This method is intermediate in cost of the three considered. Potential disadvantages with this system are that the direction and magnitude of gas discharge cannot be controlled. While more permeable pathways are provided by subsurface conduits and discharge from the riser pipes is purified by carbon filtration, there is no way to ensure that available gas will vent through the piping system. As with the other passive method, this method would not be appropriate for enclosed spaces such as restrooms or bus shelters.

Vapor Extraction System

Vapor extraction is the process of inducing air phase transport with wells and/or trenches in the unsaturated zone where contaminants in the vapor state exist. Using pressure reduction, it is possible to recover the vapors produced from refuse in the subsurface. The benefits of this method would be to collect and remove volatile compounds, and reduce the risk of exposure to potentially explosive or toxic vapors emitted to the surface region. The overall system described herein is not intended to remediate the gas problem, rather to serve as abatement for potentially toxic vapors which would rise from the subsurface areas.

Shallow vapor trenches constructed and placed in the upper layer of cap material (below the low permeable layer) will provide corridors with sufficient vacuum reaction area. The intent of this system is to collect these vapors in the piping system, under vacuum, to carry them to a vapor extraction and vapor ignition system which will completely destroy vapors prior to venting to the atmosphere. By providing valve and sampling ports, the system may be adjusted and balanced, so that greatest suction is provided in areas of greatest emissions. A discussion of the procedure and equipment and approximate costs is attached as Appendix D.

Based on available data, lateral migration of subsurface gas beyond the park limits has not occurred. This vapor extraction system could be upgraded to handle such a condition, if the need is indicated by future site monitoring by the Health District.

Recommended Gas Management System

Along the proposed park perimeter road, the portion of the site to be paved is relatively minor, and no enclosed structures are planned. Based on our modelling, passive venting via trenches would be adequate for this portion of the project, in our opinion.

For the 450 stall park and ride lot, a vapor extraction system with underground piping is recommended. This is described more fully in Appendix D. Because of the limited understanding of the variables affecting gas migration on this site, we would recommend against passive venting via riser pipers, unless the risk of some uncontrolled emissions can be tolerated.

7.4 Site Grading And Drainage

We understand the areas of the site to be developed are to be "crowned" to permit long term drainage by sheet flow to open biofiltration swales. Some "bird baths" should be anticipated with time, due to differential settlement. For this reason, we recommend grading to allow for a predicted minimum 2 percent grade after 20 years. The degree of long term settlement would be reduced by preloading, as was discussed previously. Post construction settlements of about ½ to 1 foot should be assumed if preloading is accomplished. For other alternatives, the settlement estimates of Figure 10 should be used in establishing site grades, so that sufficient slopes will remain after a 20 year design life.

The landfill is to be regraded by filling for the park and ride lot. For playfields and other unpaved portions of the site, we understand plans call for a low permeable cover overlain by a sandy drainage layer overlain by grass or a playfield surfacing. We would recommend a minimum 1 foot layer of soil cover with a

permeability of not greater than 1×10^{-6} centimeters per second. Assuming a long term slope of 2 percent, we would recommend a drainage layer possessing a permeability of 1×10^{-2} centimeters per second or greater, which would be at least 1 foot thick.

The 1 foot thick low permeable soil layer could be constructed using a sufficiently fine grained natural soil, or a soil with bentonite admixture. Bentonite admixture can be accomplished by batching in a pug mill, or in situ with controlled spreading and mixing. The actual percentage of bentonite will depend on the base soil type, and would need to be verified by the contractor in advance of construction. A suitable alternative to the 1 foot low permeable layer would be install a prefabricated bentonite mat geocomposite. This material typically consists of about 1/4 inch of bentonite between 2 layers of geotextile, which is delivered and installed as a sheet product. Overlap of adjacent sheets is recommended by the manufacturer. A minimum 8 inch soil cover is recommended above the bentonite mat to contain swell.

We recommend using a clean medium to coarse washed sand free from organic matter for the overlying drainage layer, with the following gradation:

Sieve Size	Percent Passing
3/8"	100
#4	95-100
#10	50-70
#20	15-35
#40	15 max.
#60	10 max.
#100	5 max.
#200	3 max.

A finer topsoil or playfield surfacing material may be required atop the drainage layer. We could review an appropriate layer gradation for filtration compatibility, if desired.

This cover system would greatly reduce the infiltration characteristics through the landfill, but may allow some saturation of the playfield areas during extreme wet weather conditions. A thicker or coarser drainage layer, or synthetic drainage net/geotextile sheeting product might be required if more positive drainage is needed.

We understand that complete grading of the playfields inside the perimeter road may actually occur at a later date. In this case, construction of a low permeability cover and drainage system would also occur in stages.

An alternative to construction of a continuous low permeable soil layer would be to rely on the asphalt pavement to serve as a barrier to surface water infiltration. Given that the thickness of the asphalt layer would be relatively great, this approach should be effective at this site. A modified class B asphalt used in Snohomish County utilizes a smaller aggregate size, which may reduce permeability further. Increasing the percentage of bituminous liquid in conjunction with a finer aggregate would also reduce permeability, but would make the pavement less stable, and only a slight increase should therefore be considered.

7.5 Foundations

Foundations will be required for bus shelter, covered walkway posts, the restroom building and light pole standards. Ideally, foundations would be extended through the refuse to bear directly upon the dense to very dense native soils at depth. This could be accomplished by driven piles or augercast piles. We would consider driven steel H-piles with cathodic protection to be the most successful method of installation through the refuse. Such driven piles, with 8-inch to 12-inch web dimensions could readily achieve vertical capacities of 25 tons or more, net of downdrag forces imposed by long term settlement. Lateral capacity could be provided by the upper fill soils. Pile supported structures would experience little settlement, however, resulting in potential problems with grade between them and otherwise settling features on the site. If light poles are higher than about 10 feet and must be located within the refuse, structural considerations may necessitate the use of deep foundations.

Shallow foundations could gain bearing capacity from the upper fills. We would recommend recompacting the soil beneath the footings to 95 percent density using ASTM:D-1557 as the standard. The footings should then rest on at least a 2 foot pad of compacted (as percent density) modified Gravel Borrow, to provide a uniform bearing surface. The shallow foundations should be designed for an allowable bearing capacity of 1,000 pounds per square foot. A one third increase for transient live loads may be assumed. Footings should be embedded at least 18 inches for frost protection. We assumed footings would be at least 18 inches wide for this design.

We would recommend that all footings and structures be underlain by the polymer geogrid subgrade reinforcement section presented on Figure 11 (discussed below). Assuming subgrade preparation is accomplished by preloading, we would estimate that differential settlements would be 2 inches or less. As

discussed previously, total settlements of 1/2 foot to 1 foot could still occur. Therefore, utility penetrations should be provided with flexible connections and sleeves.

Vertical posts supporting the covered walkway should be supported on reinforced structural slabs. The slab subgrade should be prepared as described above, including the geogrid subgrade reinforcement. Individual slabs should be at least 36 inches square. Provisions should be made for shimming or reveling the connection to the slab through time if required, to accommodate settlements described above.

7.6 Pavement Design

We understand pavement design is to consist of asphaltic concrete, except for a reinforced concrete pavement at the bus stop area. Because of the risk of significant differential settlement on this project, and the desire to minimize long term maintenance, we recommend that the pavement subgrade be reinforced. The polymer reinforced subgrade installed on 128th Street SE adjacent to this project has performed well. When used in conjunction with the subgrade preparation method outlined previously, long term total and differential settlements (and the need for long term maintenance) should be minimized.

We have attached as Figure 11 the pavement section used on 128th Street SE rehabilitation with minor modification. A modified class B asphalt is recommended to reduce permeability. A modified Gravel Borrow (WSDOT 9-03.14) with 5 percent fines or less is recommended. For the polymer geogrid, we recommend using Tensar SS-2 or approved equal. Where pavement spans between non-landfill and landfill areas, 3 layers of geogrid are recommended. Otherwise, only two layers of geogrid would be needed, in our opinion.

Minimum asphalt pavement sections to support the structural loading of bus and auto traffic are far exceeded in design of a pavement resistant to long term distortion. Where a reinforced concrete slab is used, we recommend the subgrade be assumed to have a modiolus of subgrade reaction of 50 pci. Using " Principles of Pavement Design" by Yoder & Witczak, we compute a reinforced concrete slab thickness of 8 inches would be recommended to support 22 buses per day (20 year design life). We recommend the pavement section be underlain by at least 4 inches of crushed rock, all atop the modified Gravel Borrow and geogrid reinforced subgrade, described previously.

Use of a reinforced concrete pavement is common construction practice for park and ride bus waiting areas, to reduce the risk of pavement rutting which occurs in asphalt under such concentrated loading. It should be recognized that deformation and settlement of rigid concrete pavement would be more difficult to repair.

Repair options for either the bus stop or concrete walkway would include planing or grouting across areas of differential movement. Repair of asphalt could be more readily accomplished.

The geogrid material may be rolled out onto the prepared surface either parallel to or transverse to the roadway axis. There is no apparent performance gain associated with either orientation. For construction expedience, we recommend that the geogrid be rolled out parallel to the roadway axis. By doing this, the overall number of cuts and possibly the amount of wastage may be reduced.

The geogrid material should be placed such that each sheet overlaps a minimum of 1-1/2 feet along the edges and a minimum of 10 feet at the ends. Where the geogrid will span from landfill to non-landfill areas, the geogrid material should extend a minimum of 10 feet onto that area not underlain by refuse. No anchoring, knitting or otherwise connecting of geogrid sheets is required, provided that the recommended modified Gravel Borrow structural fill material is used. In the existing Dumas Road interchange, we would recommend constructing the 2-layer geogrid system beginning at the south end of the existing curb return.

8.0 CONSTRUCTION CONSIDERATIONS

8.1 Site Preparation

Prior to commencing site work, the contractor should develop an appropriate Health and Safety plan to protect his workers. The proposed construction is intended to keep worker exposure to the underlying refuse to a minimum. Please refer to Section 6.0 and Appendix C.

The following discussion assumes that all areas to be paved will receive at least 3 feet of additional fill. We also assume application of a rolling surcharge as the subgrade preparation method: Prior to application of a rolling surcharge we recommend the areas to be developed be cleared of all vegetation. All grass and brush should be removed to a closely mowed surface. Grubbing to remove tree roots would only be recommended for trees greater than 1 inch in diameter. Stripping of site soils prior to further subgrade preparation is not recommended.

Any above grade structures should be removed from areas to be developed. Below grade structures or foundations, and buried utilities could be removed, but due to safety considerations, may be abandoned in place. The main utilities within the areas to be developed are in the vicinity of the Dumas Road intersection. A waterline crosses the northwest part of the site. The above grade portions of the methane vents/flares along the north side of the site should be removed. The below grade configuration of these vents is not

known. These vents may either be buried or may be tied into the gas management system described previously, by connecting on to existing piping, if feasible.

8.2 Subgrade Preparation (Rolling Surcharge)

Recommendations for fill materials and fill dimensions for the following surcharge was described in Section 7.2. Prior to surcharge placement, settlement plates should be installed on the ground surface. Sufficient riser pipe and couplings should be provided so that the pipe extends at least 2 feet above the fill surface at all times. The settlement plates should be provided at least one per every 10,000 square feet of area to be filled. A settlement plate detail is provided as Figure 12.

Actual settlements may vary from those indicated in Section 7.2. Settlement plates will indicate the relative rate of compression, giving an indication of when primary settlement has been completed. We would recommend monitoring settlement plates weekly. We could review the data and provide recommendations as to when primary settlement is substantially complete and the surcharge can be removed.

We recommend placement and compaction of the rolling surcharge fill in accordance with WSDOT 2-03.3(14)C Method A, except that fill should be placed in horizontal layers no more than 1 foot in thickness. After removal of the surcharge, the resulting surface should be compacted to a minimum 90 percent density, using ASTM:D 1557 as the standard.

8.3 Gas Management System

The gas management system described in Appendix D should then be installed through the prepared surface. This will require excavation of 1 foot deep by 1 foot wide trenches, placement of perforated pipe enveloped and backfilled to grade with pea gravel (use Bedding Material for Rigid Pipe, WSDOT 9-03.15).

8.4 Low Permeable Barrier Layer

The pavement, sidewalk and foundation areas should receive the modified Gravel Borrow (described in Section 7.2), with alternating layers of geogrid. The asphalt or concrete surface will serve as a barrier to surface water infiltration in these areas.

A 6 inch layer of compacted Gravel Borrow structural fill should be placed directly on the prepared subgrade. Over this first lift, a layer of geogrid should be placed, followed by 12 inches of structural fill. During the placement of the first 18 inches of structural fill, it may be appropriate to use lightweight construction equipment. This should be assessed at the time of construction. Following the first 18 inches

of structural fill, it may be possible to use conventional construction equipment through to completion of the pavement section.

In non-paved areas, a low permeability barrier layer should be installed above the prepared subgrade. The low permeable barrier layer may be constructed using either a bentonite geocomposite, or by a 1 foot soil layer possessing a permeability of $1X10^{-6}$ cm/sec or less. Low permeability soil may be provided from a natural soil deposit, or bentonite admixture (in situ or with a pug mill).

The low permeable barrier layer should be constructed to extend at least 18 inches inside the paved areas, so that continuity of the surface cover is provided.

8.5 Pavement Section/Drainage Layer

The pavement section can then be completed as described in Section 7.6. Compaction of the modified Gravel Borrow should be a minimum of 95 percent density, using WSDOT Method 606 as the standard. Installation, protection and overlap of the polymer grid subgrade reinforcement should be performed in accordance with the manufacturer's recommendations.

Placement of additional fill to design grades in non-structural areas should be accomplished in lifts not exceeding 8 inches in thickness, with each lift compacted to at least 90 percent density (WSDOT Method 606).

The drainage layer placed atop the barrier layer (and other fill as required) in non-paved areas should conform with the gradation described in Section 7.4. Compaction in accordance with WSDOT 2-03.3(14)C method A (1 foot lifts), would be adequate for drainage layer compaction in non-structural areas.

Topsoil layers or playfield fill should conform to gradation requirements of the landscape architect. All areas to be revegetated should be maintained and protected from erosion until vegetation becomes fully reestablished.

9.0 CLOSURE

The conclusions and recommendations presented are based on the explorations made for this and previous studies, laboratory testing, and engineering analysis. The number, location, and depth of the explorations were completed within the site and proposal constraints so as to yield the information necessary to formulate our recommendations. The integrity of the foundation and pavement systems depend on proper

subgrade preparation and construction procedures. Since considerable variability in subsurface conditions was encountered, it is recommended that we be retained to provide geotechnical engineering services during the subgrade preparation and other earthwork construction phases of this project.

Respectfully submitted,

RZA AGRA, Inc.

Henry W. Brenniman
Engineering Geologist

James S. Dransfield, P.E.
Associate

JAMES S. DRANSFIELD
STATE OF WASHINGTON
23153
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES 12/19/93

HWB/JSD/LAD

TABLE 1 - MC COLLUM PARK AND RIDE LOT

Comparison of Subgrade Preparation Alternatives *

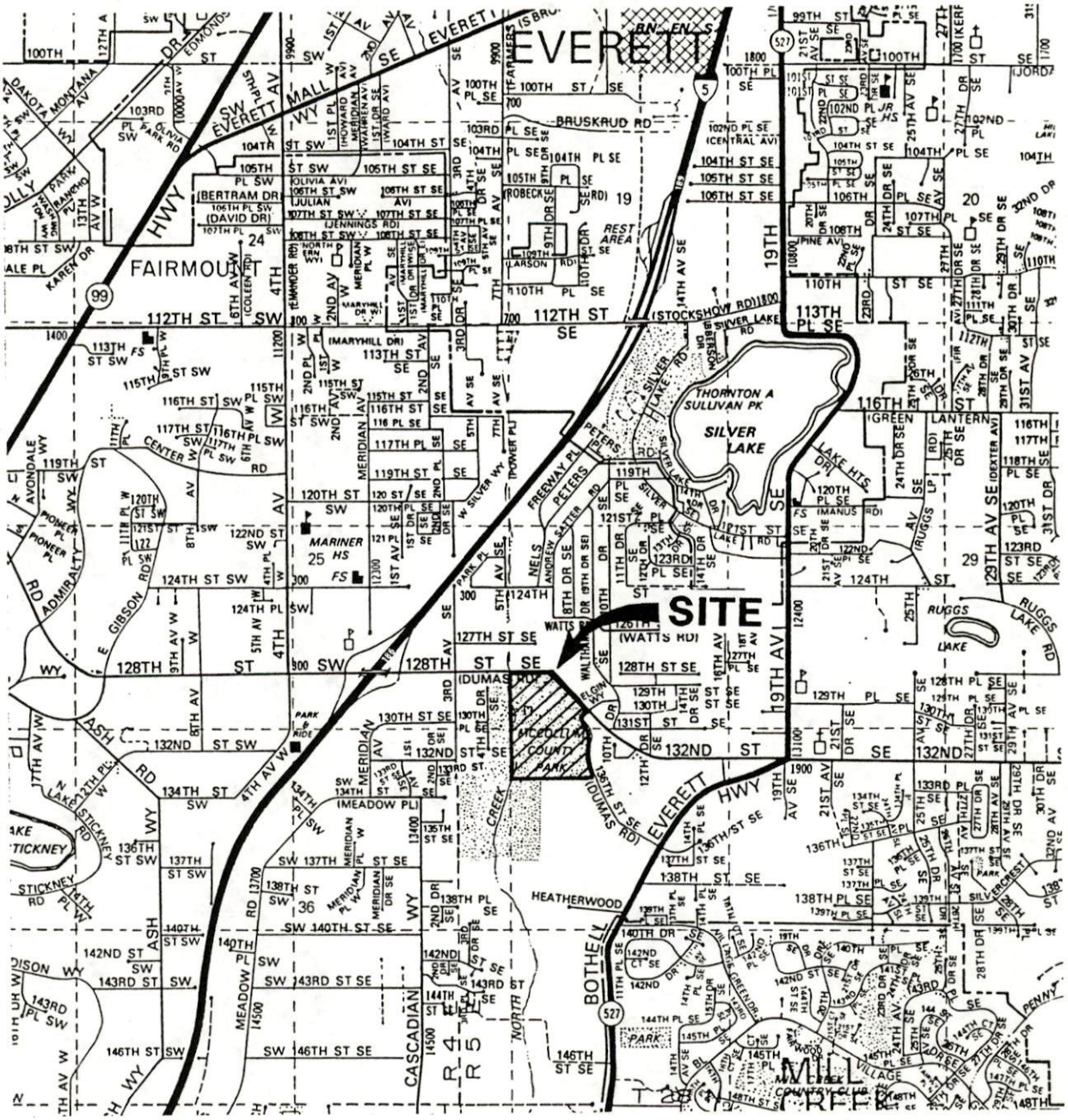
Alternative	Compensating Fill	Rolling Surcharge	Deep Dynamic Compaction
Estimated Settlement During Construction	1 Foot	2-3 Feet	2 Feet
Estimated Settlement Next 20 Years	2-2 1/2 Feet	1/2-1 Foot	1-1 1/2 Feet
Approximate Subgrade prep-time	1 Week	4-6 Months	2 Weeks
Estimated construction cost *	$1 per square foot	$4 per square foot	$2 per square foot
Estimated Maintenance tasks	Overlay every 5 years	Patch every 10 years	Overlay every 10 years Patch every 5-10 years
Other Advantages and Disadvantages	Pavement repair may be hampered by presence of severely distorted surface with geogrids	Localized settlements may be greater due to variable materials	Some risk of exposure to refuse or gasses. Possible risk of producing subterranean fire

* Comparison of alternatives made for average site conditions, as follows:

Existing refuse thickness: 16 feet

Required net fill: 4 feet

** Costs do not include fill above existing grade.



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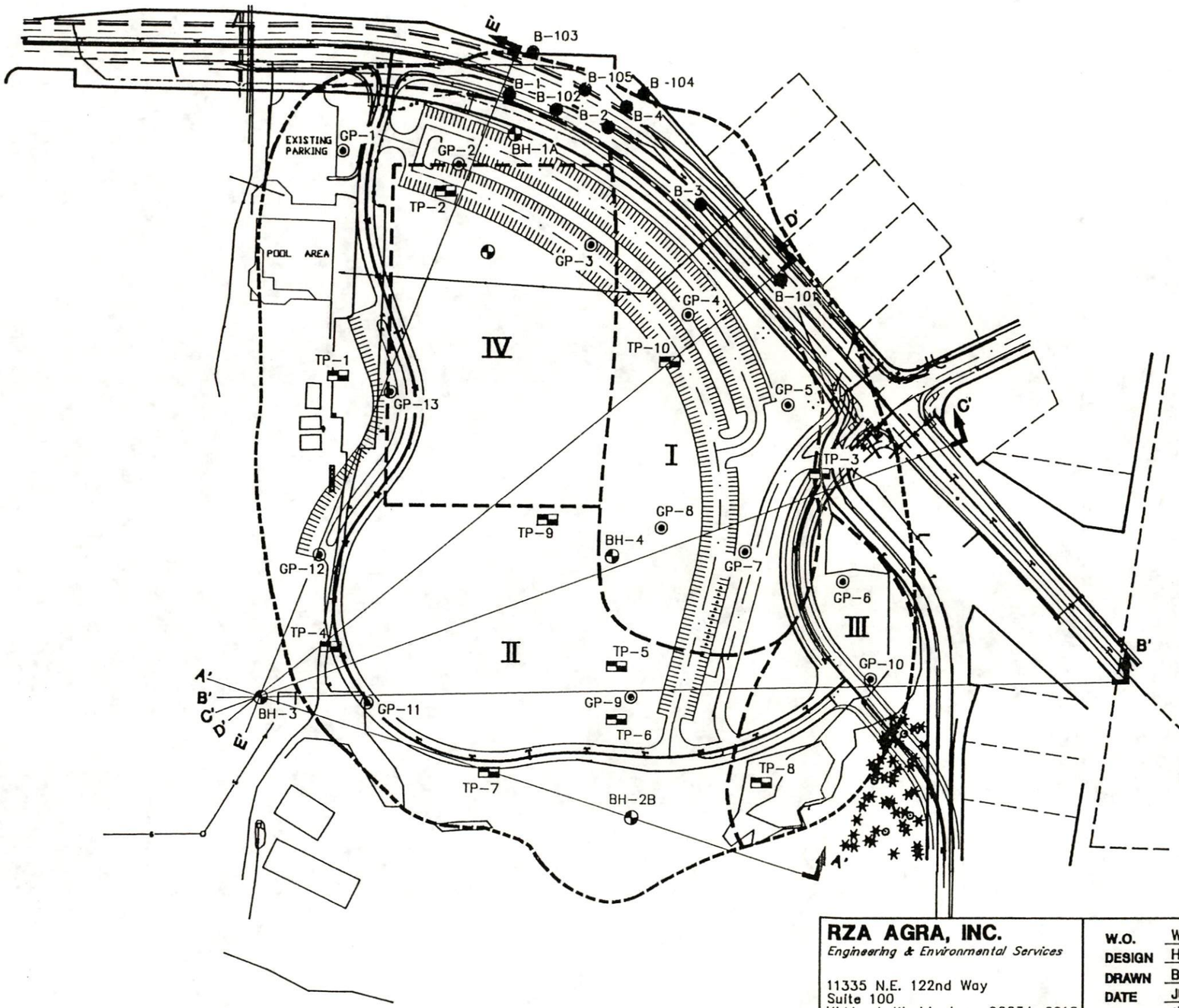
ENGINEERING & ENVIRONMENTAL SERVICES	DESIGN HWB
11335 N.E. 122nd Way	DRAWN MJF
Suite 100	DATE MAY 1992
Kirkland, Washington	SCALE N.T.S.
98034-6918	

McCOLLUM PARK -- PARK & RIDE
EVERETT, WASHINGTON

LOCATION MAP

FIGURE 1



LEGEND

B-105 ● BORING NUMBER AND LOCATION

TP-10 ▬ TEST PIT NUMBER AND LOCATION

GP-13 ◉ GAS PROBE NUMBER AND LOCATION

BH-2B ◕ MONITORING WELL NUMBER AND APPROXIMATE LOCATION

------- APPROXIMATE LIMITS OF LANDFILL

E E' CROSS-SECTION LOCATION

- - - - COVER SOIL DISTRIBUTION
(SEE SECTION 5.2.1 OF REPORT)

I GLACIAL TILL FILL
II BROWN, GRAVELLY, SILTY SAND FILL
III CLEAN SAND FILL
IV PLAYFIELD FILL

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Engineering & Environmental Services
11335 N.E. 122nd Way
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Kirkland, Washington 98034-6918

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McCOLLUM PARK - PARK & RIDE LOT
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SITE AND EXPLORATION PLAN

FIGURE 2

DRAWING NO. \78\W-7764\SITE3.DWG

A

A'

LEGEND

GP-11 INDICATES GAS PROBE NUMBER AND APPROXIMATE LOCATION

19 — STANDARD PENETRATION RESISTANCE (BLOWS PER FOOT)

LOCATION OF SCREENED INTERVAL: 1/2" DIA. PVC PIPE

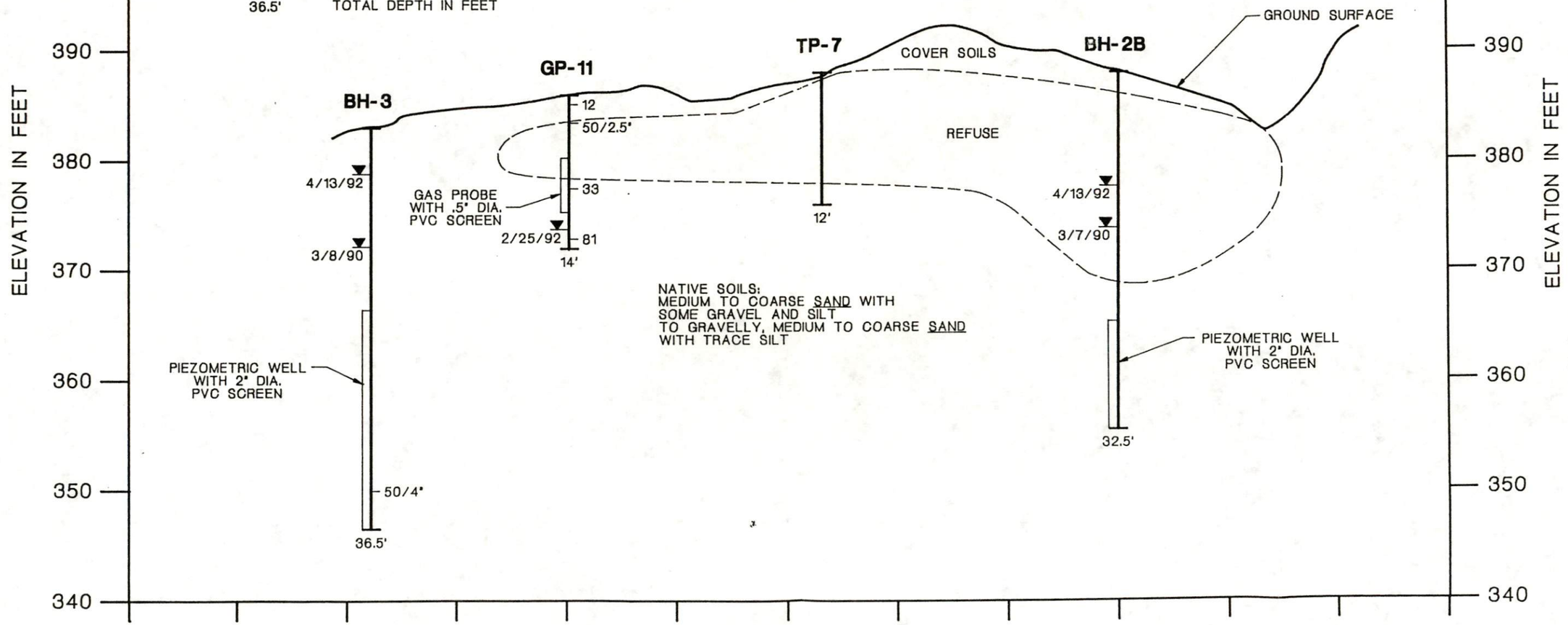
4/13/92 — GROUNDWATER LEVEL AND DATE OBSERVED

36.5' — TOTAL DEPTH IN FEET

BH-4 INDICATES MONITORING WELL NUMBER AND APPROXIMATE LOCATION

B-105 INDICATES BORING NUMBER AND APPROXIMATE LOCATION

TP-10 INDICATES TEST PIT NUMBER AND APPROXIMATE LOCATION



NOTE: THE STRATA ARE BASED UPON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS. SIMPLIFIED NAMES ARE SHOWN FOR SOIL DEPOSITS, BASED ON GENERALIZATIONS OF SOIL DESCRIPTIONS. SEE BORING LOGS AND REPORT TEXT FOR SOIL DESCRIPTIONS.

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Engineering & Environmental Services
11335 N.E. 122nd Way
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Kirkland, Washington 98034-6918

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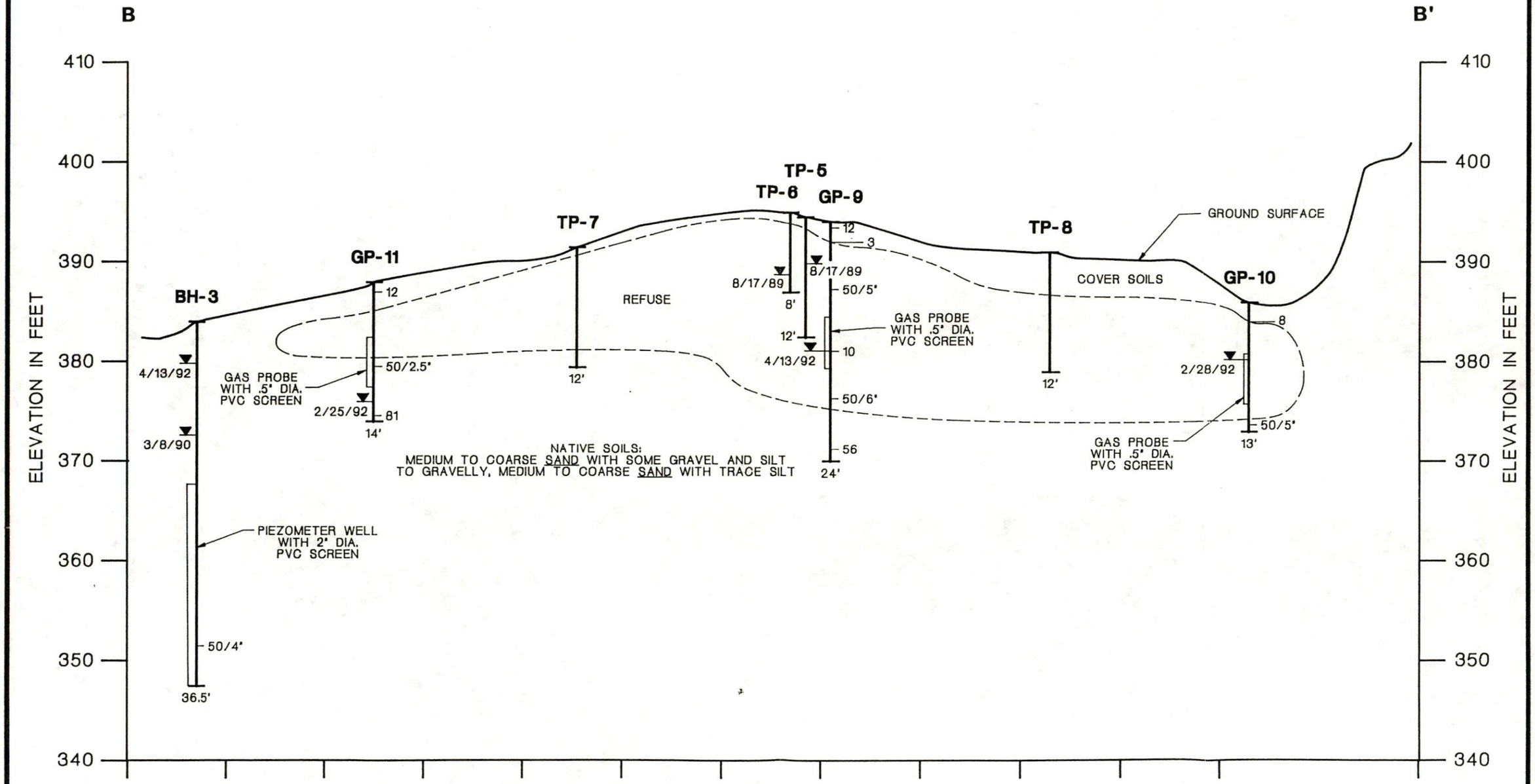
GENERALIZED SUBSURFACE CROSS-SECTION A-A'

FIGURE 3

DRAWING NO. \7B\W-7764-1\X-S-A.DWG



SEE FIGURE 3 FOR CROSS-SECTION LEGEND

DISTANCE IN FEET (1"=100')

NOTE: THE STRATA ARE BASED UPON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS. SIMPLIFIED NAMES ARE SHOWN FOR SOIL DEPOSITS, BASED ON GENERALIZATIONS OF SOIL DESCRIPTIONS. SEE BORING LOGS AND REPORT TEXT FOR SOIL DESCRIPTIONS.

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Engineering & Environmental Services
11335 N.E. 122nd Way
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McCOLLUM PARK - PARK & RIDE LOT
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GENERALIZED SUBSURFACE CROSS-SECTION B-B'

FIGURE 4

DRAWING NO. \7B\W-7764-1\X-S-B.DWG

C

C'

ELEVATION IN FEET

410
400
390
380
370
360
350
340

GROUND SURFACE

BH-3
4/13/92
3/7/90
PIEZOMETRIC WELL WITH 2" DIA. PVC SCREEN
50/4"
36.5'

GP-11
12
50/2.5"
33
GAS PROBE WITH .5" DIA. PVC SCREEN
2/25/92
1
14'

REFUSE

NATIVE SOILS:
MEDIUM TO COARSE SAND WITH SOME GRAVEL AND SILT
TO GRAVELLY, MEDIUM TO COARSE SAND WITH TRACE SILT

BH-4
4/13/92
3/2/90
50/3"
PIEZOMETRIC WELL WITH 2" DIA. PVC SCREEN
34'

GP-8
13
COVER SOILS
GAS PROBES WITH .5" DIA. PVC SCREEN
56
2/27/92
72
24'

GP-7
53
2/27/92
50/5"
23.5'

GP-5
TP-3
50/3"
GAS PROBE WITH .5" DIA. PVC SCREEN
2/27/92
50/3"
50/5"
21'
REFUSE
8/23/89
15'

DISTANCE IN FEET (1"=100')

SEE FIGURE 3 FOR CROSS-SECTION LEGEND

NOTE: THE STRATA ARE BASED UPON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS. SIMPLIFIED NAMES ARE SHOWN FOR SOIL DEPOSITS, BASED ON GENERALIZATIONS OF SOIL DESCRIPTIONS. SEE BORING LOGS AND REPORT TEXT FOR SOIL DESCRIPTIONS.

RZA AGRA, INC.
Engineering & Environmental Services
11335 N.E. 122nd Way
Suite 100
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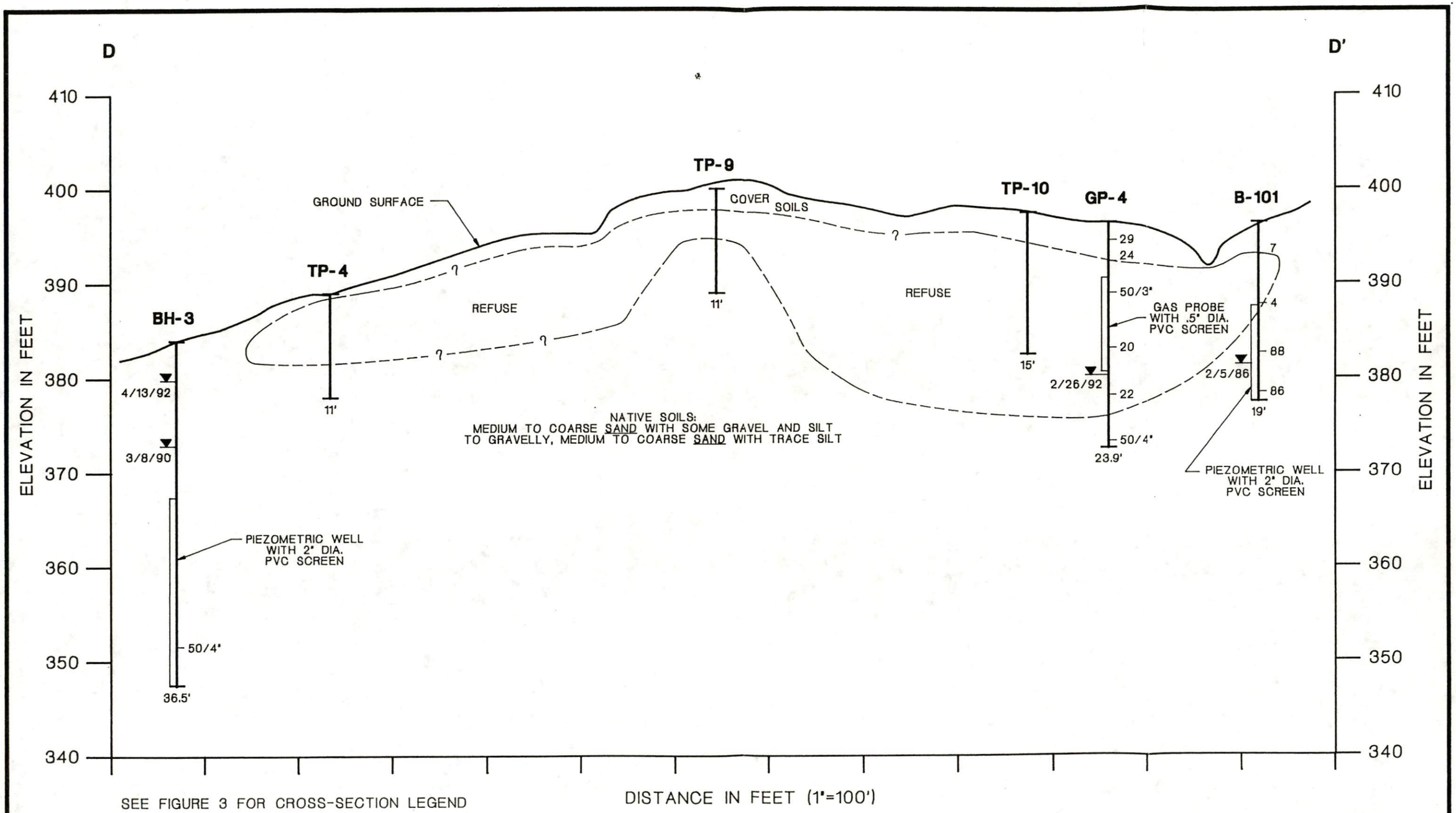
GENERALIZED SUBSURFACE CROSS-SECTION C-C'

FIGURE 5

DRAWING NO. \7B\W-7764-1\X-S-C.DWG



SEE FIGURE 3 FOR CROSS-SECTION LEGEND

NOTE: THE STRATA ARE BASED UPON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS. SIMPLIFIED NAMES ARE SHOWN FOR SOIL DEPOSITS, BASED ON GENERALIZATIONS OF SOIL DESCRIPTIONS. SEE BORING LOGS AND REPORT TEXT FOR SOIL DESCRIPTIONS.

RZA AGRA, INC.
Engineering & Environmental Services
11335 N.E. 122nd Way
Suite 100
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McCOLLUM PARK - PARK & RIDE LOT
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GENERALIZED SUBSURFACE CROSS-SECTION D-D'

FIGURE 6

DRAWING NO. \7B\W-7764-1\X-S-D.DWG

E

E'

ELEVATION IN FEET

410
400
390
380
370
360
350
340

GROUND SURFACE

COVER SOILS

REFUSE

NATIVE SOILS:
MEDIUM TO COARSE SAND WITH SOME GRAVEL AND SILT
TO GRAVELLY, MEDIUM TO COARSE SAND WITH TRACE SILT

BH-3
4/13/92
3/8/90
PIEZOMETRIC WELL WITH 2" DIA. PVC SCREEN
50/4"
36.5'

GP-12
13
5
GAS PROBE WITH .5" DIA. PVC SCREEN
14
2/25/92
13
36
16.5'

GP-13
21
7
50/4"
9
2/25/92
70
19'

TP-2
15'

GP-2
33
85
2/28/92
19'

BH-1A
3/1/90
4/13/92
PIEZOMETRIC WELL WITH 2" DIA. PVC SCREEN
50/5"
34'

GAS PROBE WITH .5" DIA. PVC SCREEN

B-1
?
12
4
2
6
2
50
63
24'

B-103
?
56
20
50/6"
13'

SEE FIGURE 3 FOR CROSS-SECTION LEGEND

DISTANCE IN FEET (1"=100')

NOTE: THE STRATA ARE BASED UPON INTERPOLATION BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS. SIMPLIFIED NAMES ARE SHOWN FOR SOIL DEPOSITS, BASED ON GENERALIZATIONS OF SOIL DESCRIPTIONS. SEE BORING LOGS AND REPORT TEXT FOR SOIL DESCRIPTIONS.

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Engineering & Environmental Services
11335 N.E. 122nd Way
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McCOLLUM PARK - PARK & RIDE LOT
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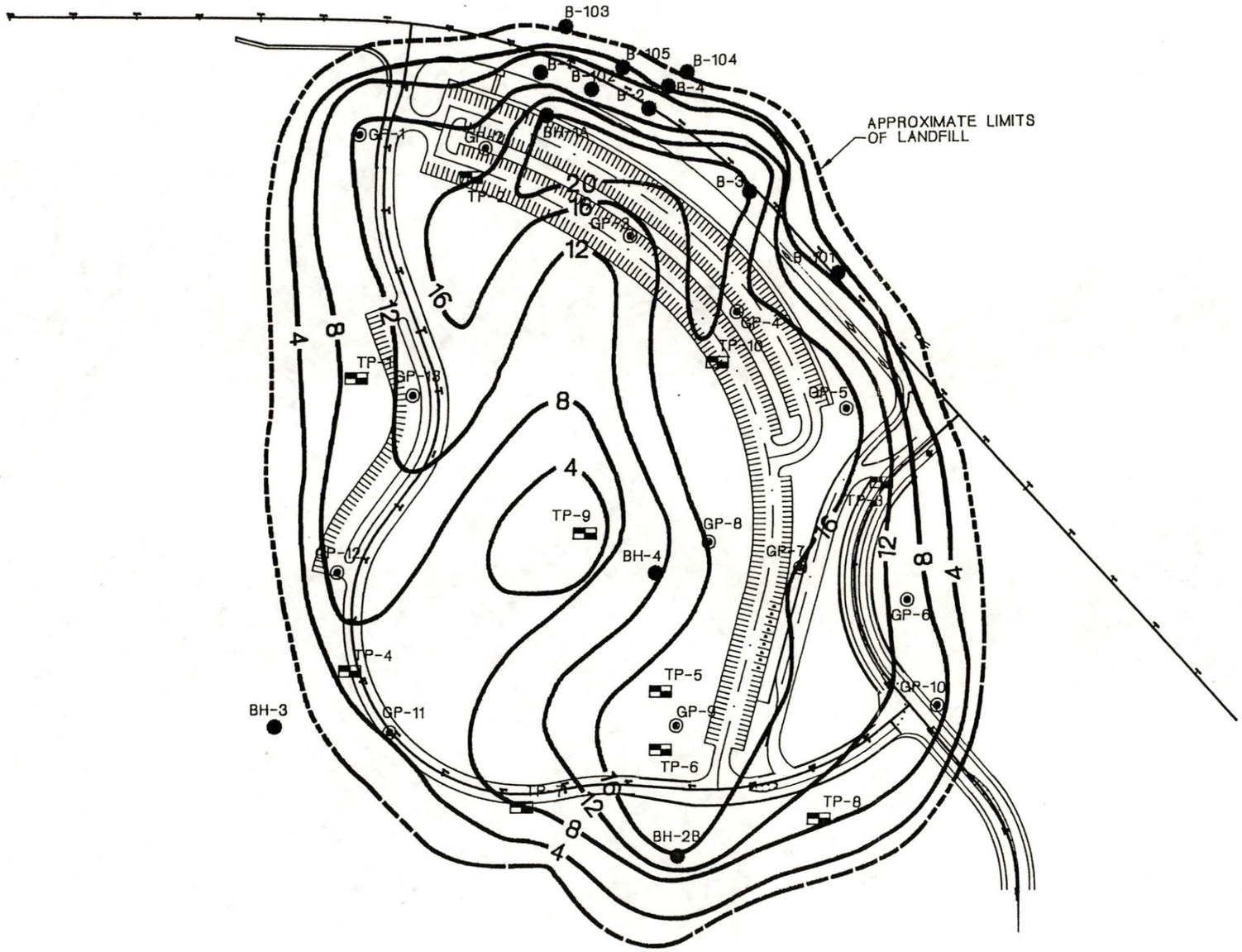
GENERALIZED SUBSURFACE CROSS-SECTION E-E'

FIGURE 7

DRAWING NO. \7B\W-7764-1\X-S-E.DWG



LEGEND

B-105 ● BORING NUMBER AND LOCATION

TP-10 ▬ TEST PIT NUMBER AND LOCATION

GP-13 ◉ GAS PROBE NUMBER AND LOCATION

—20— REFUSE THICKNESS CONTOUR

N

0 200 400

SCALE IN FEET

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DESIGN	HWB
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DATE	MAY 1992
SCALE	1"=200'

McCOLLUM PARK - PARK & RIDE
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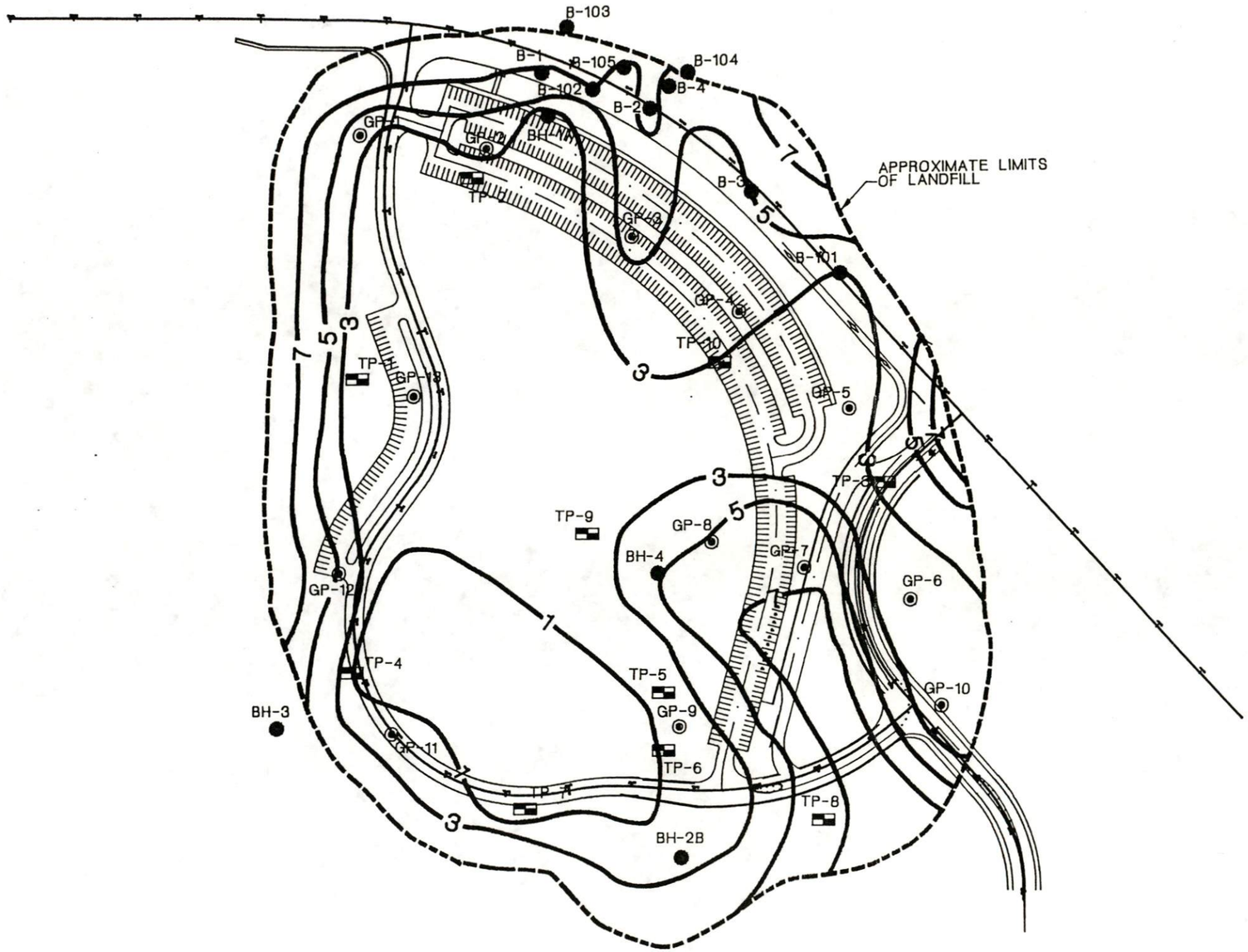
REFUSE THICKNESS CONTOUR MAP

FIGURE 8

DRAWING NO \78\W-7764-1\REFUSE.DWG



LEGEND

- B-105 ● BORING NUMBER AND LOCATION
- TP-10 ▬ TEST PIT NUMBER AND LOCATION
- GP-13 ◉ GAS PROBE NUMBER AND LOCATION
- —7— COVER SOIL THICKNESS CONTOUR

N

0 200 400
SCALE IN FEET

RZA AGRA, INC.
Engineering & Environmental Services
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Suite 100
Kirkland, Washington 98034-6918

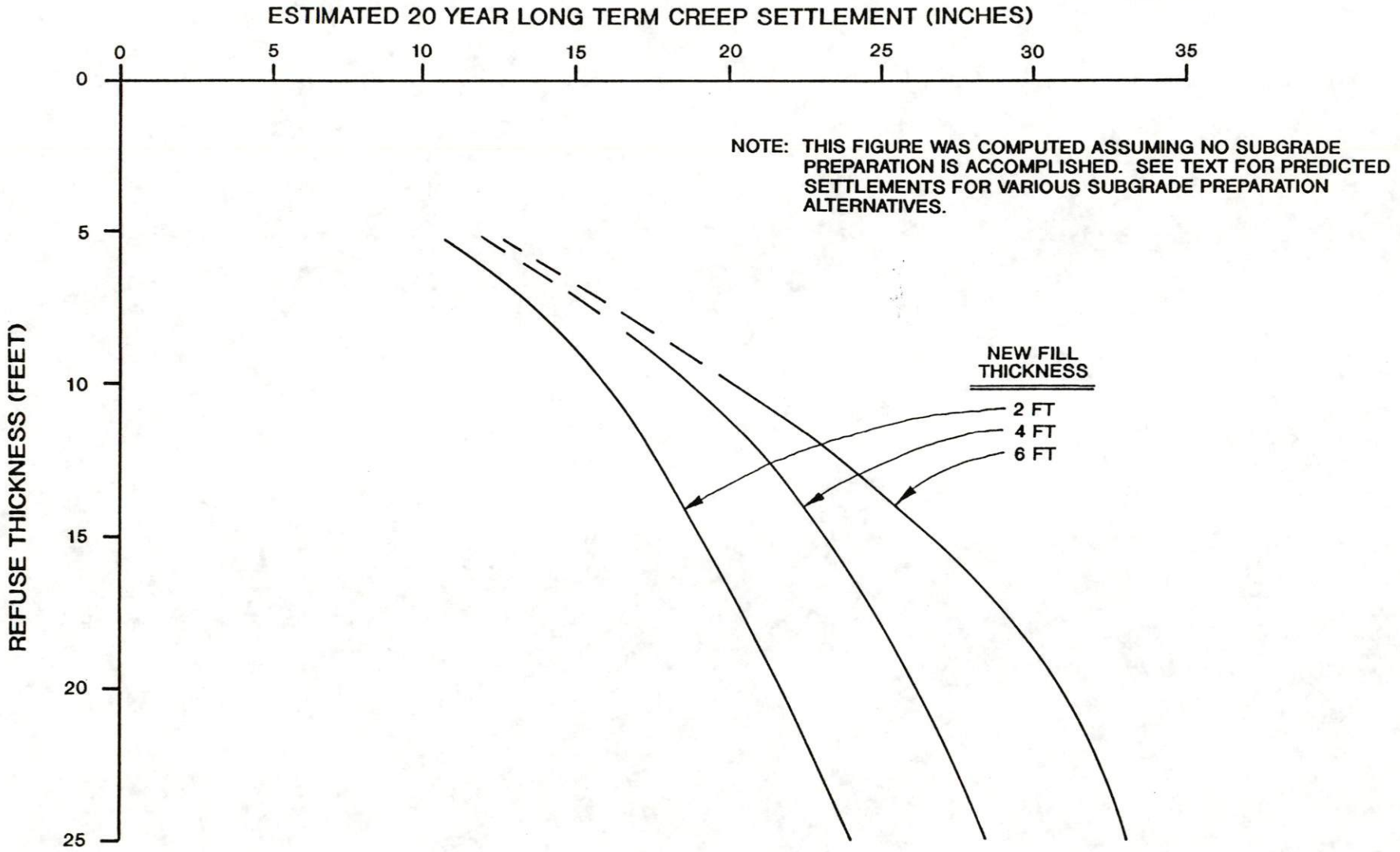
W.O.	W-7764
DESIGN	HWB
DRAWN	BDT
DATE	MAY 1992
SCALE	1"=200'

McCOLLUM PARK - PARK & RIDE
EVERETT, WASHINGTON

COVER SOIL THICKNESS CONTOUR MAP

FIGURE 9

DRAWING NO. \7B\W-7764-1\COVER.DWG



RZA-AGRA
ENGINEERING & ENVIRONMENTAL SERVICES

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Suite 100
Kirkland, Washington
98034-6918

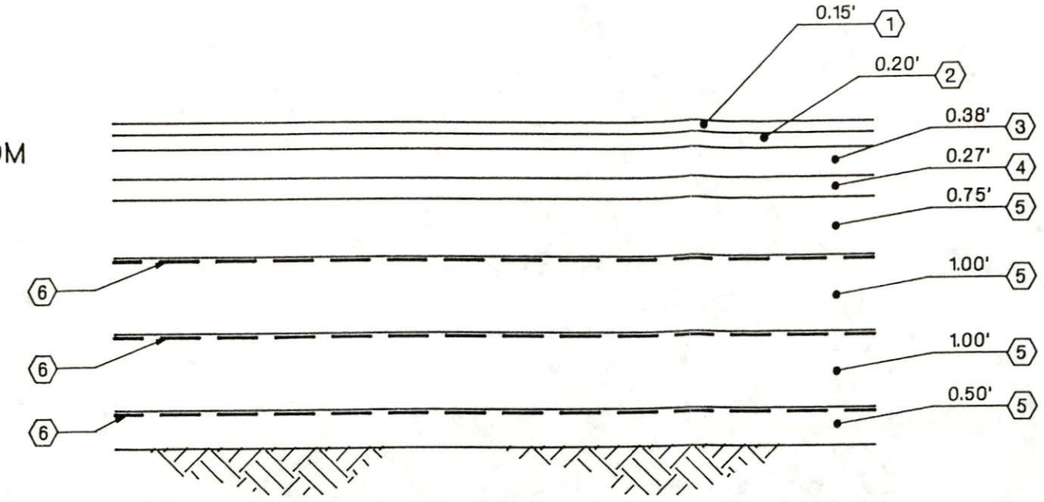
W.O.	W-7764
DESIGN	HWB
DRAWN	MJF
DATE	MAY 1992
SCALE	N.T.S.

McCOLLUM PARK -- PARK & RIDE
EVERETT, WASHINGTON

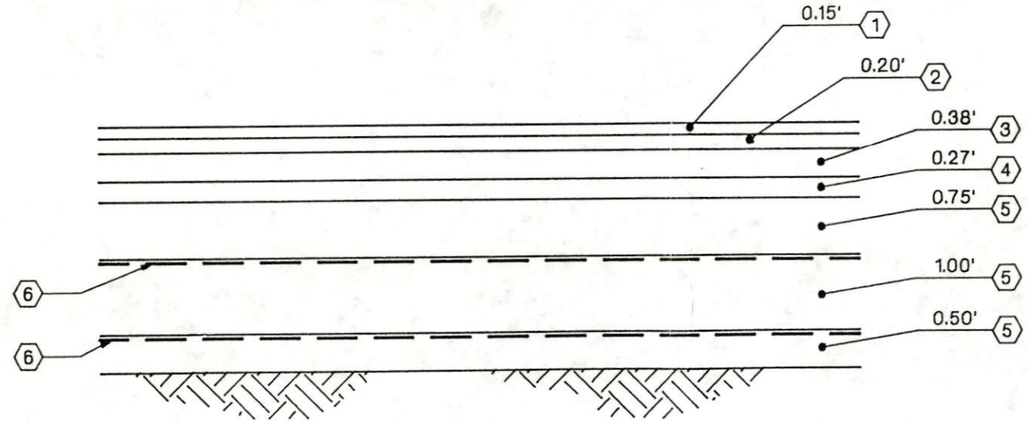
ESTIMATED SETTLEMENT FOR VARIOUS LOADS AFTER 20 YEARS

FIGURE 10

PAVEMENT SECTION
WHERE SPANNING FROM
LANDFILL TO
NON-LANDFILL AREAS



PAVEMENT SECTION
FOR AREAS UNDERLAIN
BY LANDFILL



LEGEND

1. ASPHALT CONCRETE PAVEMENT CLASS 'B' WEARING COURSE
2. ASPHALT CONCRETE PAVEMENT MODIFIED CLASS 'B' LEVELLING COURSE
3. ASPHALT TREATED BASE
4. CRUSHED SURFACING TOP COURSE
5. GRAVEL BORROW (MODIFIED)
6. POLYMER GRID SUBGRADE REINFORCEMENT (TENSAR SS-2 OR APPROVED EQUAL)

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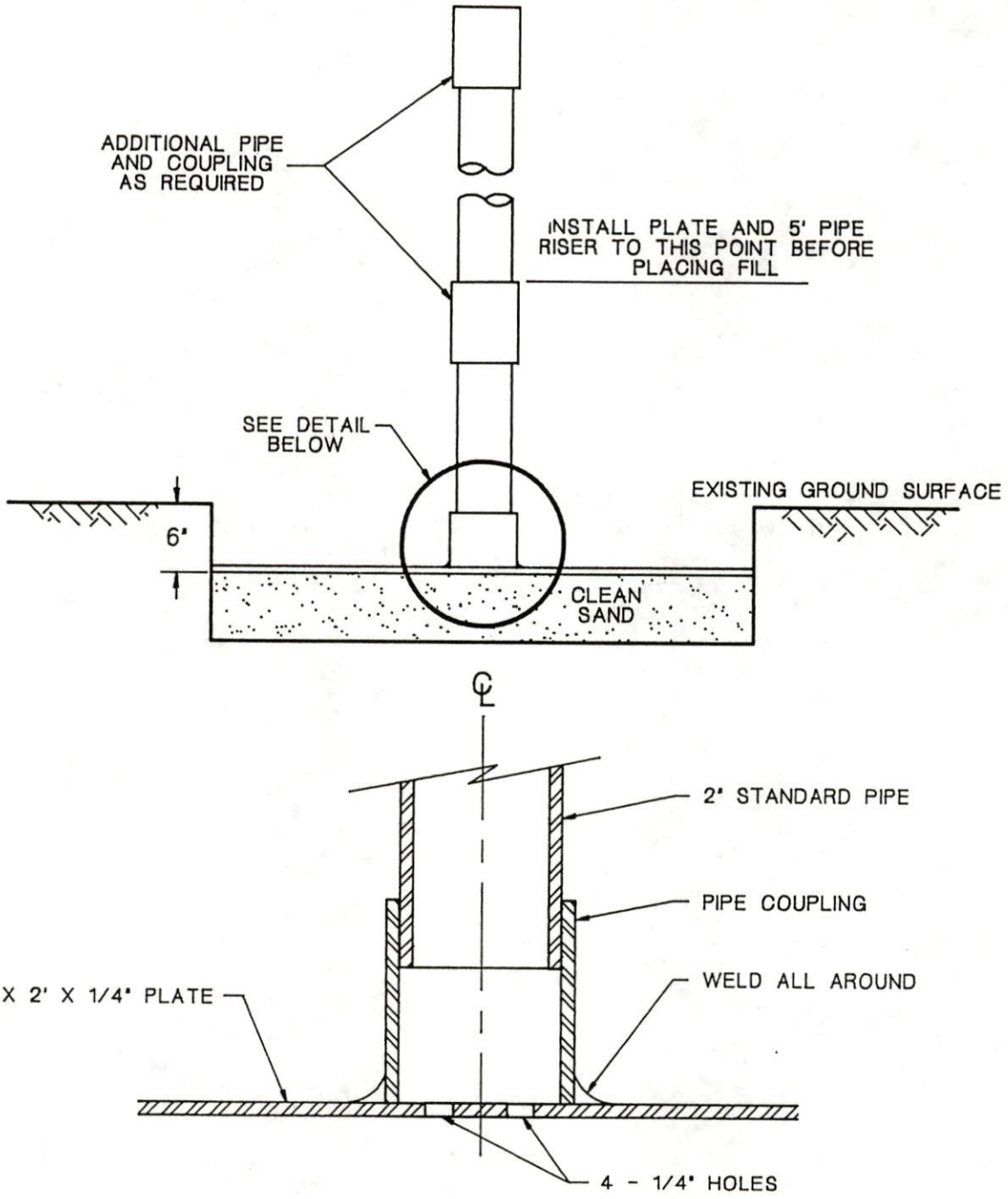
DESIGN	JSD
DRAWN	MJF
DATE	MAY 1992
SCALE	NONE

McCOLLUM PARK - PARK & RIDE LOT
EVERETT, WASHINGTON

RECOMMENDED PAVEMENT SECTION

FIGURE 11

DRAWING NO. \7A\W-7764\X-S-PAVE.DWG



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W.O.	W-7764
DESIGN	JSD
DRAWN	MJF
DATE	MAY 1992
SCALE	N.T.S.

McCOLLUM PARK - PARK & RIDE LOT
EVERETT, WASHINGTON

SETTLEMENT PLATE DETAIL

FIGURE 12

DRAWING NO. \7B\W-7764\SET-PLAT.DWG

APPENDIX A

FIELD EXPLORATION

The field exploration program conducted for this study consisted of advancing thirteen test borings. The approximate exploration locations are illustrated on the Site and Exploration Plan, Figure 2. The exploration locations were staked and later surveyed for location and elevation by Snohomish County Public Works personnel. The locations of the explorations should be considered as accurate as the degree implied by the method used.

Hollow Stem Auger Borings

The 13 borings were drilled on 24 through 28 February 1992 by a local exploration drilling company under subcontract to our firm. The borings were drilled by advancing a 4-inch inside diameter hollow-stem auger with a Nodwell-mounted drill rig. During the drilling process, samples were generally obtained at 2½ or 5 foot depth intervals. The borings were continuously observed and logged by a engineering geologist from our firm.

Disturbed samples were obtained by using the Standard Penetration Test procedure as described in ASTM:D-1586. This test and sampling method consists of driving a standard 2-inch outside diameter, split barrel sampler a distance of 18-inches into the soil with a 140 pound hammer free falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded. The number of blows required to drive the sampler the final 12 inches is considered the Standard Penetration Resistance ("N") or blow count. The blow count is presented graphically on the boring logs in this appendix. If a total of 50 blows is recorded within one 6-inch interval, the blow count is recorded as 50 blows for the number of inches of penetration. The resistance, or "N" value, provides a measure of the relative density of granular soils or the relative consistency of cohesive soils.

The soil samples obtained from the split-barrel sampler were classified in the field and representative portions were placed in plastic containers. The samples were then transported to our laboratory for further visual classification and laboratory testing. Samples are generally saved for a period of 30 days unless special arrangements are made.

Subsurface water conditions observed while advancing the test borings are indicated on the boring logs in this appendix by a triangular symbol and the designation "ATD" (At Time of Drilling). These subsurface water conditions were evaluated by observing the moisture condition of the samples or the wetted level on the drilling rods. That depth, shown on the boring logs, is generally indicative of the open water level in the borings at the time the borings were advanced.

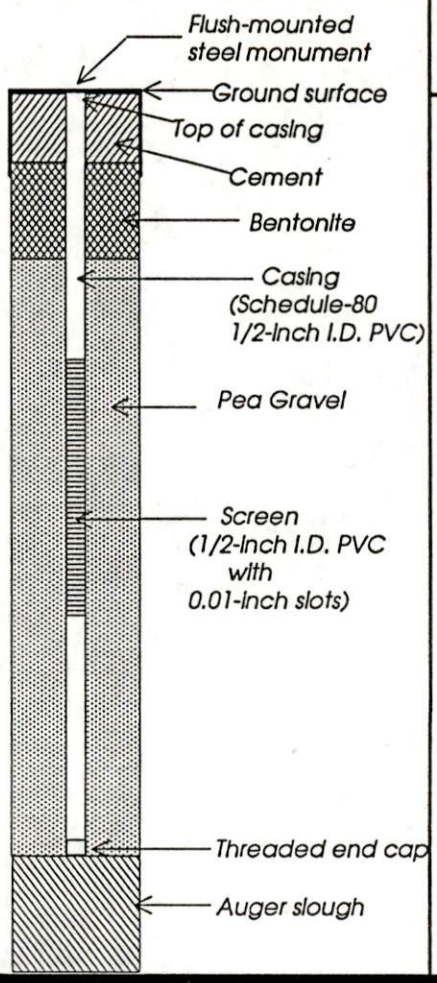
Gas probe wells were installed in each of the borings. Each well consisted of ½-inch inside diameter schedule 80 PVC pipe with a 0.01 inch screened section and blank riser pipe. Pea gravel was utilized as backfill around the slotted section to allow entry of gases into the gas observation probe. A bentonite surface seal, and flush mounted steel monument set in concrete was installed at the ground surface. A pitcock valve was installed at the top of each riser pipe, which allowed subsequent gas sampling. The gas probe installation details are shown on the exploration logs in this Appendix.

PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-1*

Elevation reference: *Topographic Map* Gas Probe Installed: *28 February 1992*
Ground surface elevation: *395.6'* Casing elevation: *395.4'±*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*TOPSOIL*						
	Dense, wet, tan, silty, gravelly SAND (Fill)		S-1	46	2		
	Refuse-wet, some to moderate decomposition with 25% dirt-plastic, paper, glass						
5							
10	*Becoming more decomposed with depth and 50% dirt*						
15						ATD	
	Dense to very dense, wet, gray, gravelly SAND with some silt Blowcount overstated-rock		S-2	50/3"	14		
20	*Boring terminated at 18.3 feet.*						
25							
30							



LEGEND

2-Inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed)

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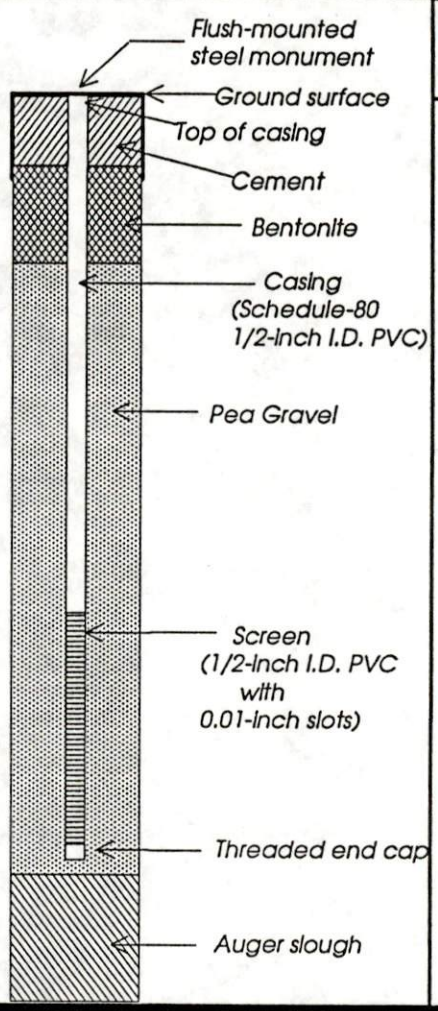
Drilling started: *28 February 1992* Drilling completed: *28 February 1992* Logged by: *HWB*

PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-2*

Elevation reference: *Topographic Map* Gas Probe Installed: *28 February 1992*
Ground surface elevation: *396.3'* Casing elevation: *396.1'±*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*TOPSOIL*						
	Dense, wet, gray-tan, silty, gravelly, SAND with scattered organics (Fill)		*S-1*	*33*	*2*		
5	*Refuse-wet, some to moderate decomposition, with 75% dirt-paper, plastic, wood*						
10							
15							
	Very dense, wet, bluish gray, silty, fine to medium SAND with trace gravel		*S-2*	*85*	*1*	ATD	
20	*Boring terminated at 19 feet.*						
25							
30							



LEGEND

2-inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed)

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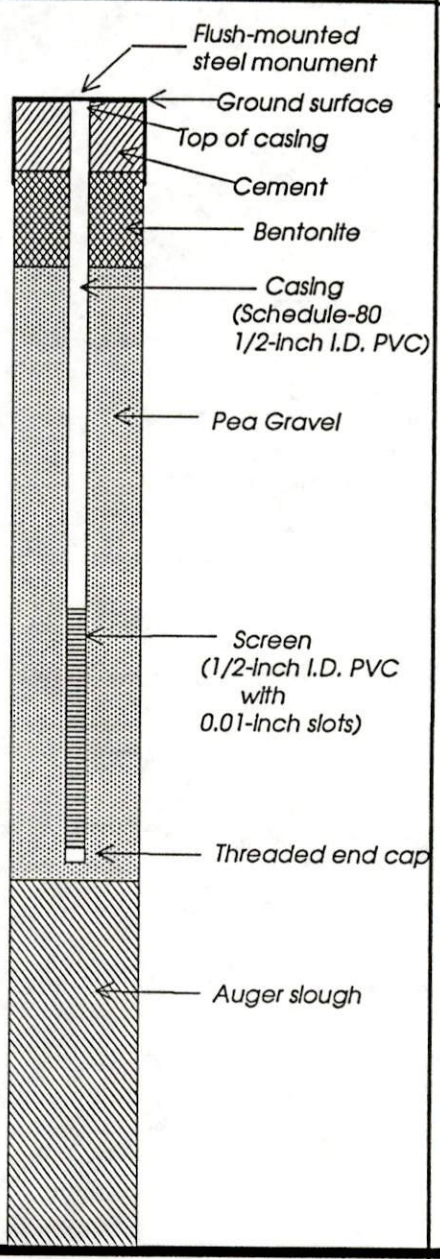
Drilling started: *28 February 1992* Drilling completed: *28 February 1992* Logged by: *HWB*

PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-3*

Elevation reference: *Topographic Map* Gas Probe Installed: *26 February 1992*
Ground surface elevation: *395.6'* Casing elevation: *395.4'±*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	TOPSOIL						
	Medium dense, moist to wet, tan-brown, silty, fine to medium SAND with some gravel and organics (Fill)		S-1	35	4		
	Medium dense to dense, wet, gray, silty, gravelly SAND (Fill)		S-2	23	24		
5	Refuse-wet, some to moderate decomposition, with 50% dirt, plastic, glass, wood debris	X	S-3	33			
10			S-4	11	4		
15	Wood debris in shoe dirt has organics		S-5	11	2		
20	Medium dense to dense, wet, gray, gravelly SAND with some silt, trace fabric at 23 1/2 (Reworked)						
	Very dense, wet, gray gravelly SAND with some silt		S-6	52	2	ATD	
25	Boring terminated at 24 feet.						
30							



LEGEND

- 2-inch O.D. split-spoon sample
- X Sample not recovered
- ATD Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed)

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Drilling started: *26 February 1992* Drilling completed: *26 February 1992* Logged by: *HWB*

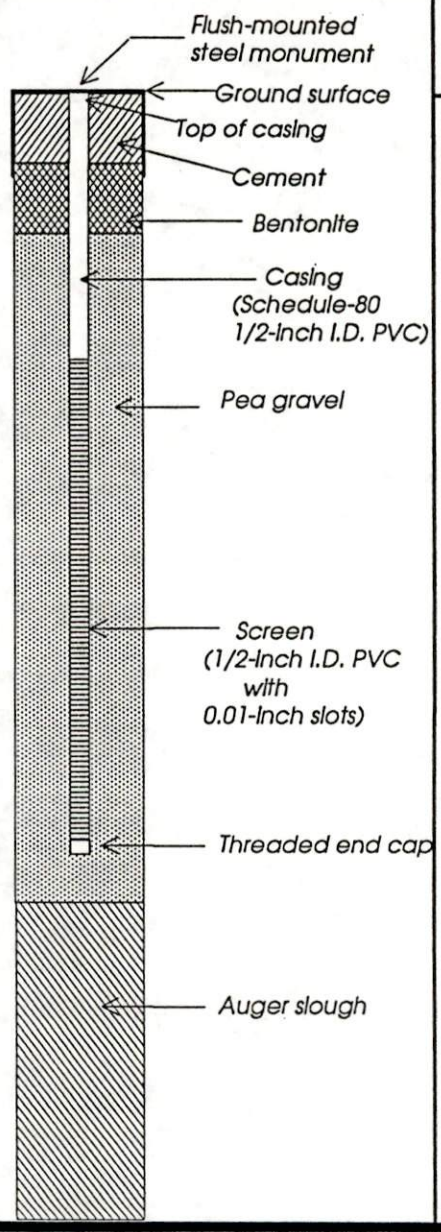
PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-4*

Elevation reference: *Topographic Map* Gas Probe Installed: *27 February 1992*
Ground surface elevation: *396.9'* Casing elevation: *396.7'±*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*TOPSOIL*					
	Medium dense, wet, gray, silty, gravelly SAND with occasional cobbles (Till fill)		*S-1*	*29*	*0*	
			S-2	*24*	*0*	
5	*Refuse-Wet, some to moderate decomposition, 50% dirt-plastic, paper, metal, glass.*					
	Blow count overstated debris		*S-3*	*50/ 3"*	*5*	
10						
	Becoming 75% dirt		*S-4*	*20*	*7*	
15						ATD
	Medium dense, wet, blackish gray, silty, gravelly, SAND with trace of debris (Reworked)		*S-5*	*22*	*2*	
20						
	Dense, wet, gray, gravelly, medium to coarse SAND with some silt					
	Blowcount overstated-heave		*S-6*	*50/ 4"*	*0*	
25	*Boring terminated at 23.9 feet.*					
30						



TESTING

8240
8270
TCLP
PH

LEGEND

2-inch O.D. split-spoon sample

8240 8270 TCLP PH — Chemical analysis

ATD — Observed groundwater level (ATD = at time of drilling: 0/00/00 = date observed)

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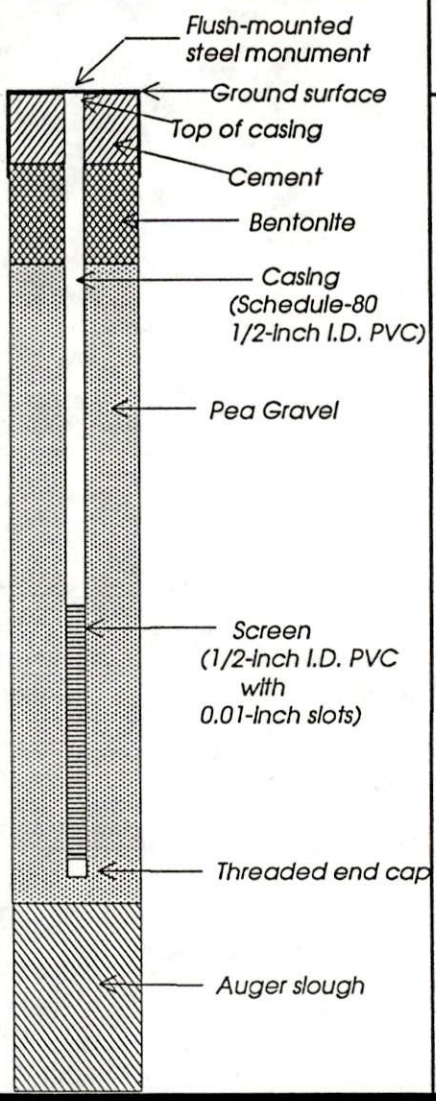
Drilling started: *26 February 1992* Drilling completed: *26 February 1992* Logged by: *HWB*

PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-5*

Elevation reference: *Topographic Map* Gas Probe Installed: *27 February 1992*
Ground surface elevation: *395.1'* Casing elevation: *394.9'±*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	TOPSOIL						
	Medium dense, wet, mixed tan-gray, silty, gravelly SAND (Fill) Blow count overstated rocks		S-1	50/3"	5		
	Refuse-wet, some to moderate decomposition, 50% dirt-metal, glass, wood-dirt is light brown						
5							
10	Dirt becoming blackish with organics						
15						ATD	
	Blow count overstated		S-2	50/3"			
20	Dense to very dense, wet, tan silty SAND with some gravel		S-3	50/5"	2		
	Boring terminated at 21 feet.						
25							
30							



LEGEND

2-inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed)

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Drilling started: *27 February 1992* Drilling completed: *27 February 1992* Logged by: *HWB*

PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-6*

Elevation reference: *Topographic Map* Gas Probe Installed: *28 February 1992*
Ground surface elevation: *389.8'* Casing elevation: *389.6'±*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	TOPSOIL						
	Loose, moist, tan, silty, fine to medium SAND with trace of gravel and rootlets (Fill)		S-1	5	2		
	Refuse-wet, some decomposition, 0-25% dirt-plastic, stuffed animals, metal, glass (whole bottles)						
5							
10						ATPI	
	Dense to very dense, wet to saturated, gray, gravelly SAND with some silt						
15						ATD	
			S-2	50/6"	4		
	Boring terminated at 18.5 feet.						
20							
25							
30							

Flush-mounted steel monument
Ground surface
Top of casing
Cement
Bentonite
Pea Gravel
Screen (Schedule 80 1/2-inch I.D. PVC with 0.01-inch slots)
Threaded end cap
Auger slough

LEGEND

2-inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed; ATPI= at time of probe installation)

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Drilling started: *28 February 1992* Drilling completed: *28 February 1992* Logged by: *HWB*

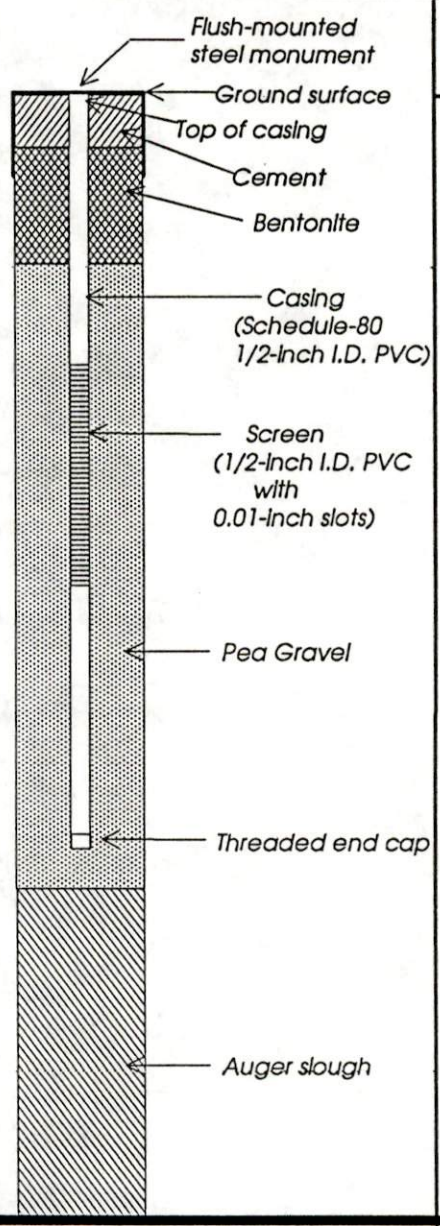
PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-7*

Elevation reference: *Topographic Map* Gas Probe Installed: *27 February 1992*
Ground surface elevation: *397.2'* Casing elevation: *397'±*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*TOPSOIL*						
	Dense, wet, gray-tan, silty, gravelly, SAND with occassional cobbles (Till fill)		*S-1*	*53*	*2*		
5	*Refuse-wet, some to moderate decomposition, 50-75% dirt-plastic, paper, wire, pieces concrete and glass*						
10							
15						ATD	
20	*Dense to very dense, wet, gray, gravelly SAND with some silt*						
	Blowcount overstated-rock		*S-2*	*50/5"*	*0*		
25	*Boring terminated at 23.5 feet.*						
30							



LEGEND

2-inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed; ATPI= at time of probe installation)

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Drilling started: *27 February 1992* Drilling completed: *27 February 1992* Logged by: *HWB*

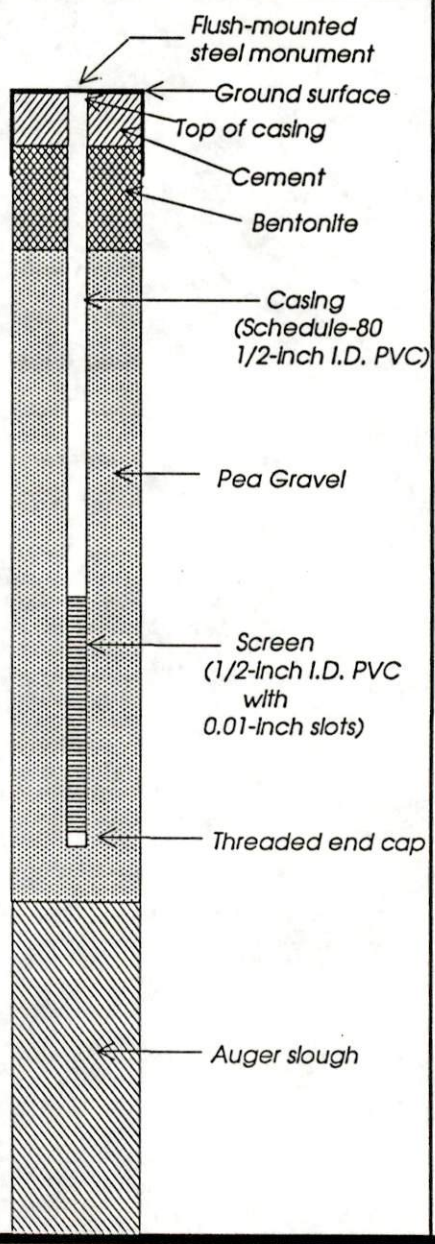
PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-8*

Elevation reference: *Topographic Map*
Ground surface elevation: *397.6'*
Gas Probe Installed: *27 February 1992*
Casing elevation: *397.4'±*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*TOPSOIL*					
	Medium dense, wet, gray, silty, gravelly, SAND (Till fill)		S-1	13		
5	*Refuse- wet, some to moderate decomposition, 50% dirt-plastic, wood, glass, flagging*					
10						
	Becoming 50-75% dirt					
15						
	Becoming 95% dirt medium dense, wet, gray, silty gravelly, SAND with some wood debris- Blowcount overstated-wood		S-2	56		
20						
	Very dense, wet, gray, gravelly, SAND with some silt.		S-3	72	10	ATD
25	*Boring terminated at 24 feet.*					
30						



TESTING

LEGEND

2-inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed; ATPI= at time of probe installation)

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Drilling started: *27 February 1992* Drilling completed: *27 February 1992* Logged by: *HWB*

PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-9*

Elevation reference: *Topographic Map* Gas Probe Installed: *24 February 1992*
Ground surface elevation: *394.7'* Casing elevation: *394.5'±*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	TOPSOIL Medium dense, moist to wet, tan, silty, gravelly SAND with scattered organics (FILL)		S-1	12	4		
	Refuse-wet, moderate decomposition, 50% dirt-plastic, wire, paper, glass, wood		S-2	3	19		
5							
	Becoming saturated with hydrocarbon sheen on sample Blow count overstated		S-3	50/ 5"	wet		
10							
	Sheen on sample		S-4	10	500	ATD	8240 8270 TCLP PCB PH
15							
	Plastic in shoe Blow count overstated		S-5	50/ 6"	58		
20	Dense to very dense, wet, gray, gravelly, medium to coarse SAND with some silt		S-6	56	10		8240 8270 TCLP PH
25	Boring terminated at 24 feet.						
30							

Flush-mounted steel monument
Ground surface
Top of casing
Cement
Bentonite
Casing (schedule-80 1/2-inch I.D. PVC)
Pea Gravel
Screen (1/2-inch I.D. PVC with 0.01-inch slots)
Threaded end cap
Auger slough

LEGEND

2-inch O.D. split-spoon sample

8240 8270 TCLP PH — Chemical analysis

ATD — Observed groundwater level (ATD = at time of drilling: 0/00/00 = date observed ATPI= at time of probe installation)

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Drilling started: *24 February 1992* Drilling completed: *24 February 1992* Logged by: *HWB*

McCollum Park-

PROJECT: *Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-10*

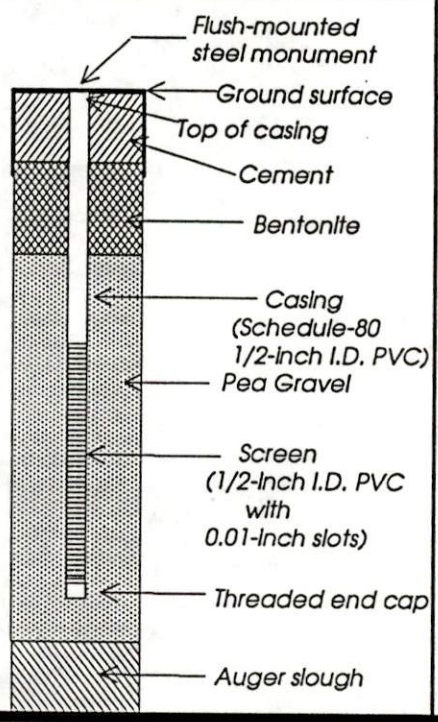
Elevation reference: *Topographic Map* Gas Probe Installed: *28 February 1992*

Ground surface elevation: *389.0'* Casing elevation: *388.8'±*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*TOPSOIL*					
	Loose, wet, tan, silty, fine to medium SAND with trace of gravel (Fill)		*S-1*	*8*	*0*	
	Refuse- wet, some decomposition, 25% dirt-glass, plastic, paper, metal					
5						ATPI
10	*Dense, wet, gray, gravelly SAND with some silt*			*50/*		
	Blowcount overstated		*S-2*	*5"*	*3*	ATD
	Boring terminated at 13 feet.					
15						
20						
25						
30						



TESTING

LEGEND

2-inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed; ATPI= at time of probe installation)

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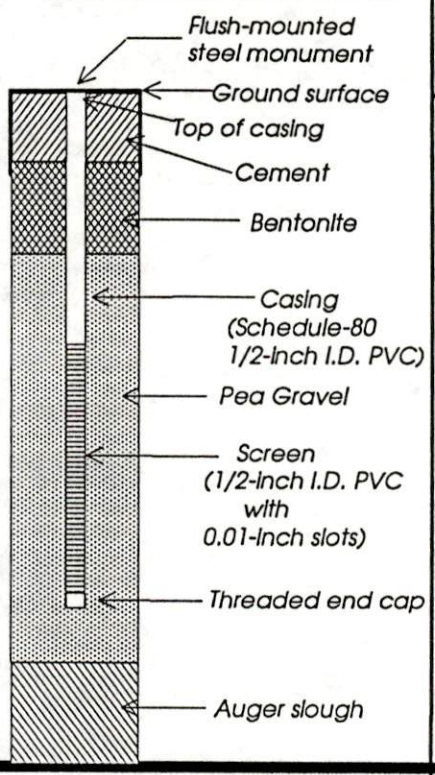
Drilling started: *28 February 1992* Drilling completed: *28 February 1992* Logged by: *HWB*

PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-11*

Elevation reference: *Topographic Map*
Ground surface elevation: *387.7'*
Gas Probe Installed: *25 February 1992*
Casing elevation: *387.5'±*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*TOPSOIL*						
	Medium dense, moist, tan-brown, silty, SAND with some gravel (Fill)		*S-1*	*12*	*4*		
	Refuse- wet, moderate to much decomposition, 25-50% dirt-mostly wood, plastic, glass. Blowcount overstated		*S-2*	*50/ 2.5"*	*0*		
5							
	Dense, wet, tan, silty, SAND with some gravel		*S-3*	*33*	*4*		
10							
	Very dense, wet, gray, silty, fine to medium SAND with some gravel					ATD	
			S-4	*81*	*7*		
15	*Boring terminated at 14 feet.*						
20							
25							
30							



LEGEND

2-Inch O.D. split-spoon sample

Observed groundwater level (ATD = at time of drilling: 0/00/00 = date observed ATPI= at time of probe installation)

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Drilling started: *25 February 1992* Drilling completed: *25 February 1992* Logged by: *HWB*

PROJECT: *McCollum Park- Park & Ride Lot*

W.O. *W-7764*

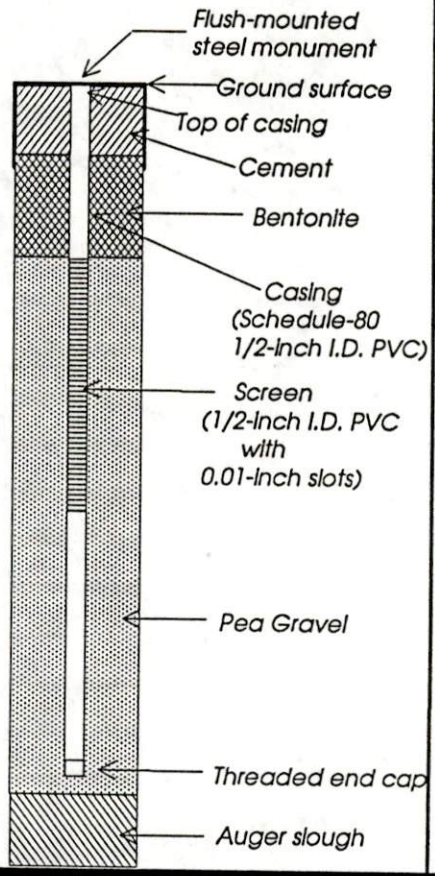
WELL NO. *GP-12*

Elevation reference: *Topographic Map*
Ground surface elevation: *389.8'*

Gas Probe Installed: *25 February 1992*
Casing elevation: *389.6'±*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	TOPSOIL					
	Medium dense, moist, tan-brown, silty, fine to medium SAND with scattered organics and rootlets (Fill)		S-1	13	4	
	Loose, wet, dark brow, silty, fine SAND with some gravel and trace glass (Fill)		S-2	5	7	
5	Refuse-wet, some to moderate decomposition, 0-25% dirt-plastic		S-3	14	16	
10	Becoming 75% dirt plastic, wood, glass					ATD
			S-4	73	7	
15	Dense to very dense, wet, gray silty, fine to medium SAND with some gravel		S-5	36	7	
	Boring terminated at 16.5 feet.					
20						
25						
30						



TESTING

LEGEND

2-inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed; ATPI= at time of probe installation)

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *25 February 1992*

Drilling completed: *25 February 1992*

Logged by: *HWB*

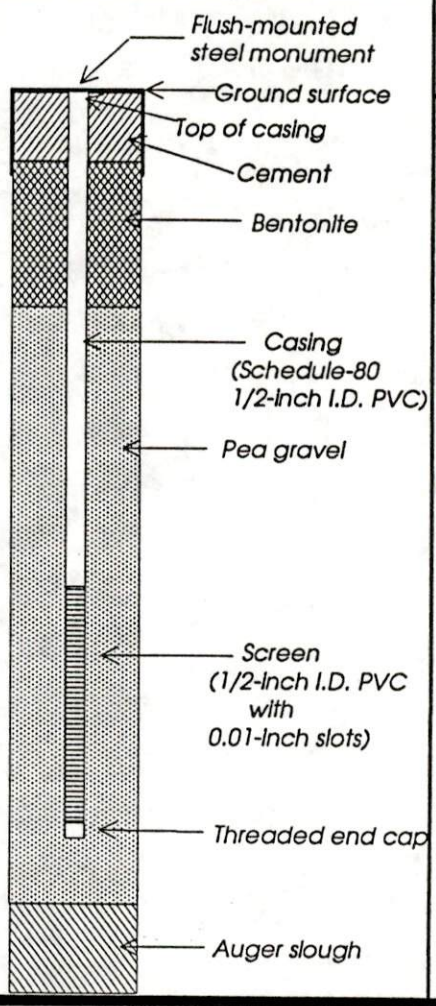
PROJECT: *McCollum Park- Park & Ride Lot* W.O. *W-7764* WELL NO. *GP-13*

Elevation reference: *Topographic Map* Gas Probe Installed: *25 February 1992*
Ground surface elevation: *397.0'* Casing elevation: *396.8'±.*

AS-BUILT DESIGN

Page 1 of 1

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	TOPSOIL					
	Loose-medium dense, wet, brown, silty, fine to medium SAND with some gravel and scattered organics (Fill)		S-1	21	4	
			S-2	7	16	
	Refuse-wet, moderate decomposition, 25% dirt-paper, plastic, wood, glass					
5						
	Blow count overstated		S-3	50/4"	40	
10						
	Organic soils with hydrocarbon sheen on sample		S-4	9	141	
15						ATD
	Very dense, wet, gray, silty, gravelly, SAND with sheen on water		S-5	70	16	
20	Boring terminated at 19 feet.					
25						
30						



TESTING

LEGEND

2-inch O.D. split-spoon sample

ATD — Observed groundwater level (ATD = at time of drilling; 0/00/00 = date observed; ATPI= at time of probe installation)

RZA AGRA, Inc.
Geotechnical & Environmental Group

11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *25 February 1992* Drilling completed: *25 February 1992* Logged by: *HWB*

APPENDIX B

W-7764

LABORATORY TESTING PROCEDURES

A series of laboratory tests were performed during the course of this study to evaluate the index and geotechnical engineering properties of the near surface soils. Descriptions of the types of tests performed are given below.

Visual Classification

Samples recovered from the exploration locations were visually classified in the field during the exploration program. Representative portions of the samples were carefully packaged in watertight containers and transported to our laboratory where the field classifications were verified or modified as required. Visual classification was done in general accordance with the Unified Soil Classification system. Visual soil classification includes color, relative moisture content, soil type based on grain size, and accessory soil types included in the sample. Soil classifications are presented on the exploration logs in Appendix A.

Moisture Content Determinations

Moisture content determinations were performed on representative samples obtained from the exploration in order to aid in identification and correlation of soil types. The determinations were made in general accordance with the test procedures described in ASTM:D-2216. The results of the tests are shown on the grain size distribution charts in Appendix B.

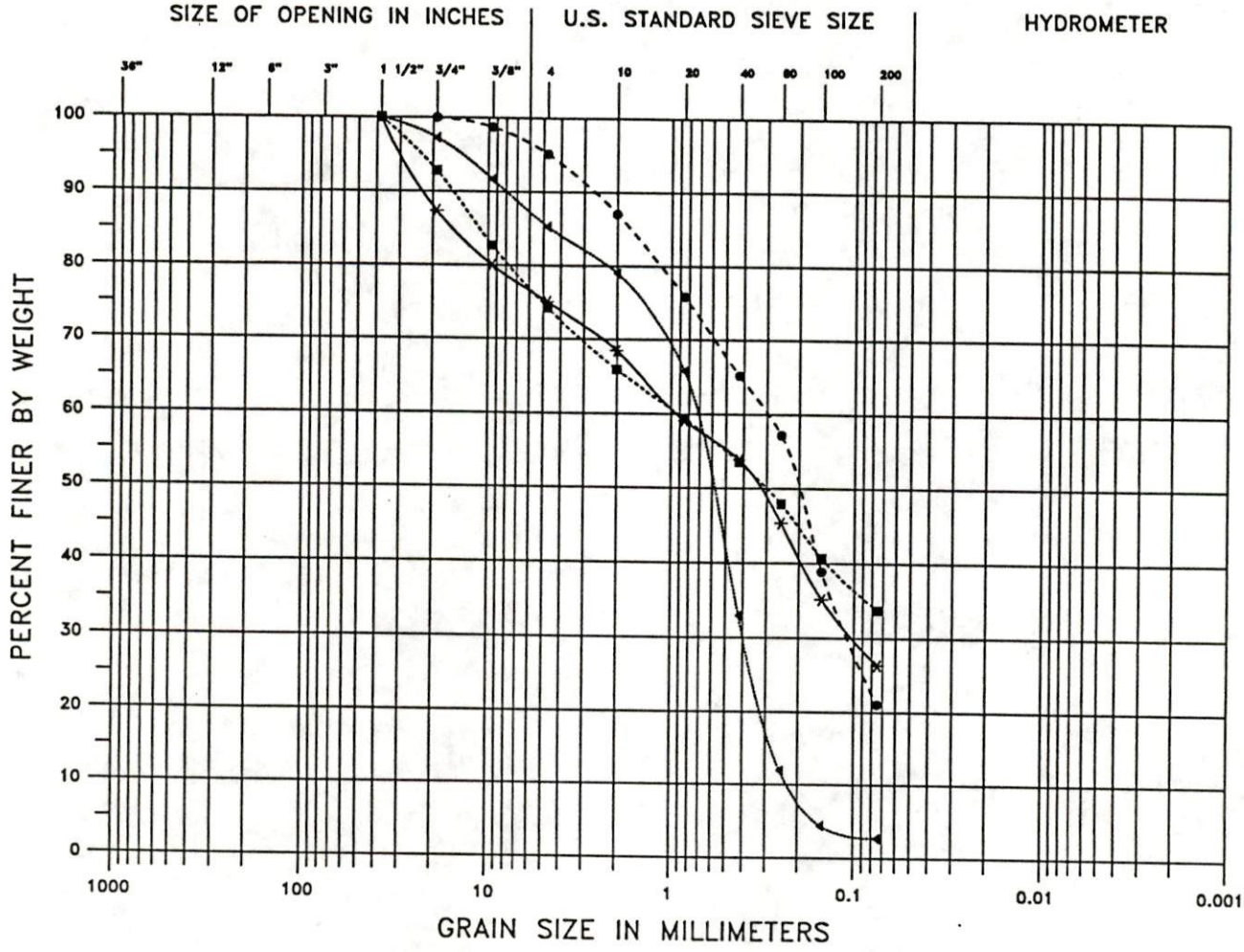
Grain Size Analysis

A grain size analysis indicates the range in diameter of soil particles included in a particular sample. Grain size analysis were performed on representative samples in general accordance with ASTM:D-422 down to the U.S. No. 200 Sieve. The results of the grain size determinations for the samples were used in classification of the soils, and are included in this Appendix.

Permeability Tests

Constant head permeability tests were performed on selected samples from the landfill, in general accordance with ASTM:D-2434. Bulk samples were screened through a 3/4 inch sieve prior to testing. The screened sample was then loaded into a 4-inch diameter cylindrical Proctor mold at its field moisture content using ASTM:D-698 Method A Standard Proctor energy. The remolded samples were then saturated under a constant reservoir head of approximately 2 psi. The coefficient of permeability was then determined by measuring the rate of flow through the sample. The results of the permeability testing are presented in this appendix.

GRAIN SIZE DISTRIBUTION



		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
BOULDERS	COBBLES	GRAVEL		SAND			FINE GRAINED	

Exploration	Sample Number Depth	Moisture	Fines	Soil Description
Near GP-2	S-2	24%	26%	Brown, silty, gravelly SAND
Near GP-3	S-5	14%	21%	Dark brown, silty SAND with trace gravel
Near GP-7	S-3	9%	34%	Grey-tan, silty, gravelly SAND
Near GP-10	S-4	9%	3%	Brown, gravelly SAND with trace silt

Project: McCollum Park-Park & Ride
Work Order: W-7764
Date: 3/19/92

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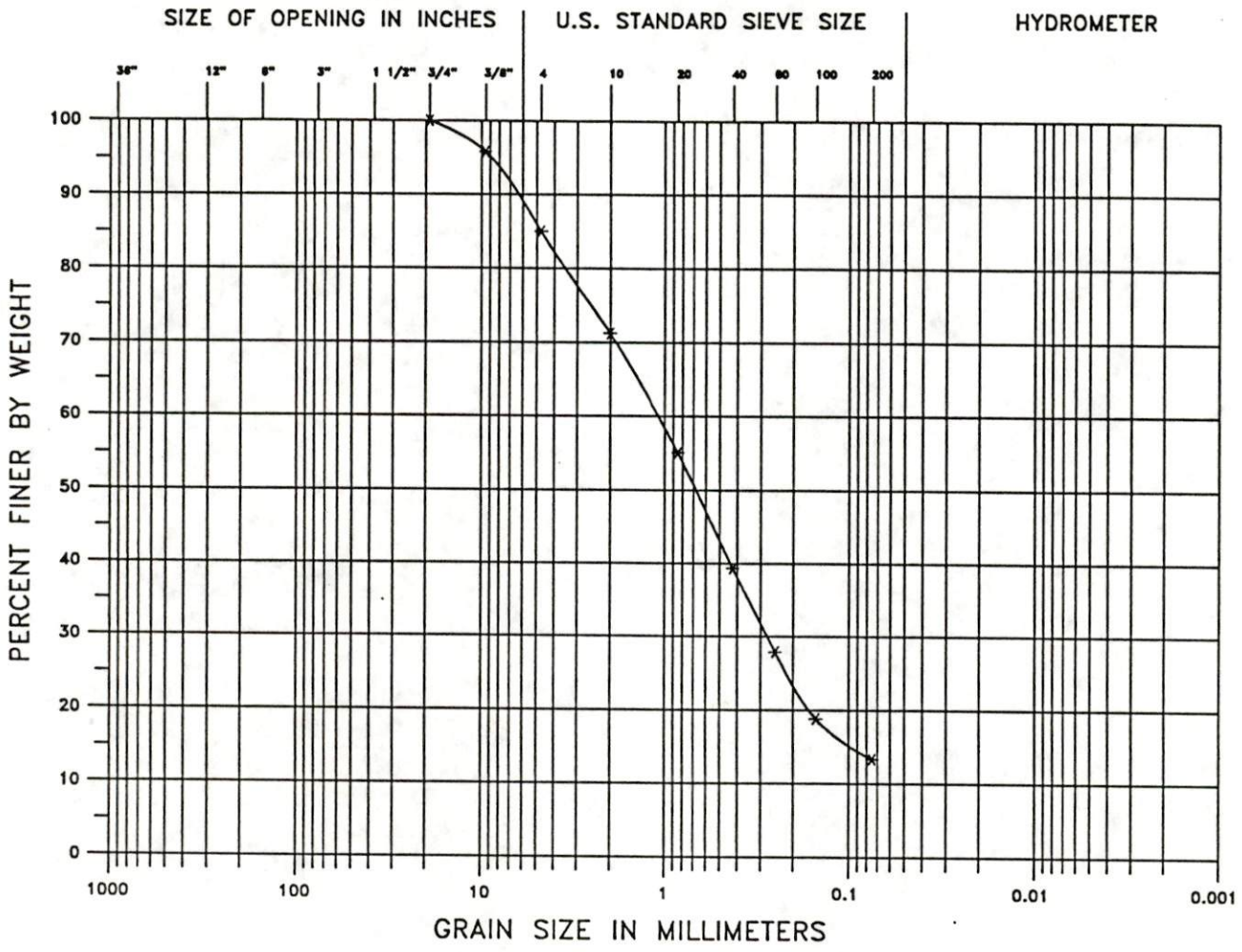
ENGINEERING & ENVIRONMENTAL SERVICES
11335 N.E. 122nd Way
Suite 100
Kirkland, Washington 98034-6918

GRAIN SIZE DISTRIBUTION



		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
BOULDERS	COBBLES	GRAVEL		SAND			FINE GRAINED	

Exploration	Sample Number	Depth	Moisture	Fines	Soil Description
Near GP-11	S-1		12%	13%	Brown, silty, gravelly SAND, some organics (roots)

Project: McCollum Park-Park & Ride
Work Order: W-7764
Date: 3/19/92

RZA – AGRA
ENGINEERING & ENVIRONMENTAL SERVICES
11335 N.E. 122nd Way
Suite 100
Kirkland, Washington 98034-6918

Job Name:	McCollum Park-Park & R	Exp:	S-1 - S-5
Job Number:	W-7764	Sample:	--
Date:	03/11/92	Depth:	--

Near GP-11 (S-1)

Test Number:	S-1 (1)	S-1 (2)	S-1 (3)	S-1 (4)	Total	
Date Started:	03/11	03/11	03/11	03/12		Average Measured Permeability
Time Started:	11:35	15:21	18:51	06:11		@ Natural Moisture
Date Ended:	03/11	03/11	03/12	03/12		Content
Time Ended:	15:21	18:51	06:10	14:06		@ ASTM D698
Time Elapsed (SEC):	13560	12600	40740	28500	95400	Standard Proctor
Volume Passed:	41	22	42	22	127	Energy (cm/sec)
Permeability (Shelf):	3.2E-06	1.9E-06	1.1E-06	8.2E-07	1.4E-06	<--

Near GP-2 (S-2)

Test Number:	S-2 (1)	S-2 (2)	S-2 (3)		Total	
Date Started:	03/11	03/11	03/12			Average Measured Permeability
Time Started:	12:50	18:50	06:10			@ Natural Moisture
Date Ended:	03/11	03/12	03/12			Content
Time Ended:	18:50	06:09	14:06			@ ASTM D698
Time Elapsed (SEC):	21600	40740	28560		90900	Standard Proctor
Volume Passed:	30	59	43		132	Energy (cm/sec)
Permeability (Shelf):	1.5E-06	1.5E-06	1.6E-06		1.5E-06	<--

Near GP-7 (S-3)

Test Number:	S-3 (1)	S-3 (2)	S-3 (3)	S-3 (4)	Total	
Date Started:	03/11	03/11	03/11	03/11		Average Measured Permeability
Time Started:	08:57:30	09:00:00	09:03:00	09:05:30		@ Natural Moisture
Date Ended:	03/11	03/11	03/11	03/11		Content
Time Ended:	08:59:30	09:02:30	09:05:00	09:07:30		@ ASTM D698
Time Elapsed (SEC):	120	150	120	120	510	Standard Proctor
Volume Passed:	65	83	65	64	277	Energy (cm/sec)
Permeability (Shelf):	5.7E-04	5.9E-04	5.7E-04	5.7E-04	5.8E-04	<--

Near GP-10 (S-4)

Test Number:	S-4 (1)	S-4 (2)	S-4 (3)	S-4 (4)	Total	
Date Started:	03/11	03/11	03/11	03/11		Average Measured Permeability
Time Started:	08:58:00	08:59:30	09:01:00	09:02:30		@ Natural Moisture
Date Ended:	03/11	03/11	03/11	03/11		Content
Time Ended:	08:59:00	09:00:30	09:02:00	09:03:30		@ ASTM D698
Time Elapsed (SEC):	60	60	60	60	240	Standard Proctor
Volume Passed:	73	73	73	72	291	Energy (cm/sec)
Permeability (Shelf):	1.3E-03	1.3E-03	1.3E-03	1.3E-03	1.3E-03	<--

Near GP-3 (S-5)

Test Number:	S-5 (1)	S-5 (2)	S-5 (3)	S-5 (4)	Total	
Date Started:	03/11	03/11	03/11	03/11		Average Measured Permeability
Time Started:	11:20	12:50	15:20	17:10		@ Natural Moisture
Date Ended:	03/11	03/11	03/11	03/11		Content
Time Ended:	12:50	15:20	17:10	18:50		@ ASTM D698
Time Elapsed (SEC):	5400	9000	6600	6000	27000	Standard Proctor
Volume Passed:	54	89	65	61	269	Energy (cm/sec)
Permeability (Shelf):	1.1E-05	1.0E-05	1.0E-05	1.1E-05	1.1E-05	<--

TABLE C 1

McCOLLUM PARK
PARK AND RIDE
SUMMARY OF SOIL CHEMISTRY ANALYSIS (PPM)

ANALYTE	WELL #/SOIL SAMPLE			MCTA/CCL[1]
	B–9 S–4[2]	B–4 S–1[3]	B–9 S–6	
Benzene	2.3	ND	ND	0.5
Toluene	36	ND	ND	40
Ethyl benzene	11	ND	ND	20
Total Xylenes	63	ND	ND	20
Trichloroethene	5.4	ND	ND	0.5
1,4–Dichlorobenzene	20	ND	ND	7.5
2–Methyl phenol	140	ND	ND	2.1
Naphthalene	300	ND	ND	20
2–Methylnapthalene	690	ND	ND	20
Acenapthene	31	ND	ND	NA
Fluorene	48	ND	ND	NA
Phenanthrene	160	ND	0.6	NA
Di–n–butylphthalate	160	2	1.9	NA
Fluoranthene	12	ND	ND	NA
Butyl benzyl phthalate	ND	ND	ND	NA
Pyrene	18	ND	ND	NA
Metals	ALL SAMPLES BELOW MCTA LEVELS			
PCB's	ND	ND	ND	

1. Model Toxic Control Act/ Clean Criteria Level
2. Soil soaked with "black liquid"
3. Typical cover soil
4. Native soil below "black liquid"

TABLE C 2

McCOLLUM PARK
PARK AND RIDE
SUMMARY OF WATER CHEMISTRY ANALYSIS (PPB)

ANALYTE	WELL NUMBER				MTCA/CCL[1]
	BH–1A	BH–2B	BH–4	BH–3[2]	
Benzene	3.0	4.8	ND	ND	5.0
Chlorobenzene	14.0	ND	ND	ND	0.2
1,3–Dichlorobenzene	ND	ND	ND	ND	NA
Naphthalene	9.7	ND	3.0	ND	0.0
2–Methylnapthalene	6.0	ND	ND	ND	NA
Diethylphthalate	9.2	1.8	ND	ND	12.8
2–ethyl hexyl phthalate	ND	2.2	ND	ND	0.0
Arsenic	50.0	19.0	20.0	<10	5.0
Barium	740.0	700.0	1300.0	26.0	0.8
Cadmium	<5	<5	<5	13.0	5.0
Chromium (total)	100.0	33.0	70.0	<10	50.0
Copper	130.0	85.0	95.0	<25	0.6
Lead	32.0	480.0	34.0	<5	5.0
Mercury	0.3	<0.2	<0.2	<0.2	2.0
Nickel (salt solns)	460.0	140.0	380.0	<40	0.3
Selenium	<5	<5	<5	<5	0.0
Silver	30.0	<20	<20	<20	0.0
Zinc	720.0	340.0	270.0	25.0	3.2

1. Model Toxic Control Act/Clean Criteria Levels
2. BH–3 is a down gradient well

TABLE C 3

McCOLLUM PARK
PARK AND RIDE
AIR EMISSIONS CHARACTERIZATION

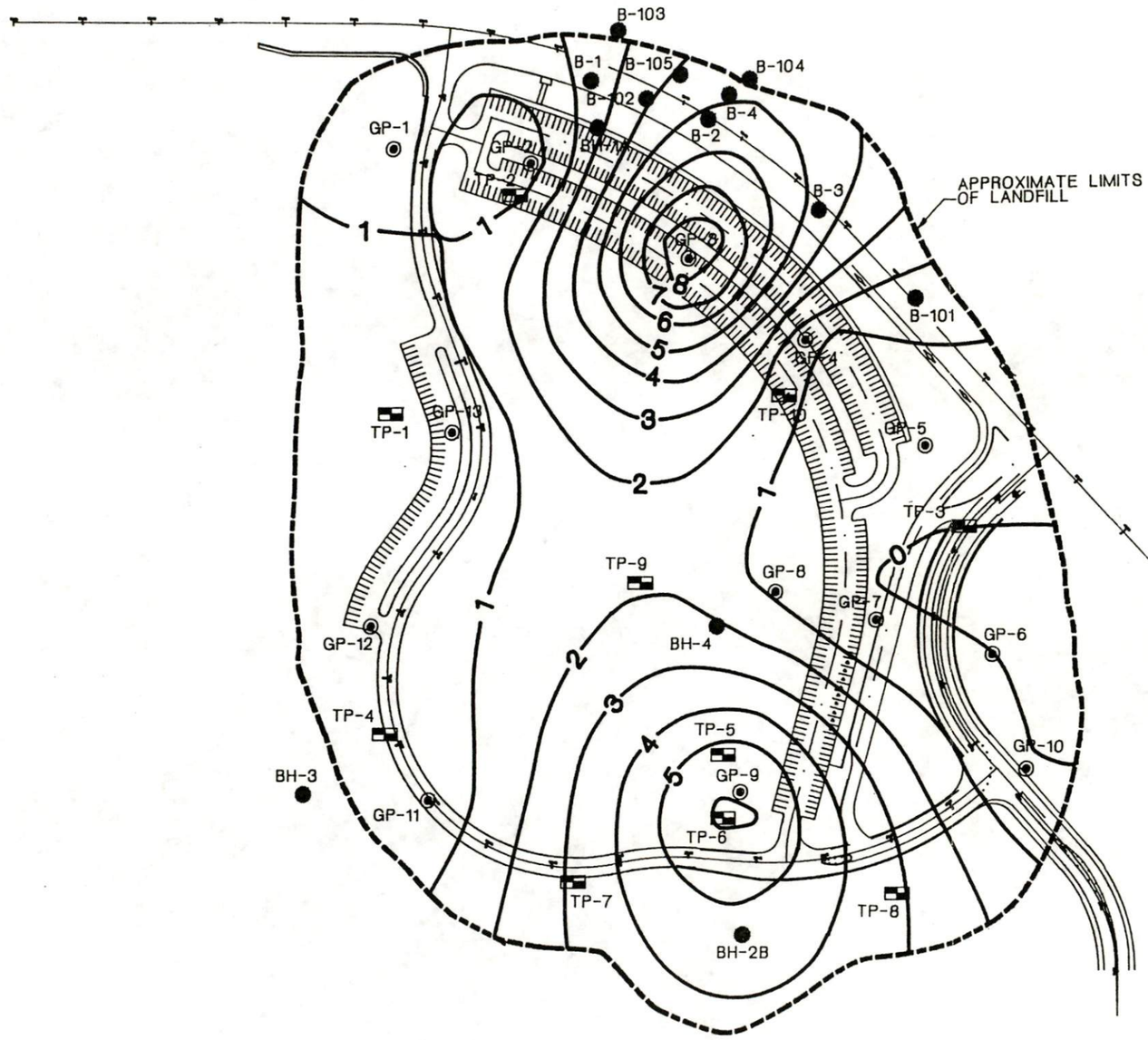
	CONCENTRATION (ppb)										
COMPOUND	GP-1	GP-3	GP-4	GP-5	GP-6	GP-8	GP-9	GP-11	GP-12	GP-13	BLANK
Acetone	8.50	ND	2.00	ND	ND	2.60	5.50	ND	ND	ND	1.10
Benzene	1.60	10.00	0.70	0.48	ND	0.66	6.80	ND	0.54	1.50	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	ND	ND	ND	ND	ND	ND	4.80	ND	0.74	ND	ND
Carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	1.30	ND	0.23	ND	0.23	ND	ND	0.24	0.19	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethyl vinyl ether	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	0.56	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.17	ND
cis-1,2-Dichloroethene	7.80	0.30	0.13	ND	ND	ND	7.80	ND	ND	0.40	ND
trans 1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis 1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans 1,3-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl benzene	2.80	2.10	ND	0.88	0.34	0.86	3.40	0.48	2.20	3.30	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	4.80	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	18.00	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	0.18	0.19	0.22	0.19	0.74	0.58	ND	13.00	ND
Toluene	26.00	2.70	2.30	0.56	0.27	1.00	23.00	0.51	7.40	2.20	0.10
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	3.60	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1.80	ND	ND	ND	ND	ND	14.00	ND	0.38	2.00	ND
Vinyl acetate	ND	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND
Vinyl chloride	35.00	1.10	2.20	0.42	ND	ND	3.90	ND	0.54	5.40	ND
Total Xylenes	5.70	4.10	ND	1.80	0.75	1.80	8.40	1.00	6.50	5.10	ND

TABLE C 4

McCOLLUM PARK
PARK AND RIDE
AIR EMISSIONS CHARACTERIZATION
ESTIMATED NON–DISPERSIVE AMBIENT CONCENTRATIONS/
ACCEPTABLE SOURCE IMPACT LEVELS (WAC 173–460)

COMPOUND	24–HOUR AVG. (ug/m^3)	ANNUAL AVG. (ug/m^3)	ASIL* (ug/m^3)
Acetone	1.01E–05	3.78E–06	5927.4
Benzene	4.84E–06	1.81E–06	0.12*
Carbon disulfide	1.31E–06	4.91E–07	99.9
Chlorobenzene	5.64E–07	2.12E–07	1165.5
Chloromethane	1.71E–07	6.42E–08	0.056*
1,1–Dichloroethene	7.86E–06	2.95E–06	0.02*
cis– 1,2–Dichloroethene	3.32E–06	1.25E–06	2630.7
Ethyl benzene	4.84E–06	1.81E–06	1448.6
Methylene chloride	1.81E–05	6.80E–06	.24*
4–Methyl–2–pentanone	1.31E–05	4.91E–06	NA
Tetrachloroethene	2.32E–05	8.69E–06	1.1*
Toluene	1.41E–05	5.29E–06	1248.8
Trichloroethene	3.53E–05	1.32E–05	0.8*
Vinyl chloride	6.55E–06	2.46E–06	0.023*
Total Xylenes	5.64E–07	2.12E–07	1448.6

* Class A Carcinogens risk is made using annual average
NA ASIL does not now exist for this compound



LEGEND

B-105 ● BORING NUMBER AND LOCATION

TP-10 ▬ TEST PIT NUMBER AND LOCATION

GP-13 ◉ GAS PROBE NUMBER AND LOCATION

—8— BENZENE CONCENTRATION CONTOUR IN PARTS PER BILLION (PPB)

N

0 200 400

SCALE IN FEET

RZA AGRA, INC.
Engineering & Environmental Services

11335 N.E. 122nd Way
Suite 100
Kirkland, Washington 98034-6918

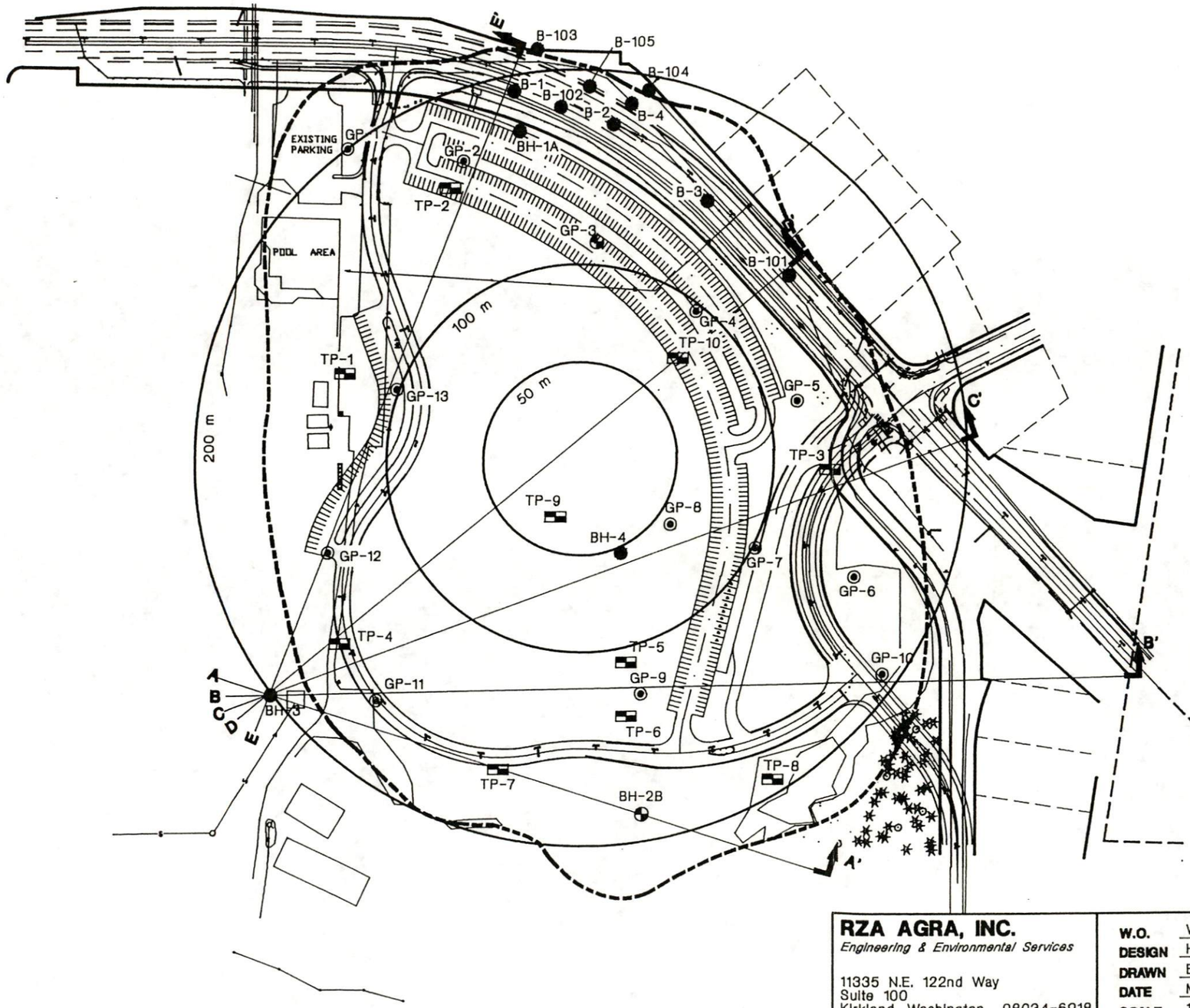
W.O.	W-7764-1
DESIGN	HWB
DRAWN	BDT
DATE	JUN 1992
SCALE	1"=200'

McCOLLUM PARK - PARK & RIDE LOT
EVERETT, WASHINGTON

BENZENE CONCENTRATION MAP

FIGURE C1

DRAWING NO. \78\W-7764\BEN-CONC.DWG



LEGEND

- GP-13 ◉ — GAS PROBE NUMBER AND LOCATION (THIS STUDY)
- BH-2B ◓ — MONITORING WELL NUMBER AND APPROXIMATE LOCATION PTL, APRIL 1990
- TP-10 ▬ — TEST PIT NUMBER AND LOCATION EARTH CONSULTANTS, NOVEMBER 1989
- B-105 ● — BORING NUMBER AND LOCATION RZA, MARCH 1986
- APPROXIMATE LIMITS OF LANDFILL
- E E' — CROSS-SECTION LOCATION (FIGURES 3 TO 7)
- LOCATION OF ESTIMATED BENZENE CONC. 50 m = 5 ug/m³, 100 m = 4 ug/m³, 200 m = 2 ug/m³.

N

0 200 400

SCALE IN FEET

RZA AGRA, INC.
Engineering & Environmental Services

11335 N.E. 122nd Way
Suite 100
Kirkland, Washington 98034-6918

W.O.	W-7764
DESIGN	HWB
DRAWN	BDT
DATE	MAY 1992
SCALE	1"=200'

McCOLLUM PARK - PARK & RIDE LOT
EVERETT, WASHINGTON

LOCATION OF ESTIMATED AMBIENT BENZENE CONCENTRATIONS

FIGURE C2

DRAWING NO. \7B\W-7764-1\SITE.DWG

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 10, 1992

Report On: Analysis of Soil

Lab No.: 22981-1

IDENTIFICATION:

Sample Received on 03-03-92
Project: W-7764 McCollum Park
Client ID: B-9,S-4

ANALYSIS:

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8240 (Volatile Organics)

CAS No.	Compounds	Concentration ug/kg	PQL
74-87-3	Chloromethane	ND	12,000
74-83-9	Bromomethane	ND	12,000
75-01-4	Vinyl Chloride	ND	12,000
75-00-3	Chloroethane	ND	12,000
75-09-2	Methylene Chloride	ND	6,000
67-64-1	Acetone	ND	60,000
75-15-0	Carbon Disulfide	ND	6,000
75-35-4	1,1-Dichloroethene	ND	6,000
75-34-3	1,1-Dichloroethane	ND	6,000
540-59-0	1,2-Dichloroethene (Total)	ND	6,000
67-66-3	Chloroform	ND	6,000
107-06-2	1,2-Dichloroethane	ND	6,000
78-93-3	2-Butanone	ND	30,000
71-55-6	1,1,1-Trichloroethane	ND	6,000
56-23-5	Carbon Tetrachloride	ND	6,000
108-05-4	Vinyl Acetate	ND	30,000
75-27-4	Bromodichloromethane	ND	6,000
78-87-5	1,2-Dichloropropane	ND	6,000
10061-01-5	Cis-1,3-Dichloropropene	ND	6,000
79-01-6	Trichloroethene	*(5,400)	6,000
124-48-1	Dibromochloromethane	ND	6,000
79-00-5	1,1,2-Trichloroethane	ND	6,000

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA

Lab No. 22981-1
March 10, 1992

Client ID: B-9,S-4

EPA Method 8240 Continued . . . . .

CAS No.	Compounds	Concentration ug/kg	PQL
71-43-2	Benzene	*(2,300)	6,000
10061-02-6	Trans-1,3-Dichloropropene	ND	6,000
75-25-2	Bromoform	ND	6,000
108-10-1	4-Methyl-2-Pentanone	ND	30,000
591-78-6	2-Hexanone	ND	6,000
127-18-4	Tetrachloroethene	ND	6,000
79-34-5	1,1,2,2-Tetrachloroethane	ND	6,000
108-88-3	Toluene	36,000	6,000
108-90-7	Chlorobenzene	ND	6,000
100-41-4	Ethyl Benzene	11,000	6,000
100-42-5	Styrene	ND	6,000
1330-20-7	Total Xylenes	63,000	6,000

ND = Not Detected

PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

* = Compound was detected but below PQL.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	98	81 - 117
Bromofluorobenzene	96	74 - 121
1,2-Dichloroethane D4	97	70 - 121

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA

Lab No. 22981-1
March 10, 1992

Client ID: B-9,S-4

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8270 (ABN Semivolatiles)

CAS No.	Compounds	Concentration ug/kg	PQL
108-95-2	Phenol	ND	110,000
111-44-4	bis(2-Chloroethyl) ether	ND	110,000
95-57-8	2-Chlorophenol	ND	110,000
541-73-1	1,3-Dichlorobenzene	ND	110,000
106-46-7	1,4-Dichlorobenzene	*(20,000)	110,000
100-51-6	Benzyl Alcohol	ND	230,000
95-50-1	1,2-Dichlorobenzene	ND	110,000
95-48-7	2-Methylphenol	140,000	110,000
39638-32-9	bis(2-Chloroisopropyl)ether	ND	110,000
106-44-5	4-Methylphenol	ND	110,000
621-64-7	N-Nitroso-Di-N-propylamine	ND	110,000
67-72-1	Hexachloroethane	ND	110,000
98-95-3	Nitrobenzene	ND	110,000
78-59-1	Isophorone	ND	110,000
88-75-5	2-Nitrophenol	ND	110,000
105-67-9	2,4-Dimethylphenol	ND	110,000
65-85-0	Benzoic Acid	ND	570,000
111-91-1	bis(2-Chloroethoxy)methane	ND	110,000
120-83-2	2,4-Dichlorophenol	ND	110,000
120-82-1	1,2,4-Trichlorobenzene	ND	110,000
91-20-3	Naphthalene	300,000	110,000
106-47-8	4-Chloroaniline	ND	230,000
87-68-3	Hexachlorobutadiene	ND	110,000
59-50-7	4-Chloro-3-methylphenol	ND	230,000

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA

Lab No. 22981-1
March 10, 1992

Client ID: B-9,S-4

EPA Method 8270 continued

CAS No.	Compounds	Concentration ug/kg	PQL
91-57-6	2-Methylnaphthalene	690,000	110,000
77-47-4	Hexachlorocyclopentadiene	ND	110,000
88-06-2	2,4,6-Trichlorophenol	ND	110,000
95-95-4	2,4,5-Trichlorophenol	ND	110,000
91-58-7	2-Chloronaphthalene	ND	110,000
88-74-4	2-Nitroaniline	ND	570,000
131-11-3	Dimethyl phthalate	ND	110,000
208-96-8	Acenaphthylene	ND	110,000
99-09-2	3-Nitroaniline	ND	570,000
83-32-9	Acenaphthene	*(31,000)	110,000
51-28-5	2,4-Dinitrophenol	ND	570,000
100-02-7	4-Nitrophenol	ND	570,000
132-64-9	Dibenzofuran	ND	110,000
121-14-2	2,4-Dinitrotoluene	ND	110,000
606-20-2	2,6-Dinitrotoluene	ND	110,000
84-66-2	Diethylphthalate	ND	110,000
7005-72-3	4-Chlorophenyl phenyl ether	ND	110,000
86-73-7	Fluorene	*(48,000)	110,000
100-01-6	4-Nitroaniline	ND	570,000
534-52-1	4,6-Dinitro-2-methylphenol	ND	570,000
86-30-6	N-Nitrosodiphenylamine	ND	110,000
101-55-3	4-Bromophenyl phenyl ether	ND	110,000
118-74-1	Hexachlorobenzene	ND	110,000
87-86-5	Pentachlorophenol	ND	570,000
85-01-8	Phenanthrene	160,000	110,000
120-12-7	Anthracene	ND	110,000
84-74-2	Di-n-butylphthalate	160,000	110,000

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Page 5 of 7
Lab No. 22981-1
March 10, 1992

Client ID: B-9,S-4

EPA Method 8270 Continued

CAS No.	Compounds	Concentration ug/kg	PQL
206-44-0	Fluoranthene	*(12,000)	110,000
129-00-0	Pyrene	*(18,000)	110,000
85-68-7	Butyl benzyl phthalate	ND	110,000
91-94-1	3,3'-Dichlorobenzidine	ND	110,000
56-55-3	Benzo(a)anthracene	ND	110,000
117-81-7	bis(2-ethylhexyl)phthalate	ND	110,000
218-01-9	Chrysene	ND	110,000
117-84-0	Di-n-octyl phthalate	ND	110,000
205-99-2	Benzo(b)fluoranthene	ND	110,000
207-08-9	Benzo(k)fluoranthene	ND	110,000
50-32-8	Benzo(a)pyrene	ND	110,000
193-39-5	Indeno(1,2,3-cd)pyrene	ND	110,000
53-70-3	Dibenz(a,h)anthracene	ND	110,000
191-24-2	Benzo(g,h,i)perylene	ND	110,000

ND = Not Detected
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.
* = Compound was detected but below PQL. Value shown is an estimated quantity.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits Water	Soil
Nitrobenzene - d_5	91	35 - 114	23 - 120
2-Fluorobiphenyl	118**	43 - 116	30 - 115
p-Terphenyl-d_{14}	99	33 - 141	18 - 137
Phenol-d_6	97	10 - 94	24 - 113
2-Fluorophenol	96	21 - 100	25 - 121
2,4,6-Tribromophenol	104	10 - 123	19 - 122

** Surrogate recovery outside control limits due to matrix interference.

Continued . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA

Lab No. 22981-1
March 10, 1992

Client ID: B-9,S-4

Sample was extracted in accordance with Toxicity Characteristic Leaching Procedure (TCLP) in accordance with EPA SW-846 Method 1311. The TCLP leachate was analyzed for metals in accordance with EPA SW-846 Method 6010 (ICP). Mercury was analyzed by cold vapor AA per Method 7470.

Contaminant	Concentration (mg/l)	Max Conc., (mg/l)
Arsenic	0.7	5.0
Barium	< 0.1	100.0
Cadmium	< 0.1	1.0
Chromium	0.2	5.0
Lead	2.5	5.0
Mercury	< 0.002	0.2
Selenium	< 0.1	1.0
Silver	< 0.1	5.0

Continued . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Page 7 of 7
Lab No. 22981-1
March 10, 1992

Client ID: B-9,S-4

PCB Compounds	Conc., mg/kg	Detection Limit
Aroclor 1016	ND	0.1
Aroclor 1221	ND	0.1
Aroclor 1232	ND	0.1
Aroclor 1242	ND	0.1
Aroclor 1248	ND	0.1
Aroclor 1254	ND	0.1
Aroclor 1260	ND	0.1

ND = Not Detected.

SURROGATE RECOVERY, %	
2,4,5,6-Tetrachloro-m-xylene	*
Decachlorobiphenyl	108

* Surrogate Recovery invalid due to matrix interference.

pH 4.4

SOUND ANALYTICAL SERVICES

Dennis L. Bean

DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 10, 1992

Report On: Analysis of Soil

Lab No.: 22981-2

IDENTIFICATION:

Sample Received on 03-03-92
Project: W-7764 McCollum Park
Client ID: B-4,S-1

ANALYSIS:

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8240 (Volatile Organics)

CAS No.	Compounds	Concentration ug/kg	PQL
74-87-3	Chloromethane	ND	400
74-83-9	Bromomethane	ND	400
75-01-4	Vinyl Chloride	ND	400
75-00-3	Chloroethane	ND	400
75-09-2	Methylene Chloride	ND	200
67-64-1	Acetone	ND	2,000
75-15-0	Carbon Disulfide	ND	200
75-35-4	1,1-Dichloroethene	ND	200
75-34-3	1,1-Dichloroethane	ND	200
540-59-0	1,2-Dichloroethene (Total)	ND	200
67-66-3	Chloroform	ND	200
107-06-2	1,2-Dichloroethane	ND	200
78-93-3	2-Butanone	ND	1,000
71-55-6	1,1,1-Trichloroethane	ND	200
56-23-5	Carbon Tetrachloride	ND	200
108-05-4	Vinyl Acetate	ND	1,000
75-27-4	Bromodichloromethane	ND	200
78-87-5	1,2-Dichloropropane	ND	200
10061-01-5	Cis-1,3-Dichloropropene	ND	200
79-01-6	Trichloroethene	ND	200
124-48-1	Dibromochloromethane	ND	200
79-00-5	1,1,2-Trichloroethane	ND	200

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA

Lab No. 22981-2
March 10, 1992

Client ID: B-4,S-1

EPA Method 8240 Continued . . . . .

CAS No.	Compounds	Concentration ug/kg	PQL
71-43-2	Benzene	ND	200
10061-02-6	Trans-1,3-Dichloropropene	ND	200
75-25-2	Bromoform	ND	200
108-10-1	4-Methyl-2-Pentanone	ND	1,000
591-78-6	2-Hexanone	ND	200
127-18-4	Tetrachloroethene	ND	200
79-34-5	1,1,2,2-Tetrachloroethane	ND	200
108-88-3	Toluene	ND	200
108-90-7	Chlorobenzene	ND	200
100-41-4	Ethyl Benzene	ND	200
100-42-5	Styrene	ND	200
1330-20-7	Total Xylenes	ND	200

ND = Not Detected

PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	96	81 - 117
Bromofluorobenzene	100	74 - 121
1,2-Dichloroethane D4	81	70 - 121

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA

Lab No. 22981-2
March 10, 1992

Client ID: B-4,S-1

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8270 (ABN Semivolatiles)

CAS No.	Compounds	Concentration ug/kg	PQL
108-95-2	Phenol	ND	360
111-44-4	bis(2-Chloroethyl) ether	ND	360
95-57-8	2-Chlorophenol	ND	360
541-73-1	1,3-Dichlorobenzene	ND	360
106-46-7	1,4-Dichlorobenzene	ND	360
100-51-6	Benzyl Alcohol	ND	720
95-50-1	1,2-Dichlorobenzene	ND	360
95-48-7	2-Methylphenol	ND	360
39638-32-9	bis(2-Chloroisopropyl)ether	ND	360
106-44-5	4-Methylphenol	ND	360
621-64-7	N-Nitroso-Di-N-propylamine	ND	360
67-72-1	Hexachloroethane	ND	360
98-95-3	Nitrobenzene	ND	360
78-59-1	Isophorone	ND	360
88-75-5	2-Nitrophenol	ND	360
105-67-9	2,4-Dimethylphenol	ND	360
65-85-0	Benzoic Acid	ND	1,800
111-91-1	bis(2-Chloroethoxy)methane	ND	360
120-83-2	2,4-Dichlorophenol	ND	360
120-82-1	1,2,4-Trichlorobenzene	ND	360
91-20-3	Naphthalene	ND	360
106-47-8	4-Chloroaniline	ND	720
87-68-3	Hexachlorobutadiene	ND	360
59-50-7	4-Chloro-3-methylphenol	ND	720

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Page 4 of 6
Lab No. 22981-2
March 10, 1992

Client ID: B-4,S-1

EPA Method 8270 continued

CAS No.	Compounds	Concentration ug/kg	PQL
91-57-6	2-Methylnaphthalene	ND	360
77-47-4	Hexachlorocyclopentadiene	ND	360
88-06-2	2,4,6-Trichlorophenol	ND	360
95-95-4	2,4,5-Trichlorophenol	ND	360
91-58-7	2-Chloronaphthalene	ND	360
88-74-4	2-Nitroaniline	ND	1,800
131-11-3	Dimethyl phthalate	ND	360
208-96-8	Acenaphthylene	ND	360
99-09-2	3-Nitroaniline	ND	1,800
83-32-9	Acenaphthene	ND	360
51-28-5	2,4-Dinitrophenol	ND	1,800
100-02-7	4-Nitrophenol	ND	1,800
132-64-9	Dibenzofuran	ND	360
121-14-2	2,4-Dinitrotoluene	ND	360
606-20-2	2,6-Dinitrotoluene	ND	360
84-66-2	Diethylphthalate	ND	360
7005-72-3	4-Chlorophenyl phenyl ether	ND	360
86-73-7	Fluorene	ND	360
100-01-6	4-Nitroaniline	ND	1,800
534-52-1	4,6-Dinitro-2-methylphenol	ND	1,800
86-30-6	N-Nitrosodiphenylamine	ND	360
101-55-3	4-Bromophenyl phenyl ether	ND	360
118-74-1	Hexachlorobenzene	ND	360
87-86-5	Pentachlorophenol	ND	1,800
85-01-8	Phenanthrene	ND	360
120-12-7	Anthracene	ND	360
84-74-2	Di-n-butylphthalate	1,990	360

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

Client ID: B-4,S-1

EPA Method 8270 Continued

CAS No.	Compounds	Concentration ug/kg	PQL
206-44-0	Fluoranthene	ND	360
129-00-0	Pyrene	ND	360
85-68-7	Butyl benzyl phthalate	*(62)	360
91-94-1	3,3'-Dichlorobenzidine	ND	360
56-55-3	Benzo(a)anthracene	ND	360
117-81-7	bis(2-ethylhexyl)phthalate	ND	360
218-01-9	Chrysene	ND	360
117-84-0	Di-n-octyl phthalate	ND	360
205-99-2	Benzo(b)fluoranthene	ND	360
207-08-9	Benzo(k)fluoranthene	ND	360
50-32-8	Benzo(a)pyrene	ND	360
193-39-5	Indeno(1,2,3-cd)pyrene	ND	360
53-70-3	Dibenz(a,h)anthracene	ND	360
191-24-2	Benzo(g,h,i)perylene	ND	360

ND = Not Detected
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.
* = Compound was detected but below PQL. Value shown is an estimated quantity.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits Water	Soil
Nitrobenzene - d_5	46	35 - 114	23 - 120
2-Fluorobiphenyl	47	43 - 116	30 - 115
p-Terphenyl-d_{14}	47	33 - 141	18 - 137
Phenol-d_6	44	10 - 94	24 - 113
2-Fluorophenol	42	21 - 100	25 - 121
2,4,6-Tribromophenol	68	10 - 123	19 - 122

Continued . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Page 6 of 6
Lab No. 22981-2
March 10, 1992

Client ID: B-4,S-1

Sample was extracted in accordance with Toxicity Characteristic Leaching Procedure (TCLP) in accordance with EPA SW-846 Method 1311. The TCLP leachate was analyzed for metals in accordance with EPA SW-846 Method 6010 (ICP). Mercury was analyzed by cold vapor AA per Method 7470.

Contaminant	Concentration (mg/l)	Max Conc., (mg/l)
Arsenic	< 0.1	5.0
Barium	0.1	100.0
Cadmium	< 0.1	1.0
Chromium	< 0.1	5.0
Lead	< 0.1	5.0
Mercury	< 0.002	0.2
Selenium	< 0.1	1.0
Silver	< 0.1	5.0
pH	6.3	

SOUND ANALYTICAL SERVICES

Dennis L. Bean

DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 10, 1992

Report On: Analysis of Soil

Lab No.: 22981-3

IDENTIFICATION:

Sample Received on 03-03-92
Project: W-7764 McCollum Park
Client ID: B-9,S-6

ANALYSIS:

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8240 (Volatile Organics)

CAS No.	Compounds	Concentration ug/kg	PQL
74-87-3	Chloromethane	ND	500
74-83-9	Bromomethane	ND	500
75-01-4	Vinyl Chloride	ND	500
75-00-3	Chloroethane	ND	500
75-09-2	Methylene Chloride	ND	250
67-64-1	Acetone	ND	2,500
75-15-0	Carbon Disulfide	ND	250
75-35-4	1,1-Dichloroethene	ND	250
75-34-3	1,1-Dichloroethane	ND	250
540-59-0	1,2-Dichloroethene (Total)	ND	250
67-66-3	Chloroform	ND	250
107-06-2	1,2-Dichloroethane	ND	250
78-93-3	2-Butanone	ND	1,250
71-55-6	1,1,1-Trichloroethane	ND	250
56-23-5	Carbon Tetrachloride	ND	250
108-05-4	Vinyl Acetate	ND	1,250
75-27-4	Bromodichloromethane	ND	250
78-87-5	1,2-Dichloropropane	ND	250
10061-01-5	Cis-1,3-Dichloropropene	ND	250
79-01-6	Trichloroethene	ND	250
124-48-1	Dibromochloromethane	ND	250
79-00-5	1,1,2-Trichloroethane	ND	250

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Page 2 of 6
Lab No. 22981-3
March 10, 1992

Client ID: B-9,S-6

EPA Method 8240 Continued . . . . .

CAS No.	Compounds	Concentration ug/kg	PQL
71-43-2	Benzene	ND	250
10061-02-6	Trans-1,3-Dichloropropene	ND	250
75-25-2	Bromoform	ND	250
108-10-1	4-Methyl-2-Pentanone	ND	1,250
591-78-6	2-Hexanone	ND	250
127-18-4	Tetrachloroethene	ND	250
79-34-5	1,1,2,2-Tetrachloroethane	ND	250
108-88-3	Toluene	ND	250
108-90-7	Chlorobenzene	ND	250
100-41-4	Ethyl Benzene	ND	250
100-42-5	Styrene	ND	250
1330-20-7	Total Xylenes	ND	250

ND = Not Detected

PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	94	81 - 117
Bromofluorobenzene	104	74 - 121
1,2-Dichloroethane D4	82	70 - 121

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA

Lab No. 22981-3
March 10, 1992

Client ID: B-9,S-6

Sample was analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986 Method 8270 (ABN Semivolatiles)

CAS No.	Compounds	Concentration ug/kg	PQL
108-95-2	Phenol	ND	400
111-44-4	bis(2-Chloroethyl) ether	ND	400
95-57-8	2-Chlorophenol	ND	400
541-73-1	1,3-Dichlorobenzene	ND	400
106-46-7	1,4-Dichlorobenzene	ND	400
100-51-6	Benzyl Alcohol	ND	800
95-50-1	1,2-Dichlorobenzene	ND	400
95-48-7	2-Methylphenol	ND	400
39638-32-9	bis(2-Chloroisopropyl)ether	ND	400
106-44-5	4-Methylphenol	ND	400
621-64-7	N-Nitroso-Di-N-propylamine	ND	400
67-72-1	Hexachloroethane	ND	400
98-95-3	Nitrobenzene	ND	400
78-59-1	Isophorone	ND	400
88-75-5	2-Nitrophenol	ND	400
105-67-9	2,4-Dimethylphenol	ND	400
65-85-0	Benzoic Acid	ND	2,000
111-91-1	bis(2-Chloroethoxy)methane	ND	400
120-83-2	2,4-Dichlorophenol	ND	400
120-82-1	1,2,4-Trichlorobenzene	ND	400
91-20-3	Naphthalene	*(110)	400
106-47-8	4-Chloroaniline	ND	800
87-68-3	Hexachlorobutadiene	ND	400
59-50-7	4-Chloro-3-methylphenol	ND	800

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Page 4 of 6
Lab No. 22981-3
March 10, 1992

Client ID: B-9,S-6

EPA Method 8270 continued

CAS No.	Compounds	Concentration ug/kg	PQL
91-57-6	2-Methylnaphthalene	*(360)	400
77-47-4	Hexachlorocyclopentadiene	ND	400
88-06-2	2,4,6-Trichlorophenol	ND	400
95-95-4	2,4,5-Trichlorophenol	ND	400
91-58-7	2-Chloronaphthalene	ND	400
88-74-4	2-Nitroaniline	ND	2,000
131-11-3	Dimethyl phthalate	ND	400
208-96-8	Acenaphthylene	ND	400
99-09-2	3-Nitroaniline	ND	2,000
83-32-9	Acenaphthene	*(130)	400
51-28-5	2,4-Dinitrophenol	ND	2,000
100-02-7	4-Nitrophenol	ND	2,000
132-64-9	Dibenzofuran	*(110)	400
121-14-2	2,4-Dinitrotoluene	ND	400
606-20-2	2,6-Dinitrotoluene	ND	400
84-66-2	Diethylphthalate	ND	400
7005-72-3	4-Chlorophenyl phenyl ether	ND	400
86-73-7	Fluorene	ND	400
100-01-6	4-Nitroaniline	ND	2,000
534-52-1	4,6-Dinitro-2-methylphenol	ND	2,000
86-30-6	N-Nitrosodiphenylamine	ND	400
101-55-3	4-Bromophenyl phenyl ether	ND	400
118-74-1	Hexachlorobenzene	ND	400
87-86-5	Pentachlorophenol	ND	2,000
85-01-8	Phenanthrene	610	400
120-12-7	Anthracene	*(49)	400
84-74-2	Di-n-butylphthalate	1,900	400

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Page 5 of 6
Lab No. 22981-3
March 10, 1992

Client ID: B-9,S-6

EPA Method 8270 Continued

CAS No.	Compounds	Concentration ug/kg	PQL
206-44-0	Fluoranthene	*(76)	400
129-00-0	Pyrene	*(69)	400
85-68-7	Butyl benzyl phthalate	*(64)	400
91-94-1	3,3'-Dichlorobenzidine	ND	400
56-55-3	Benzo(a)anthracene	ND	400
117-81-7	bis(2-ethylhexyl)phthalate	*(62)	400
218-01-9	Chrysene	ND	400
117-84-0	Di-n-octyl phthalate	ND	400
205-99-2	Benzo(b)fluoranthene	ND	400
207-08-9	Benzo(k)fluoranthene	ND	400
50-32-8	Benzo(a)pyrene	ND	400
193-39-5	Indeno(1,2,3-cd)pyrene	ND	400
53-70-3	Dibenz(a,h)anthracene	ND	400
191-24-2	Benzo(g,h,i)perylene	ND	400

ND = Not Detected
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.
* = Compound was detected but below PQL. Value shown is an estimated quantity.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits Water	Soil
Nitrobenzene - d_5	70	35 - 114	23 - 120
2-Fluorobiphenyl	65	43 - 116	30 - 115
p-Terphenyl-d_{14}	58	33 - 141	18 - 137
Phenol-d_6	70	10 - 94	24 - 113
2-Fluorophenol	67	21 - 100	25 - 121
2,4,6-Tribromophenol	103	10 - 123	19 - 122

Continued . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Page 6 of 6
Lab No. 22981-3
March 10, 1992

Client ID: B-9,S-6

Sample was extracted in accordance with Toxicity Characteristic Leaching Procedure (TCLP) in accordance with EPA SW-846 Method 1311. The TCLP leachate was analyzed for metals in accordance with EPA SW-846 Method 6010 (ICP). Mercury was analyzed by cold vapor AA per Method 7470.

Contaminant	Concentration (mg/l)	Max Conc., (mg/l)
Arsenic	< 0.1	5.0
Barium	0.2	100.0
Cadmium	< 0.1	1.0
Chromium	< 0.1	5.0
Lead	< 0.1	5.0
Mercury	< 0.002	0.2
Selenium	< 0.1	1.0
Silver	< 0.1	5.0
pH	6.3	

SOUND ANALYTICAL SERVICES

Dennis L. Bean

DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

METHOD BLANK

Client: RZA - AGRA
Project: W-7764 McCollum Park
Lab No: 22981
Units: mg/kg
Date: March 10, 1992

PARAMETER	BLANK VALUE
Aroclor 1016	< 0.1
Aroclor 1221	< 0.1
Aroclor 1232	< 0.1
Aroclor 1242	< 0.1
Aroclor 1248	< 0.1
Aroclor 1254	< 0.1
Aroclor 1260	< 0.1
Surrogate Recovery, %	
2,4,5,6-TCMX	101
Decachlorobiphenyl	103

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

ANALYTICAL NARRATIVE

Client: RZA - AGRA

Date: March 10, 1992

Project: W-7764 McCollum Park

Lab No.: 22981

Delivered by: SAS

Date Sampled: 02-24-92 and 02-26-92

Condition of Samples on Receipt:

Samples were received cold and in good condition. Chain-of-custody was in order.

EXTRACTION AND ANALYSIS DATES

Samples were extracted using Toxicity Characteristic Leaching Procedure (TCLP) in accordance with EPA SW-846 Method 1311 on 03-04-92. The TCLP leachates were analyzed for metals by ICP in accordance with Method 6010 on 03-09-92. Mercury was analyzed by cold vapor AA per Method 7470 on 03-06-92.

Samples were analyzed for PCB's in accordance with EPA SW-846 Method 8080. Soil samples were extracted on 03-03-92 and analyzed on 03-04-92. Results are reported on a dry weight basis.

Samples were analyzed for volatile organics by GC/MS in accordance with EPA SW-846 Method 8240. Soil samples were extracted on 03-03-92. The extracts were analyzed on 03-04-92 and reported on a dry weight basis.

Samples were analyzed for semi-volatile organics by GC/MS in accordance with EPA SW-846 Method 8270. Soil samples were extracted on 03-04-92. The extracts were analyzed on 03-05-92 and reported on a dry weight basis.

All Quality Control was within acceptable limits.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-1

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-1A S-1

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 624 (Purgeable Organics).

CAS No.	Compounds	Concentration ug/l	PQL
74-87-3	Chloromethane	ND	10
74-83-9	Bromomethane	ND	10
75-01-4	Vinyl Chloride	ND	10
75-00-3	Chloroethane	ND	10
75-09-2	Methylene Chloride	ND	5
67-64-1	Acetone	ND	50
75-15-0	Carbon Disulfide	ND	5
75-35-4	1,1-Dichloroethene	ND	5
75-34-3	1,1-Dichloroethane	ND	5
540-59-0	1,2-Dichloroethene (Total)	ND	5
67-66-3	Chloroform	ND	5
107-06-2	1,2-Dichloroethane	ND	5
78-93-3	2-Butanone	ND	25
71-55-6	1,1,1-Trichloroethane	ND	5
56-23-5	Carbon Tetrachloride	ND	5
108-05-4	Vinyl Acetate	ND	25
75-27-4	Bromodichloromethane	ND	5
78-87-5	1,2-Dichloropropane	ND	5
10061-01-5	Cis-1,3-Dichloropropene	ND	5
79-01-6	Trichloroethene	ND	5
124-48-1	Dibromochloromethane	ND	5
79-00-5	1,1,2-Trichloroethane	ND	5

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764
Lab No. 23105-1

March 18, 1992

Client ID: BH-1A S-1

EPA Method 624 Continued . . . . .

CAS No.	Compounds	Concentration ug/l	PQL
71-43-2	Benzene	*(3.0)	5
10061-02-6	Trans-1,3-Dichloropropene	ND	5
75-25-2	Bromoform	ND	5
108-10-1	4-Methyl-2-Pentanone	ND	25
591-78-6	2-Hexanone	ND	5
127-18-4	Tetrachloroethene	ND	5
79-34-5	1,1,2,2-Tetrachloroethane	ND	5
108-88-3	Toluene	ND	5
108-90-7	Chlorobenzene	14	5
100-41-4	Ethyl Benzene	ND	5
100-42-5	Styrene	ND	5
1330-20-7	Total Xylenes	ND	5

ND = Not Detected
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.
* = Compound was detected but below PQL. Value shown is an estimated quantity.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	98	81 - 117
Bromofluorobenzene	91	74 - 121
1,2-Dichloroethane D4	99	70 - 121

SOUND ANALYTICAL SERVICES

DENNIS L. BEAN

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-5

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-1A S-2

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 625 (Base/Neutrals & Acids).

CAS No.	Compounds	Concentration ug/l	PQL
108-95-2	Phenol	ND	9.8
111-44-4	bis(2-Chloroethyl) ether	ND	9.8
95-57-8	2-Chlorophenol	ND	9.8
541-73-1	1,3-Dichlorobenzene	ND	9.8
106-46-7	1,4-Dichlorobenzene	*(2.5)	9.8
100-51-6	Benzyl Alcohol	ND	20
95-50-1	1,2-Dichlorobenzene	ND	9.8
95-48-7	2-Methylphenol	ND	9.8
39638-32-9	bis(2-Chloroisopropyl)ether	ND	9.8
106-44-5	4-Methylphenol	ND	9.8
621-64-7	N-Nitroso-Di-N-propylamine	ND	9.8
67-72-1	Hexachloroethane	ND	9.8
98-95-3	Nitrobenzene	ND	9.8
78-59-1	Isophorone	ND	9.8
88-75-5	2-Nitrophenol	ND	9.8
105-67-9	2,4-Dimethylphenol	ND	9.8
65-85-0	Benzoic Acid	ND	49
111-91-1	bis(2-Chloroethoxy)methane	ND	9.8
120-83-2	2,4-Dichlorophenol	ND	9.8
120-82-1	1,2,4-Trichlorobenzene	ND	9.8
91-20-3	Naphthalene	*(9.7)	9.8
106-47-8	4-Chloroaniline	ND	20
87-68-3	Hexachlorobutadiene	ND	9.8
59-50-7	4-Chloro-3-methylphenol	ND	20

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764

Lab No. 23105-5
March 18, 1992

Client ID: BH-1A S-2

EPA Method 625 Continued

CAS No.	Compounds	Concentration ug/l	PQL
91-57-6	2-Methylnaphthalene	*(6.0)	9.8
77-47-4	Hexachlorocyclopentadiene	ND	9.8
88-06-2	2,4,6-Trichlorophenol	ND	9.8
95-95-4	2,4,5-Trichlorophenol	ND	9.8
91-58-7	2-Chloronaphthalene	ND	9.8
88-74-4	2-Nitroaniline	ND	49
131-11-3	Dimethyl phthalate	ND	9.8
208-96-8	Acenaphthylene	ND	9.8
99-09-2	3-Nitroaniline	ND	49
83-32-9	Acenaphthene	ND	9.8
51-28-5	2,4-Dinitrophenol	ND	49
100-02-7	4-Nitrophenol	ND	49
132-64-9	Dibenzofuran	ND	9.8
121-14-2	2,4-Dinitrotoluene	ND	9.8
606-20-2	2,6-Dinitrotoluene	ND	9.8
84-66-2	Diethylphthalate	*(9.2)	9.8
7005-72-3	4-Chlorophenyl phenyl ether	ND	9.8
86-73-7	Fluorene	ND	9.8
100-01-6	4-Nitroaniline	ND	49
534-52-1	4,6-Dinitro-2-methylphenol	ND	49
86-30-6	N-Nitrosodiphenylamine	ND	9.8
101-55-3	4-Bromophenyl phenyl ether	ND	9.8
118-74-1	Hexachlorobenzene	ND	9.8
87-86-5	Pentachlorophenol	ND	49
85-01-8	Phenanthrene	ND	9.8
120-12-7	Anthracene	ND	9.8
84-74-2	Di-n-butylphthalate	ND	9.8

ND = Not Detected

* Compound was detected but below PQL. Value shown is an estimated quantity.

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764

Lab No. 23105-5
March 18, 1992

Client ID: BH-1A S-2

EPA Method 625 Continued

CAS No.	Compounds	Concentration ug/l	PQL
206-44-0	Fluoranthene	ND	9.8
129-00-0	Pyrene	ND	9.8
85-68-7	Butyl benzyl phthalate	ND	9.8
91-94-1	3,3'-Dichlorobenzidine	ND	20
56-55-3	Benzo(a)anthracene	ND	9.8
117-81-7	bis(2-ethylhexyl)phthalate	ND	9.8
218-01-9	Chrysene	ND	9.8
117-84-0	Di-n-octyl phthalate	ND	9.8
205-99-2	Benzo(b)fluoranthene	ND	9.8
207-08-9	Benzo(k)fluoranthene	ND	9.8
50-32-8	Benzo(a)pyrene	ND	9.8
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.8
53-70-3	Dibenz(a,h)anthracene	ND	9.8
191-24-2	Benzo(g,h,i)perylene	ND	9.8

ND = Not Detected
PQL - Practical Quantitation Limit - These are the quantitation limits for this sample. This number is based on sample size, matrix and dilution required.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits Water	Soil
Nitrobenzene - d_5	60	35 - 114	23 - 120
2-Fluorobiphenyl	60	43 - 116	30 - 115
p-Terphenyl-d_{14}	61	33 - 141	18 - 137
Phenol-d_6	29	10 - 94	24 - 113
2-Fluorophenol	43	21 - 100	25 - 121
2,4,6-Tribromophenol	76	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES

Dennis L. Bean

DENNIS L. BEAN

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA Date: March 18, 1992

Report On: Analysis of Water Lab No.: 23105-9

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-1 S-3

ANALYSIS:

Total Metals:	Concentration, ug/l
Arsenic (GFAA)	50
Barium	740
Cadmium	< 5
Chromium	100
Copper	130
Lead (GFAA)	32
Mercury (CVAA)	0.3
Nickel	460
Selenium (GFAA)	< 5
Silver	30
Zinc	720

SOUND ANALYTICAL SERVICES

STAN P. PALMQUIST

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-2

IDENTIFICATION:

Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-2B S-1

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 624 (Purgeable Organics).

CAS No.	Compounds	Concentration ug/l	PQL
74-87-3	Chloromethane	ND	10
74-83-9	Bromomethane	ND	10
75-01-4	Vinyl Chloride	ND	10
75-00-3	Chloroethane	ND	10
75-09-2	Methylene Chloride	ND	5
67-64-1	Acetone	ND	50
75-15-0	Carbon Disulfide	ND	5
75-35-4	1,1-Dichloroethene	ND	5
75-34-3	1,1-Dichloroethane	ND	5
540-59-0	1,2-Dichloroethene (Total)	ND	5
67-66-3	Chloroform	ND	5
107-06-2	1,2-Dichloroethane	ND	5
78-93-3	2-Butanone	ND	25
71-55-6	1,1,1-Trichloroethane	ND	5
56-23-5	Carbon Tetrachloride	ND	5
108-05-4	Vinyl Acetate	ND	25
75-27-4	Bromodichloromethane	ND	5
78-87-5	1,2-Dichloropropane	ND	5
10061-01-5	Cis-1,3-Dichloropropene	ND	5
79-01-6	Trichloroethene	ND	5
124-48-1	Dibromochloromethane	ND	5
79-00-5	1,1,2-Trichloroethane	ND	5

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764
Lab No. 23105-2

March 18, 1992

Client ID: BH-2B S-1

EPA Method 624 Continued . . . . .

CAS No.	Compounds	Concentration ug/l	PQL
71-43-2	Benzene	*(4.8)	5
10061-02-6	Trans-1,3-Dichloropropene	ND	5
75-25-2	Bromoform	ND	5
108-10-1	4-Methyl-2-Pentanone	ND	25
591-78-6	2-Hexanone	ND	5
127-18-4	Tetrachloroethene	ND	5
79-34-5	1,1,2,2-Tetrachloroethane	ND	5
108-88-3	Toluene	ND	5
108-90-7	Chlorobenzene	ND	5
100-41-4	Ethyl Benzene	ND	5
100-42-5	Styrene	ND	5
1330-20-7	Total Xylenes	ND	5

ND = Not Detected
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.
* = Compound was detected but below PQL. Value shown is an estimated quantity.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	97	81 - 117
Bromofluorobenzene	89	74 - 121
1,2-Dichloroethane D4	96	70 - 121

SOUND ANALYTICAL SERVICES

DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-6

IDENTIFICATION:

Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-2B S-2

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 625 (Base/Neutrals & Acids).

CAS No.	Compounds	Concentration ug/l	PQL
108-95-2	Phenol	ND	9.8
111-44-4	bis(2-Chloroethyl) ether	ND	9.8
95-57-8	2-Chlorophenol	ND	9.8
541-73-1	1,3-Dichlorobenzene	ND	9.8
106-46-7	1,4-Dichlorobenzene	ND	9.8
100-51-6	Benzyl Alcohol	ND	20
95-50-1	1,2-Dichlorobenzene	ND	9.8
95-48-7	2-Methylphenol	ND	9.8
39638-32-9	bis(2-Chloroisopropyl)ether	ND	9.8
106-44-5	4-Methylphenol	ND	9.8
621-64-7	N-Nitroso-Di-N-propylamine	ND	9.8
67-72-1	Hexachloroethane	ND	9.8
98-95-3	Nitrobenzene	ND	9.8
78-59-1	Isophorone	ND	9.8
88-75-5	2-Nitrophenol	ND	9.8
105-67-9	2,4-Dimethylphenol	ND	9.8
65-85-0	Benzoic Acid	ND	49
111-91-1	bis(2-Chloroethoxy)methane	ND	9.8
120-83-2	2,4-Dichlorophenol	ND	9.8
120-82-1	1,2,4-Trichlorobenzene	ND	9.8
91-20-3	Naphthalene	ND	9.8
106-47-8	4-Chloroaniline	ND	20
87-68-3	Hexachlorobutadiene	ND	9.8
59-50-7	4-Chloro-3-methylphenol	ND	20

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764

Lab No. 23105-6
March 18, 1992

Client ID: BH-2B S-2

EPA Method 625 Continued

CAS No.	Compounds	Concentration ug/l	PQL
91-57-6	2-Methylnaphthalene	ND	9.8
77-47-4	Hexachlorocyclopentadiene	ND	9.8
88-06-2	2,4,6-Trichlorophenol	ND	9.8
95-95-4	2,4,5-Trichlorophenol	ND	9.8
91-58-7	2-Chloronaphthalene	ND	9.8
88-74-4	2-Nitroaniline	ND	49
131-11-3	Dimethyl phthalate	ND	9.8
208-96-8	Acenaphthylene	ND	9.8
99-09-2	3-Nitroaniline	ND	49
83-32-9	Acenaphthene	ND	9.8
51-28-5	2,4-Dinitrophenol	ND	49
100-02-7	4-Nitrophenol	ND	49
132-64-9	Dibenzofuran	ND	9.8
121-14-2	2,4-Dinitrotoluene	ND	9.8
606-20-2	2,6-Dinitrotoluene	ND	9.8
84-66-2	Diethylphthalate	*(1.8)	9.8
7005-72-3	4-Chlorophenyl phenyl ether	ND	9.8
86-73-7	Fluorene	ND	9.8
100-01-6	4-Nitroaniline	ND	49
534-52-1	4,6-Dinitro-2-methylphenol	ND	49
86-30-6	N-Nitrosodiphenylamine	ND	9.8
101-55-3	4-Bromophenyl phenyl ether	ND	9.8
118-74-1	Hexachlorobenzene	ND	9.8
87-86-5	Pentachlorophenol	ND	49
85-01-8	Phenanthrene	ND	9.8
120-12-7	Anthracene	ND	9.8
84-74-2	Di-n-butylphthalate	ND	9.8

ND = Not Detected

* Compound was detected but below PQL. Value shown is an estimated quantity.

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764

Lab No. 23105-6
March 18, 1992

Client ID: BH-2B S-2

EPA Method 625 Continued

CAS No.	Compounds	Concentration ug/l	PQL
206-44-0	Fluoranthene	ND	9.8
129-00-0	Pyrene	ND	9.8
85-68-7	Butyl benzyl phthalate	ND	9.8
91-94-1	3,3'-Dichlorobenzidine	ND	20
56-55-3	Benzo(a)anthracene	ND	9.8
117-81-7	bis(2-ethylhexyl)phthalate	*(2.2)	9.8
218-01-9	Chrysene	ND	9.8
117-84-0	Di-n-octyl phthalate	ND	9.8
205-99-2	Benzo(b)fluoranthene	ND	9.8
207-08-9	Benzo(k)fluoranthene	ND	9.8
50-32-8	Benzo(a)pyrene	ND	9.8
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.8
53-70-3	Dibenz(a,h)anthracene	ND	9.8
191-24-2	Benzo(g,h,i)perylene	ND	9.8

ND = Not Detected
PQL - Practical Quantitation Limit - These are the quantitation limits for this sample. This number is based on sample size, matrix and dilution required.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits Water	Soil
Nitrobenzene - d_5	48	35 - 114	23 - 120
2-Fluorobiphenyl	51	43 - 116	30 - 115
p-Terphenyl-d_{14}	56	33 - 141	18 - 137
Phenol-d_6	20	10 - 94	24 - 113
2-Fluorophenol	30	21 - 100	25 - 121
2,4,6-Tribromophenol	74	10 - 123	19 - 122

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DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 18, 1992
Revised: March 20, 1992

Report On: Analysis of Water

Lab No.: 23105-10

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-2B S-3

ANALYSIS:

Total Metals:	Concentration, ug/l
Arsenic (GFAA)	19
Barium	700
Cadmium	< 5
Chromium	33
Copper	85
Lead (GFAA)	480
Mercury (CVAA)	< 0.2
Nickel	140
Selenium (GFAA)	< 5
Silver	< 20
Zinc	340

SOUND ANALYTICAL SERVICES

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Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-3

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-3 S-3

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 624 (Purgeable Organics).

CAS No.	Compounds	Concentration ug/l	PQL
74-87-3	Chloromethane	ND	10
74-83-9	Bromomethane	ND	10
75-01-4	Vinyl Chloride	ND	10
75-00-3	Chloroethane	ND	10
75-09-2	Methylene Chloride	ND	5
67-64-1	Acetone	ND	50
75-15-0	Carbon Disulfide	ND	5
75-35-4	1,1-Dichloroethene	ND	5
75-34-3	1,1-Dichloroethane	ND	5
540-59-0	1,2-Dichloroethene (Total)	ND	5
67-66-3	Chloroform	ND	5
107-06-2	1,2-Dichloroethane	ND	5
78-93-3	2-Butanone	ND	25
71-55-6	1,1,1-Trichloroethane	ND	5
56-23-5	Carbon Tetrachloride	ND	5
108-05-4	Vinyl Acetate	ND	25
75-27-4	Bromodichloromethane	ND	5
78-87-5	1,2-Dichloropropane	ND	5
10061-01-5	Cis-1,3-Dichloropropene	ND	5
79-01-6	Trichloroethene	ND	5
124-48-1	Dibromochloromethane	ND	5
79-00-5	1,1,2-Trichloroethane	ND	5

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764
Lab No. 23105-3

March 18, 1992

Client ID: BH-3 S-3

EPA Method 624 Continued . . . . .

CAS No.	Compounds	Concentration ug/l	PQL
71-43-2	Benzene	ND	5
10061-02-6	Trans-1,3-Dichloropropene	ND	5
75-25-2	Bromoform	ND	5
108-10-1	4-Methyl-2-Pentanone	ND	25
591-78-6	2-Hexanone	ND	5
127-18-4	Tetrachloroethene	ND	5
79-34-5	1,1,2,2-Tetrachloroethane	ND	5
108-88-3	Toluene	ND	5
108-90-7	Chlorobenzene	ND	5
100-41-4	Ethyl Benzene	ND	5
100-42-5	Styrene	ND	5
1330-20-7	Total Xylenes	ND	5

ND = Not Detected.
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	97	81 - 117
Bromofluorobenzene	88	74 - 121
1,2-Dichloroethane D4	97	70 - 121

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Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-7

IDENTIFICATION:

Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-3 S-2

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 625 (Base/Neutrals & Acids).

CAS No.	Compounds	Concentration ug/l	PQL
108-95-2	Phenol	ND	9.9
111-44-4	bis(2-Chloroethyl) ether	ND	9.9
95-57-8	2-Chlorophenol	ND	9.9
541-73-1	1,3-Dichlorobenzene	ND	9.9
106-46-7	1,4-Dichlorobenzene	ND	9.9
100-51-6	Benzyl Alcohol	ND	20
95-50-1	1,2-Dichlorobenzene	ND	9.9
95-48-7	2-Methylphenol	ND	9.9
39638-32-9	bis(2-Chloroisopropyl)ether	ND	9.9
106-44-5	4-Methylphenol	ND	9.9
621-64-7	N-Nitroso-Di-N-propylamine	ND	9.9
67-72-1	Hexachloroethane	ND	9.9
98-95-3	Nitrobenzene	ND	9.9
78-59-1	Isophorone	ND	9.9
88-75-5	2-Nitrophenol	ND	9.9
105-67-9	2,4-Dimethylphenol	ND	9.9
65-85-0	Benzoic Acid	ND	50
111-91-1	bis(2-Chloroethoxy)methane	ND	9.9
120-83-2	2,4-Dichlorophenol	ND	9.9
120-82-1	1,2,4-Trichlorobenzene	ND	9.9
91-20-3	Naphthalene	ND	9.9
106-47-8	4-Chloroaniline	ND	20
87-68-3	Hexachlorobutadiene	ND	9.9
59-50-7	4-Chloro-3-methylphenol	ND	20

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764

Lab No. 23105-7
March 18, 1992

Client ID: BH-3 S-2

EPA Method 625 Continued

CAS No.	Compounds	Concentration ug/l	PQL
91-57-6	2-Methylnaphthalene	ND	9.9
77-47-4	Hexachlorocyclopentadiene	ND	9.9
88-06-2	2,4,6-Trichlorophenol	ND	9.9
95-95-4	2,4,5-Trichlorophenol	ND	9.9
91-58-7	2-Chloronaphthalene	ND	9.9
88-74-4	2-Nitroaniline	ND	50
131-11-3	Dimethyl phthalate	ND	9.9
208-96-8	Acenaphthylene	ND	9.9
99-09-2	3-Nitroaniline	ND	50
83-32-9	Acenaphthene	ND	9.9
51-28-5	2,4-Dinitrophenol	ND	50
100-02-7	4-Nitrophenol	ND	50
132-64-9	Dibenzofuran	ND	9.9
121-14-2	2,4-Dinitrotoluene	ND	9.9
606-20-2	2,6-Dinitrotoluene	ND	9.9
84-66-2	Diethylphthalate	ND	9.9
7005-72-3	4-Chlorophenyl phenyl ether	ND	9.9
86-73-7	Fluorene	ND	9.9
100-01-6	4-Nitroaniline	ND	50
534-52-1	4,6-Dinitro-2-methylphenol	ND	50
86-30-6	N-Nitrosodiphenylamine	ND	9.9
101-55-3	4-Bromophenyl phenyl ether	ND	9.9
118-74-1	Hexachlorobenzene	ND	9.9
87-86-5	Pentachlorophenol	ND	50
85-01-8	Phenanthrene	ND	9.9
120-12-7	Anthracene	ND	9.9
84-74-2	Di-n-butylphthalate	ND	9.9

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764

Lab No. 23105-7
March 18, 1992

Client ID: BH-3 S-2

EPA Method 625 Continued

CAS No.	Compounds	Concentration ug/l	PQL
206-44-0	Fluoranthene	ND	9.9
129-00-0	Pyrene	ND	9.9
85-68-7	Butyl benzyl phthalate	ND	9.9
91-94-1	3,3'-Dichlorobenzidine	ND	20
56-55-3	Benzo(a)anthracene	ND	9.9
117-81-7	bis(2-ethylhexyl)phthalate	ND	9.9
218-01-9	Chrysene	ND	9.9
117-84-0	Di-n-octyl phthalate	ND	9.9
205-99-2	Benzo(b)fluoranthene	ND	9.9
207-08-9	Benzo(k)fluoranthene	ND	9.9
50-32-8	Benzo(a)pyrene	ND	9.9
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.9
53-70-3	Dibenz(a,h)anthracene	ND	9.9
191-24-2	Benzo(g,h,i)perylene	ND	9.9

ND = Not Detected
PQL - Practical Quantitation Limit - These are the quantitation limits for this sample. This number is based on sample size, matrix and dilution required.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits Water	Soil
Nitrobenzene - d_5	85	35 - 114	23 - 120
2-Fluorobiphenyl	77	43 - 116	30 - 115
p-Terphenyl-d_{14}	70	33 - 141	18 - 137
Phenol-d_6	33	10 - 94	24 - 113
2-Fluorophenol	50	21 - 100	25 - 121
2,4,6-Tribromophenol	91	10 - 123	19 - 122

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 18, 1992
Revised: March 20, 1992

Report On: Analysis of Water

Lab No.: 23105-11

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-3 S-1

ANALYSIS:

Total Metals:	Concentration, ug/l
Arsenic (GFAA)	< 10
Barium	26
Cadmium	13
Chromium	< 10
Copper	< 25
Lead (GFAA)	< 5
Mercury (CVAA)	< 0.2
Nickel	< 40
Selenium (GFAA)	< 5
Silver	< 20
Zinc	25

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Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-4

IDENTIFICATION:

Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-4 S-1

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 624 (Purgeable Organics).

CAS No.	Compounds	Concentration ug/l	PQL
74-87-3	Chloromethane	ND	10
74-83-9	Bromomethane	ND	10
75-01-4	Vinyl Chloride	ND	10
75-00-3	Chloroethane	ND	10
75-09-2	Methylene Chloride	ND	5
67-64-1	Acetone	ND	50
75-15-0	Carbon Disulfide	ND	5
75-35-4	1,1-Dichloroethene	ND	5
75-34-3	1,1-Dichloroethane	ND	5
540-59-0	1,2-Dichloroethene (Total)	ND	5
67-66-3	Chloroform	ND	5
107-06-2	1,2-Dichloroethane	ND	5
78-93-3	2-Butanone	ND	25
71-55-6	1,1,1-Trichloroethane	ND	5
56-23-5	Carbon Tetrachloride	ND	5
108-05-4	Vinyl Acetate	ND	25
75-27-4	Bromodichloromethane	ND	5
78-87-5	1,2-Dichloropropane	ND	5
10061-01-5	Cis-1,3-Dichloropropene	ND	5
79-01-6	Trichloroethene	ND	5
124-48-1	Dibromochloromethane	ND	5
79-00-5	1,1,2-Trichloroethane	ND	5

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764
Lab No. 23105-4

March 18, 1992

Client ID: BH-4 S-1

EPA Method 624 Continued . . . . .

CAS No.	Compounds	Concentration ug/l	PQL
71-43-2	Benzene	ND	5
10061-02-6	Trans-1,3-Dichloropropene	ND	5
75-25-2	Bromoform	ND	5
108-10-1	4-Methyl-2-Pentanone	ND	25
591-78-6	2-Hexanone	ND	5
127-18-4	Tetrachloroethene	ND	5
79-34-5	1,1,2,2-Tetrachloroethane	ND	5
108-88-3	Toluene	ND	5
108-90-7	Chlorobenzene	ND	5
100-41-4	Ethyl Benzene	ND	5
100-42-5	Styrene	ND	5
1330-20-7	Total Xylenes	ND	5

ND = Not Detected
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	96	81 - 117
Bromofluorobenzene	87	74 - 121
1,2-Dichloroethane D4	97	70 - 121

SOUND ANALYTICAL SERVICES

Dennis L. Bean

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-8

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-4 S-2

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 625 (Base/Neutrals & Acids).

CAS No.	Compounds	Concentration ug/l	PQL
108-95-2	Phenol	ND	9.9
111-44-4	bis(2-Chloroethyl) ether	ND	9.9
95-57-8	2-Chlorophenol	ND	9.9
541-73-1	1,3-Dichlorobenzene	ND	9.9
106-46-7	1,4-Dichlorobenzene	ND	9.9
100-51-6	Benzyl Alcohol	ND	20
95-50-1	1,2-Dichlorobenzene	ND	9.9
95-48-7	2-Methylphenol	ND	9.9
39638-32-9	bis(2-Chloroisopropyl)ether	ND	9.9
106-44-5	4-Methylphenol	ND	9.9
621-64-7	N-Nitroso-Di-N-propylamine	ND	9.9
67-72-1	Hexachloroethane	ND	9.9
98-95-3	Nitrobenzene	ND	9.9
78-59-1	Isophorone	ND	9.9
88-75-5	2-Nitrophenol	ND	9.9
105-67-9	2,4-Dimethylphenol	ND	9.9
65-85-0	Benzoic Acid	ND	50
111-91-1	bis(2-Chloroethoxy)methane	ND	9.9
120-83-2	2,4-Dichlorophenol	ND	9.9
120-82-1	1,2,4-Trichlorobenzene	ND	9.9
91-20-3	Naphthalene	*(3.0)	9.9
106-47-8	4-Chloroaniline	ND	20
87-68-3	Hexachlorobutadiene	ND	9.9
59-50-7	4-Chloro-3-methylphenol	ND	20

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764

Lab No. 23105-8
March 18, 1992

Client ID: BH-4 S-2

EPA Method 625 Continued

CAS No.	Compounds	Concentration ug/l	PQL
91-57-6	2-Methylnaphthalene	ND	9.9
77-47-4	Hexachlorocyclopentadiene	ND	9.9
88-06-2	2,4,6-Trichlorophenol	ND	9.9
95-95-4	2,4,5-Trichlorophenol	ND	9.9
91-58-7	2-Chloronaphthalene	ND	9.9
88-74-4	2-Nitroaniline	ND	50
131-11-3	Dimethyl phthalate	ND	9.9
208-96-8	Acenaphthylene	ND	9.9
99-09-2	3-Nitroaniline	ND	50
83-32-9	Acenaphthene	ND	9.9
51-28-5	2,4-Dinitrophenol	ND	50
100-02-7	4-Nitrophenol	ND	50
132-64-9	Dibenzofuran	ND	9.9
121-14-2	2,4-Dinitrotoluene	ND	9.9
606-20-2	2,6-Dinitrotoluene	ND	9.9
84-66-2	Diethylphthalate	ND	9.9
7005-72-3	4-Chlorophenyl phenyl ether	ND	9.9
86-73-7	Fluorene	ND	9.9
100-01-6	4-Nitroaniline	ND	50
534-52-1	4,6-Dinitro-2-methylphenol	ND	50
86-30-6	N-Nitrosodiphenylamine	ND	9.9
101-55-3	4-Bromophenyl phenyl ether	ND	9.9
118-74-1	Hexachlorobenzene	ND	9.9
87-86-5	Pentachlorophenol	ND	50
85-01-8	Phenanthrene	ND	9.9
120-12-7	Anthracene	ND	9.9
84-74-2	Di-n-butylphthalate	ND	9.9

ND = Not Detected

* Compound was detected but below PQL. Value shown is an estimated quantity.

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764

Lab No. 23105-8
March 18, 1992

Client ID: BH-4 S-2

EPA Method 625 Continued

CAS No.	Compounds	Concentration ug/l	PQL
206-44-0	Fluoranthene	ND	9.9
129-00-0	Pyrene	ND	9.9
85-68-7	Butyl benzyl phthalate	ND	9.9
91-94-1	3,3'-Dichlorobenzidine	ND	20
56-55-3	Benzo(a)anthracene	ND	9.9
117-81-7	bis(2-ethylhexyl)phthalate	ND	9.9
218-01-9	Chrysene	ND	9.9
117-84-0	Di-n-octyl phthalate	ND	9.9
205-99-2	Benzo(b)fluoranthene	ND	9.9
207-08-9	Benzo(k)fluoranthene	ND	9.9
50-32-8	Benzo(a)pyrene	ND	9.9
193-39-5	Indeno(1,2,3-cd)pyrene	ND	9.9
53-70-3	Dibenz(a,h)anthracene	ND	9.9
191-24-2	Benzo(g,h,i)perylene	ND	9.9

ND = Not Detected
PQL - Practical Quantitation Limit - These are the quantitation limits for this sample. This number is based on sample size, matrix and dilution required.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits Water	Soil
Nitrobenzene - d_5	64	35 - 114	23 - 120
2-Fluorobiphenyl	62	43 - 116	30 - 115
p-Terphenyl-d_{14}	60	33 - 141	18 - 137
Phenol-d_6	31	10 - 94	24 - 113
2-Fluorophenol	47	21 - 100	25 - 121
2,4,6-Tribromophenol	74	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA Date: March 18, 1992

Report On: Analysis of Water Lab No.: 23105-12

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-4 S-3

ANALYSIS:

Total Metals:	Concentration, ug/l
Arsenic (GFAA)	20
Barium	1,300
Cadmium	< 5
Chromium	70
Copper	95
Lead (GFAA)	34
Mercury (CVAA)	< 0.2
Nickel	380
Selenium (GFAA)	< 5
Silver	< 20
Zinc	270

SOUND ANALYTICAL SERVICES

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4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: March 18, 1992

Report On: Analysis of Water

Lab No.: 23105-3D

IDENTIFICATION:
Sample Received on 03-09-92
Project: W-7764 McCollum Park
Client ID: BH-3 S-3 **(DUPLICATE)**

ANALYSIS:

Sample was analyzed in accordance with 40 CFR 136, Appendix A, Method 624 (Purgeable Organics).

CAS No.	Compounds	Concentration ug/l	PQL
74-87-3	Chloromethane	ND	10
74-83-9	Bromomethane	ND	10
75-01-4	Vinyl Chloride	ND	10
75-00-3	Chloroethane	ND	10
75-09-2	Methylene Chloride	ND	5
67-64-1	Acetone	ND	50
75-15-0	Carbon Disulfide	ND	5
75-35-4	1,1-Dichloroethene	ND	5
75-34-3	1,1-Dichloroethane	ND	5
540-59-0	1,2-Dichloroethene (Total)	ND	5
67-66-3	Chloroform	ND	5
107-06-2	1,2-Dichloroethane	ND	5
78-93-3	2-Butanone	ND	25
71-55-6	1,1,1-Trichloroethane	ND	5
56-23-5	Carbon Tetrachloride	ND	5
108-05-4	Vinyl Acetate	ND	25
75-27-4	Bromodichloromethane	ND	5
78-87-5	1,2-Dichloropropane	ND	5
10061-01-5	Cis-1,3-Dichloropropene	ND	5
79-01-6	Trichloroethene	ND	5
124-48-1	Dibromochloromethane	ND	5
79-00-5	1,1,2-Trichloroethane	ND	5

ND = Not Detected

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-7764
Lab No. 23105-3D

March 18, 1992

Client ID: BH-3 S-3 **(DUPLICATE)**

EPA Method 624 Continued . . . . .

CAS No.	Compounds	Concentration ug/l	PQL
71-43-2	Benzene	ND	5
10061-02-6	Trans-1,3-Dichloropropene	ND	5
75-25-2	Bromoform	ND	5
108-10-1	4-Methyl-2-Pentanone	ND	25
591-78-6	2-Hexanone	ND	5
127-18-4	Tetrachloroethene	ND	5
79-34-5	1,1,2,2-Tetrachloroethane	ND	5
108-88-3	Toluene	ND	5
108-90-7	Chlorobenzene	ND	5
100-41-4	Ethyl Benzene	ND	5
100-42-5	Styrene	ND	5
1330-20-7	Total Xylenes	ND	5

ND = Not Detected.
PQL - Practical Quantitation Limit - These are the detection limits for this sample. This number is based on sample size, matrix and dilution required.

Volatile Surrogates

Surrogate	Percent Recovery	Control Limits
Toluene - D8	97	81 - 117
Bromofluorobenzene	88	74 - 121
1,2-Dichloroethane D4	97	70 - 121

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

Client: RZA - AGRA
Project: W-7764 McCollum Park
Client ID: BH-3 S-1
Lab No: 23105-11
Matrix: Water
Units: mg/l
Date: March 18, 1992

MATRIX SPIKES

Parameter	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R
Arsenic	2,000	50	2,000	97.5
Barium	1,900	26	2,000	93.7
Cadmium	1,800	13	2,000	89.4
Chromium	1,700	< 10	2,000	85.0
Copper	1,900	< 25	2,000	95.0
Lead	1,900	32	2,000	93.4
Mercury	2.0	< 0.2	2.0	100
Nickel	1,800	< 40	2,000	90.0
Selenium	1,800	< 5	2,000	90.0
Silver	1,800	< 20	2,000	90.0
Zinc	1,800	25	2,000	90.0

%R = percent recovery
= [(SSR - SR) / SA] x 100

MATRIX SPIKE DUPLICATE

Parameter	Matrix Spike(MS)	Matrix Spike Duplicate(MSD)	RPD
Arsenic	2,000	1,900	5.1
Barium	1,900	1,800	5.4
Cadmium	1,800	1,800	0.0
Chromium	1,700	1,700	0.0
Copper	1,900	1,800	5.4
Lead	1,900	1,900	0.0
Mercury	2.0	2.0	0.0
Nickel	1,800	1,800	0.0
Selenium	1,800	1,800	0.0
Silver	1,800	1,800	0.0
Zinc	1,800	1,800	0.0

RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) /2)] x 100

Continued . . . . .

SOUND ANALYTICAL SERVICES, INC.

Client: RZA - AGRA
Project: W-7764 McCollum Park
Client ID: BH-3 S-1
Lab No: 23105-11
Matrix: Water
Units: mg/l
Date: March 18, 1992

CHECK STANDARDS

Parameter	Result (R)	True Value(TV)	%D
Mercury	1.107	1.000	11

%D = % Difference
= TV - R / TV x 100
Origin of standard: Environmental Resource Associates

METHOD BLANK

Parameter	Blank Value
Mercury	< 0.2

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

ANALYTICAL NARRATIVE

Client: RZA - AGRA

Date: March 18, 1992

Project: W-7764 McCollum Park

Lab No.: 23105

Delivered by: SAS

Date Sampled: 03-06-92

Condition of Samples on Receipt:

Samples were received cold and in good condition. Chain-of-custody was in order.

EXTRACTION AND ANALYSIS DATES

Samples were analyzed for metals by ICP in accordance with EPA SW-846 Method 6010. Samples were digested on 03-10-92 and analyzed on 03-16-92. Mercury was analyzed by cold vapor AA per SW-846 Method 7471 on 03-11-92.

Samples were analyzed for purgeable organics in accordance with 40 CFR 136, Appendix A, Method 624 on 03-10-92.

Samples were analyzed for base/neutrals & acids in accordance with 40 CFR 136, Appendix A, Method 625. Samples were extracted on 03-10-92 and analyzed on 03-11-92.

All Quality Control was within acceptable limits.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

Client: RZA - AGRA
Project: W-7764 McCollum Park
Client ID: BH-1A S-2
Lab No: 23105
Date: March 20, 1992

TRACE METALS
METHOD BLANKS

PARAMETER	BLANK VALUE
Arsenic	< 10
Barium	< 5
Cadmium	< 5
Chromium	< 10
Lead	< 5
Mercury	< 0.2
Selenium	< 5
Silver	< 10
Copper	< 25
Nickel	< 40
Zinc	< 20

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-9200 • FAX (206) 485-2992

RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 1	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0461	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	2.0	8.5
Benzene	0.40	1.6
Bromodichloromethane	0.40	N.D.
Bromoform	0.40	N.D.
Bromomethane	0.40	N.D.
2-Butanone	2.0	N.D.
Carbon disulfide	0.40	N.D.
Carbon tetrachloride	0.40	N.D.
Chlorobenzene	0.40	N.D.
Chlorodibromomethane	0.40	N.D.
Chloroethane	0.40	N.D.
2-Chloroethyl vinyl ether	2.0	N.D.
Chloroform	0.40	N.D.
Chloromethane	0.40	N.D.
1,1-Dichloroethane	0.40	N.D.
1,2-Dichloroethane	0.40	N.D.
1,1-Dichloroethene	0.40	N.D.
cis 1,2-Dichloroethene	0.40	7.8
trans 1,2-Dichloroethene	0.40	N.D.
1,2-Dichloropropane	0.40	N.D.
cis 1,3-Dichloropropene	0.40	N.D.
trans 1,3-Dichloropropene	0.40	N.D.
Ethylbenzene	0.40	2.8
2-Hexanone	2.0	N.D.
Methylene chloride	2.0	N.D.
4-Methyl-2-pentanone	2.0	N.D.
Styrene	0.40	N.D.
1,1,2,2-Tetrachloroethane	0.40	N.D.
Tetrachloroethene	0.40	N.D.
Toluene	0.40	26
1,1,1-Trichloroethane	0.40	N.D.
1,1,2-Trichloroethane	0.40	N.D.
Trichloroethene	0.40	1.8
Vinyl acetate	0.40	N.D.
Vinyl chloride	0.40	35
Total Xylenes	0.40	5.7

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	104
Toluene-d8	108
4-Bromofluorobenzene	99

NORTH CREEK ANALYTICAL

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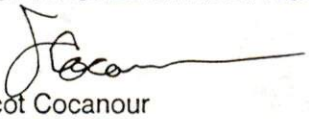
RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 3	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0462	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	1.0	N.D.
Benzene	0.20	10
Bromodichloromethane	0.20	N.D.
Bromoform	0.20	N.D.
Bromomethane	0.20	N.D.
2-Butanone	1.0	N.D.
Carbon disulfide	0.20	N.D.
Carbon tetrachloride	0.20	N.D.
Chlorobenzene	0.20	1.3
Chlorodibromomethane	0.20	N.D.
Chloroethane	0.20	N.D.
2-Chloroethyl vinyl ether	1.0	N.D.
Chloroform	0.20	N.D.
Chloromethane	0.20	N.D.
1,1-Dichloroethane	0.20	N.D.
1,2-Dichloroethane	0.20	N.D.
1,1-Dichloroethene	0.20	N.D.
cis 1,2-Dichloroethene	0.20	0.30
trans 1,2-Dichloroethene	0.20	N.D.
1,2-Dichloropropane	0.20	N.D.
cis 1,3-Dichloropropene	0.20	N.D.
trans 1,3-Dichloropropene	0.20	N.D.
Ethylbenzene	0.20	2.1
2-Hexanone	1.0	N.D.
Methylene chloride	1.0	N.D.
4-Methyl-2-pentanone	1.0	N.D.
Styrene	0.20	N.D.
1,1,2,2-Tetrachloroethane	0.20	N.D.
Tetrachloroethene	0.20	N.D.
Toluene	0.20	2.7
1,1,1-Trichloroethane	0.20	N.D.
1,1,2-Trichloroethane	0.20	N.D.
Trichloroethene	0.20	N.D.
Vinyl acetate	0.20	N.D.
Vinyl chloride	0.20	1.1
Total Xylenes	0.20	4.1

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL



Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	112
Toluene-d8	108
4-Bromofluorobenzene	115

NORTH CREEK ANALYTICAL

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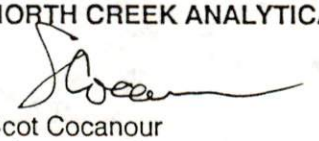
RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 4	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0463	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	0.50	2.0
Benzene	0.10	0.70
Bromodichloromethane	0.10	N.D.
Bromoform	0.10	N.D.
Bromomethane	0.10	N.D.
2-Butanone	0.50	N.D.
Carbon disulfide	0.10	N.D.
Carbon tetrachloride	0.10	N.D.
Chlorobenzene	0.10	N.D.
Chlorodibromomethane	0.10	N.D.
Chloroethane	0.10	N.D.
2-Chloroethyl vinyl ether	0.50	N.D.
Chloroform	0.10	N.D.
Chloromethane	0.10	N.D.
1,1-Dichloroethane	0.10	N.D.
1,2-Dichloroethane	0.10	N.D.
1,1-Dichloroethene	0.10	N.D.
cis 1,2-Dichloroethene	0.10	0.13
trans 1,2-Dichloroethene	0.10	N.D.
1,2-Dichloropropane	0.10	N.D.
cis 1,3-Dichloropropene	0.10	N.D.
trans 1,3-Dichloropropene	0.10	N.D.
Ethylbenzene	0.10	N.D.
2-Hexanone	0.50	N.D.
Methylene chloride	0.50	N.D.
4-Methyl-2-pentanone	0.50	N.D.
Styrene	0.10	N.D.
1,1,2,2-Tetrachloroethane	0.10	N.D.
Tetrachloroethene	0.10	0.16
Toluene	0.10	2.3
1,1,1-Trichloroethane	0.10	N.D.
1,1,2-Trichloroethane	0.10	N.D.
Trichloroethene	0.10	N.D.
Vinyl acetate	0.10	N.D.
Vinyl chloride	0.10	2.2
Total Xylenes	0.10	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL



Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	111
Toluene-d8	105
4-Bromofluorobenzene	115

NORTH CREEK ANALYTICAL

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RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 5	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0467	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	0.50	N.D.
Benzene	0.10	0.48
Bromodichloromethane	0.10	N.D.
Bromoform	0.10	N.D.
Bromomethane	0.10	N.D.
2-Butanone	0.50	N.D.
Carbon disulfide	0.10	N.D.
Carbon tetrachloride	0.10	N.D.
Chlorobenzene	0.10	0.23
Chlorodibromomethane	0.10	N.D.
Chloroethane	0.10	N.D.
2-Chloroethyl vinyl ether	0.50	N.D.
Chloroform	0.10	N.D.
Chloromethane	0.10	N.D.
1,1-Dichloroethane	0.10	N.D.
1,2-Dichloroethane	0.10	N.D.
1,1-Dichloroethene	0.10	N.D.
cis 1,2-Dichloroethene	0.10	N.D.
trans 1,2-Dichloroethene	0.10	N.D.
1,2-Dichloropropane	0.10	N.D.
cis 1,3-Dichloropropene	0.10	N.D.
trans 1,3-Dichloropropene	0.10	N.D.
Ethylbenzene	0.10	0.86
2-Hexanone	0.50	N.D.
Methylene chloride	0.50	N.D.
4-Methyl-2-pentanone	0.50	N.D.
Styrene	0.10	N.D.
1,1,2,2-Tetrachloroethane	0.10	N.D.
Tetrachloroethene	0.10	0.19
Toluene	0.10	0.56
1,1,1-Trichloroethane	0.10	N.D.
1,1,2-Trichloroethane	0.10	N.D.
Trichloroethene	0.10	N.D.
Vinyl acetate	0.10	N.D.
Vinyl chloride	0.10	0.42
Total Xylenes	0.10	1.8

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	111
Toluene-d8	110
4-Bromofluorobenzene	94

NORTH CREEK ANALYTICAL

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RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 6	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0468	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	0.50	N.D.
Benzene	0.10	N.D.
Bromodichloromethane	0.10	N.D.
Bromoform	0.10	N.D.
Bromomethane	0.10	N.D.
2-Butanone	0.50	N.D.
Carbon disulfide	0.10	N.D.
Carbon tetrachloride	0.10	N.D.
Chlorobenzene	0.10	N.D.
Chlorodibromomethane	0.10	N.D.
Chloroethane	0.10	N.D.
2-Chloroethyl vinyl ether	0.50	N.D.
Chloroform	0.10	N.D.
Chloromethane	0.10	N.D.
1,1-Dichloroethane	0.10	N.D.
1,2-Dichloroethane	0.10	N.D.
1,1-Dichloroethene	0.10	N.D.
cis 1,2-Dichloroethene	0.10	N.D.
trans 1,2-Dichloroethene	0.10	N.D.
1,2-Dichloropropane	0.10	N.D.
cis 1,3-Dichloropropene	0.10	N.D.
trans 1,3-Dichloropropene	0.10	N.D.
Ethylbenzene	0.10	0.34
2-Hexanone	0.50	N.D.
Methylene chloride	0.50	N.D.
4-Methyl-2-pentanone	0.50	N.D.
Styrene	0.10	N.D.
1,1,2,2-Tetrachloroethane	0.10	N.D.
Tetrachloroethene	0.10	0.22
Toluene	0.10	0.27
1,1,1-Trichloroethane	0.10	N.D.
1,1,2-Trichloroethane	0.10	N.D.
Trichloroethene	0.10	N.D.
Vinyl acetate	0.10	N.D.
Vinyl chloride	0.10	N.D.
Total Xylenes	0.10	0.75

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	111
Toluene-d8	109
4-Bromofluorobenzene	94

NORTH CREEK ANALYTICAL

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RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 8	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0466	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	0.50	2.6
Benzene	0.10	0.66
Bromodichloromethane	0.10	N.D.
Bromoform	0.10	N.D.
Bromomethane	0.10	N.D.
2-Butanone	0.50	N.D.
Carbon disulfide	0.10	N.D.
Carbon tetrachloride	0.10	N.D.
Chlorobenzene	0.10	0.23
Chlorodibromomethane	0.10	N.D.
Chloroethane	0.10	N.D.
2-Chloroethyl vinyl ether	0.50	N.D.
Chloroform	0.10	N.D.
Chloromethane	0.10	N.D.
1,1-Dichloroethane	0.10	N.D.
1,2-Dichloroethane	0.10	N.D.
1,1-Dichloroethene	0.10	N.D.
cis 1,2-Dichloroethene	0.10	N.D.
trans 1,2-Dichloroethene	0.10	N.D.
1,2-Dichloropropane	0.10	N.D.
cis 1,3-Dichloropropene	0.10	N.D.
trans 1,3-Dichloropropene	0.10	N.D.
Ethylbenzene	0.10	0.86
2-Hexanone	0.50	N.D.
Methylene chloride	0.50	N.D.
4-Methyl-2-pentanone	0.50	N.D.
Styrene	0.10	N.D.
1,1,2,2-Tetrachloroethane	0.10	N.D.
Tetrachloroethene	0.10	0.19
Toluene	0.10	1.0
1,1,1-Trichloroethane	0.10	N.D.
1,1,2-Trichloroethane	0.10	N.D.
Trichloroethene	0.10	N.D.
Vinyl acetate	0.10	0.12
Vinyl chloride	0.10	N.D.
Total Xylenes	0.10	1.8

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	112
Toluene-d8	110
4-Bromofluorobenzene	94

NORTH CREEK ANALYTICAL

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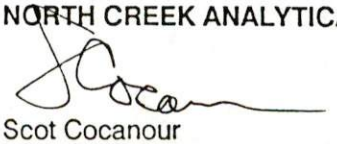
RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 9	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0469	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	1.0	~550
Benzene	0.20	6.8
Bromodichloromethane	0.20	N.D.
Bromoform	0.20	N.D.
Bromomethane	0.20	N.D.
2-Butanone	1.0	N.D.
Carbon disulfide	0.20	4.8
Carbon tetrachloride	0.20	N.D.
Chlorobenzene	0.20	N.D.
Chlorodibromomethane	0.20	N.D.
Chloroethane	0.20	N.D.
2-Chloroethyl vinyl ether	1.0	N.D.
Chloroform	0.20	N.D.
Chloromethane	0.20	0.56
1,1-Dichloroethane	0.20	N.D.
1,2-Dichloroethane	0.20	N.D.
1,1-Dichloroethene	0.20	N.D.
cis 1,2-Dichloroethene	0.20	7.8
trans 1,2-Dichloroethene	0.20	N.D.
1,2-Dichloropropane	0.20	N.D.
cis 1,3-Dichloropropene	0.20	N.D.
trans 1,3-Dichloropropene	0.20	N.D.
Ethylbenzene	0.20	3.4
2-Hexanone	1.0	N.D.
Methylene chloride	1.0	4.8
4-Methyl-2-pentanone	1.0	18
Styrene	0.20	N.D.
1,1,2,2-Tetrachloroethane	0.20	N.D.
Tetrachloroethene	0.20	0.74
Toluene	0.20	23
1,1,1-Trichloroethane	0.20	3.6
1,1,2-Trichloroethane	0.20	N.D.
Trichloroethene	0.20	14
Vinyl acetate	0.20	N.D.
Vinyl chloride	0.20	3.9
Total Xylenes	0.20	8.4

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL



Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	112
Toluene-d8	108
4-Bromofluorobenzene	96

NORTH CREEK ANALYTICAL

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RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 11	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0465	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	0.50	N.D.
Benzene	0.10	N.D.
Bromodichloromethane	0.10	N.D.
Bromoform	0.10	N.D.
Bromomethane	0.10	N.D.
2-Butanone	0.50	N.D.
Carbon disulfide	0.10	N.D.
Carbon tetrachloride	0.10	N.D.
Chlorobenzene	0.10	N.D.
Chlorodibromomethane	0.10	N.D.
Chloroethane	0.10	N.D.
2-Chloroethyl vinyl ether	0.50	N.D.
Chloroform	0.10	N.D.
Chloromethane	0.10	N.D.
1,1-Dichloroethane	0.10	N.D.
1,2-Dichloroethane	0.10	N.D.
1,1-Dichloroethene	0.10	N.D.
cis 1,2-Dichloroethene	0.10	N.D.
trans 1,2-Dichloroethene	0.10	N.D.
1,2-Dichloropropane	0.10	N.D.
cis 1,3-Dichloropropene	0.10	N.D.
trans 1,3-Dichloropropene	0.10	N.D.
Ethylbenzene	**0.10**	**0.48**
2-Hexanone	0.50	N.D.
Methylene chloride	0.50	N.D.
4-Methyl-2-pentanone	0.50	N.D.
Styrene	0.10	N.D.
1,1,2,2-Tetrachloroethane	0.10	N.D.
Tetrachloroethene	**0.10**	**0.58**
Toluene	**0.10**	**0.51**
1,1,1-Trichloroethane	0.10	N.D.
1,1,2-Trichloroethane	0.10	N.D.
Trichloroethene	0.10	N.D.
Vinyl acetate	0.10	N.D.
Vinyl chloride	0.10	N.D.
Total Xylenes	**0.10**	**1.0**

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	113
Toluene-d8	108
4-Bromofluorobenzene	102

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-9200 • FAX (206) 485-2992

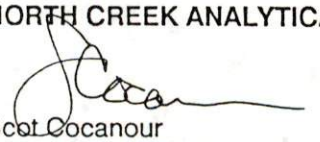
RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 12	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0470	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	1.0	N.D.
Benzene	0.20	0.54
Bromodichloromethane	0.20	N.D.
Bromoform	0.20	N.D.
Bromomethane	0.20	N.D.
2-Butanone	1.0	N.D.
Carbon disulfide	0.20	0.74
Carbon tetrachloride	0.20	N.D.
Chlorobenzene	0.20	0.24
Chlorodibromomethane	0.20	N.D.
Chloroethane	0.20	N.D.
2-Chloroethyl vinyl ether	1.0	N.D.
Chloroform	0.20	N.D.
Chloromethane	0.20	N.D.
1,1-Dichloroethane	0.20	N.D.
1,2-Dichloroethane	0.20	N.D.
1,1-Dichloroethene	0.20	N.D.
cis 1,2-Dichloroethene	0.20	N.D.
trans 1,2-Dichloroethene	0.20	N.D.
1,2-Dichloropropane	0.20	N.D.
cis 1,3-Dichloropropene	0.20	N.D.
trans 1,3-Dichloropropene	0.20	N.D.
Ethylbenzene	0.20	2.2
2-Hexanone	1.0	N.D.
Methylene chloride	1.0	N.D.
4-Methyl-2-pentanone	1.0	N.D.
Styrene	0.20	N.D.
1,1,2,2-Tetrachloroethane	0.20	N.D.
Tetrachloroethene	0.20	N.D.
Toluene	0.20	7.4
1,1,1-Trichloroethane	0.20	N.D.
1,1,2-Trichloroethane	0.20	N.D.
Trichloroethene	0.20	0.38
Vinyl acetate	0.20	N.D.
Vinyl chloride	0.20	0.54
Total Xylenes	0.20	6.5

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL



Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	115
Toluene-d8	108
4-Bromofluorobenzene	106

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-9200 • FAX (206) 485-2992

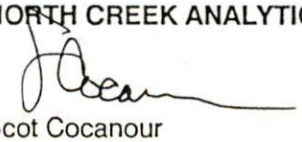
RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air, GP 13	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12-13, 1992
Attention: Jim Dransfield	Lab Number:	203-0464	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	0.50	N.D.
Benzene	0.10	1.5
Bromodichloromethane	0.10	N.D.
Bromoform	0.10	N.D.
Bromomethane	0.10	N.D.
2-Butanone	0.50	N.D.
Carbon disulfide	0.10	N.D.
Carbon tetrachloride	0.10	N.D.
Chlorobenzene	0.10	0.19
Chlorodibromomethane	0.10	N.D.
Chloroethane	0.10	N.D.
2-Chloroethyl vinyl ether	0.50	N.D.
Chloroform	0.10	N.D.
Chloromethane	0.10	N.D.
1,1-Dichloroethane	0.10	N.D.
1,2-Dichloroethane	0.10	N.D.
1,1-Dichloroethene	0.10	0.17
cis 1,2-Dichloroethene	0.10	0.40
trans 1,2-Dichloroethene	0.10	N.D.
1,2-Dichloropropane	0.10	N.D.
cis 1,3-Dichloropropene	0.10	N.D.
trans 1,3-Dichloropropene	0.10	N.D.
Ethylbenzene	0.10	3.3
2-Hexanone	0.50	N.D.
Methylene chloride	0.50	N.D.
4-Methyl-2-pentanone	0.50	N.D.
Styrene	0.10	N.D.
1,1,2,2-Tetrachloroethane	0.10	N.D.
Tetrachloroethene	0.10	13
Toluene	0.10	2.2
1,1,1-Trichloroethane	0.10	N.D.
1,1,2-Trichloroethane	0.10	N.D.
Trichloroethene	0.10	2.0
Vinyl acetate	0.10	N.D.
Vinyl chloride	0.10	5.4
Total Xylenes	0.10	5.1

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL



Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	113
Toluene-d8	107
4-Bromofluorobenzene	114

NORTH CREEK ANALYTICAL

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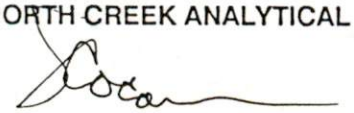
RZA/AGRA	Client Project ID:	McCollum Park		
11335 NE 122nd Way, #100	Sample Descript:	Method Blank		
Kirkland, WA 98034	Analysis Method:	EPA 624	Analyzed:	Mar 12, 1992
Attention: Jim Dransfield	Lab Number:	BLK031292	Reported:	Mar 18, 1992

PURGEABLES by GC/MS (EPA 624)

Analyte	Detection Limit µg/L	Sample Results µg/L
Acetone	0.50	1.1
Benzene	0.10	N.D.
Bromodichloromethane	0.10	N.D.
Bromoform	0.10	N.D.
Bromomethane	0.10	N.D.
2-Butanone	0.50	N.D.
Carbon disulfide	0.10	N.D.
Carbon tetrachloride	0.10	N.D.
Chlorobenzene	0.10	N.D.
Chlorodibromomethane	0.10	N.D.
Chloroethane	0.10	N.D.
2-Chloroethyl vinyl ether	0.50	N.D.
Chloroform	0.10	N.D.
Chloromethane	0.10	N.D.
1,1-Dichloroethane	0.10	N.D.
1,2-Dichloroethane	0.10	N.D.
1,1-Dichloroethene	0.10	N.D.
cis 1,2-Dichloroethene	0.10	N.D.
trans 1,2-Dichloroethene	0.10	N.D.
1,2-Dichloropropane	0.10	N.D.
cis 1,3-Dichloropropene	0.10	N.D.
trans 1,3-Dichloropropene	0.10	N.D.
Ethylbenzene	0.10	N.D.
2-Hexanone	0.50	N.D.
Methylene chloride	0.50	N.D.
4-Methyl-2-pentanone	0.50	N.D.
Styrene	0.10	N.D.
1,1,2,2-Tetrachloroethane	0.10	N.D.
Tetrachloroethene	0.10	N.D.
Toluene	0.10	0.10
1,1,1-Trichloroethane	0.10	N.D.
1,1,2-Trichloroethane	0.10	N.D.
Trichloroethene	0.10	N.D.
Vinyl acetate	0.10	N.D.
Vinyl chloride	0.10	N.D.
Total Xylenes	0.10	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL



Scot Cocanour
Laboratory Director

Surrogate Standards Percent Recovery:	
1,2-Dichloroethane-d4	113
Toluene-d8	108
4-Bromofluorobenzene	107

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-2569
Phone (206) 481-9200 • FAX (206) 485-2992

RZA/AGRA	Client Project ID:	McCollum Park	Sampled:	Mar 10, 1992
11335 NE 122nd Way, #100	Sample Descript:	Air	Received:	Mar 10, 1992
Kirkland, WA 98034	Analysis for:	Hydrogen Sulfide		
Attention: Jim Dransfield	First Sample #:	203-0461	Analyzed:	Mar 17, 1992
			Reported:	Mar 18, 1992

LABORATORY ANALYSIS FOR: Hydrogen Sulfide

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L
203-0461	GP 1	0.10	N.D.
203-0462	GP 3	0.10	N.D.
203-0463	GP 4	0.10	N.D.
203-0464	GP 13	0.10	N.D.
203-0465	GP 11	0.10	N.D.
203-0466	GP 8	0.10	N.D.
203-0467	GP 5	0.10	N.D.
203-0468	GP 6	0.10	N.D.
203-0469	GP 9	0.10	0.75
203-0470	GP 12	0.10	N.D.
BLK031792	Method Blank	0.10	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

NORTH CREEK ANALYTICAL

Scot Cocanour
Laboratory Director

NORTH CREEK ANALYTICAL

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Phone (206) 481-9200 • FAX (206) 485-2992

RZA/AGRA
11335 NE 122nd Way, #100
Kirkland, WA 98034
Attention: Jim Dransfield

Client Project ID: McCollum Park
Method : EPA 1311/8240
Sample Matrix : Air
Units : NG
QC Sample #: BLK031392

Analyst : J. Kimball

Analyzed: Mar 13, 1992
Reported: Mar 18, 1992

QUALITY CONTROL DATA REPORT

Analyte	Sample Conc.	Spike Conc. Added	Conc. Matrix Spike	Matrix Spike % Recovery	Conc. Matrix Spike Duplicate	Matrix Spike Duplicate % Recovery	Relative % Difference
Vinyl chloride	N.D.	100	174	174%	157	157%	10%
1,1-Dichloro-ethene	N.D.	100	93	93%	88	88%	6%
2-Butanone	N.D.	200	306	153%	264	132%	15%
Chloroform	N.D.	100	96	96%	97	97%	1%
Carbon tetrachloride	N.D.	100	93	93%	92	92%	1%
1,2-Dichloro-ethane	N.D.	100	144	144%	129	129%	11%
Benzene	N.D.	100	108	108%	106	106%	2%
Trichloro-ethene	N.D.	100	94	94%	91	91%	3%
Tetrachloro-ethene	N.D.	100	83	83%	81	81%	2%
Chlorobenzene	N.D.	100	91	91%	84	84%	8%

NORTH CREEK ANALYTICAL

Scot Cocanour
Laboratory Director

$$\text{\% Recovery:} \quad \frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$$

$$\text{Relative \% Difference:} \quad \frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{\text{(Conc. of M.S. + Conc. of M.S.D.) / 2}} \times 100$$

As discussed in Section 6.0, vapor trenches are proposed to be placed in the northern and western portion of the property (see Figure D-1). The trenches are to be 1 foot by 1 foot construction. One inch schedule 40 PVC pipe with 0.020 inch slots will be placed in trenches and filled with pea-gravel sealed from the surface with 10 mil polyethylene sheeting covered with imported fill to specified grade level (see Figure D-2).

Reduced pressure will be induced in the subsurface by using ROTRON DR 808 regenerative glowers and control system manifolded to underground piping. All equipment will be placed in a fenced treatment equipment compound located in the southern portion of the property (see Figure D-3). Risers will bring the slotted piping sections to the initial surface level and all headers will be covered with the imported fill materials.

Shallower trenching (about ½ foot deep) will be needed for headers but health and safety factors and precautions must still be taken into consideration. Electrical supply to equipment will need to be installed to all applicable fire and regional specifications in water-proof enclosures (Nema 3R). All exhaust off-gasses will be monitored and in the event that emission limits are exceeded system shut down will be implemented.

The following summary of equipment and supplies needed are based on drawings provided and are only accurate for approximate lengths and angels of piping placement. Prices include Washington state sales tax and additional freight on some items may be necessary.

EQUIPMENT SCHEDULE

	Quantity	Equipment
Venting System		
High Vacuum Blower	2	Regenerative Blower: 347 SCFM Maximum flow, 82 inches-H_20 Maximum Vacuum 5.0-HP, Explosion-proof motor enclosure (ROTRON Model #DR808f72X, 230V, 14.0 A, 3-phase or pre-approved equivalent)
Treatment Controller	1	Interlocked control system for three blowers with alarm override capabilities pre-determined. All control components are intrinsically safe. (230V, 20A, 3-phase)
Combustible Gas Monitoring System	1	Combustible Gas Monitoring System, 2-Channel, trouble signal output to Master Control Panel, continuous monitoring (M.S.A. Model #5100 Combustible Gas Monitoring System or pre-approved equivalent)
Off-gas Ignition/ Sensor Controller	1	Ignition system to read output levels and ignite off-gasses when predetermined limits are reached. Carbon canisters may be used initially to provide treatment until appropriate system is selected.
Support Equipment & Material		
Electrical Installation		Provide materials for 115V and 230V power supply to compound and arrange permits and inspection by local code officials. Install power supply, power switches and junction boxes to each compound, all associates wiring and conduit for power supply.

Trench Excavations	Piping trenches approximately 1' deep X 1' wide X 5710 total L.F. Contractor provides removed soils handling, imported backfill materials, compaction, and grading to sufficient inspected standards,
Compound Foundation	15'X15' P.C. concrete slab minimum 6" thick, steel wire mesh reinforcement, slopes (minimum 1/8" per foot), medium broom finish.
Compound Enclosure	Chain link fence with 4' gate 15'X15', 6' high. Optional privacy slats upon request, install mounting posts for electrical panels.

The costs and procedures provided in this document reflect the understanding of capturing fugitive vapors escaping from the subsurface material and not to be promoted as a remediation of subsurface materials. We can provide more details incorporation of this system into other site electrical, mechanical and ventilation system as your design develops.

W-7764

McCOLLUM PARK

PARK & RIDE FACILITY

TABLE 1: EQUIPMENT SCHEDULE AND COSTS ESTIMATE

PIPING SYSTEM MATERIALS

MATERIALS	QUANTITY	TOTAL LENGTH (L.F.)
2" SCH 40 PVC (20' SECTIONS)	10	200
2"-0.010' SLOTTED PVC (10' SECTIONS)	391	3910
½ BEND 2" SCH 40	10	
TEE WYE 2"X2"X-22" SCH 40 PVC	7	
2"-THREADED ENDCPAS SCH 40 PVC	2	
2"X2"X2"X2" CROSS	5	
2"X4" SLIP BUSING	8	
2" GLOBE VALVE PVC	12	
2" SLIP COUPLERS	215	
4" SCH 40 PVC (20' SECTIONS)	18	360
4"-0.010" SLOTTED PVC (10' SECTIONS)	124	1240
½ BEND 4" SCH 40 PVC	2	
TEE WYE 4"X4"X4" SCH 40 PVC	7	
4" GLOBE VALVES PVC	2	
4" SLIPE COUPLERS	65	

COSTS FOR VES SYSTEM	COSTS
PIPING AND FITTINGS	$25,000.00
VES SYSTEM	$10,000.00
COMBUSTIBLE GAS MONITOR	$4,000.00
VAPOR IGNITION SYSTEM	$6,000.00
PEA-GRAVEL FOR TRENCHES	$16,000.00
ESTIMATED TOTAL FOR VES EQUIPMENT	**$61,000.00**

EXISTING PARKING

POOL AREA

TREATMENT COMPOUND

LEGEND

- 4" DIA. SCH 40 0.010" SLOTTED PVC VENT LINE
- 2" DIA. SCH 40 0.010" SLOTTED PVC VENT LINE
- 4" DIA. SCH 40 BLANK PVC HEADER LINE
- 2" PVC GLOBE VALVE BELOW EMCO WHEATON SURFACE MONUMENT
- C C' CROSS-SECTION LOCATION (SEE FIGURE D2)

N

0 150 300

SCALE IN FEET

RZA AGRA, INC.
Engineering & Environmental Services

11335 N.E. 122nd Way
Suite 100
Kirkland, Washington 98034-6918

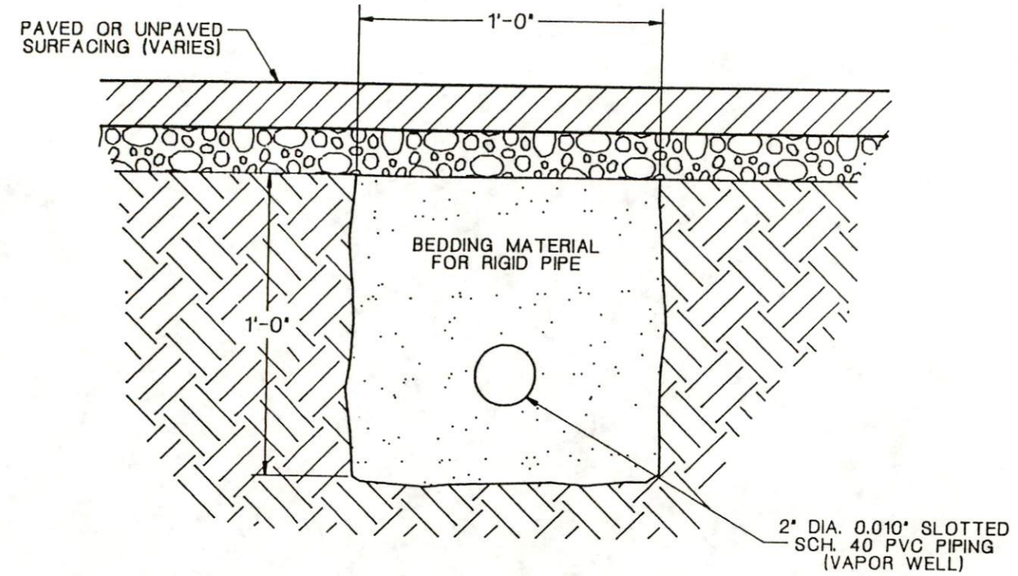
W.O.	W-7764
DESIGN	CSS
DRAWN	MJF
DATE	MAY 1992
SCALE	1"=150'

McCOLLUM PARK - PARK & RIDE LOT
EVERETT, WASHINGTON

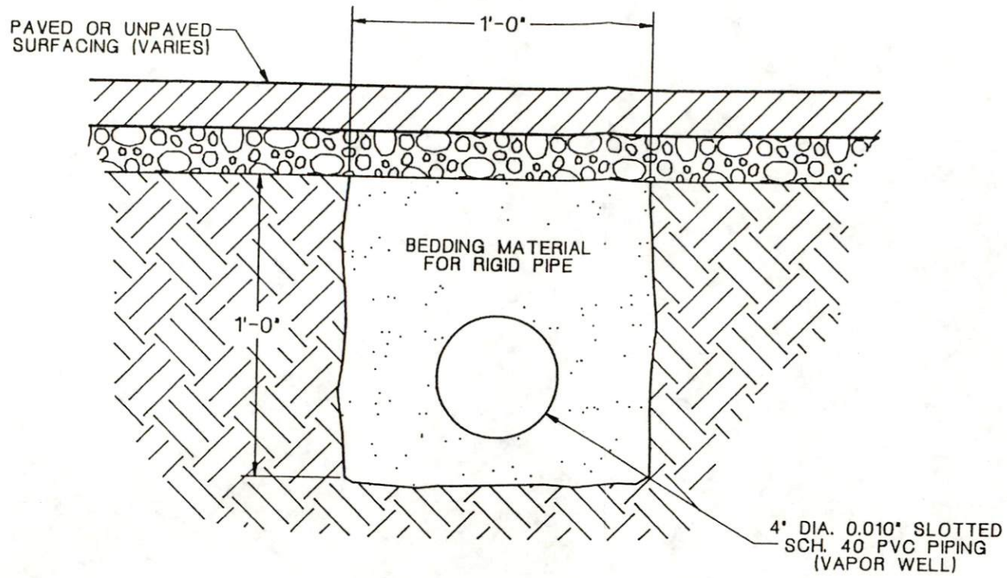
SITE PLAN/PIPE LAYOUT

FIGURE D1

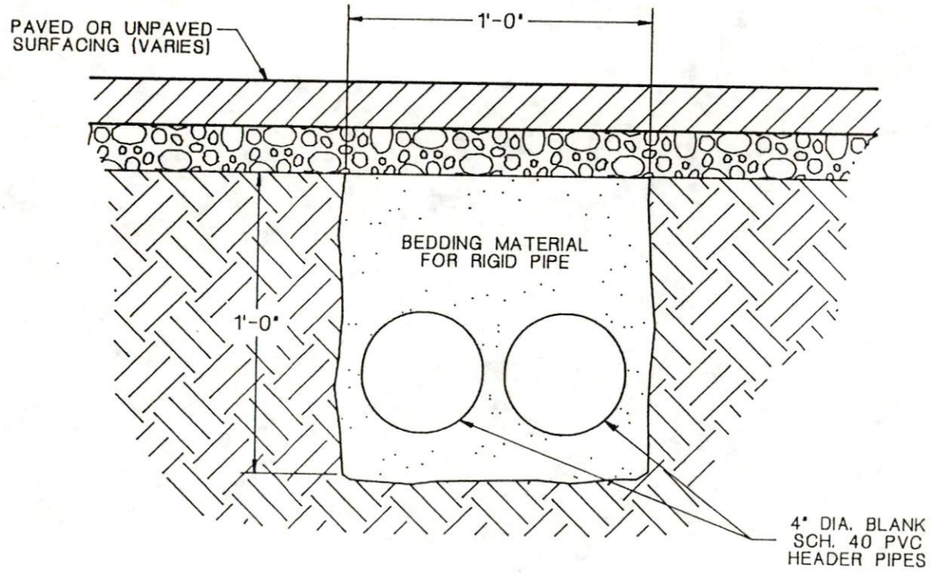
DRAWING NO. \78\W-7764\VES-SITE.DWG



CROSS SECTION A-A'



CROSS SECTION B-B'



CROSS SECTION C-C'

RZA AGRA, INC.
Engineering & Environmental Services

11335 N.E. 122nd Way
Suite 100
Kirkland, Washington 98034-6918

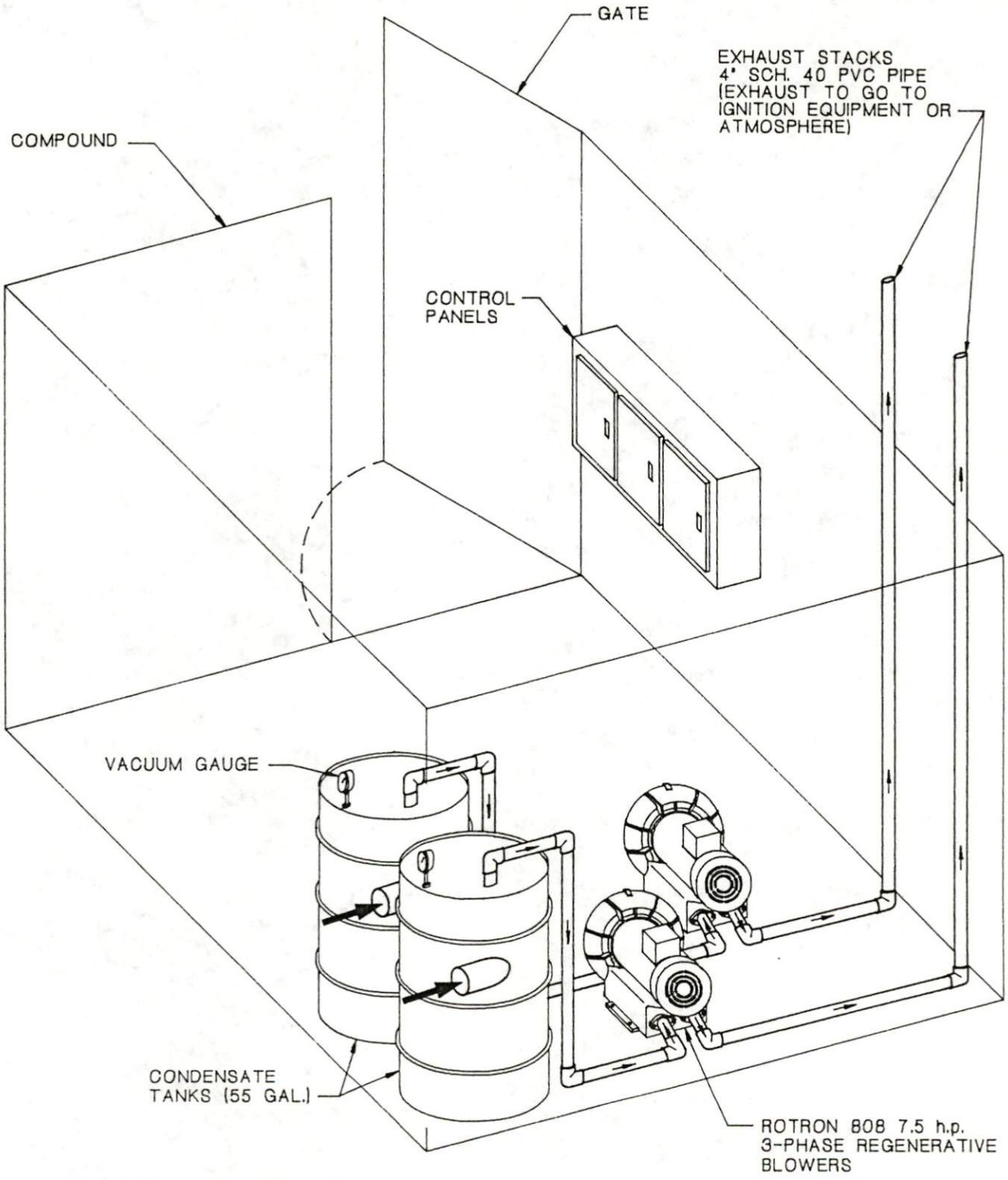
W.O.	W-7764
DESIGN	CSS
DRAWN	MJF
DATE	JUN 1992
SCALE	NONE

McCOLLUM PARK - PARK & RIDE LOT
EVERETT, WASHINGTON

TYPICAL TRENCH DETAILS

FIGURE D2

DRAWING NO. \7B\W-7764\VES-X-8.DWG



VAPOR EXTRACTION COMPOUND

RZA AGRA, INC.
Engineering & Environmental Services

11335 N.E. 122nd Way
Suite 100
Kirkland, Washington 98034-6918

W.O.	W-7764
DESIGN	CSS
DRAWN	MJF
DATE	JUN 1992
SCALE	N.T.S.

McCOLLUM PARK - PARK & RIDE LOT
EVERETT, WASHINGTON

VAPOR EXTRACTION SYSTEM
ABOVE GROUND FEATURES

FIGURE D3

DRAWING NO. \78\W-7764\VES-COMP.DWG

APPENDIX E

References

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Rittenhouse-Zeman & Associates, Inc. 1986, Subsurface Investigation and Geotechnical Engineering Study Phase II, 128th Street S.E. Rehabilitation, Snohomish County, Washington, 12p.