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ACRONYMS

AA	atomic absorbtion
BHI	Bechtel Hanford, Inc.
CAS	Chemical Abstract Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLARC II	Cleanup Levels and Risk Calculations
CRDL	Contract Required Detection Limit
DOE-RL	U.S. Department of Energy, Richland Operations Office
DQO	data quality objectives
EPA	Environmental Protection Agency
ICP	inductively coupled plasma
LOD	limit of detection
LOQ	level of quantitation
MDL	Mechanical Development Laboratory
MTCA	Model Toxics Control Act
PCB	polychlorinated biphenyl
QC	quality control
RCRA	Resource Conservation and Recovery Act
RESRAD	Residual Radioactive Material Guidelines
SVOA	semivolatile organics analysis
TCL	target compound list
TCLP	toxicity characteristic leachate procedure
TOX	total organic halogens
TSD	treatment, storage, and/or disposal
VOA	Volatile organics analysis
WHC	Westinghouse Hanford Company
WTF	Waste treatment facility
Ecology	Washington State Department of Ecology
ANL	Argonne National Laboratory
PNL	Pacific Northwest Laboratory
DOH	Washington State Department of Health
TLD	Thermoluminescent dosimeter
UCL	Upper confidance level
WAC	Washington Administrative Code
CFR	Code of Federal Regulations
EB	equipment blank
TB	trip blank
Tri-Party Agreement	Hanford Federal Facility Agreement and Consent Order

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1.0 INTRODUCTION

The purpose of this data evaluation report is to summarize and evaluate the data obtained during soil and water sampling conducted at the 100-D Ponds. The data will support the development of a closure strategy for the deactivated 100-D Pond, a waste management unit located on the Hanford Site in southeastern Washington State.

The report is presented in four parts. The first section gives a broad overview of site. Section 2.0 discusses the sampling, laboratory analysis, and validation activities. Section 3.0 describes how the laboratory data was compared to risk based values. The last section discusses the conclusions drawn from the data. While the focus of this report is on nonradioactive waste materials; radionuclide data is presented to provide a complete evaluation of potential site risks.

Sampling and analysis of the 100-D Pond water and soil has taken place in two phases. These two phases allowed different laboratories to be used and different analytical target lists to be utilized. This report assesses data quality and useability of both sampling phases.

1.1 REGULATORY BACKGROUND

The U.S. Department of Energy, Richland Operations Office (RL), the U.S. Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) have entered into an agreement called the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1994). Included in the goals of this agreement are to list treatment, storage, and disposal (TSD) units, identify which units will undergo closure, schedule cleanup milestones, and integrate regulatory requirements.

The EPA and Ecology jointly oversee the *Resource Conservation and Recovery Act of 1976* (RCRA) regulations in Washington State. The EPA retains oversight authority while delegating to Ecology the administration of a state program that is consistent with, or more stringent than, the federal program. The regulations can be found in WAC 173-303 and 40 CFR 260 to 270. Ecology's authorization includes regulating the closure of TSD units.

The 100-D Pond is an interim-status TSD unit under RCRA, which is currently undergoing closure pursuant to WAC 173-303. The 100-D Pond is located in the 100-DR-1 Operable Unit, a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) unit designated for remedial investigation and remedial action. The risk based standards presented in this report and used in the data evaluation are intended to be consistent with RCRA and CERCLA, as required by the Tri-Party Agreement. A RCRA closure plan has been submitted to Ecology and is in review (DOE-RL 1992). The evaluation presented in this report is based on current regulations, the requirements identified in the *100-D Ponds Closure Plan* and regulatory negotiations that have occurred for this and other units as documented in Unit Manager Meetings minutes as per the Tri-Party Agreement (Ecology et.al, 1994).

1.2 FACILITY INFORMATION

1.2.1 Facility Description

The 100-D Pond TSD unit is located adjacent to and north of the north perimeter fence of the 100-D Area (Figure 1). This TSD unit was constructed as a surface impoundment for liquid effluent and began operations in 1977. It was constructed primarily for the impoundment and disposal of

nonradioactive, nondangerous liquid effluent from the 183-D Water Treatment Facility (WTF). This unit currently consists of two surface ponds interconnected by effluent transfer piping.

Beginning in 1950, before the operation of this site as a TSD unit, this location served as the 188-D Ash Disposal Basin which received coal ash from the 184-D Powerhouse. Between 1950 and 1966, the location received ash/water effluent only. The ash basin was retired in 1966, and between 1966 and 1977 the site received no discharges. By 1977, when pond operations began, the 100-D Area industrial sewer system had been permanently diverted to discharge solely into 100-D Pond. All discharges to this location have arrived by way of the same influent pipe from the 100-D Area process sewer system. The pond was operated as a TSD facility until June 1994, when all discharges to the pond ceased.

1.2.2 RCRA TSD Unit

The 100-D Pond TSD unit began operations in 1977, as a single, uncovered, unlined pond of approximately 0.2 hectare in size. In 1979, the original pond was modified to eliminate a bottom sealing problem caused by the accumulation of flocculent. To resolve the problem, the pond was divided into two ponds by the construction of a dike with sloping walls, and this configuration is how the facility exists today (Figure 2). The ponds had a combined surface area of 50 m by 67 m (164 ft by 219 ft) and the two ponds maintain the surface elevation of the original pond. Two horizontal effluent transfer pipes were installed at different elevations in the dike to allow flow of clarified effluent from the settling pond to the percolation pond (Figure 2). Effluent enters 100-D Pond at what is now the northeast corner of the settling pond through a 0.9-m (3-ft)-diameter influent pipe originating from the 100-D Area process sewer system. The influent pipe protrudes from a concrete abutment and was partially submerged by the settling pond water and sediment.

The sources of effluent that entered the 100-D Pond are the 183-D WTF, the 182-D Reservoir, and the 189-D Mechanical Development Laboratory (MDL). The average 183-D WTF daily discharge to the pond was 19 to 265 L/min (5 to 7 gal/min). In addition to this daily discharge, the 183-D WTF multimedia filters were backwashed monthly. This generated 530,600 L (140,100 gal) of waste discharged to 100-D Pond. Biannually, the 183-D WTF settling ponds were washed down and this generated 2,728,800 L (720,400 gal) of waste per year that was discharged to the pond (DOE-RL 1992). Any discharge from the 182-D Reservoir resulted from reservoir overflow and consisted of raw water from the Columbia River (DOE-RL 1992). From 1977 to 1988, discharge from the 189-D MDL contributed to the waste disposed at 100-D Pond. The 189-D MDL complex consisted of activities involved in 185-D/189-D, 190-D, 190-DA, and 1724-DA facilities. The discharges from these facilities were small and of an intermittent nature (DOE-RL 1992). The 100-D Pond is identified as a TSD unit because the 189-D MDL complex discharged corrosive demineralizer regenerative solutions to the pond. The 100-D Pond has not received dangerous waste since January 1986.

2.0 SAMPLING AND ANALYSIS

In September 1992, phase I samples were collected at the 100-D Pond. The protocol used was based on RCRA and CERCLA guidance. The media sampled included water and sediment from the settling pond and soils from the percolation pond (DOE-RL 1992). Phase II samples were collected in January 1995. Phase II samples consisted of soils collected in both ponds, along and in the berm, and along the sides of the settling pond (BHI 1995a).

2.1. PHASE I SAMPLING AND ANALYSIS

The phase I sampling event was designed to meet the requirements of both RCRA and CERCLA by providing information that can be used to develop a closure strategy for the RCRA TSD unit and to provide characterization information for the 100-DR-1 Operable Unit remedial investigation. The sampling activities, including the number of samples to be taken (soil, sediment, water, splits, duplicates, and quality assurance samples), the sample locations, and the analyte list are described in the *Description of Work 100-D Ponds Nonintrusive Characterization* (WHC 1992a).

One water sample was taken in the settling pond near the influent to the pond (Figure 2). Two equipment blanks and one trip blank were taken. Procedures from the *Environmental Investigation and Site Characterization Manual* (WHC 1988) were used to collect samples.

Soil and sediment samples were collected from the settling pond and percolation pond (Figure 2). A total of 22 soil and sediment samples were taken including splits and duplicate samples. In addition to the soil and sediment samples, one equipment blank and three trip blanks were taken. The sample sites (Figure 2) were selected using both random and non-random statistical methods. Eleven sediment samples were collected from the settling pond. Five samples were selected randomly and seven samples were chosen at nonrandom points of interest. The nonrandom samples were collected at the influent and the deepest sections of the settling pond. Eleven soil samples were collected from the percolation pond. Five of the samples were collected randomly and six samples were collected at the influent and deepest sections of the pond. All samples were drawn from the top 30 cm (11.82 in.) of sediment or soil. Procedures from the *Environmental Investigation and Site Characterization Manual* (WHC 1988) were used to collect samples.

After sampling was completed, the samples were sent to two offsite laboratories for analysis. Weston was the primary laboratory and TMA analyzed the split samples. The samples were analyzed for the constituents designated in the *100-D Ponds Closure Plan*, DOE/RL-92-71 (DOE 1992). Twenty two samples were analyzed using RCRA SW-846 (EPA 1986) methods and eight samples analyzed using CERCLA contract lab procedures.

Analytical results for the water samples are presented in Table 1. Table 2 and 3 present the soil and sediment analytical results.

2.2 PHASE II SAMPLING AND ANALYSIS

Several meetings were held with RL and Ecology to establish the data quality objectives (DQO) for the phase II sampling. It was determined that the data collected would be used for characterization of the 100-D Ponds and to determine the need for a barrier around the 100-D Ponds. The meetings resulted in a DQO agreement that identified the number of samples to be taken (including splits, duplicates, and quality assurance samples), the sample locations, the analyte list, the validation requirements, and the schedule for completion of activities. The DQO agreement can be found in the *Description of Work for*

100-D Pond Sampling, Phase II (BHI 1995a).

Soil and sediment samples were collected from the settling pond and percolation pond (Figure 3). A total of 28 soil and sediment samples were taken including split and duplicate samples. In addition to the soil and sediment samples, two equipment blanks were taken. All samples were taken using SW-846 protocols (EPA 1986). Most sample sites were selected during the DQO process. Additional sample sites were identified during sampling to account for field conditions. Per the DQO process the percolation pond test pit 3 was to be excavated in the pond near the two overflow pipes. This resulted in the test pit being excavated in the berm rather than the pond bottom. To obtain samples at and below the percolation pond bottom, test pit 5 was excavated and samples obtained. Other field changes included collecting additional samples from test pit 2 and the surface soil around test pit 2. The additional samples collected in test pit 2 were to further characterize the layers of soil encountered in the test pit. An extra surface sample collected near test pit 2 was intended to characterize the unanticipated radioactive material found on the surface of the pond sediment. Field change documentation is provided in Appendix A. Surface samples were collected within the top 15 cm (6 in.) of soil (Figure 3). Samples in the test pits were sampled at various depths from the surface to 244 cm (96 in.) deep. Procedures from the *Environmental Investigation and Site Characterization Manual* (WHC 1988) were used to collect samples. The following provides a detailed discussion of the sampling.

A total of seven phase II surface samples were collected in the settling pond. Six sample locations (Figure 3) were defined in the 100-D Pond DQO meetings. Two of these six locations were from surface soil inside the settling pond. The four other samples were taken from the banks of the settling pond. Based on field decisions a seventh sample was collected southwest of test pit 2. A surface layer (off white material 5 mm thick) was encountered that showed a higher than normal background reading using field radiation detection instrumentation. This material was scraped off the pond surface and collected for radionuclide analysis and metals analysis (B0DMT7).

Five test pits were excavated during Phase II sampling. Test pit 1 was dug in the southwest quadrant of the settling pond. This portion was near the deepest area of the pond when water was present. Three samples were collected at depths of <15 cm, 15 - 41 cm, and 107 cm (<6 in., 6 - 16 in., and 42 in., respectively). Figure 4 shows the geologic log for test pit 1.

Test pit 2 was excavated in the northeast quadrant of the settling pond. This area is near the influent of the pond. Eleven samples were collected at depths of <15 cm, 24 - 49 cm, 49 - 61 cm, 61 -64 cm, and 64 - 119 cm (<6 in., 9.4 - 19.3 in., 19.3 - 24 in., 24 - 25.2 in., and 25.2 - 46.8 in., respectively). Splits and duplicate samples were collected at depths of <15 cm, 24-49 cm, and 64-119 cm. Figure 5 shows the geologic log for test pit 2.

Test pit 3 was excavated in the percolation pond side of the berm that separates the percolation and the settling ponds. The pit was excavated between the two influent pipes to the percolation pond. Two samples were collected at depths of <15 and 122 cm (<6.0 and 48 in., respectively). Figure 6 shows the geologic log for test pit 3.

Test pit 4 was excavated in the middle of the berm that separates the percolation and settling ponds. Two samples were collected at depths of 122 and 244 cm (48 and 96 in., respectively). Figure 7 shows the geologic log for test pit 4.

Test pit 5 was excavated in the southeast quadrant of the percolation pond under the main influent pipe into the pond. Three samples were collected at depths of <15 cm, 91 cm, and 244 cm (<6 in., 35.8 in., and 96 in., respectively). Figure 8 shows the geologic log for test pit 5.

After sampling was completed, the samples were sent to offsite laboratories for analysis. Quanterra was the primary laboratory and Lockheed analyzed the split samples. The samples were analyzed for the constituents designated in the *Description of Work for 100-D Ponds Sampling, Phase II* (BHI 1995a). The analysis methods used were RCRA SW-846 (EPA 1986) and laboratory specific procedures for radionuclides.

Table 4 presents the settling pond surface analytical results; Table 5 presents test pit 1 analytical results; Table 6 presents test pit 2 analytical results; Table 7 presents test pit 3 and 4 analytical results, and Table 8 presents test pit 5 analytical results.

2.3 DATA VALIDATION

After the analysis was completed, all of the phase I sample data and data for three phase II samples were validated. The objective of the data validation is to determine the usability of analytical results to support programmatic decisions concerning the waste site. The validation process consists of:

- Verifying the data packages for completeness;
- Editing and correcting reported results;
- Verifying compliance with quality assurance requirements;
- Checking quality control (QC) values against the defined limits;
- Determining correctness of qualitative identifications and quantitative results; and
- Applying qualifiers to analytical results for the purpose of defining the limitations of the reviewed data.

The qualifier flags used are associated with analytes not detected, estimated values, unusable results, and blank contamination. The qualifier flags are explained in the footnotes to the data tables. For the purpose of this report generally only one flag per analyte is listed. The qualifier flag for undetected (U) was given precedent over the estimated qualifier flag (J).

2.3.1 Phase I Validation

The data was validated using Westinghouse Hanford Company data validation procedures (WHC 1992b and WHC 1992c) and are reported in the *Data Validation Report for the 100-D Ponds Operable Unit - 100-D Ponds Sampling* (WHC 1994). The following deficiencies were noted in the validation report.

- Excess moisture present in samples for volatile organic analysis (VOA), semi-volative organic analysis (SVOA), and pesticide/polychlorinated byphenyls (PCB) analysis;
- VOA analysis outside quality control (QC) calibration limits;
- Blank contamination for methylene chloride and acetone;
- Low internal standard recovery for chlorobenzene-d5, 1,4-difluorobenzene, and bromochloromethane;
- Laboratory blank contamination for di-n-butylphthalate;
- Blank contamination for nine metals;
- Matrix spike recovery outside of QC limits for five metals;
- Analytical spike recovery outside of QC limits for four metals;
- VOA surrogate recovery for 1 compound outside QC limits;
- Pesticide/PCB surrogate recovery outside QC limits;
- Holding time exceeded for mercury and pesticide/PCB;
- Inductively coupled plasma (ICP) serial dilution results outside QC limits for zinc;
- Relative percent difference above QC limits for mercury.

Qualifier flags have been added to Tables 1 through 3 to indicate the analytical results that are associated with the above deficiencies. None of the data have been flagged as unusable, although some of the results are flagged as estimated.

2.3.2 Phase II Validation

Three samples (10% of the samples per the DQO) from test pit 2 were validated: B0DMT2, B0DMT3, and B0DMT4. The data was validated using Westinghouse Hanford Company data validation procedures which have been adopted by Bechtel Hanford, Inc. (WHC 1993a and WHC 1993b). The phase II validation results are reported in *Data Validation Summary Report for the 100-DR-1 Operable Unit 100-D Ponds Phase II Sampling* (BHI 1995b).

The following deficiencies were noted in the validation report for samples BODMT2 and BODMT3:

- Blank contamination for methylene chloride (for BODMT2 only), acetone, buthylbenzylphthalate;
- Internal standard recovery for perylene-d12 outside of QC limits;
- Calibration verification on 12 pesticide compounds outside of QC limits;
- Relative percent difference of 39% for ^{238}U duplicate results;
- Lack of ^{228}Ra duplicate results.

The following deficiencies were noted in the validation report for sample BODMT4:

- Blank contamination for methylene chloride and buthylbenzylphthalate;
- Calibration verification on 11 pesticides or PCB compounds outside of QC limits;
- Blank contamination for beryllium;
- Matrix spike accuracy fell outside of QC limits for antimony, manganese, and thallium results.

Qualifier flags have been added to Tables 4 through 8 to indicate the analytical results that are associated with the above deficiencies. None of the data have been flagged as unusable, although some of the results are flagged as estimated. Estimated results are usable for making decisions (BHI 1995b).

3.0 RISK EVALUATION

Analytes detected in soil were evaluated for contaminants that could potentially pose a risk to human health and the environment. Evaluation of soil data involved comparing the constituent concentrations with existing and proposed regulatory standards. Concentrations of non-radioactive constituents in soil were compared with contaminant-specific cleanup standards (also referred to as formula values) in the Model Toxics Control Act (MTCA). Doses associated with radionuclides in soil were calculated, and compared to a level of 15 mrem/year above background, which is the EPA proposed radionuclide soil cleanup standard (40 CFR 196).

3.1 MODEL TOXICS CONTROL ACT

MTCA (WAC 173-340) provides three options, Methods A, B, and C, for establishing site-specific cleanup levels, two of which (B and C) are potentially applicable to the Hanford Site. Method A is intended for sites with few well-defined contaminants and has limited applicability to the Hanford Site. Method B in MTCA establishes cleanup levels for individual carcinogenic substances based on an increased cancer risk of 1×10^{-6}. Individual noncarcinogen cleanup levels are based on a hazard index of one. MTCA formula values for numerous contaminants are available from Ecology in its *Cleanup Levels and Risk Calculation (CLARC II)* tables (Ecology 1994). MTCA formula values for Method B, Method C, and Method C - industrial land use are presented in Table 9.

In cases where cleanup levels under Method B are lower than background, provisions are available in the regulations to set cleanup levels equal to background concentrations in soils. The background data for non-radioactive contaminants are discussed below in Section 3.3. In cases where cleanup levels under Method B are technically impracticable to achieve, but do not have a potential for creating a significantly greater overall threat to human health or the environment, or where the site may have industrial land use, cleanup levels may be developed using Method C. Method C cleanup levels are developed in the same manner as Method B, except that the cleanup levels for individual carcinogenics are based on an increased cancer risk of 1×10^{-5}.

Sample analytical values exceeding Method B (that are above background), Method C, and Method C - industrial land use formula values are footnoted in the data tables (Tables 1-8).

3.2 EPA PROPOSED RADIONUCLIDE SOIL CLEANUP STANDARD

The EPA's proposed standard for remediation of sites with radionuclide contamination would limit radiation doses from contaminated sites to 15 mrem/year above background levels (40 CFR 196). The 15 mrem/year proposed standard corresponds to a increased cancer risk of 3×10^{-4}, based on the following assumptions:

- The site would be used in the future for residential use;
- Residents are potentially exposed for 350 days/year for 30 years;
- "All potential exposure pathways" are considered in assessing exposure to future residents (the exposure pathways are not specified in the proposed rule, but are described in the Background Information Document supporting the proposed rule).

Doses potentially associated with radionuclides in soil at this site were estimated using the RESidual RADioactivity (RESRAD) model, version 5.43. RESRAD was developed by Argonne National Laboratory (ANL) for use in implementing DOE orders (DOE 5400.5) regarding residual radioactive materials in soil (ANL 1993). RESRAD has been evaluated for use in implementing the EPA proposed

radionuclide soil cleanup standard in the draft *Technical Summary Report Supporting the Development of Standards for the Cleanup of Radioactively Contaminated Sites* (EPA 1994).

3.3 BACKGROUND CONCENTRATIONS AND DOSES IN SOIL

3.3.1 Nonradioactive Soil Background

Site-wide background concentrations of nonradioactive constituents in soil have been defined in the *Hanford Site Background; Part 1, Soil Background for Nonradioactive Analytes, Vol. 1 & 2* (DOE-RL 1994). This document presents statistical distributions of nonradioactive constituents in soil that represent the range of natural variability in soil composition. This range provides a consistent basis for evaluating nonradioactive contamination in soil. Threshold values used in determining background for the remediation goals process are based on the 95% upper confidence limit of the 95th percentile of the background data (95/95), using the Weibull distribution (DOE 1994). The threshold method was used here to expedite evaluation of the contaminant data in soil. Comparison of sample results to a threshold level requires less time, and fewer samples are necessary to perform other statistical tests, such as a hypothesis test, while assuring identification of contaminant concentrations above background. The nonradioactive soil background data is provided in Table 10.

3.3.2 Radionuclide Soil Background

Surface soil samples from the Hanford Site and south-central Washington State have been collected over a number of years by Pacific Northwest Laboratory (PNL) and the Washington State Department of Health (DOH). The majority of these samples have been collected in order to monitor operations at facilities that handle radioactive material (e.g., Hanford, WNP-2, ACI-Yakima). A limited number of samples have been collected away from surveillance sites to monitor radiological background conditions in this area (e.g., Sunnyside, Moses Lake, Walla Walla).

The radionuclide soil analyses generated by PNL and DOH are used to establish background conditions that could apply for the entire Hanford Site. These data were screened to eliminate sites that contained potential contamination, and resulted in a database containing 2085 analyses for 15 radionuclides. The screening process is described in *Hanford Site Background: Evaluation of Existing Soil Radionuclide Data*, which will be released by June 1995. Once screened, existing data were used to calculate confidence intervals and limits using both parametric (lognormal and Weibull) and nonparametric techniques, which is similar to what was done for the nonradioactive contaminants.

Background levels measured by thermoluminescent dosimeters (TLDs) can be found in the annual environmental reports issued by PNL (e.g., *Hanford Site Environmental Report for Calendar Year 1993*, PNL-9823). In 1993, the average background dose rate as measured by TLDs at two distant locations was approximately 88 mrem/year (this includes an approximate 30 mrem/year contribution from cosmic radiation). Background dose rates measured by field instruments were reported by Rathbun (*The Determination of the Penetrating Radiation Dose at Hanford*, PNL 1989) for the Hanford area, perimeter, and distant sites. This report concluded that average doses ranged from 70 to nearly 90 mrem/year for the different locations measured. Radionuclides in soil at background concentrations that could contribute to these estimated doses include ^{40}K and ^{226}Ra.

4.0 DISCUSSIONS AND CONCLUSIONS

4.1 LITHOLOGY

The lithology encountered was recorded by a geologist that was present during sampling. The test pit logs are presented in Figures 4 through 8. The following summarizes the lithology described in these logs. The lithology of the site ranges from clay to sand. The generic lithology of the settling pond soils is a covering of silty gravelly sand or sandy clay from 0-0.02 m (0-0.7 ft). The next layer is a clay layer that ends at 0.6-0.9 m (2-3 ft.) below the surface. Extending from 0.6-0.9 m (2-3 ft) to the bottom of the excavation, the soil was sand with a few gravels (Figure 4 and 5). The percolation pond lithology is not as distinct as that identified for the settling pond and ranges from silty sand to sand to gravelly sand down to the end of the excavation at 3 m (10 ft.) (Figure 8). The berm separating the settling and percolation ponds is composed of different layers of sand (Figure 7 and 8). As the 100-D Ponds is located in an ash basin, ash/coal/slag are common components of the soils and sediments.

4.2 CHEMICAL DATA

4.2.1 Percolation Pond and Berm

Arsenic was the only constituent in the percolation pond detected above both the MTCA Method B and the background levels. One sample contained an arsenic value of 10.8 mg/kg which is only 1.98 mg/kg above the background value of 8.92 mg/kg. However, this value is well below the maximum background value of 27.7 mg/kg.

4.2.2 Settling Pond

Contamination was detected in the settling pond within the clay layer ending 0.6-0.9 m (2-3 ft) below the surface and the sediment above this layer. No contamination was found below the clay horizon. Contaminants were detected in two of the settling pond wall samples taken close to the pond inlet. The analytes that exceed both MTCA Method B formula values and background values are presented in Table 11.

Table 11. MTCA Method B Contaminants.

Contaminant	Number of Samples Exceeding MTCA B[1]	Total Number of Samples Analyzed[1]	Maximum Concentration (mg/kg)
Aldrin	1	30	65
Antimony	1	25	37.2
Aroclor-1254	12	30	17
Aroclor-1260	12	30	12
Arsenic	178	25	62.2
Cadmium	13	25	6.3
Lead	2	25	519

[1] Includes splits and duplicates.

The analytes that exceed the MTCA Method C formula values are presented in Table 12.

Table 12. MTCA Method C Contaminants.

Contaminant	Number of Samples Exceeding MTCA C[1]	Total Number of Samples Analyzed[1]	Maximum Concentration (mg/kg)
Aroclor-1254	3	30	17
Aroclor-1260	3	30	12
Arsenic	1	25	62.2

[1] Includes splits and duplicates.

No results exceeded the MTCA Method C industrial formula values. One analyte (Aroclor-1254) was equal to the MTCA C value. However, concentrations in the duplicate and split samples were less than the primary sample.

One analytical detection of mercury in water was also compared to MTCA Method B and C formula values and was found to be less than the groundwater formula values of 4.8 ug/L for mercury.

4.3 RADIONUCLIDES DATA

4.3.1 Evaluation of Radionuclides in the Crust Overlying the Settling Pond Soil

Doses associated with concentrations of radionuclides in the thin crust overlying the settling pond soils were evaluated separately from the concentrations detected in the underlying soils. The concentrations in Sample BODMT7 were used to calculate the doses associated with the layer. The assumptions used in the calculations are summarized below:

- Surface area of the site: 1415 m^2 (1692 yd^2) crust;
- Thickness of the crust: 0.005 m (0.016 ft);
- Concentrations in BODMT7 are assumed to be present across the entire surface area of the crust;
- Assumptions correspond to potential exposure to an individual resident;
- Pathways of exposure are assumed to be: external exposure; soil ingestion, inhalation of suspended dust and inhalation of radon emanations from radium. For the radionuclides detected at the 100-D Pond, external exposure provided the largest contribution to total dose.

All other assumptions were default values supplied by RESRAD. Assumptions used in RESRAD are summarized in Table 13. Concentrations of radionuclides used in the model, along with the estimated doses at different time intervals following sampling, are presented in Table 14. Figure 9 summarizes the changes in dose rates over time, which indicate that doses decay to less than 40 mrem/year in 3 years. Note that RESRAD provides no dose predictions past 3 years

following sampling. Within 3 years, the dose rate associated with the radionuclides in the surface crust decline to within background dose rates. Background for external exposure from radionuclides in soil and cosmic radiation has been reported to be 88 mrem/year in PNL-9823, and PNL-7124 (Dirkes 1994, Rathbun 1989). Most of the estimated dose is from radium, which occurs naturally in soil, but is enriched in the crust.

4.3.2 Evaluation of Radionuclides in the 100-D Pond

Doses associated with radionuclides in soil were evaluated using median concentrations. The assumptions used were the same as presented previously for the overlying crust, with the exception that the thickness of contaminated soil was assumed to be 2 m (6.6 ft) and the surface area was assumed to be 3,350 m^2 (4,007 yd^2). The assumptions used in RESRAD are summarized in Table 13. Concentrations of radionuclides used in the model, along with estimated doses in 22 years (assumed to be 2018), are summarized in Table 15. Figure 10 summarizes the change in doses over time. Estimated doses in soil at the pond include the contribution from naturally occurring radionuclides, such as radium and potassium. The largest contribution to total dose was from ^{226}Ra. In general, the estimated doses associated with soils at 100-D ponds fell within background, as described in PNL-9823 and PNL-7124.

4.4 FIELD QUALITY ASSURANCE

Five equipment blanks (3 in phase I and 2 in phase II) and four trip blanks (phase I) were collected during sampling. During phase I, samples were analyzed using SW-846 methods and CERCLA contract laboratory protocal (section 2.1). During phase II, samples were analyzed using SW-846 methods (Section 2.2) . Trace quantities of organics such as acetone, methylene chloride, bis (2-ethylhexyl) phthalate, diethylphthalate and butylbenzphthalate were detected in most blanks. Butylbenzphthalate and acetone were the only organic compounds detected above contract required detection limits, and most were estimated values. Acetone was detected in sample B06D54 and B06D56, at concentrations of 14 and 21 ug/kg respectively. Butylbenzyphthalate was detected in sample B0DMT6 at a concentration of 1100 ug/kg. These analytes are common laboratory contaminants introduced during laboratory analysis and are generally not considered contaminants of concern.

Sample splits and duplicates were collected at seven different locations (Table 16). Most of the constituents present in the primary sample were also present in the split and duplicate samples. The exceptions were:

- VOA and SVOA constituents were detected in the phase I CERCLA samples but not in the phase I RCRA samples. VOA and SVOA constituents were detected in phase II samples.

- PCB contamination was detected in phase I settling pond RCRA sample B06D44, but PCB contamination was not detected in the associated CERCLA sample. PCB contamination was detected in phase II settling pond samples in the clay layer and the sediment above this layer.

Excluding the above exceptions, the sample sets can generally be considered representative. The laboratories demonstrated similar precision and accuracy for the sample sets.

Table 16. Quality Control Samples

LOCATION	SAMPLE NUMBER	ASSOCIATED SAMPLE NUMBER	TYPE	PROTOCOL
Phase I settling pond water	B06D51	B06D53 B06D52 B06D57	Trip blank Equipment blank Equipment blank	SW-846
Phase I settling pond soil (SP-6)	B06D27	B06D28 B06D29 B06D44	Duplicate Split Duplicate	CERCLA CERCLA SW-846*
Phase I settling pond soil (SP-7)	B06D30	B06D49	Duplicate	CERCLA[1] SW-846*
Phase I percolation pond (PP-6)	B06D26	B06D34	Duplicate	CERCLA[1] SW-846*
Phase I percolation pond (PP-7)	B06D31	B06D32 B06D33 B06D25	Duplicate Split Duplicate	SW-846 SW-846 CERCLA*
Phase I percolation and settling pond soil	All CERCLA samples	B06D50 B06D54	Equipment Trip	CERCLA CERCLA
Phase I percolation and settling pond soil	All SW-846 samples	B06D55 B06D56	Trip Trip	SW-846 SW-846
Phase II test pit 2 <15 cm	B0DMR2	B0DMT2 B0DMX2	Duplicate Split	SW-846 SW-846
Phase II test pit 2 24-49 cm	B0DMR3	B0DMT3 B0DMX3	Duplicate Split	SW-846 SW-846
Phase II test pit 2 64-119 cm	B0DMR4	B0DMT4 B0DMX4	Duplicate Split	SW-846 SW-846
Phase II percolation and settling pond	Phase II sampling	B0DMT6 B0DMX5	Equipment Equipment	SW-846 SW-846

* Only part of the constituent list are the same as the primary sample
"1" One sample was analyzed using SW-846 protocol and one sample using CERCLA protocol

4.5 GROUNDWATER PROTECTION

As discussed in Section 4.2, contamination was detected in the settling pond only within the clay layer ending 0.6-0.9 m (2-3 ft) below the surface and the sediment above this layer. No contamination was found below the clay horizon which indicates that contaminants have not migrated below the settling pond clay layer. The TCLP results from phase I surface sampling also support the conclusion that groundwater has not been impacted. Of the 26 samples taken during phase I sampling, 17 were analyzed using the TCLP. Results indicated that only barium, cadmium, chromium, and lead were present above the detection limit. All values, except two, were within the MTCA Method B formula values for groundwater protection. One sample showed cadmium at 8.7 ug/L and one sample showed barium at 1500 ug/L, which are above the MTCA Method B values of 8 ug/L and 1120 ug/L. The MTCA Method C formula values for cadmium and barium are 17.5 ug/L and 2450 ug/L, respectively. Therefore, even if the results are above the MTCA Method B values they are still significantly below the MTCA Method C values. Groundwater monitoring data also substantiates the contaminants from the 100-D Pond have not migrated to the groundwater as identified in the groundwater monitoring quarterly reports (e.g., DOE-RL 1995).

5.0 REFERENCES

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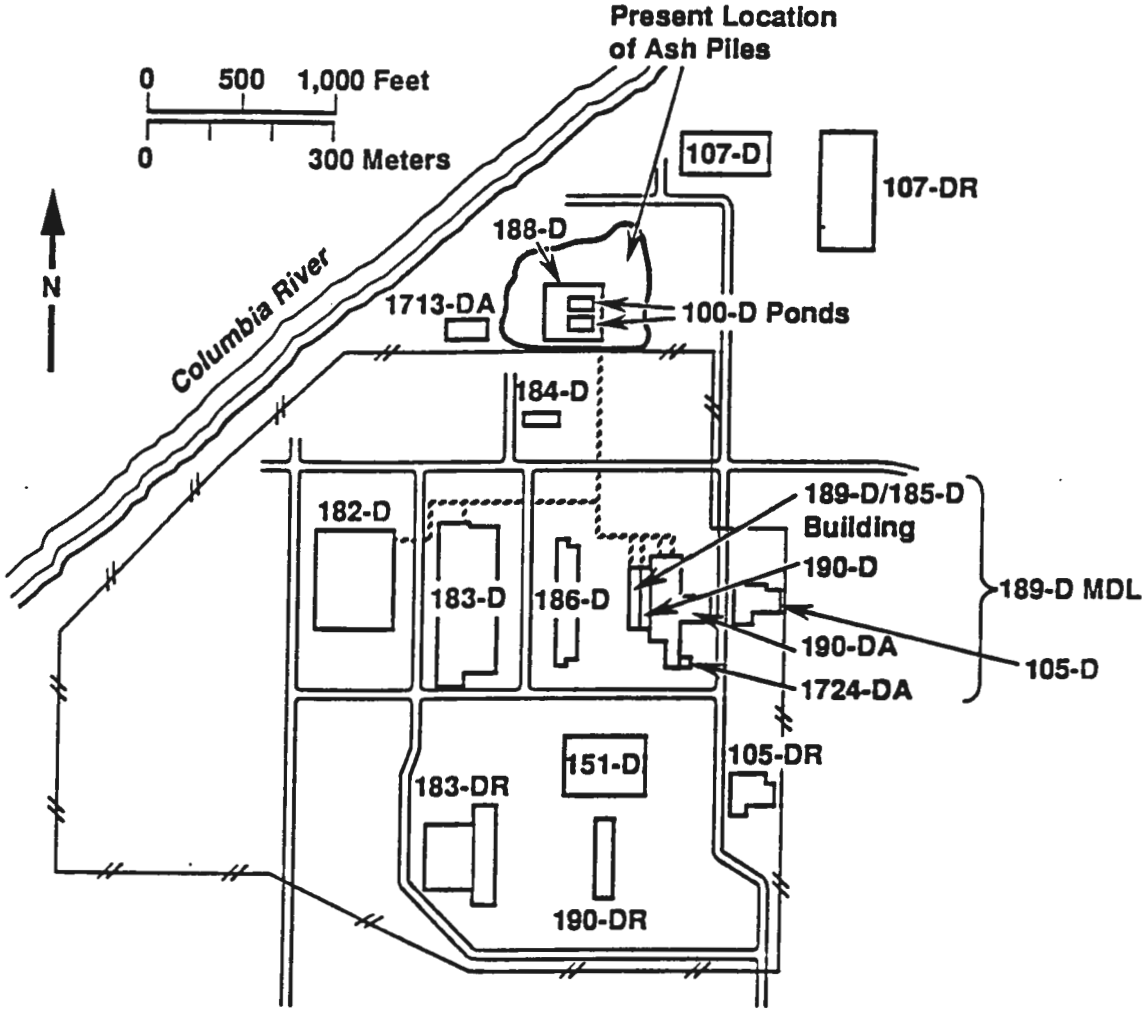
Figure 1. 100-D Pond.

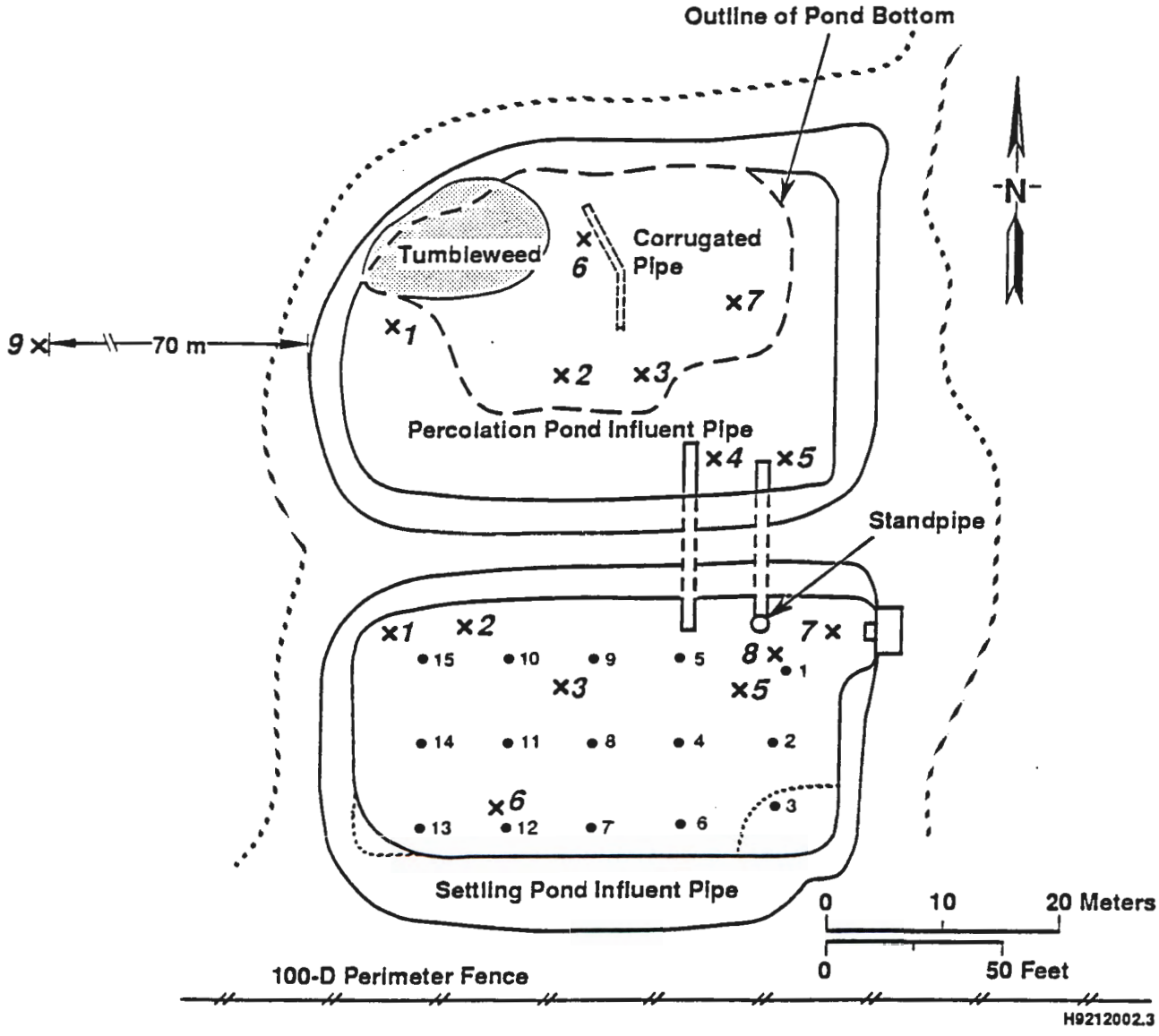


100-D/DR Area Perimeter Fence

100-D Area Process Sewer System

184-D Powerhouse
188-D Ash Disposal Basin (ADB)
100-D Ponds RCRA TSD Unit
183-D Water Treatment Facility (WTF)
182-D Reservoir
189D MDL Mechanical Development Laboratory
(Includes 185-D, 189-D, 190-D, 190-DA, 1724-DA)

Figure 2. 100-D Pond Phase I Sampling.



• Point of Depth Measurement

× = Sample Locations in 100-D Ponds (sampling completed under 100-DR-1 operable unit)

1-5 Randomly Determined Sample Locations (each pond) - RCRA Samples
6 Deep Point (each pond) - 100-DR-1 RCRA Past Practice Operable Unit Sample
7 Influent Point (each pond) - 100-DR-1 RCRA Past Practice Operable Unit Sample
8 RCRA Water Sample (settling pond only)
9 RCRA Past Practice Coal Ash Sample Location - - 4 samples (1 at 1', 3 at 3')

Figure 3. 100-D Pond Phase II Sampling.

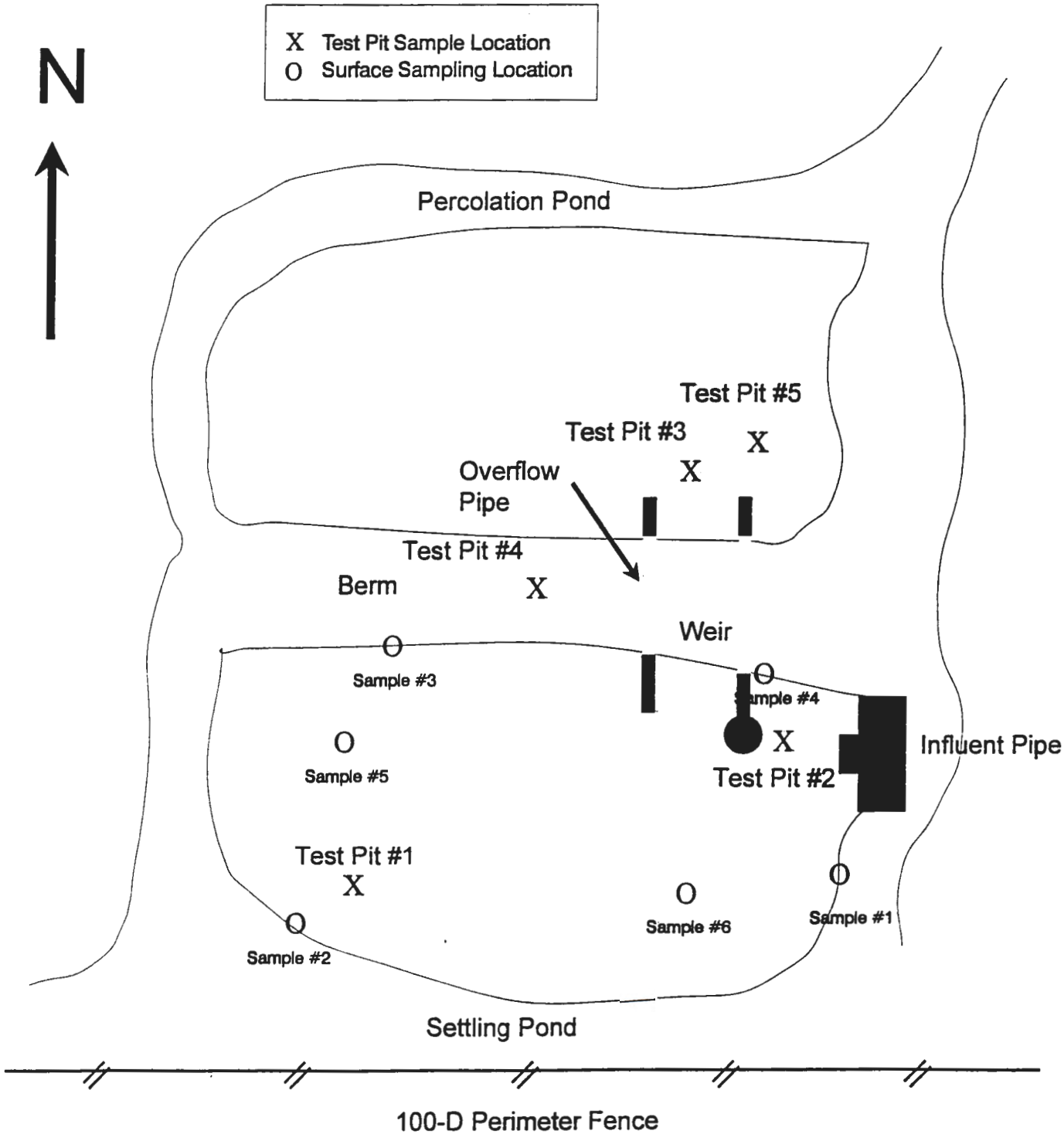


Figure 4. Test Pit 1 Geologic Log.

GEOLOGIC LOG	Boring or Well No. TEST PIT #1 Northing Easting Sheet 1 of 1

Location 100D POND N OF 193 BLDG — Project 100D POND PHASE II SAMPLING

Elevation — Drilling Contractor KEH

Driller R. MILLER — Drilling Method/Equipment TEST PIT/BACKHOE

Prepared by GK JAEGER (Sign/Print Name) — Reviewed By (Sign/Print Name) — Date

Depth (Feet)	Graphic Log	GEOLOGIC/HYDROLOGIC DATA Lithologic Description
		0-0.5' Sandy CLAY Color: reddish yellow (7.5YR 6/6) Bedding: 2-6" thick; blocky, frozen, thin crust on surf is v pale brown (10YR 7/2 to 7/3) and may be radioactive Other: can feel motion through surface when ground is struck
1		0.5-3.0' CLAY Color: light yellowish brown (10YR 6/4) and black (7.5YR N2/) Other: black clay is like jelly, brown clay is stiffer (like fudge) and splits easily when disturbed Tumbleweed frags (crisp) at interface of brown/black and black clay (@ 10") 1/4" layer of light gray (7.5YR N7/) coarse to medium sand (@ 15") Few irregularly spaced dark gray to black clay laminations (1-2')
2		Occ paper-thin, irregularly shaped, white (5YR 8/1), horizontal and vertical veins of very soft (smearable/hydrated) clay (1.5-2') Soft sediment deformation (load features) between black and brown horizons; brown clay is injected into black clay as dikes (10"-1.5') Black (7.5YR N2/) w/occ pockets of visible moisture; occ irregularly spaced laminations of lighter black to gray clay (1-3')
3		3-4' SAND w/few gravel Sharp, irregular contact w/clay above w/reddish yellow zone similar to the one at test pit #2; load features; few 1/2-3/4" well rounded pebbles; more moisture than at test pit #2 Occ well rounded, sub-prismoidal pebbles commonly 1 1/2 to 2", occ 3" (3.5-4')
4		
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8		
9		
10		

C/Z S P C/B

Figure 5. Test Pit 2 Geologic Log.

GEOLOGIC LOG	Boring or Well No. TEST PIT #2 Northing Easting Sheet 1 of 1
Location 100D POND N OF 193 BLDG	Project 100D POND PHASE II SAMPLING
Elevation	Drilling Contractor KEH
Driller R. MILLER	Drilling Method/Equipment TEST PIT/BACKHOE
Prepared by GK JAEGER GK Jaeger (Sign/Print Name)	Reviewed By (Sign/Print Name) Date

Depth (Feet)	Graphic Log	GEOLOGIC/HYDROLOGIC DATA Lithologic Description
		0-0.7' Silty gravelly SAND Color: light yellowish brown (10YR 6/4) Grainsize distribution: 20-25% gravel, 70-75% sand, 5% silt/clay Gravel distribution: 10% small cobbles, 70% pebbles, 20% fine pebbles Sand distribution: 30% coarse sand, 60% medium sand, 10% fine sand Roundness: gravel - well; sand - angular to sub-angular Sphericity: gravel - sub-prismoidal to spherical; sand - spherical Bedding: massive Other: thin roots, occ very thin black streaks (probably organic mat'l)
1		0.7-1.5' Sandy SILT/CLAY Color: light yellowish brown (10YR 6/4) to light gray (10YR 7/1), mottled to streaked Grainsize distribution: 20% sand, 80% silt/clay Roundness: sand - angular to sub-angular Sphericity: sand - spherical Bedding: laminated; sand layers are 1mm to 1cm thick; silt/clay and sandy silt/clay layers are up to several inches thick Other: clay is soft, blocky, nubby on broken surface; mod blebs and streaks of yellowish red (5YR 5/8) and white (10YR 8/1 to 8/2) clay w/in the silt/clay and sandy silt/clay layers; few coal and slag frags; few paper-thin, white (2.5Y N8/) mat'l, 1mm to 1cm wide, occuring randomly throughout interval as easily broken chips lying horizontally along clay partings, irregularly shaped as though precipitated on an uneven surface
2		1.5-2.0' CLAY Color: light gray (10YR 7/2) to light yellowish brown (10YR 6/4) and black (7.5YR N2/) Bedding: massive; at the top contact are coarse to medium sand sized particles of slag and coal forming a grainsize thick layer Other: plastic, greasy, organic odor; mod to abundant, irregularly shaped nodules of black clay (7.5YR N2/); few nodules of light yellowish brown (10YR 6/4) clay; few dark brown (7.5YR 3/2) organic mat'l; few yellowish red (5YR 5/8) and black (7.5YR N2/) streaks
3		2-10' SAND 2-2.08': Color: reddish yellow (7.5YR 6/8) Distribution: 75% very coarse sand, 25% coarse sand Composition: 90% coal/ash/slag, 10% quartz/glass Roundness: angular to sub-angular Sphericity: spherical Bedding: massive Other: mod. firm, cemented; 1mm thick yellowish red (5YR 5/8) sand at contact w/black sand below; sharp, irregular contact w/clay above 2.08-10': As above Color: black (7.5YR N2/) (salt & pepper) Other: sharp, irregular contact w/reddish yellow sand above; occ, irregularly shaped reddish yellow (7.5YR 6/8) and yellowish red (5YR 5/8) areas - many elongated vertically; light gray (10YR 7/1) clay nodules formed around 1-2" rounded pebbles 6" below reddish yellow layer occur randomly in sand; can't tell if yellowish red mat'l in the black sand is a precipitate from leaching through above clay or an alt'n product of the sand; yellowish red areas vary in intensity of color and are zoned; evidence of fluid movement to at least 6' randomly around pit
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7		
8		
9		
10	C/Z S P C/B	

Figure 6. Test Pit 3 Geologic Log.

GEOLOGIC LOG

Boring or Well No. **TEST PIT #3**
Northing Easting
Sheet 1 of 1

Location 100D POND N OF 193 BLDG
Project 100D POND PHASE II SAMPLING
Elevation
Drilling Contractor KEH
Driller R. MILLER
Drilling Method/Equipment TEST PIT/BACKHOE
Prepared by GK JAEGER (Sign/Print Name)
Reviewed By (Sign/Print Name) Date

Depth (Feet)	Graphic Log	GEOLOGIC/HYDROLOGIC DATA: Lithologic Description
		0-8' Gravelly SAND Color: light yellowish brown (10YR 6/4); salt & pepper Grainsize distribution: 25% cobbles and boulders, 75% coarse sand Roundness: gravel - well, sand - angular to sub-angular Spherisity: gravel - sub-prismoidal to spherical, sand - spherical Bedding: massive Other: loose
1		1-2': 10-15% small cobbles and pebbles; salt & pepper sand (ash) 5' from top of dike is a 6" black layer
2		2-4': Black (7.5YR N2/) (7' below top of dike and similar to the black layer in test pit #4); sometimes clast supported; occ reddish yellow (7.5YR 6/8) areas; occ light yellowish brown (10YR 6/4) silt/clay around gravel forming lenses
3		
4		4-8': Lighter black than above
5		
6		Few horizontal reddish yellow (7.5YR 6/8) zones at about 6-7'
7		
8		
9		
10	C/Z S P C/B	

Figure 7. Test Pit 4 Geologic Log.

GEOLOGIC LOG	Boring or Well No. TEST PIT #4 Northing Easting Sheet 1 of 1
Location 100D POND N OF 193 BLDG	Project 100D POND PHASE II SAMPLING
Elevation	Drilling Contractor KEH
Driller R. MILLER	Drilling Method/Equipment TEST PIT/BACKHOE
Prepared by GK JAEGER (Sign/Print Name)	Reviewed By (Sign/Print Name) Date

Depth (Feet)	Graphic Log	GEOLOGIC/HYDROLOGIC DATA Lithologic Description
		0-1' Gravelly SAND to sandy GRAVEL (thickness varies from 0.5' to 2.0') Color: light yellowish brown (10YR 6/4); salt & pepper Grainsize distribution: 25% gravel 70-75% sand up to 5% silt/clay Gravel distribution: 5% large and small cobble 50% medium pebble 45% small pebble Sand distribution: 10% coarse sand 50% medium sand 25% fine sand 15% very fine sand Roundness: gravel - well; sand - angular to sub-angular Sphericity: gravel - sub-prismoidal to spherical; sand - spherical Bedding: massive Other: loose; clast supported in places w/reddish yellow (7.5YR 6/6) gravelly silty SAND lenses; thin roots; max particle size is 8"
1		
2		1-2' SAND (thickness varies from 0.5' to 2.0') Color: black (7.5YR N2/) Grainsize distribution: 100% coarse sand Roundness: angular to sub-angular Sphericity: spherical Bedding: massive, irregular shaped, irregular thickness Other: loose; dull, black coating on sand grains (unburned coal dust?); black (10YR 2/1) shiney (wet) coating on gravel at bottom of layer; no odor; occ, small, light gray (7.5YR N7/), highly cemented, mod firm, coarse sand lenses at top of black sand--couldn't tell if cementing agent was CaCO3 (no HCl)
3		2-5' SAND w/gravel Loose, salt & pepper, ash
4		
5		5-5.5' Gravelly SAND Gravel is occ cobbles and mostly pebbles; salt & pepper, spherical coarse sand
		5.5-10' SAND w/gravel Loose, salt & pepper, ash
6		
7		
8		
9		
10	C/Z S P C/B	

Figure 8. Test Pit 5 Geologic Log.

GEOLOGIC LOG

Boring or Well No. TEST PIT #5
Northing Easting
Sheet 1 of 1

Location 100D POND N OF 193 BLDG
Project 100D POND PHASE II SAMPLING
Elevation
Drilling Contractor KEH
Driller R. MILLER
Drilling Method/Equipment TEST PIT/BACKHOE
Prepared by GK JAEGER (Sign/Print Name)
Reviewed By (Sign/Print Name)
Date

Depth (Feet)	Graphic Log	GEOLOGIC/HYDROLOGIC DATA: Lithologic Description
		0-0.2' Silty SAND Color: v dk grayish brown (2.5Y 3/2) Grainsize distribution: 60% sand 40% silt/clay Sand distribution: 80% coarse 20% fine Roundness: angular to sub-angular Sphericity: spherical Bedding: massive; loose; moist Other: thin roots; few yellow (2.5Y 7/6) clay lenses or rip up clasts (1" by 1/2"); firm, blocky clay on surface (result of freeze/thaw)
1		0.2-0.5' SAND Color: dark grayish brown (10YR 4/2); salt & pepper Grainsize distribution: 100% coarse sand Roundness: angular to sub-angular Sphericity: spherical Bedding: massive; loose; moist
2		0.5-0.7' Gravelly sandy SILT/CLAY Color: olive brown (2.5Y 4/3) Grainsize distribution: 20% gravel 30% sand 50% silt/clay Gravel distribution: 5% cobbles 5% small cobbles 50% large pebbles 40% medium pebbles Sand distribution: 50% medium 25% fine 25% v fine Roundness: gravel - well; sand - angular to sub-angular Sphericity: gravel - sub-prismoidal to spherical; sand - spherical Bedding: massive; loose to mod firm; moist Other: roots
3		0.7-3' Sandy GRAVEL Color: v dk gray to black (10YR 3/1 to 10YR 2/1); salt & pepper Grainsize distribution: 40% gravel 60% sand Gravel distribution: 5% boulders 5% large cobbles 25% small cobbles 20% coarse pebbles 15% medium pebbles 10% fine pebbles 20% v fine pebbles Sand distribution: 100% coarse Roundness: gravel - well; sand - angular to sub-angular Sphericity: gravel - sub-prismoidal to spherical; sand - spherical Bedding: massive; loose; moist
4		3-4' Sandy GRAVEL Color: yellow (2.5Y 7/6) Grainsize distribution: 70% gravel 25% sand 5% silt/clay Gravel distribution: 20% cobbles 40% medium pebbles 40% fine pebbles Sand distribution: 100% coarse Sand composition: 90-95% quartz/glass 5% coal/ash/slag trace mica Roundness: gravel - well; sand - angular to sub-angular Sphericity: gravel - sub-prismoidal to spherical; sand - spherical Bedding: clast supported; massive; loose; moist Other: top side of gravels are coated w/yellow silt/clay; described from backhoe bucket
5		4-10' Gravelly SAND Color: v dk gray to black (10YR 3/1 to 10YR 2/1); salt & pepper Grainsize distribution: 60% gravel 40% sand Gravel distribution: 5% large cobbles 25% small cobbles 5% very coarse pebbles 20% coarse pebbles 15% medium pebbles 10% fine pebbles 20% very fine pebbles Sand distribution: 100% coarse Roundness: gravel - well; sand - angular to sub-angular Sphericity: gravel - sub-prismoidal to spherical; sand - spherical Bedding: massive; loose; moist Other: occ very firm, mottled (very pale brown (10YR 7/4) and dark yellowish brown (10YR 4/4) clay nodules (2", 8", and 14") w/occ fractures filled w/white (10YR 8/1) precipitate; white (10YR 8/1) clay chunks of unknown orientation; described from backhoe bucket
6		
7		
8		
9		
10	C/Z S P C/B	

Figure 9. Evaluation of Radionuclides in Surface Crust - 100-D Pond.

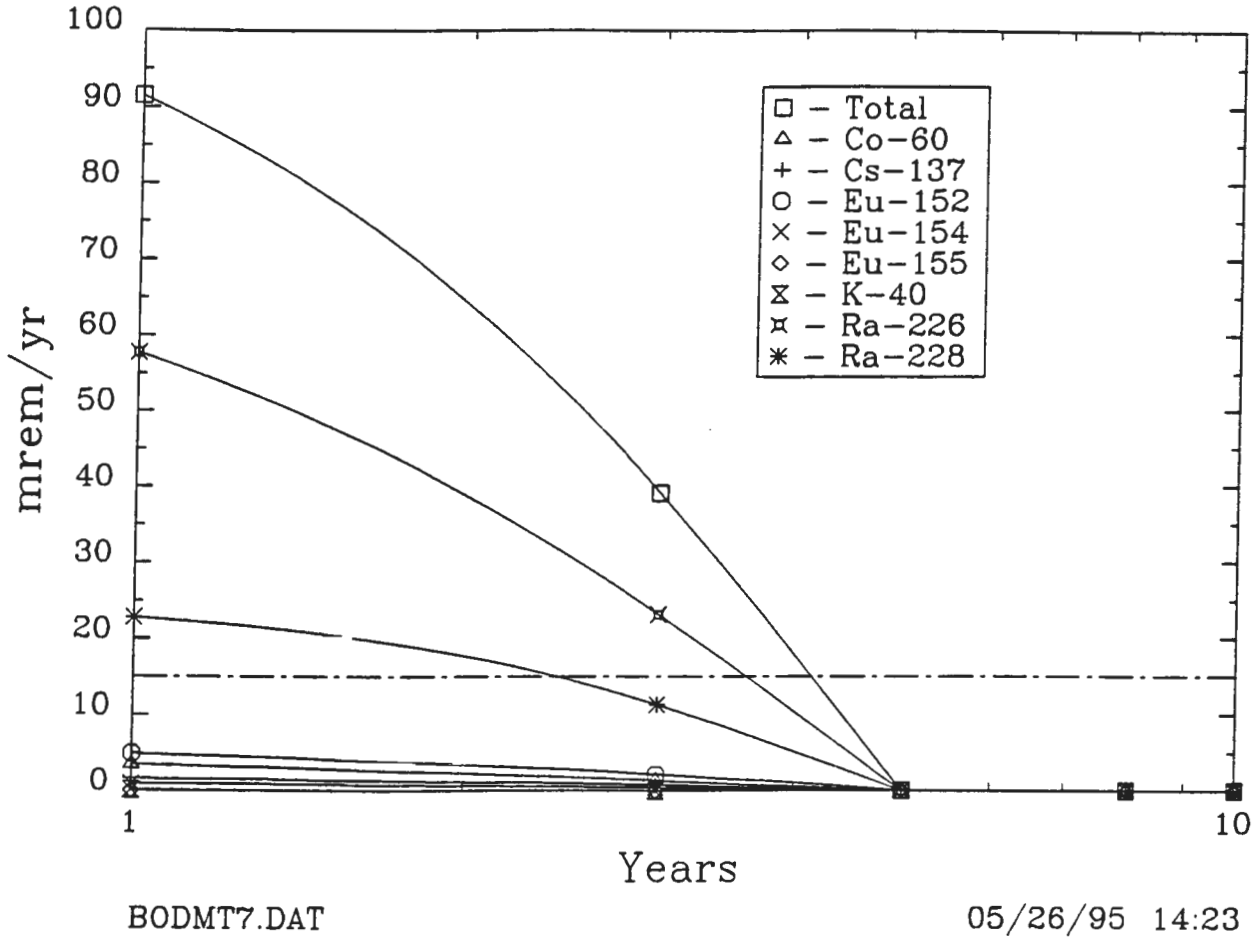

Figure 10. Evaluation of Radionuclides in Soil - 100-D Pond.

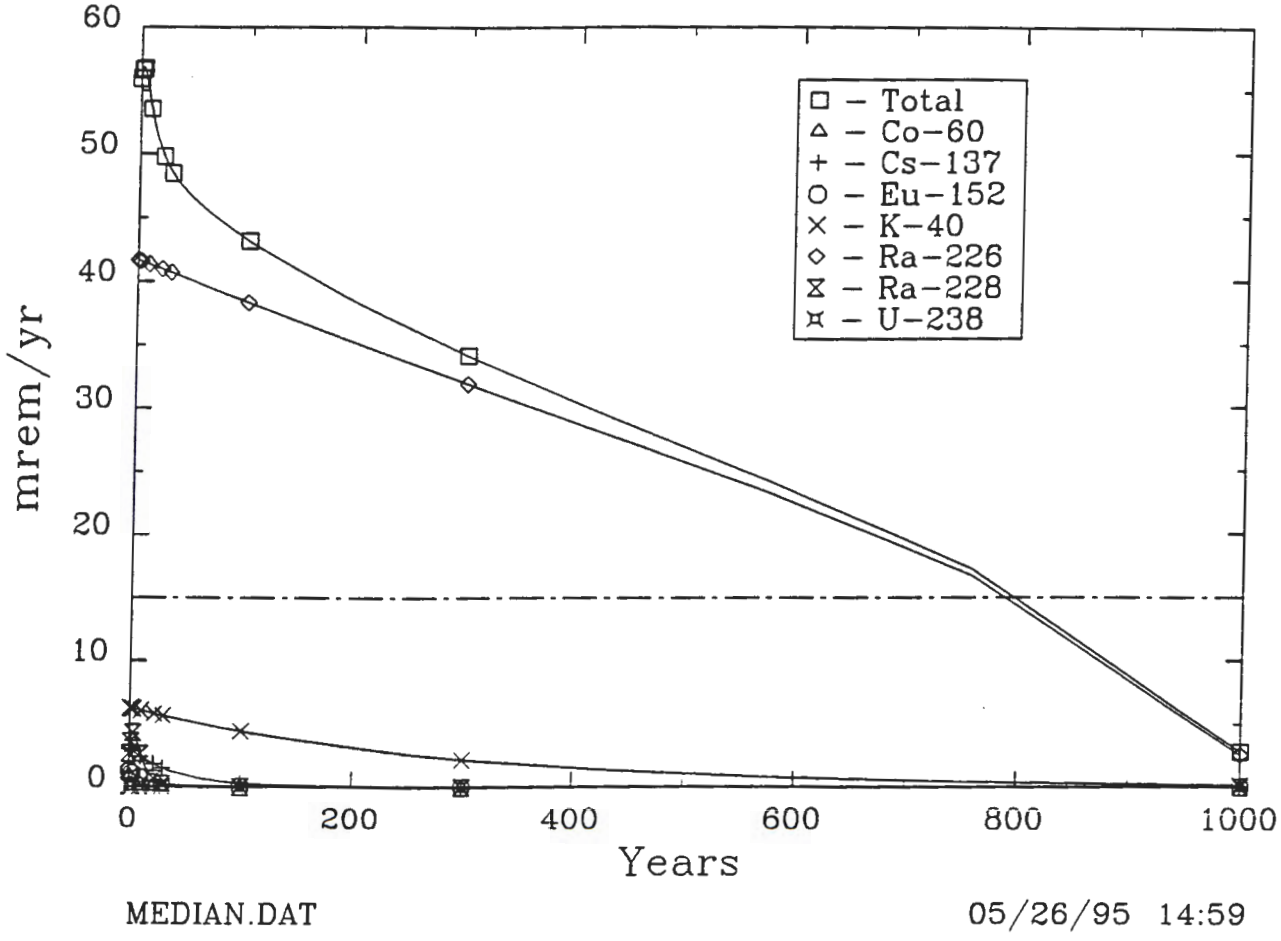

Table 1. Settling Pond Water Samples Phase I Sampling.

Analyte	Sample Number			
	B06D51 SP5+7	B06D52 EB	B06D53 TB	B06D57 EB
VOA-TCL ug/l				
Methylene Chloride	U	2 J	2 J	3 J
Other VOA-TCL	U	U	U	U
SVOA-TCL ug/l			NS	
Di-n-buthylphthalate	U	3 J		3 J
Other SVOA-TCL	U	U		U
PCB-Pesticide ug/l	U	U	NS	U
ICP and AA Metals mg/l	NS	NS	NS	NS
Mercury	0.22	U	NS	U
TCLP ug/l	U	U	NS	U

U = undetected (all blank contamination identified as U)
NS = not sampled
SP = settling pond
EB = equipment blank
TB = trip blank

Table 2. Settling Pond Phase I Sampling. (Page 1 of 4)

Analyte	Sample Number			
	BO6D43 SP-1 <15 cm	B06D45 SP-2 <15 cm	B06D46 SP-3 <15 cm	B06D47 SP-4 <15 cm
VOA-TCL ug/kg				
Acetone	850 J	570 J	380 J	580 J
Carbon Disulfide	U	29 J	40 J	U
Other VOA-TCL	U	U	U	U
SVOA-TCL ug/kg				
Bis(2-Ethylhexyl)phthalate	410 J	U	240 J	U
Diethylphthalate	1000 J	U	U	U
Other SVOA-TCL	- U	U	U	U
PCB-Pesticides ug/kg				
Methoxychlor	85 J	U	U	U
Other PCB-Pesticide	U	U	U	U
ICP and AA Metals mg/kg	NS	NS	NS	NS
Mercury mg/kg	2.1	0.36	0.51	0.75
Cyanide mg/kg	NS	NS	NS	NS
TCLP mg/kg				
Barium	1060	1050	916	568
Cadmium	5.2	U	U	U
Chromium	15.3	U	U	U
Other TCLP	U	U	U	U

Table 2. Settling Pond Phase I Sampling. (Page 2 of 4)

Analyte	Sample Number			
	B06D48 SP-5 < 15 cm	BO6D44 SP-6 < 15 cm (RCRA)	B06D27 SP-6 < 15 cm (CERCLA)	B06D28 SP-6 (dup.) < 15 cm
VOA-TCL ug/kg				
Methylene Chloride	U	U	U	U
Acetone	2200 J	500 J	780 J	970 J
Carbon Disulfide	U	U	31 J	71 J
2 Butanone	390 J	U	140 J	240 J
4-Methly-2-Pentanone	U	U	U	7 J
Toluene	U	U	13 J	11 J
Other VOA-TCL	U	U	U	U
SVOA-TCL ug/kg				
Diethylphthalate	U	U	170 J	U
Di-n-buthylphthalate	U	U	U	270 J
Bis(2-Ethylhexyl)phthalate	U	400 J	U	U
Other SVOA-TCL	U	U	U	U
PCB-Pesticides				
4,4 DDE	U	U	U	U
Aroclor 1260	U	U	U	U
Other PCB-Pesticides ug/kg	U	U	U	U
ICP and AA Metals mg/kg	NS	NS		
Aluminum			78400	69400
Arsenic			62.2[2] J	45.7[1]
Barium			188	162
Calcium			5220	4900
Chromium			77.1	70.1
Copper			56.9	52
Iron			23300	22000
Lead			92.5	71.3
Magnesium			4660	4880
Mangenese			462	666
Mercury	0.84	1.7	2.9	2.2
Potassium			1090	929
Sodium			351	U
Vanadium			66.2	64.4
Zinc			641	569
Other Metals			U	U
Cyanide mg/kg	NS	NS	U	U
TCLP ug/L			NS	NS
Barium	608	789		
Cadmium	U	5.8		
Chromium	13.5	U		
Other TCLP	U	U		

Table 2. Settling Pond Phase I Sampling. (Page 3 of 4)

Analyte	Sample Number		
	B06D29 SP-6 (split) <15 cm	B06D30 SP-7 <15 cm (CERCLA)	B06D49 SP-7 <15 cm (RCRA)
VOA-TCL ug/kg			
Methylene Chloride	110 J	U	U
Acetone	490 J	610 J	430 J
Carbon Disulfide	U	38 J	U
2 Butanone	32 J	150 J	U
4-Methyl-2-Pentanone	U	U	U
Toluene	5 J	U	U
Other VOA-TCL	U	U	U
SVOA-TCL ug/kg			
Di-n-Butylphthalate	U	U	U
Bis(2-Ethylhexyl)phthalate	370 J	U	U
Other SVOA-TCL	U	U	U
Pesticide Organics ug/kg			
4,4' - DDE	U	170 J	U
Aroclor 1260	U	U	3500[1] J
Other PCB-Pesticides	U	U	U
ICP and AA Metals			NS
Aluminum	46200	65300	
Arsenic	28[1]	36.9[1]	
Barium	144	61.6	
Calcuim	4340	1820	
Chromium	48.9	68.8	
Cobalt	10.6	U	
Copper	41.4	54.1	
Iron	18500	14100	
Lead	46.2 J	59.8	
Magnesium	3240	2360	
Mangenese	431 J	101	
Mercury	2.85 J	1.2	1.02
Potasium	U	539	
Selinium	U	11.1 J	
Sodium	244	U	
Vanadium	47.7	42.1	
Zinc	432 J	564	
Other Metals	U	U	
Cyanide mg/kg	U	U	NS
TCLP ug/L	NS	NS	
Barium			402
Cadmium			8.7
Chromium			14.1
Lead			95
Other TCLP			U

Table 2. Settling Pond Phase I Sampling. (Page 4 of 4)

Analyte	Sample Number			
	B06D50 EB	B06D54 TB	B06D55 TB	B06D56 TB
VOA-TCL ug/kg				
Acetone	U	14	8 J	21 J
Other VOA-TCL	U	U	U	U
SVOA-TCL ug/kg				
Bis(2-Ethylhexyl)phthalate	34 J			
Other SVOA-TCL	U	NS	NS	NS
Pesticide Organics ug/kg	U	NS	NS	NS
ICP and AA Metals mg/kg		NS	NS	NS
Aluminum	45.2			
Arsenic	0.93			
Iron	199			
Other ICP and AA Metals	U			
Cyanide mg/l	U	NS	NS	NS

U = undetected (all blank contmination identified as U)
J = qualified as estimate
NS = not sampled
"1" = greater than MTCA B soil values
SP = settling pond
EB = equipment blank
TB = trip blank

Table 3. Percolation Pond Phase I Sampling. (Page 1 of 3)

Analyte	Sample Number			
	B06D42 PP-1 < 15 cm	B06D41 PP-2 < 15 cm	B06D40 PP-3 < 15 cm	B06D39 PP-4 < 15 cm
VOA-TCL ug/kg				
Toluene	12 J	14 J	22 J	14 J
Other VOA-TCL	U	U	U	U
SVOA-TCL ug/kg	U	U	U	U
PCB-Pesticide ug/kg	U	U	U	U
ICP and AA Metals mg/kg	NS	NS	NS	NS
Mercury	0.07	U	U	U
TCLP ug/l				
Barium	1100	1000	755	1500
Other TCLP	U	U	U	U

Table 3. Percolation Pond Phase I Sampling. (Page 2 of 3)

Analyte	Sample Number			
	B06D38 PP-5 <15 cm	BO6D26 PP-6 (dup.) <15 cm	B06D34 PP-6 <15 cm	B06D32 PP-7 (dup.) <15 cm
VOA-TCL ug/kg				
1,1,1-Trichloroethane	U	6 J	U	U
2-Butanone	U	12	U	U
Toluene	8	U	U	4 J
Other VOA-TCL	U	U	U	U
SVOA-TCL ug/kg	U	U	U	U
Pesticide Organics ug/kg				
Methoxchlor	U	U	15 J	U
Aroclor-1254	U	100	U	U
Aroclor-1260	U	U	34 J	U
Other PCB-Pesticides	U	U	U	U
ICP and AA Metals mg/kg	NS		NS	NS
Aluminum		32800		
Arsenic		10.8[1] J		
Barium		149		
Beryllium		0.63		
Calcium		5560		
Chromium		36.1		
Cobalt		9.5		
Copper		55.4		
Iron		20700		
Lead		23.9		
Magnesium		4790		
Mangenese		377		
Mercury	0.07	0.54	1.4	0.16
Nickel		13.5		
Potassium		970		
Sodium		259		
Vanadium		53.4		
Zinc		213		
Other Metals		U		
Cyanide mg/kg	NS	U	NS	NS
TCLP ug/l				
Barium	972		790	821
Other TCLP	U	NS	U	U

Table 3. Percolation Pond Phase I Sampling. (Page 3 of 3)

Analyte	Sample Number		
	B06D33 PP-7 (split) < 15 cm	B06D31 PP-7 < 15 cm	BO6D25 PP-7 < 15 cm
VOA-TCL ug/kg			
4-Methyl-2-Pentanone	U	U	9 J
2 Hexanone	U	U	9 J
1,1,2,2-Tetrachloroethane	U	U	3 J
2-Butanone	U	U	10 J
Toluene	U	9	U
Other VOA-TCL	U	U	U
SVOA-TCL ug/kg			
Di-n-Butylphthalate	850	U	U
Bis(2-EthylHexyl)phthalate	39 J	U	U
Phenol	130 J	U	U
Other SVOA-TCL	U	U	U
Pesticide Organics ug/kg	U	U	U
ICP and AA Metals mg/kg	NS	NS	
Aluminum			6350
Arsenic			2
Barium			133
Beryllium			0.42
Calcium			5780
Chromium			6.8
Cobalt			13.6
Copper			19.8
Iron			26900
Lead			3.6
Magnesium			4900
Mangenese			332
Mercury		0.21	0.15
Nickle			8.9
Potassium			440
Sodium			272
Vanadium			77.3
Zinc			59
Other Metals			- U
Cyanide mg/kg	NS	NS	U
TCLP ug/l			NS
Barium	768	929	
Other TCLP	U	U	

U = undetected (all blank contamination identied as U)
J = qualified as estimates.
NS = not sampled
"!" = greater than MTCA B soil values
PP = percolation pond

Table 4. Surface Sampling Phase II Sampling. (4 sheets)

Analyte	Sample Number				
	B0DMS6 S1 <15 cm	B0DMS7 S2 <15 cm	B0DMS8 S3 <15 cm	B0DMS9 S4 <15 cm	B0DMT0 S5 <15 cm
VOA-TCL ug/kg					
Methylene Chloride	14 B	6 B			
Other VOA-TCL	U	U	NS	NS	NS
SVOA-TCL ug/kg			NS	NS	NS
Phenanthrene	110 J	U			
Fluoranthrene	220 J	U			
Pyrene	230 J	U			
Buthylbenzylphthalate	640 BJ	490 BJ			
Other SVOA-TCL	U	U	NS	NS	NS
Pesticide Organics ug/kg					
Aldrin	U	U	U	4.2	U
Aroclor-1254	U	U	U	200[1]	150[1]
Aroclor-1260	U	U	U	94	150[1]
Other PCB-Pesticides	U	U	U	U	U
ICP and AA Metals mg/kg					
Aluminum	105000	7880	5170	32300	8910
Antimony	U	6.5 J	5.5 J	U	14.9 J
Arsenic	29.2[1]	2.4	2.4	14.4[1]	23.6[1]
Barium	66.1	68.7	78.6	163	105
Beryllium	0.34	0.45	0.36	0.78	0.64
Cadmium	3.8[1]	0.48	0.42	1.4[1]	3.5[1]
Calcium	4420	4570	4700	5530	5370
Chromium	126	10.4	6.6	39.5	102
Cobalt	5.4	13.1	10.5	11.3	6.3
Copper	135	18.8	18.6	55.8	157
Iron	17700	29900	22800	25900	20600
Lead	102	4	3.7	42.4	83.9
Magnesium	2700	4450	4080	4330	3130
Mangenese	137	257	264	338	224
Nickel	16.2	10	8.2	13.1	16.3
Potassium	U	U	600	1100	826
Silver	U	U	U	0.72	U
Sodium	183	150	144	266	284
Thallium	U	U	0.17 J	0.14	0.47 J
Vanadium	51	72	50.7	61.6	54.2
Zinc	548	95.1	72.9	230	517
Other Metals	U	U	U	U	U

Table 4. Surface Sampling Phase II Sampling. (4 sheets)

Analyte	Sample Number				
	B0DMS6 S1 < 15 cm	B0DMS7 S2 < 15 cm	B0DMS8 S3 < 15 cm	B0DMS9 S4 < 15 cm	B0DMT0 S5 < 15 cm
Anions mg/kg					
Fluorides	U	U	1.19	U	U
Chlorides	82.5	13.3	6.2	81.7	39.1
Nitrates	41.2	6.02	4.51	20	U
Sulfates	2250	113	63.9	U	1520
Other Anions	U	U	U	U	U
Nitrate-Nitrite mg/kg	27.5	5.61	NS	NS	NS
Sulfides mg/kg	27.1	14.2	NS	U	NS
TOX mg/kg	U	U	NS	NS	NS
Radionuclides pCi/g					
^{58}Co	U	U	U	U	U
^{60}Co	7.63E-01	U	5.83E-02	6.47E-01	7.82E-01
^{137DA}Cs	1.92E+00	6.17E-01	1.01E+00	2.48E+00	1.97E+00
^{152}Eu	9.65E-01	U	2.12E-01	2.86E+00	3.22E+00
^{154}Eu	1.70E-01	U	U	4.45E-01	3.87E-01
^{155}Eu	U	U	U	U	U
^{59}Fe	U	U	U	U	U
^{40}K	4.71E+00	8.89E+00	9.96E+00	9.52E+00	4.79E+00
^{22}Na	U	U	U	U	2.10E-01
^{224DA}Ra	7.20E-01	4.57E-01	6.68E-01	1.89E+00	9.51E-01
^{226DA}Ra	4.93E-01	3.89E-01	5.76E-01	2.10E+00	6.30E-01
^{228DA}Ra	8.58E-01	4.41E-01	6.68E-01	1.58E+00	U
^{235}U	U	U	U	U	9.16E-01
^{238DA}U	6.03E-01	U	U	U	U
^{238DLP}U	8.25E+00	6.79E-01	U	3.79E+00	1.29E+01
^{131M}Xe	5.98E+00	U	U	U	U
Alpha	2.06E+01	5.89E+00	1.29E+01	2.58E+01	2.15E+01
Beta	2.55E+01	1.31E+01	1.53E+01	2.37E+01	2.77E+01

Table 4. Surface Sampling Phase II Sampling. (4 sheets)

Analyte	Sample Number			
	B0DMT1 S6 < 15 cm	B0DMT6 EB	B0DMT7 S7 < 15 cm	B0DMX5 EB
VOA-TCL ug/kg	NS		NS	
Methylene Chloride		4 BJ		5 B
Acetone		8 BJ		U
Other VOA-TCL ug/kg		U		U
SVOA-TCL ug/kg	NS		NS	
Diethylphthalate		U		39 J
bis(2-Ethylhexyl)phthalate		U		37 J
Butylbenzyphthalate		1100 B		180 BJ
Other SVOA-TCL		U		U
Pesticide Organics ug/kg			NS	
Aroclor-1254	400[1]	U		U
Aroclor-1260	470[1]	U		U
Other PCB-Pesticides	U	U		U
ICP and AA Metals mg/kg				
Aluminum	126000	54.8	69200	50.1
Antimony	U	U	37.2[1] J	U
Arsenic	19.7[1]	U	8.6	U
Barium	90 J	1.1	639	0.33
Beryllium	0.68 J	U	1.3	U
Cadmium	2.9[1]	0.7	0.90[1]	U
Calcium	6040	149	7500	126
Chromium	96.1	0.46	226	0.41
Cobalt	4.7	U	29.5	U
Copper	184	1.6	195	0.71
Iron	18400	154	22400	131
Lead	69.5	U	441[4]	0.15
Magnesium	2470	47.6	1130	30.9
Mangenese	190	0.7	48.7	0.33
Nickel	16.7	U	11.7	U
Potassium	858	U	1810	U
Silver	U	U	4.6	U
Sodium	139	34.1	472	21.1
Thallium	0.47 J	U	0.26 J	U
Vanadium	44.6	1.0	242	U
Zinc	497	1.9	105	1.3
Other Metals	U	U	U	U

Table 4. Surface Sampling Phase II Sampling. (4 sheets)

Analyte	Sample Number			
	B0DMT1 S6 < 15 cm	B0DMT6 EB	B0DMT7 S7 < 15 cm	B0DMX5 EB
Anions mg/kg			NS	
Chlorides	11.6	2.96		3
Nitrates	10.4	U		0.269
Sulfates	1830	U		U
Other Anions	U	U		U
Nitrate-Nitrite mg/kg	NS	U	NS	U
Sulfides mg/kg	NS	10.8	NS	U
TOX mg/kg	NS	U	NS	U
Radionuclides pCi/g				
^{58}Co	1.46E-01	U	U	U
^{60}Co	6.30E+00	U	6.93E+00	U
^{137DA}Cs	9.84E+00	U	1.11E+01	U
^{152}Eu	2.62E+01	U	2.10E+01	U
^{154}Eu	4.00E+00	U	3.68E+00	U
^{155}Eu	4.00E-01	U	5.33E+00	7.97E-03
^{59}Fe	U	U	U	U
^{40}K	3.25E+00	6.32E-01	1.48E+01	3.73E-01
^{224DA}Ra	6.55E-01	1.26E-01	1.27E+02	1.11E-01
^{226DA}Ra	5.84E-01	7.37E-02	1.74E+02	U
^{228DA}Ra	U	U	9.18E+01	U
^{235}U	8.13E-01	U	U	U
Alpha	2.35E+01	U	1.14E+03	U
Beta	3.79E+01	3.75E+00	5.45E+02	U

U = undetected
J = qualified as estimates
B = blank contamination
NS = not sampled
"1" = greater than MTCA B soil value
"4" = greater than MCTA A soil value
S = sample

Table 5. Test Pit 1 Phase II Sampling. (2 sheets)

Analyte	Sample Number		
	BODMR5 < 15 cm	BODMR6 15-41 cm	BODMR7 ~ 107 cm
VOA-TCL ug/kg			
Methylene Chloride	19 BJ	46 B	3 BJ
Acetone	U	290 J	U
Other VOA-TCL	U	U	U
SVOA-TCL ug/kg			
Chrysene	170 J	U	U
bis(2-Ethylhexyl)phthalate	160 J	U	U
Benzo(b)fluoranthene	220 J	U	U
Benso(a)pyrene	110 J	U	U
Phenanthrene	150 J	U	U
Fluoranthene	320 J	U	U
Pyrene	310 J	U	U
Butylbenzylphthalate	430 BJ	1900 BJ	560 BJ
Benzo(a)anthracene	110 J	U	U
Other SVOA-TCL	U	U	U
Pesticide Organics ug/kg			
Aldrin	3.3	U	U
Aroclor-1254	320[1]	320[1]	U
Aroclor-1260	190[1]	460[1]	U
Other PCB-Pesticides	U	U	U
ICP and AA Metals mg/kg			
Aluminum	9420	159000	4560
Antimony	U	U	5.8 J
Arsenic	19.4[1]	45.3[1]	2.1
Barium	118	72.1	118
Beryllium	0.58	- U	0.43
Cadmium	3.7[1]	U	U
Calcium	7250	4650	4790
Chromium	106	187	5.2
Cobalt	5.3	4	12.9
Copper	202	125	14.5
Iron	23500	19300	26600
Lead	104	66.2	2.7
Magnesium	4140	2530	4580
Mangenese	223	164	590
Nickel	17	16.3	9.9
Potassium	840	U	547
Sodium	126	338	141

Table 5. Test Pit 1 Phase II Sampling. (2 sheets)

Analyte	Sample Number		
	BODMR5 < 15 cm	BODMR6 15-41 cm	BODMR7 ~ 107 cm
Thallium	0.46 J	U	U
Vanadium	53	101	66.3
Zinc	468	503	57.3
Other Metals	U	U	U
Anions mg/kg			
Fluorides	U	U	1.13
Clorides	U	49.5	U
Nitrates	3.54	U	0.37
Sulfates	2000	1440	24.5
Other Anions	U	U	U
Nitrate-Nitrite mg/kg	5.69	U	0.859
Sulfides mg/kg	33	372	U
TOX mg/kg	U	U	U
Radionuclides pCi/g			
^{58}Co	U	U	U
^{60}Co	7.64E+00	5.47E-01	2.13E-02
^{137DA}Cs	1.15E+01	9.68E-01	5.80E-02
^{152}Eu	3.40E+01	5.82E-01	U
^{154}Eu	5.21E+00	U	U
^{155}Eu	5.29E-01	U	U
^{59}Fe	U	U	U
^{40}K	1.10E+00	4.01E+00	8.41E+00
^{224DA}Ra	8.80E-01	8.84E-01	4.12E-01
^{226DA}Ra	6.78E-01	5.03E-01	3.83E-02
^{228DA}Ra	U	1.02E+00	4.59E-01
^{235}U	5.37E-01	U	U
^{238DA}U	U	4.13E-01	U
^{238DLP}U	1.25E+01	8.72E+00	U
Alpha	2.15E+01	2.14E+01	9.67E+00
Beta	3.64E+01	2.36E+01	1.55E+01

U = undetected
J = qualified as estimates
NS = not sampled
"1" = greater than MTCA B soil values
B = blank contamination

Table 6. Test Pit 2 Phase II Sampling. (6 sheets)

Analyte	Sample Number		
	BODMR2 < 15 cm	BODMT2 < 15 cm Dup.	BODMX2 < 15 cm Split
VOA-TCL ug/kg			
Acetone	23 BJ	U	U
Methylene Chloride	11 B	U	U
Other VOA-TCL	U	U	U
SVOA-TCL ug/kg			
Anthracene		430 J	
Chrysene	170 J	220 J	U
bis(2-Ethylhexyl)phthalate	77 J	81 J	280 J
Benzo(b)fluoranthene	310 J	420 J	U
Phenanthrene	260 J	440 J	U
Fluoranthene	420 J	590 J	U
Pyrene	420 J	570 J	U
Butylbenzylphthalate	1300 J	U	U
Benzo(a)anthracene	120 J	180 J	U
Benzo(k)fluoranthene	U	130 J	U
Di-n-Buthylphthalate	U	170 J	230 J
Other SVOA-TCL	U	U	U
Pesticide Organics ug/kg			
gamma-BHC (Lidane)	U	4.5	U
Aldrin	12	8.2 J	U
Aroclor-1254	4700[1]	2300[1]	2000[1]
Aroclor-1260	3800[1]	1800[1]	2000[1]
Other PCB-Pesticides	U	U	U
ICP and AA Metals mg/kg			
Aluminum	42100	53700	37000 J
Antimony	9.9	7.8	U
Arsenic	16[1]	14.4[1]	14[1] J
Barium	142	74.3	99
Beryllium	1.1	0.59	0.38[1]
Cadmium	2.8	2.6	1.5[1]
Calcium	7740	3630	5100
Chromium	50.3	66.4	48 J
Cobalt	17.6	7.3	7.5
Copper	74	68.6	59
Iron	39300	20100	23000
Lead	76.1	104	35
Magnesium	6720	3090	4000
Mangenese	421	140	230
Nickel	19.1	14.7	18

Table 6. Test Pit 2 Phase II Sampling. (6 sheets)

Analyte	Sample Number		
	BODMR2 < 15 cm	BODMT2 < 15 cm Dup.	BODMX2 < 15 cm Split
Potassium	1200	654	900
Silver	1.5	0.76	U
Sodium	315	244	670
Thallium	0.24	0.28	U
Vanadium	91.3	45	52
Zinc	366	450	330 J
Other Metals	U	U	U
Anions mg/kg			
Fluorides	U	U	0.93
Chlorides	16.9	15.4	10
Nitrates	78.4	69.5	44 J
Sulfates	2130	2230	1500
Other Anions	U	U	U
Nitrate-Nitrite mg/kg	60.8	53.4	27
Sulfides mg/kg	U	21	U
TOX mg/kg	U	U	U
Radionuclides pCi/g			
^{58}Co	U	U	U
^{60}Co	3.83E-01	0.929	5.10E-01
^{137DA}Cs	2.06E+00	2.72E+00	2.15E+00
^{152}Eu	1.11E+00	1.55E+00	1.41E+00
^{154}Eu	1.71E-01	3.31E-01	U
^{155}Eu	U	U	U
^{59}Fe	U	U	U
^{40}K	9.83E+00	9.57E+00	U
^{212}Pb	U	U	7.20E-01
^{214}Pb	U	U	6.20E-01
^{224DA}Ra	7.80E-01	8.63E-01	U
^{226DA}Ra	7.43E-01	8.13E-01	2.80E+00
^{228DA}Ra	6.83E-01	7.21E-01J	5.50E-01
^{235}U	U	U	U
^{238DLP}U	U	2.76E+00J	U
Alpha	1.74E+01	9.95E+00	5.30E+00
Beta	1.84E+01	2.06E+01	1.97E+01

Table 6. Test Pit 2 Phase II Sampling. (6 sheets)

Analyte	Sample Number		
	BODMR3 24 - 49 cm	BODMT3 24 - 49 cm Dup.	BODMX3 24 - 49 cm Split
VOA-TCL ug/kg			
Acetone	40 BJ	U	U
Methylene Chloride	19 B	U	U
Other VOA-TCL	U	U	U
SVOA-TCL ug/kg			
Anthracene		460 J	
Chrysene	310 J	400 J	430 J
bis(2-Ethylhexyl)phthalate	220 J	130 J	U
Benzo(b)fluoranthene	440 J	580 J	470 J
Phenanthrene	640 J	470 J	630 J
Fluoranthene	820 J	940 J	1100 J
Pyrene	620 J	820 J	530 J
Butylbenzylphthalate	1900 BJ	U	U
Benzo(a)anthracene	220 J	340 J	270 J
Benzo(k)fluoranthene	170 J	220 J	270 J
Benzo(a)pyrene	180 J	290 J	240 J
Indeno(1,2,3-cd)pyrene	U	U	200 J
Benzo(g,h,i)perylene	U	U	240 J
Di-n-Butylphthalate	4800	U	U
Other SVOA-TCL	U	U	U
Pesticide Organics ug/kg			
Aldrin	65[1]	36 J	U
Aroclor-1254	17000[3]	9800[2]	11000[2]
Aroclor-1260	12000[2]	7500[2]	11000[2]
Other PCB-Pesticides	U	U	U
ICP and AA Metals mg/kg			
Aluminum	69900	63400	62000 J
Arsenic	37.2[1]	41.1[1]	40[1] J
Barium	130	107	99
Beryllium	0.82	0.76	U
Cadmium	6.3	4.7	3.3[1]
Calcium	4670	4200	4000
Chromium	103	77.1	82 J
Cobalt	10.1	9.4	8.5
Copper	86.1	55.8	66
Iron	25800	21000	24000
Lead	519[1]	197	160
Magnesium	4500	4180	3700
Mangenese	183	201	180

Table 6. Test Pit 2 Phase II Sampling. (6 sheets)

Analyte	Sample Number		
	BODMR3 24 - 49 cm	BODMT3 24 - 49 cm Dup.	BODMX3 24 - 49 cm Split
Nickel	22.5	18.8	24
Potassium	1030	970	1300
Silver	1.6	1.3	U
Sodium	365	286	1200
Thalliium	U	0.32	U
Vanadium	60.5	46.5	49
Zinc	1050	1030	830 J
Other Metals	U	U	U
Anions mg/kg			
Fluorides	6.45	6.25	6.7
Chlorides	21.5	20.3	7.1
Nitrates	40.2	50.3	12 J
Sulfates	4390	4040	1600
Other Anions	U	U	U
Nitrate-Nitrite mg/kg	19.3	35.4	14
Sulfides mg/kg	39.9	44.7	5.3 J
TOX mg/kg	U	U	28 J
Radionuclides pCi/g			
^{58}Co	U	U	U
^{60}Co	7.89E-01	2.43E+00	7.50E-01
^{137DA}Cs	3.05E+00	3.09E+00	2.56E+00
^{152}Eu	2.05E+00	1.96E+00	2.09E+00
^{154}Eu	2.65E-01	4.60E-01	U
^{155}Eu	U	U	U
^{59}Fe	U	U	U
^{40}K	6.56E+00	6.77E+00	U
^{212}Pb	U	U	8.50E-01
^{214}Pb	U	U	7.70E-01
^{224DA}Ra	1.13E+00	1.05E+00	U
^{226DA}Ra	7.54E-01	8.01E-01	U
^{228DA}Ra	1.09E+00	1.51E+00J	8.90E-01
^{235}U	U	U	5.00E-01
^{238DLP}U	5.40E+00	5.90E+00J	U
Alpha	1.46E+01	2.50E+01	1.82E+01
Beta	2.12E+01	2.11E+01	2.30E+01

Table 6. Test Pit 2 Phase II Sampling. (6 sheets)

Analyte	Sample Number				
	B0DMT5 49 - 61 cm	B0DMT9 61 - 64 cm	B0DMR4 64 - 119 cm	B0DMT4 64 - 119 cm Dup.	B0DMX4 64 - 119 cm Split
VOA-TCL ug/kg		NS			
Acetone	150 BJ		U	U	U
Methylene Chloride	20 B		8 B	U	U
2-Butanone	19 J		U	U	U
Other VOA-TCL	U		U	U	U
SVOA-TCL ug/kg		NS			
Buthylbenzylphthalate	580 BJ		94 BJ	U	U
Other SVOA-TCL	U		U	U	U
Pesticide Organics ug/kg		NS			
Aldrin	7.5		U	U	U
Aroclor-1254	480[1]		U	U	U
Aroclor-1260	360[1]		U	U	U
Other PCB-Pesticides	U		U	U	U
ICP and AA Metals mg/kg					
Aluminum	64800	3710	5220	4010	5100
Antimony	U	8.8 J	6.9 J	6.3 J	U
Arsenic	43.7[1]	2	0.58	0.68	1
Barium	107	104	107	93.5	110
Beryllium	0.70	0.34	0.58	0.45 J	0.31
Cadmium	4.6	0.42	0.41	U	U
Calcium	3300	3530	4640	4020	4700
Chromium	80.3	5	6.7	4.9	4.2
Cobalt	6.6	11.6	16.1	13	8.1
Copper	53.5	10.1	17.8	14.5	15
Iron	18700	11200	31200	13400	30000
Lead	129	2.1	2.2	1.7	2.1
Magnesium	3290	3470	5040	4060	4500
Mangenese	137	363	415	311 J	390
Nickel	18.3	6.3	9.7	7.1	8.8
Potassium	U	437	781	477	400
Sodium	225	108	188	129	510
Thallium	0.43	U	U	U	U
Vanadium	38.7	65.6	83.9	68.7	75
Zinc	885	52.5	71.3	56.2	55
Other Metals	U	U	U	U	U

Table 6. Test Pit 2 Phase II Sampling. (6 sheets)

Analyte	Sample Number				
	B0DMT5 49 - 61 cm	B0DMT9 61 - 64 cm	B0DMR4 64 - 119 cm	B0DMT4 64 - 119 cm Dup.	B0DMX4 64 - 119 cm Split
Anions mg/kg		NS			
Flourides	U	U	U	U	1.2
Chlorides	17.6		U	U	0.74
Nitrates	U		1.17	1.03	0.57
Sulfates	2100		79	54.1	46
Other Anions	U	NS	U	U	U
Nitrate-Nitrite mg/kg	U	NS	1.09	1.00	1.1
Sulfide mg/kg	36.4	NS	12.2	11.8	U
TOX mg/kg	U	NS	U	U	12 J
Radionuclide pCi/g		NS			
^{58}Co	U		U	U	U
^{60}Co	6.96E-01		6.78E-02	U	U
^{137DA}Cs	2.04E+00		5.48E-02	2.54E-02	U
^{152}Eu	4.45E+00		U	U	U
^{154}Eu	7.22E-01		U	U	U
^{155}Eu	1.55E-01		U	U	U
^{59}Fe	U		U	U	U
^{40}K	7.55E+00		9.39E+00	9.42E+00	U
^{212}Pb	U		U	U	4.28E-01
^{224DA}Ra	1.75E+00		4.21E-01	4.14E-01	U
^{226DA}Ra	1.05E+00		3.47E-01	3.67E-01	3.13E-01
^{228DA}Ra	1.66E+00		4.85E-01	4.42E-01	4.45E-01
^{235}U	U		U	U	U
^{238DLP}U	1.29E+01		4.51E-01	U	U
Alpha	2.52E+01		5.44E+00	U	6.80E+00
Beta	2.96E+01		1.59E+01	1.59E+01	3.18E+01

B = blank contamination (for all unvalidated organic analyses, all organic validated data is flagged as U)
U = undetected
J = qualified as estimates
NS = not sampled
"1" = greater than MTCA B soil value
"2" = greater than MTCA C soil value
"3" = greater than MTCA C industrial value
"4" = greater than MCTA A soil value
S = sample

Table 7. Test Pit 3 and 4 Phase II Sampling. (2 sheets)

Analyte	Test Pit 3		Test Pit 4	
	Sample Number			
	BODMR9 < 15 cm	BODMS0 ~122 cm	BODMS3 ~ 122 cm	BODMS4 ~244 cm
VOA-TCL ug/kg				
Methylene Chloride	11 B	2 BJ	12 B	U
Other VOA-TCL	U	U	U	U
SVOA-TCL ug/kg				
Buthylbenzylphthalate	260 BJ	160 BJ	210 BJ	230 BJ
Other SVOA-TCL	U	U	U	U
Pesticide Organics ug/kg	U	U	U	U
ICP and AA Metals mg/kg				
Aluminum	7610	4080	4910	4120
Antimony	7.3 J	6.6 J	5.3 J	7.8 J
Arsenic	2.6[1]	0.64	0.82	0.73
Barium	177	98.9	128	107
Beryllium	0.59	0.42	0.5	0.49
Cadmium	0.53	0.46	U	U
Calcium	12600	9520	10200	10300
Chromium	9.1	4.1	7.6	4.6
Cobalt	12.5	12.4	13.1	11.8
Copper	18.6	16.4	15.2	14.8
Iron	26100	25400	12400	24400
Lead	5.3	1.5	1.9	1.7
Magnesium	5280	4770	5400	4360
Mangenese	325	305	353	274
Nickel	10.3	8.5	11.1	7.9
Potassium	800	366	680	589
Sodium	245	155	241	184
Vanadium	65	56.4	63.1	58.7
Zinc	70	45.5	47.5	43.6
Other Metals	U	U	U	U
Anions mg/kg				
Fluorides	3.18	U	U	U
Nitrates	1.01	1.31	4.04	5.42
Sulfates	U	U	31.3	25.1
Other Anions	U	U	U	U
Nitrate-Nitrite mg/kg	0.664	1.44	3.86	4.73
Sulfides mg/kg	U	U	U	U
TOX mg/kg	U	U	U	U

Table 7. Test Pit 3 and 4 Phase II Sampling. (2 sheets)

Analyte	Test Pit 3		Test Pit 4	
	Sample Number			
	BODMR9 <15 cm	BODMS0 ~122 cm	BODMS3 ~ 122 cm	BODMS4 ~244 cm
Radionuclides pCi/g				
^{58}Co	U	U	U	U
^{60}Co	U	U	U	U
^{137DA}Cs	6.20E-02	U	U	U
^{152}Eu	U	U	U	U
^{154}Eu	U	U	U	U
^{155}Eu	U	U	U	U
^{59}Fe	U	U	U	U
^{40}K	7.43E+00	8.58E+00	9.17E+00	8.91E+00
^{224DA}Ra	4.33E-01	4.02E-01	4.71E-01	4.34E-01
^{226DA}Ra	4.21E-01	3.54E-01	4.28E-01	4.22E-01
^{228DA}Ra	5.14E-01	4.13E-01	4.39E-01	5.21E-01
^{238DLP}U	U	U	6.54E-01	U
Alpha	U	U	4.44E+00	U
Beta	1.59E+01	U	1.26E+01	1.52E+02

B = blank contamination
U = undetected
J = qualified as estimates
NS = not sampled

Table 8. Test Pit 5 Phase II Sampling. (2 sheets)

Analyte	Sample Number		
	BODMV0 <15 cm	BODMV1 ~91 cm	BODMV2 ~244 cm
VOA-TCL ug/kg			
Acetone	U	4 BJ	U
Methylene Chloride	5 BJ	9 BJ	3 BJ
Other VOA-TCL	U	U	U
SVOA-TCL ug/kg			
Buthylbenzylphthalate	130 BJ	130 BJ	120 BJ
Other SVOA-TCL	U	U	U
Pesticide Organics ug/kg	U	U	U
ICP and AA Metals mg/kg			
Aluminum	6570	4840	7050
Antimony	7.1 J	4.9 J	4.7 J
Arsenic	1.1	0.95	0.95
Barium	169	88.5	88
Beryllium	0.52	0.42	0.43
Cadmium	0.43	U	U
Calcium	6120	4870	13900
Chromium	10.1	4.7	12.8
Cobalt	12.3	11.3	9.4
Copper	19.6	15.9	15.7
Iron	25400	24600	21500
Lead	3.3	2.9	3.8
Magnesium	4890	4230	5600
Mangenese	347	287	374
Nickel	11.3	6.2	13.9
Potassium	458	398	800
Sodium	221	182	175
Vanadium	61.9	54.3	42.9
Zinc	58.8	54	43.5
Other Metals	U	U	U
Anions mg/kg			
Nitrates	0.852	0.302	1.6
Other Anions	U	U	U
Nitrate-Nitrite mg/kg	0.839	U	0.924
Sulfides mg/kg	U	U	U
TOX mg/kg	67.2	U	U

Table 8. Test Pit 5 Phase II Sampling. (2 sheets)

Analyte	Sample Number		
	BODMV0 < 15 cm	BODMV1 ~91 cm	BODMV2 ~244 cm
Radionuclides pCi/g			
^{58}Co	U	U	U
^{60}Co	2.07E-02	U	U
$^{137DA}Cs$	1.09E-01	8.04E-02	U
^{152}Eu	U	U	U
^{154}Eu	U	U	U
^{155}Eu	U	U	U
^{59}Fe	U	U	U
^{40}K	9.44E+00	7.97E+00	1.46E+01
$^{224DA}Ra$	5.52E-01	4.33E-01	6.89E-01
$^{226DA}Ra$	5.50E-01	3.73E-01	4.88E-01
$^{228DA}Ra$	5.45E-01	5.04E-01	8.42E-01
$^{238DLP}U$	4.39E-01	U	U
Alpha	1.29E+01	U	U
Beta	1.89E+01	1.49E+01	2.33E+01

B = blank contamination
U = undetected
J = qualified as estimates
NS = not sampled

Table 9. CLARC II Values. (Page 1 of 4)

Analyte (alphabetical)	Associated CAS Number	Soil Method B Carcinogen (mg/kg)	Soil Method B Noncarcinogen (mg/kg)	Soil Method C Carcinogen (mg/kg)	Soil Method C Noncarcinogen (mg/kg)	Indust. Soil Method C Carcinogen (mg/kg)	Indust. Soil Method C Noncarcinogen (mg/kg)	Notes
1,1,2,2-Tetrachloethane	79-34-5	5.00E+00	--	2.00E+02	--	6.56E+02	--	--
1,1,1-Trichlorethane	71-55-6	--	7.20E+04	--	2.88E+05	--	3.15E+06	--
2-Butanone	78-93-3	--	4.80E+04	--	1.92E+05	--	2.10E+06	Alias: Methyl ethyl ketone
4,4' - DDE	50-29-3	2.94E+00	4.00E+01	1.18E+02	1.60E+02	3.86E+02	1.75E+03	--
4-Methyl-2-Pentanone	108-10-1	--	4.80E+04	--	1.60E+04	--	1.75E+05	--
Acetone	67-64-1	--	8.00E+03	--	3.20E+04	--	3.50E+05	--
Aldrin	309-00-2	5.88e-02	2.40E+00	2.35E+00	9.60E+00	7.72E+00	1.05E+02	--
Aluminum	NA	--	--	--	--	--	--	--
Antimony	7440-36-0	--	3.20E+01	--	1.28E+02	--	1.40E+03	--
Aroclor-1254	As 1336-36-3	1.30e-01	--	5.19E+00	--	1.70E+01	--	Table values for "Polychlorinated biphenyls," 1336-36-3
Aroclor-1260	As 1336-36-3	1.30e-01	--	5.19E+00	--	1.70E+01	--	Table values for "Polychlorinated biphenyls," 1336-36-3
Arsenic	7440-38-2	1.43E+00	6.00E+01	5.71E+01	2.40E+02	1.88E+02	2.62E+03	--
Barium	7440-39-3	--	5.60E+03	--	2.24E+04	--	2.45E+05	--
Benzo(a)anthracene	56-55-3	1.37E-01	--	5.48E+00	--	1.80E+01	--	--
Benzo(a)pyrene	50-32-8	1.37E-01	--	5.48E+00	--	1.80E+01	--	--
Benzo(b)fluoranthene	205-99-2	1.37E-01	--	5.48E+00	--	1.80E+01	--	--
Benzo(g,h,i)perylene	191-24-2	--	--	--	--	--	--	Unlisted

Table 9. CLARC II Values. (Page 2 of 4)

Analyte (alphabetical)	Associated CAS Number	Soil Method B Carcinogen (mg/kg)	Soil Method B Noncarcinogen (mg/kg)	Soil Method C Carcinogen (mg/kg)	Soil Method C Noncarcinogen (mg/kg)	Indust. Soil Method C Carcinogen (mg/kg)	Indust. Soil Method C Noncarcinogen (mg/kg)	Notes
Benzo(k)fluoranthene	207-08-9	1.37E-01	--	5.48E+00	--	1.80E+01	--	--
Beryllium	7440-41-7	2.33e-01	4.00E+02	9.30E+00	1.60E+03	3.05E+01	1.75E+04	--
Bis(2-Ethylhexyl) phthalate	117-81-7	7.14E+01	1.60E+03	2.86E+03	6.40E+03	9.37E+03	7.00E+04	--
Butylbenzyphthalate	85-68-7	--	1.60E+04	--	6.40E+04	--	7.00E+05	--
Cadmium	7440-43-9a	1.64e-01	8.00E+01	6.56E+00	3.20E+02	2.15E+01	3.50E+03	--
Calcium	NA	--	--	--	--	--	--	--
Carbon disulfide	75-15-0	--	8.00E+03	--	3.20E+04	--	3.50E+05	--
Chlorides	As 7782-50-5	--	8.00E+03	--	3.20E+04	--	3.50E+05	Table values for "Chlorine," 7782-50-5
Chromium	As 18540-29-9	--	4.00E+02	--	1.60E+03	--	1.75E+04	Total Cr no value; evaluated as all Cr(VI), 18540-29-9
Chrysene	218-01-9	1.37E-01	--	5.48E+00	--	1.80E+01	--	--
Cobalt	NA	--	--	--	--	--	--	--
Copper	7440-50-8	--	2.96E+03	--	1.18E+04	--	1.30E+05	--
Cyanide	57-12-5	--	1.60E+03	--	6.40E+03	--	7.00E+04	--
Diethylphthalate	84-66-2	--	6.40E+04		2.56E+05	--	2.80E+06	
Di-n-Butylphthalate	84-74-2	--	8.00E+03	--	3.20E+04	--	3.50E+05	--
Fluoranthrene	206-44-0	--	3.2E+03	--	1.28E+04	--	1.40E+05	--
Fluorides	As 7782-41-4	--	4.80E+03	--	1.92E+04	--	2.10E+05	Table values for "Fluorine, soluble fluoride," 7782-41-4
gamma-BHC (Lidane)	58-89-9	7.69E-01	2.40E+01	3.08E+01	9.60E+01	1.01E+02	1.05E+03	--

Table 9. CLARC II Values. (Page 3 of 4)

Analyte (alphabetical)	Associated CAS Number	Soil Method B Carcinogen (mg/kg)	Soil Method B Noncarcinogen (mg/kg)	Soil Method C Carcinogen (mg/kg)	Soil Method C Noncarcinogen (mg/kg)	Indust. Soil Method C Carcinogen (mg/kg)	Indust. Soil Method C Noncarcinogen (mg/kg)	Notes
Hexadecanoic Acid	NA	--	--	--	--	--	--	--
2-Hexanone	591-78-6	--	--	--	--	--	--	--
Indeno(1,2,3-cd) pyrene	193-39-0	1.37E-01	--	5.54E+00	--	1.80E+01	--	--
Iron	NA	--	--	--	--	--	--	--
Lead	7439-92-1	--	--	--	--	--	--	Lead no value; method A=250 mg/kg
Magnesium	NA	--	--	--	--	--	--	--
Mangenese	7439-96-5a	--	1.12E+04	--	4.48E+04	--	4.90E+05	Evaluated as mangenese in soil
Mercury	7439-97-6	--	2.40E+01	--	9.60E+01	--	1.05E+03	--
Methoxychlor	72-43-5	--	4.00E+02	--	1.60E+03	--	1.75E+04	--
Methylene Chloride	75-09-2	1.33E+02	4.80E+03	5.33E+03	1.92E+04	1.75E+04	2.10E+05	--
Nickel	As 7440-02-0	--	1.60E+03	--	6.40E+03	--	7.00E+04	Table values for "Nickel, soluble salts," 7440-02-0
Nitrate-Nitrite		--	8.00E+03	--	3.20E+04	--	3.50E+05	Table value for "Nitrites." 14797-65-0
Nitrate	14797-55-8	--	1.28E+05	--	5.12E+05	--	5.60E+06	--
Phenanthrene	85-01-8	--	--	--	--	--	--	--
Phenol	108-95-2	--	4.80E+04	--	1.92E+05	--	2.10E+06	--
Potassium	NA	--	--	--	--	--	--	--
Pyrene	129-00-0	--	2.40E+03	--	9.60E+03	--	1.05E+05	--
Selenium	7782-49-2	--	4.00E+02	--	1.60E+03	--	1.75E+04	--
Sodium	NA	--	--	--	--	--	--	--

Table 9. CLARC II Values. (Page 4 of 4)

Analyte (alphabetical)	Associated CAS Number	Soil Method B Carcinogen (mg/kg)	Soil Method B Noncarcinogen (mg/kg)	Soil Method C Carcinogen (mg/kg)	Soil Method C Noncarcinogen (mg/kg)	Indust. Soil Method C Carcinogen (mg/kg)	Indust. Soil Method C Noncarcinogen (mg/kg)	Notes
Sulfates	NA	--	--	--	--	--	--	--
Sulfides	NA	--	--	--	--	--	--	--
Toluene	108-88-3	--	1.60E+04	--	6.40E+04	--	7.00E+05	--
Vanadium	7440-62-2	--	5.60E+02	--	2.24E+03	--	2.45E+04	--
Zinc	7440-66-6	--	2.40E+04	--	9.60E+04	--	1.05E+06	--

Table 10. General Characteristics of the Sitewide Background Data.

Analyte	95% UCL	Overall Maximum Concentration (mg/kg[+])
Aluminum	15600	28800
Antimony	52.2[1]	31
Arsenic	8.92	27.7
Barium	171	480
Beryllium	1.77	10
Cadmium	0.79[1]	11
Calcium	23920	105000
Chromium	28	320
Cobalt	19.6	110
Copper	28	61
Iron	39160	68100
Lead	14.8	74.1
Magnesium	8760	32300
Manganese	612	1110
Mercury	1.25	3.8
Nickel	25	200
Potassium	3120	7900
Selenium	0.5[2]	6
Silver	2.7	14.6
Sodium	1290	6060
Thallium	3.7[2]	3.7
Vanadium	111	140
Zinc	79	366
Flouride	12	73.3
Chloride	763	1480
Nitrites	21[2]	36.5
Nitrates	199	906
Organo-Phosphates	16	225
Sulfates	1320	12600

Notes:
[1] Limits of Quantification
[2] Limits of Detection

Table 13. RESRAD Parameters for Assumed Residential Use at 100-D Pond. (Page 1 of 2)

Parameter	Selected Value	Default	Units	Citation	Rationale
Soil Density	1.5	1.5	g/cm^3		Default
Total Porosity	0.4	0.4			Default
Effective Porosity	0.2	0.2			Default
Hydraulic conductivity	10	10	m/yr		Default
Volumetric water content	0.05	0.05			Default
Effective radon diffusion coefficient	3.00E-07	3.00E-07	m^2/s		Default
Radon emanation coefficient - Ra-222	0.25	0.25			Default
Ra-220	0.15	0.15			Default
Precipitation rate	0.15	1	m/yr		Based on 6" per year annual rainfall
Runoff coefficient	0.2	0.2			Default
Irrigation rate	Not used	2	m/yr		No biota pathways included. Irrigation not assumed for this site.
Evapotranpiration coefficient	0.5	0.5			Default
Soil-specific exponential b parameter	5.3	5.3			Default
Erosion rate	0.001	0.001	m/yr		Default
Hydraulic gradient in groundwater	Not used				
Length of contaminated zone parallel to aquifer flow	Not used				
Watershed area for nearby stream or pond	Not used				
Water table drop rate	Not used				
Radon vertical mixing dimension	2	2	m		Default
Annual average windspeed	2	2	m/s		Default
Average building air exchange rate	0.5	0.5	h^{-1}		Default
Building room height	2.5	2.5	m		Default
Building indoor area factor	1	1			Default
Thickness of uncontaminated unsaturated zone	12	4	m		Assumes depth to groundwater is 40 ft
Building foundation thickness	0.15	0.15	m		Default
Foundation depth below ground surface	1	1	m		Default
Fraction of time spent indoors on-site	0.5	0.5			Default
Fraction of time spent outdoors on site	0.25	0.25			Default
Area of contaminated zone (crust)	1415	10000	m^2		Estimated surface area of the settling pond.
Area of contaminated zone	3350	10000	m^2		Estimated surface area of all the pond.
Cover depth	0	0	m		Default; assumes contaminated soil spread on the surface.

Table 13. RESRAD Parameters for Assumed Residential Use at 100-D Pond. (Page 2 of 2)

Distribution coefficients	Contaminant-specific				Default
Mass loading for inhalation	2.00E-04	2.00E-04	g/m^3		Default
Shielding factor for inhalation	0.4	0.4			Default
Depth of roots	0.9	0.9	m		Default
Soil ingestion rate	36.5	36.5	g/yr		Default
Thickness of contaminated zone - thin surface crust	0.005	2	m		Based on observed thickness of surface crust.
Thickness of underlying soil	2	2	m		Default
Seafood consumption rate	Not used				
Fruit, vegetable and grain consumption rate	Not used	160	kg/yr		Default
Inhalation rate	8400	8400	m^3/yr		Default
Leafy vegetable consumption rate	Not used	14	kg/yr		Default
Livestock water ingestion rate for beef cattle	Not used	50	L/d		Default
Livestock water ingestion rate for milk cows	Not used	160	L/d		Default
Meat and poultry consumption rate63	Not used	63	kg/yr		Default
Milk consumption rate	Not used	92	L/yr		Default
Shielding facator for external gamma radiation	0.7	0.7			Default
Elapsed time of waste placement	0	0	yr		Default
Shape factor (external gamma)	1	1			Default
Drinking water intake rate	Not used				

Table 14. Radionuclide Concentrations in 100-D Pond Surface Crust Used for RESRAD Calculations.

Radionuclide	Concentration (pCi/g)	Contaminant-Specific Doses (mrem/year) at Years Following Sampling		
		0 years	1 year	3 years
Co-60	6.93	4.98	3.48	1.33
Cs-137	11.1	2.04	1.59	0.75
Eu-152	21	6.48	4.87	2.15
Eu-154	3.68	1.3	0.95	0.4
Eu-155	5.33	.06	0.05	0.017
K-40	14.8	0.5	0.1	0.03
Ra-226	174	80.4	57.1	23.2
Ra-228	91.8	23.5	21.3	11.3
Total		119.3	89.4	39.2

Table 15. Radionuclide Concentrations in 100-D Pond (medium values) Used for RESRAD Calculations.

Radionuclide	Concentration (pCi/g)	Contaminant-Specific Doses 22 Years Following Sampling (2018) (mrem/year)
Co-60	0.068	0.053
Cs-137	0.968	1.82
Eu-152	0.21	0.4
Eu-154	0.026	0.029
Eu-155	0.053	0.0003
K-40	8.58	5.8
Ra-226	0.5	41
Ra-228	0.52	0.66
U-238	0.44	0.075
Total		49.8

APPENDIX A

100-D Pond Phase II Sampling Project Change Form

Date: February 8, 1995

Person Initiating Change: Mike Stankovich

Changes:

§3.1.2 Settling Pond Surficial Sampling, ¶ 1 calls for sampling within 15 cm of the pond bottom surface.

Sample #5 was taken from 0 to 18 cm.

Reason for Change:

The pond surface at this location was deeply mudcracked and partially frozen. To ensure enough sample was collected it was necessary to remove soil down to 18 cm.

Approval:

Technical Lead: Mike Stankovich 2/8/95

Task Lead: Joan Woolard 2/8/95

Quality Assurance Representative: Doug Bryant 2/8/95

100-D Pond Phase II Sampling Project Change Form

Date: February 7, 1995

Person Initiating Change: Mike Stankovich

Changes:

§ 3.1.1 Settling Pond Walls, ¶ 1, calls for samples to be collected within 15 cm of the surface.

Sample #1 was collected from 23 to 38 cm below the surface.
Sample #3 was collected from 5 to 20 cm below the surface.

Reason for Change:

Plant vegetation (e.g. reed, grasses, and tight bundles of roots) was found at sample locations #1 and #3. Sample location #1 had a 23 cm layer of plant vegetation and sample location #3 had a 5 cm layer of plant vegetation. Discussion was held at the site with Ecology, it was agreed that the samples should be taken from soil below the vegetation and not from the plant vegetation .

Approval:

Technical Lead: Mike Stankovich 2/8/95

Task Lead: Joan Woolard 2/8/95

Quality Assurance Representative: Doug Bryant 2/8/95

100-D Pond Phase II Sampling Project Change Form

Date: February 8, 1995

Person Initiating Change: Mike Stankovich

Changes:

1. §3.1.3, Settling Pond Test Pit #1, ¶ 2:
   silty/compacted layer sample changed from 15-22.5 cm to ~46 cm
   media immediately below silty/compacted layer sample changed from 22.5-45 cm to ~107 cm

2. §3.1.3, Settling Pond Test Pit #1, ¶ 2:
   The test pit will be excavated down to 3 meters looking for signs of leaching. With the concurrence of Ecology this requirement was canceled in the field.

Reason for Change:

1.0 The description of work calls for three mandatory samples to be collected, surficial media (<15 cm), a silty/compacted layer (15 to 22.5 cm), and immediately below the silty/compacted layer (22.5 to 45 cm). The actual sample depths were changed to reflect field conditions

2.0 Because radioactive contamination was found in the settling pond the test pit was dug by hand to minimize the potential for contamination spread with a backhoe. It was not feasible to hand dig to 3 meters. The lithology of the test pit was discussed with Ecology concerning the similarities of test pit #1 and #2. It was agreed between the parties (ERC technical lead and Ecology) it would be unnecessary to excavate the test pit to 3 meters.

Approval:

Technical Lead: Mike Stankovich 2/8/95

Task Lead: Joan Woolard 2/8/95

Quality Assurance Representative: Doug Bryant 2/8/95

100-D Pond Phase II Sampling Project Change Form

Date: February 8, 1995

Person Initiating Change: Mike Stankovich

Changes:

1. §3.1.4 Settling Pond Test Pit #2, ¶ 2
   silty/compacted layer sample changed from 15-22.5 cm to 20-61 cm
   media immediately below silty/compacted layer sample changed from 22.5-45 cm to 66-136 cm

2. Added an extra sample at ~61 cm level.

3. No contingency sample taken.

Reason for Change:

1. The description of work calls for three mandatory samples to be collected, surficial media (<15 cm), a silty/compacted layer (15 to 22.5 cm), and immediately below the silty/compacted layer (22.5 to 45 cm). The actual sample depths were changed to reflect field conditions

2. Extra sample collected to reflect discovery of band of reddish yellow media found at the 61-63.5 cm level

3. Ecology, geologist, and the technical lead discussed the necessity of collecting the contingency sample. It was agreed between Ecology and the technical lead that sample #12 would suffice for the DQO objective of the contingency. Sample 12 was taken below the silty/compacted layer in an area that showed strong signs fluid movement.

Approval:

Technical Lead: Mike Stankovich 2/8/95

Task Lead: Joan Woolard 2/8/95

Quality Assurance Representative: Doug Bryant 2/8/95

100-D Pond Phase II Sampling Project Change Form

Date: February 8, 1995

Person Initiating Change: Mike Stankovich

Changes:

3.1.5 Percolation Pond Test Pit #3, ¶ 1, selected a new site in the field to meet the objective of the DQO.

Reason for Change:

Test Pit #3 location was original sited in the percolation pond between the two overflow pipes from the settling pond. Field observation showed that this site was located on the berm separating the settling and percolation pond. Examination of the site raised two issues on the validity of this location fulfilling the DQO criteria. The first issue raised a concerned that test pit #3 location was situated on the berm at a location that displayed a possibility the sampling area had never being subjected to effluent from the settling pond. The second issue was, at the location selected for test pit #3, the 3 m sample would still be above the percolation pond bottom and would not fulfill the DQO objective of getting samples from below the pond.

Approval:

Technical Lead: Mike Stankovich 2/8/95

Task Lead: Joan Woolard 2/8/95

Quality Assurance Representative: Doug Bryant 2/8/95

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