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Remedial Investigation Report for the Eastern Michaud Flats Site

Part II
Surface and Subsurface Characterizations

Volume II
Sections 4 – 4.2

Prepared for
FMC Corporation
J.R. Simplot Company

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°C	degrees centigrade
°F	degrees Fahrenheit
µg/g	micrograms per gram
µmhos/cm	micromhos per centimeter
µmoles/g	micromoles per gram
µrem/h	microrems per hour
ADB	Arimo-Downey-Baham
AET	Apparent Effect Toxicity Threshold
AFLB	American Falls Lake Beds
AFM	Andersen Filter Media
AFR	American Falls Reservoir
ammo-phos	ammonium phosphate
AOC	Administrative Order of Consent
ASC	Additional Source Characterization
ASTM	American Society of Testing and Measurement
AVS	acid-volatile sulfide
BAPCO	Bannock Paving Company
BEI	Bechtel Environmental, Inc.
bgs	below ground surface
BLM	Bureau of Land Management
BPIP	Building Profile Input Program
CAA	Clean Air Act
CAP	capture efficiency
CE	control efficiency
CEC	cation exchange capacity
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cfs	cubic feet per second
Chester	Chester Environmental
CHV	Camelback-Hades-Valmar
CLP	Contract Laboratory Program
COPC	Constituents of Potential Concern
cps	counts per second
Cr^{+6}	hexavalent chromium

DAP	di-ammonium phosphate
DO	dissolved oxygen
DOE	Department of Energy
DQO	data quality objectives
DRR	Data recovery rate
E&E	Ecology and Environment, Inc.
EFSP	Ecological Field Sampling Plan
EIS	Environmental Impact Statement
EMF	Eastern Michaud Flats
EPA	U.S. Environmental Protection Agency
EQAPjP	Ecological Quality Assurance Project Plan
ESAP	Ecological Sampling and Analysis Plan
FDM	Fugitive dust model
FFA	FMC Facility Assessment
FMC	FMC Corporation
GEL	General Engineering Laboratories
GFAA	graphite furnace atomic absorption
gpm	gallons per minute
GPS	global positioning system
ha	hectare
HDPE	high-density polyethylene
HEAST	Health Effects Assessment Summary Tables
hi-vol	high-volume
hp	horsepower
I-86	Interstate Highway 86
ICAP	Inductively Coupled Argon Plasma Atomic Emission Spectrometry
ICP	Inductively Coupled Plasma
ID	inner diameter
IDEQ	Idaho Department of Environmental Quality
IDL	instrument detection limit
IGM	integrated gaussian model
IJ	Inkow-Joesvar
InterISC2	Inter-Industrial Source Complex 2

ISCST2	Industrial Source Complex-Short Term 2
ISU	Idaho State University
IWW	Industrial wastewater
kmph	kilometers per hour
LCS	laboratory control samples
LEC	Level of Ecological Concern
LEL	Lowest Effect Level
lo-vol	low volume
MCL	Maximum Contaminant Level
MDA	minimum detectable activity
MG	million gallons
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
milliBq	milliBecquerel
mS/cm	milliSiemens per centimeter
MSAI	Mountain States Analytical, Inc.
msl	mean sea level
mv	millivolts
MW	megawatt
Mwe	megawatt electric
NAAQS	National Ambient Air Quality Standards
NEIC	National Enforcement Investigation Center
NIOSH	National Institute of Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NWS	National Weather Service
OD	outer diameter
OMEE	Ontario Ministry of Environment and Energy
P_2O_5	phosphate
PARCC	Precision, Accuracy, Representativeness, Completeness and Comparability
PCB	polychlorinated biphenyl
pCi/l	picocuries per liter

PEI	PEDCO Environmental, Inc.
PIC	pressurized ionization chamber
PM_{10}	particulate matter of 10 microns or less
ppm	parts per million
PRV	pressure relief valve
PSD	Prevention of Significant Deterioration
PSCS	Preliminary Site Characterization Summary
PVC	polyvinyl chloride
QA/QC	Quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	Quality Control
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RRL	Riric-Rexburg-Lanoak
SAP	Sampling and Analysis Plan
SCS	U.S. Soil Conservation Service
SEM	simultaneously extracted metals
SET	source emissions tests
SII	Sciences International, Inc.
Simplot	J.R. Simplot Company
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_4	sulfate
SOP	standard operating procedures
STP	Sewage Treatment Plant
T/yr	tons per year
TAL	Target analyte list
TBD	to be determined
TCLP	Toxicity Characteristic Leaching Procedure
TDS	total dissolved solids
TLV-TWA	threshold limit value-time weighted average
TOC	total organic carbon

TPH	total petroleum hydrocarbon
TSP	total suspended particulates
TV	tolerance values
U.S. FWS	U.S. Fish and Wildlife Service
UCL	upper confidence level
UPRR	Union Pacific Railroad
USC & GS	U.S. Coast and Geodetic Survey
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UTM	universal transverse mercator
WAC	Washington Administrative Code
XRF	x-ray fluorescence

Nature and Extent of Constituents of Potential Concern

This section of the RI report provides an interpretation of data gathered to assess the nature and extent of EMF-related constituents and migration pathways in the EMF study area. Information presented here is derived primarily from the following sources:

- Results of RI sampling and analysis per methodologies described in Section 2
- Information obtained from previous investigations. (Reference summary of previous investigations in Section 1.3.)

Section 3, which describes the regional and site physical characteristics of the EMF study area, provides the context for evaluating the nature and extent of EMF-related constituents in the area.

This section is organized into six subsections:

- Section 4.1 addresses issues of RI data quality.
- Section 4.2 evaluates the potential sources of EMF-related constituents and their effect on facility soils.
- Section 4.3 describes the nature and extent of EMF-related constituents in surface soils.
- Section 4.4 presents an interpretation of the nature and extent of EMF-related constituents in groundwater.
- Section 4.5 characterizes the types and distribution of constituents in surface water and sediments of the Portneuf River and related springs and, where applicable, their relationship to the EMF facilities.
- Section 4.6 summarizes the findings of aquatic and terrestrial ecology investigations requested by the EPA.
- Section 4.7 summarizes the results of air monitoring.

4.1 REVIEW OF SITE CHARACTERIZATION DATA AND DATA QUALITY

Characterization of the nature and extent of constituents of potential concern in the EMF study area involved the collection of numerous samples of each medium investigated. These samples were collected in accordance with the DQOs presented in the RI/FS Work Plan (Bechtel, 1992a) and the SAP (Bechtel, 1992b). Both the RI/FS Work Plan and the SAP were approved by the EPA.

This section describes selected data quality issues. Deviations from the SAP are described in Sections 4.1.1 and 4.1.2. Data limitations and uncertainties relevant to more than one of the investigated media (e.g., soil, groundwater) are discussed in Section 4.1.3. Data limitations or uncertainties specific to a single investigated medium are discussed in the relevant medium-specific sections of the RI Report, namely, Sections 4.2 through 4.7. A detailed summary of the precision, accuracy, representativeness, completeness, and comparability of the data is provided in Appendix J. Ecology data validation summaries are provided in Appendix N.

The objectives of this preliminary explanation of data quality are to:

- Identify analytical results that may not be representative of the sampled media (e.g., groundwater, soil, sediments, etc.).
- Identify any data limitations or qualifications used in reporting RI data or interpreting the nature and extent of constituents of potential concern.

4.1.1 DEVIATION FROM SAP DURING SAMPLE COLLECTION, TRANSPORT, AND ANALYSIS

As is true of any site investigation of this complexity, deviation from the SAP and RI/FS Work Plan occurred during data collection and laboratory analysis. Data sets with questions relating to holding times, laboratory procedures, and analytical technique have been flagged with a data qualifier on the Form 1s and in the electronic database. Use of these data was limited as appropriate for the data qualifier. Data validation guidelines published by the EPA (EPA, 1988b and 1988e) were followed in this process. Appendix H presents an explanation of the data validation qualification codes.

4.1.2 DEVIATIONS FROM THE SAP DURING SAMPLING

Technical review of sampling procedures indicated that certain samples may not be entirely representative. On the basis of professional judgment, these data points have only been used to a limited extent or with qualification. These samples consist of a set of groundwater samples collected several days after a group of new wells was installed in April and May 1992. Inadequate time had elapsed between well installation and well development and sampling to ensure that the grout used to isolate the well screen from potential down-hole infiltration had set properly. Therefore samples collected in April and May were believed to be unrepresentative of groundwater conditions due to concern that the grout had not yet consolidated. Rather, results from subsequent samples collected from these wells have been used; these samples were collected in four or more separate quarterly events between the summer of 1992 and December 1993. A list of the "unrepresentative" samples is presented in Table 4.1-1.

4.1.3 DATA LIMITATIONS AND UNCERTAINTIES

This section describes analytical results that have either not been used in this report or have been used with qualifications. An explanation of the basis for this qualification is presented.

4.1.3.1 Mercury

Mercury was reported above the EMF laboratory's instrument detection limit (IDL) in a number of samples and associated field quality control results. These mercury results appear to be false positives for the reasons provided below.

Low levels of mercury were reported in some of the laboratory and field blanks analyzed in conjunction with samples of various media. The highest concentrations of mercury were often reported in these blanks. The appearance of mercury in such blanks was sporadic in nature and can be attributable to low-level laboratory contamination and/or to electronic noise. The mercury results are below the laboratory's reporting limit of 0.5 ug/l (i.e., between the laboratory's instrument detection limit of approximately 0.1 ug/l and its reporting limit). For values close to

the IDL, it is difficult to clearly resolve a response due to the variation in background. Examination of the low end of the analytical curve used by the laboratory demonstrates that only 0.0024 absorbence units separate a detect from a nondetect (i.e., very little drift in the instrument yields a mercury detect).

The effect of the sporadic appearance of mercury in these blanks was to require qualification of some, but not all, of the results as nondetects through application of the "5 times" rule described in EPA's "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics" (EPA, 1988b) (i.e. assigning a nondetect or "U" qualifier to any result less than five times the concentration measured in an associated blank). If laboratory contamination and/or electronic "noise" caused sporadic detection of mercury in laboratory and/or field blanks, it can be assumed that these possible causes had the same effect on the actual samples that were in some cases paired with blanks in which mercury happened not to appear.

Furthermore, the EPA Contract Laboratory Program (CLP) Statement of Work (SOW) directs laboratories to carry out quarterly IDL determinations. Expected variations in IDL's throughout the project yielded variations in the "detect" versus "nondetect" concentrations of an element.

The belief that the low levels of mercury detected in some samples are false positives is further supported by results reported by a June 1994 referee laboratory that participated in the June 1994 Surface Water and Sediment Sampling event. The principal laboratory and the referee laboratory reported the same results (ND) for 11 of the 12 samples analyzed by both laboratories. The referee laboratory reported a nondetect at 0.1 ug/l in a rinsate in which the principal laboratory reported a result at 0.19 ug/l.

4.1.3.2 Fluoride Results

Soluble Versus Total Fluoride

During the 1990 FMC Facility Assessment, a number of soil samples were collected and analyzed for soluble fluoride. These results are included in the discussion of constituents

detected in soils in Section 4.2.3. The test method employed for this analysis utilizes a distilled water extraction procedure. Subsequently, soil samples collected during the RI were analyzed for total fluoride utilizing a sulfuric acid digestion method.

The two methods are not directly comparable. To provide a basis for comparison, five soil samples and two sediment samples were subjected to analysis by both methods during the RI. The results of these analyses are presented in Table 4.1-2. The soluble results are generally less than 5 percent of the total value.

Fluoride Validation

Soil Analysis in Sagebrush Steppe and Riparian Habitat. Ten soil samples were collected from 5 sampling locations within the riparian and sagebrush steppe habitats. The samples were analyzed for fluoride by Mountain States Analytical, Inc. The soils were digested using method ASA 26.4.3.4 and analyzed using EPA SW846, method 6010A. As indicated in the Ecological Data Validation report provided as Appendix N, Attachment N-1, all laboratory quality criteria were met, all samples were analyzed within their holding time, no blank contamination occurred, and matrix spikes/matrix spike duplicates and laboratory control samples (LCSs) were within the control limits.

Vegetation Analysis in Sagebrush Steppe and Riparian Habitat. Vegetation samples were analyzed for fluoride by EA Engineering Laboratory. The samples were washed following method AOAC3.085. All samples were digested according to method AOAC3.086 and analyzed following AOAC3.087. As indicated in the Ecological Data Validation report provided as Appendix N, Attachment N-1, the quality of these data was as follows:

- LCS: Internal LCS control limits were not available since this was the first time the method was performed in this lab. Eight LCSs ranged in recoveries from 57.4 to 104.8 percent.

- Matrix Spikes: Four matrix spike recoveries (VSUU0101-washed, VGU0301, VSUU0301-washed, and VROU0401) were below standard control limits of 75 to 125 percent and may have biased the associated samples low. In terms of the impact on risk assessment, neither horned lark nor sage grouse was affected because washed samples were not used in the risk assessment and Russian olive samples from Portneuf and Snake rivers (associated with matrix spike on VROU0401) and Ferry Butte grass samples (associated with matrix spike on VGU0301) are not dietary components of these species. All other vegetation samples in the impacted areas were not affected or biased.
- All samples were positively affected by NaOH during sample ashing and fusion, which may have biased vegetation samples high.
- Three of the eight method blanks were above the 25 mg/kg reporting limit. This may have resulted in high bias to the following samples that were associated with these blanks:

Blank Preparation Data	Blank Concentration (mg/kg)	Affected Samples
12/1/94	67.0	(washed)-VSUU0101, VSUU0103 – 0115
12/23/94	26.5	(washed)-USUU0308, 0309, 0311, 0315, 0318
12/28/94	60.2	(washed)-VSUU0320, VSUU0201 – 0220, PBU0101, 0103

Mouse Tissue Analysis. The mouse tissue samples were digested and analyzed by EA Engineering Laboratory, following methods AOAC3.086 and 3.087. As indicated in the Ecological Data Validation report provided as Appendix N, Attachment N-3, only the LCSs associated with femur samples MSUO110 through MSUO310 had a recovery below the required control limits (47 percent). The LCSs associated with all 60 of the whole body and the

remaining femurs samples had recoveries that ranged from 87 to 105 percent, well within the control limits of 80 to 120 percent.

The matrix spike recoveries for samples MWBU0201 and MWBU0309 are below standard control limits and may bias the associated sample results low. All other quality control criteria were met.

Surface and Subsurface Characterizations Tables for Section 4.1

Table 4.1-1
Samples Not Representative of Groundwater
(Collected in April, May, and June 1992)

Well Number	Sample ID	Sample Date	Sample Type
139	FG139	5/17/92	GW
140	FG140B	5/11/92	GW
140	FG140BD	5/11/92	GW
141	FG141	5/17/92	GW
142	FG142	5/29/92	GW
143	FG143	5/12/92	GW
143	FG143D	5/12/92	GW
144	FG144	5/8/92	GW
144	FG144D	5/8/92	GW
145	FG145	5/7/92	GW
145	FG145D	5/7/92	GW
146	FG146	5/9/92	GW
146	FG146D	5/9/92	GW
147	FG147	5/12/92	GW
147	FG147D	5/12/92	GW
148	FG148	5/13/92	GW
149	FG149B	5/13/92	GW
149	FG149BD	5/13/92	GW
149	FGDUP1	5/13/92	GWD
149	FGDUP1A	5/13/92	GWD
149	FGDUP1AD	5/13/92	GWD
149	FGDUP1B	5/13/92	GWD
149	FGDUP1BD	5/13/92	GWD
149	FGDUP1D	5/13/92	GWD
150	FG150AA	4/29/92	GW
150	FG150B	5/12/92	GW
150	FG150BD	5/12/92	GW
151	FG151B	5/7/92	GW
151	FG151BD	5/7/92	GW
152	FG152	6/4/92	GW
300	SG300	5/26/92	GW
300	SG300D	5/26/92	GW
304	SG304	5/8/92	GW

Notes:
GW = Groundwater sample.
GWD = Duplicate groundwater sample.

Table 4.1-1 (continued)
Samples Not Representative of Groundwater
(Collected in April, May, and June 1992)

Well Number	Sample ID	Sample Date	Sample Type
304	SG304D	5/8/92	GW
306	SG306	5/28/92	GW
307	SG307	5/10/92	GW
307	SG307D	5/10/92	GW
308	SG308	5/8/92	GW
312	SG312	6/1/92	GW
312	SGDUP2	6/1/92	GWD
312	SGDUP2A	6/1/92	GWD
312	SGDUP2B	6/1/92	GWD
313	SG313	5/29/92	GW
317	SG317	5/7/92	GW
317	SG317D	5/7/92	GW
318	SG318	5/7/92	GW
318	SG318D	5/7/92	GW
321	SG321	5/27/92	GW
322	SG322	6/11/92	GW
500	OG500	6/14/92	GW
501	OG501	6/3/92	GW
502	OG502	5/30/92	GW
503	OG503	5/30/92	GW
504	OG504	5/31/92	GW
505	OG505	5/31/92	GW
506	OG506	5/29/92	GW
507	OG507	5/28/92	GW
508	OG508	6/3/92	GW
509	OG509	6/2/92	GW
510	OG510	6/10/92	GW
511	OG511	6/10/92	GW
512	OG512	6/1/92	GW
513	OG513	5/31/92	GW

Notes:
GW = Groundwater sample.
GWD = Duplicate groundwater sample.

TABLE 4.1-2
COMPARISON OF ANALYTICAL METHODS OF DETERMINING FLUORIDE CONCENTRATIONS IN SOIL

Location	Total	Soluble
SS-045-1-A	10000	187
BS-023-3-B	520	24
SD-17	3900	38
SD-22	540	18
BS-150-11	5300	76
BS-B-13-90	480	16
BS-B-12-70	500	19

Notes: SS - Surface sample.
BS - Below surface sample.
SD - Sediment.
Results in mg/kg.

4.2 POTENTIAL SOURCES AND FACILITY SOILS

Section 4.2 presents the results of the investigations of potential sources and soils at the EMF facilities. These investigations were begun in Phase I of the RI in 1992 and continued in Phase II in 1993. Data from investigations at FMC in 1990 were also used in the evaluations. Samples were, by intent, collected in areas of known or suspected facility influence. As such, the sampling program was biased toward identification of facility effects and any interpolation between individual areas of investigation is inappropriate.

Potential Source and Facility Soils Investigation Objectives

The objectives of the potential source and facility soils investigation were:

- To examine the nature of constituents present in feedstocks, coproducts, by-products, and wastes from the industrial processes, and to identify any distinctive patterns in the chemical content of these materials that would allow them to be readily differentiated from each other.
- To evaluate whether units used to store, transport, or dispose of these materials have affected soils in the vicinity of the units, and, if so, to identify the vertical and horizontal extent of any effects. The chemical characteristics of the materials described under the first objective were used as a tool in evaluating sampling results; these characteristics also allowed specific sources to be identified in areas where multiple sources were possible.

Overview of Potential Source and Facility Soils Investigation Findings

The major findings of the investigation of potential sources and facility soils were as follows:

- The principal feed stock at the EMF facilities is phosphate rock mined from the Phosphoria Formation. This shale contains apatite, a mineral containing calcium, phosphate, and fluoride. The ore also contains trace levels of arsenic, cadmium, chromium, vanadium, uranium-238 and its daughters, zinc, and other elements. The processing operations at the EMF facilities separate these components into various products, coproducts, by-products, and wastes.
- A suite of characteristic constituents was identified by concentration for major feed stocks, coproducts, by-products, and waste materials. The primary constituents found in the solid fraction of these materials at both FMC and Simplot are cadmium, chromium,

fluoride, total phosphorus, vanadium, and zinc. Four or more of these six characteristic constituents were usually among the predominant constituents detected in fill material or EMF-affected soils sampled as part of the potential source and facility soils investigation. For this reason, the presence of four or more of these constituents in excess of their concentrations in undisturbed, native soils indicates EMF facility effects. Indications of EMF-related materials were also based on visual inspection of the samples as noted in the soil boring logs (Appendix B).

- Specific feed stocks, coproducts, by-products, and wastes can be distinguished by characteristic levels of additional constituents. At FMC, these materials include: phossy waste solids, containing characteristic levels of cadmium, lead-210 and zinc; precipitator slurry, containing characteristic levels of arsenic, potassium and zinc; ferrophos, containing characteristic levels of chromium, iron, and vanadium; and calciner pond sediments, containing characteristic levels of calcium, fluoride, potassium, and selenium. At Simplot, these materials include gypsum, containing characteristic levels of calcium, fluoride, phosphorus, and sulfate.
- Arsenic concentrations did not appear to be distinguishing characteristics in these data. Arsenic concentrations measured in Simplot ore, gypsum and other solid byproducts were below EPA's soil representative levels. Arsenic in FMC ore (14 mg/kg) was slightly greater than the representative level (7.7 mg/kg), but it was below the representative level in ferrophos and slag. Arsenic concentrations in sediments from former ponds at FMC ranged from approximately 20 to 250 mg/kg, but were not considered to be characteristic when compared with other constituents (e.g., zinc, detected at over 35,000 mg/kg in precipitator sediments).
- Soil quality has generally been degraded only where mechanical actions have mixed native soils with the source materials or where a sustained hydraulic head has transported constituents from source materials into underlying soils.
- Where a sustained head is absent, inorganic and radiological constituents introduced into subsurface soils through mechanical actions are generally below soil representative levels in deeper soils.
- PCBs and other organics were not found in facility soils in significant quantities.

Section Content and Organization

Section 4.2 summarizes constituents and constituent concentrations measured in EMF potential source materials and in soils beneath the facilities. The background or representative soil

constituent levels with which facility soils are compared are presented in Section 4.2.1. A description of potential sources and soils at Simplot is then presented in Section 4.2.2; potential sources and facility soils at FMC are described in Section 4.2.3. The results of the overall study are summarized in Section 4.2.4. An overview of the structure and conclusions of Section 4.2 is shown on Figure 4.2-1. All potential source material and soil data are provided in Appendix W.

Radiological Data

The discussion of radiological data for facility soil samples, provided in Sections 4.2.2 and 4.3.3, is limited to gross alpha and beta measurements as they were the only radiological measurements made on these samples. Activities of the individual isotopes most likely responsible for the gross alpha and beta measurements were estimated for samples in which gross alpha or beta measurements exceeded representative levels. The estimates are provided in Appendix P along with a description of the approach by which the estimates were developed. In summary, the primary alpha emitters in the facility soil samples are assumed to be uranium-238, uranium-234, thorium-230, radium-226 and polonium-210; the primary beta emitters are assumed to be lead-210 and potassuim-40. The estimated activities of radium-226 ranged from 4 to 24% of the corresponding soil gross alpha measurements.

Subsequent to the estimation of individual radioisotope activities described above, three FMC facility soil samples (F046B000, F050B000, and F130B000) were tested for radium-226 activity and at the same time, were retested for gross alpha activity. Ra-226 activities as a percent of gross alpha activities ranged from 8 to 13 percent.

Radionuclides in the uranium-238 decay series are present in secular equilibrium at activities of approximately 21 to 27 pCi/g in phosphate ore. This is approximately 10 times higher than EPA's representative level in soils. These radionuclides include uranium-238, -234, thorium-230, radium-226, polonium-210, and lead-210. Radium-226 is slightly enriched in gypsum (mean activity of 31 pCi/g) when compared with ore. Slag at FMC has slightly greater activities of uranium, thorium, and radium isotopes (approximately 22 to 30 pCi/g) compared with ore, due to chemical fractionation in the furnace reaction activities. Solid materials collected from gaseous

emissions at FMC (e.g., calciner stack scrubber sediments and electrostatic precipitator dusts) are enriched in polonium-210, which is sublimated from the ore in the calciners and furnaces.

Gamma Radiation Studies

An aerial radiological survey of the Pocatello area was conducted by EG&G on behalf of EPA during 1986 and was used by Ecology and Environment (E&E) to produce estimated gamma exposure rates at the Simplot and FMC facilities. In addition, for the purpose of estimating worker exposure rates, E&E utilized low end (lower 95th percentile) shielding factors derived from a plant at a different location than the EMF facilities. Due to the lack of site-specific data, Simplot and FMC conducted gamma radiation studies at various areas of their facilities to develop site-specific data relating to gamma exposure rates and shielding factors provided by heavy equipment utilized by workers at the facilities.

Exposure rate measurements were obtained at over 24 locations at Simplot and 63 locations at FMC. The objective of these measurements was to characterize the potential exposure of plant workers to gamma radiation emitted from industrial feedstocks, byproducts, and wastes. Measurements were obtained using standard equipment and methods utilized in evaluating the need for radiation protection programs under 29 CFR 1910.96 Reports describing the measurement methods and results for both facilities are presented in Appendix O, Attachments O-1 and O-2.

Exposure rates were measured under the typical worker conditions (e.g., in equipment cabs) or directly atop source areas (e.g., the gypstack and slag pile). Exposure rate measurements were made with a pressurized ionization chamber (PIC) and with a Bicron micro(μ)rem meter. The Bicron meter was used to obtain measurements within equipment cabs and work areas that were too small to allow the use of a PIC. Measurements obtained within cabs were compared with measurements obtained at the same area in the absence of the equipment to determine the shielding factor afforded by the equipment structure. To ensure accuracy, the Bicron meter was calibrated against measurements obtained with the PIC.

Additional measurements were obtained to characterize background exposure rates. These were collected both within the foothills of the Bannock Range south of the slag pile and gypstack, as

well as in the several areas within the Michaud Flats north of the industrial operations areas of the FMC and Simplot facilities. Background levels ranged between 15 and 40 microrems per hour (µrem/h) in the foothills and 12 to 15 µrem/h in the Michaud Flats. The higher rates in the foothills are attributable to the natural presence of radionuclides of the uranium-238 decay series present in rhyolitic rocks and soils derived from these rocks in the foothills, compared with the calcareous soils found in the Michaud Flats area.

Exposure rates (unshielded) within the production area of the Simplot facility were generally 10 µrem/h (within the range of background for Michaud Flats), while rates (unshielded) measured on the gypstack ranged between 10 and 30 µrem/h (within the range of background for the Bannock Hills). Shielded exposure rates in equipment used in operating the gypstack were lower, ranging between 9 and 15 µrem/h, which are well within the range of background levels in both the Bannock Range and the Michaud Flats areas.

Exposure rates (unshielded) within the FMC plant ranged between 10 to 25 µrem/h near offices buildings and several operations areas. Near the ore stockpile and ore crushing operations, exposure rates (unshielded) ranged between 35 and 50 µrem/h. The unshielded measurement at the slag pile was 52 µrem/h, which was the highest level recorded. The average shielding factor afforded by operating equipment was 0.77, with shielding factors at individual sites ranging between 0.41 (in a cab at the ore stacker area) to 0.95 (in the cab of the slag dumping truck). The average shielding factors reduce exposure rates to within background levels for all areas except the orestacker area which is slightly above the range of background for the Michaud Flats.

The Simplot and FMC facilities' site-specific data show that the exposure rates derived from the 1986 aerial survey are generally higher than the measured exposure rates throughout the facilities. More significantly, the shielding factors assumed by E&E (0.47 for heavy equipment) are significantly lower than the actual shielding factors measured during the FMC study (0.95 for slag haul trucks), and therefore, the risk assessment prepared by E&E likely significantly overestimates the worker exposure rates.

CHARACTERIZATION OF REPRESENTATIVE SOIL (SECTION 4.2.1)	Chemical constituent representative levels were identified and are shown in Table 4.2.1-1.
CHARACTERIZATION OF POTENTIAL SOURCES AND ONSITE SOILS:	**Simplot** (Section 4.2.2) **FMC** (Section 4.2.3) • Characteristic constituents were identified for phosphate ore, major waste types, and by-product materials: cadmium, chromium (total), fluoride, total phosphorus, vanadium, and zinc, and uranium-238 decay series radionuclides. • Additional constituents are associated with specific solid wastes and by-products at the two facilities. These constituents are identified in Section 4.2.2.1 for Simplot, and Section 4.2.3.1 for FMC.
CONCLUSIONS (SECTION 4.2.4):	There has been widespread use of facility by-products as fill for grading in some portions of the EMF facilities. Fill extends to depths of up to 8 feet at Simplot and 30 feet at FMC. The fill materials contain concentrations of various constituents above soil representative levels. In areas to which no sustained hydraulic head has been applied: • EMF-related constituent concentrations were generally less than soil representative levels in native silts or clays beneath fill materials. Elevated constituents in the silts or clays were generally limited to fluoride, total phosphorus, sulfate (Simplot), potassium (FMC), sodium (FMC) and, to a lesser extent, zinc (FMC). Constituents concentrations greater than soil representative levels were generally not found in excess of 10 feet below the source or fill and native soil interface. • PCBs were detected in scattered locations across both facilities at concentrations of less than 1 mg/kg. However, most of the samples analyzed for PCBs did not contain any at detectable levels. There was no evidence of vertical migration. • TPH were detected in several locations near the surface and on roads. They were not detected at depth.

FIGURE 4.2-1
OVERVIEW OF POTENTIAL SOURCES AND FACILITY SOILS

CONCLUSIONS (*continued*) (SECTION 4.2.4):	• Volatile organic compounds (primarily xylenes and toluene) were found near detection limits in the boreholes drilled in FMC's chemical laboratory drainfield and near the active landfill. No EMF-related semivolatile organics were detected in any sample. • Gross alpha and gross beta activities in excess of representative levels were generally confined to fill materials. There was no evidence of radionuclide migration into the native soils in areas lacking a sustained hydraulic head. The above conclusions support the more general conclusion that the main facility areas have widespread surficial effects due to EMF-related activities, in particular due to the use of EMF-related materials for fill. Even so, many of the surficial soils, particularly at Simplot, are beneath asphalt or concrete, and, in the absence of a sustained hydraulic head, there has been little effect on the subsurface native soils. In areas to which a sustained hydraulic head has been or is applied: • Most trace metals are below representative levels in the first 10 to 20 feet of native soil where the soil is a clay or silt. Clay or silt predominate in the western and central pond area of the FMC facility and beneath the upper gypsum stack at the Simplot facility. • In areas underlain by few fine-grained soils, metals such as zinc and nickel exceed representative levels to depths greater than 20 feet. However, they are rarely above representative levels near the water table. These conditions are generally confined to the northern portion of the Simplot facility and the eastern part of the FMC facility. • Gravels containing volcanic rock fragments and fines often have constituent concentrations that differ from the representative characteristics of loess-related materials. • In some of the areas to which a sustained hydraulic head was or is applied, fluoride, total phosphorus, sulfate and potassium exceed representative levels throughout the soil column.

FIGURE 4.2-1 (*continued*)
OVERVIEW OF POTENTIAL SOURCES AND FACILITY SOILS

The levels of radiation generally measured within both the plant boundaries and at specific locations directly above the gypsum stack and slag pile were well below levels which require a radiation protection program under 29 CFR 1910.96. A radiation protection program is required where external radiation doses have a potential to exceed 500 mrem/y if there are workers less than 18 years of age; a level of 1250 mrem/y is applicable for workers 18 years or older. The highest dose rates observed were near 55 µrem/h, which after subtracting a conservative measure of background of 15 µrem/h, yields an excess dose rate of 42 µrem/h. Full-time exposure at this rate for 2000 hours per year results in 84 mrem/y, which is well below a level that warrants a radiation protection program.

4.2.1 Characterization of Representative Soil Chemistry in the EMF Study Area

Soil constituent levels (i.e., representative levels) were defined by EPA, above which soil may be identified as potentially affected by EMF facilities operations. These levels are presented in Table 4.2.1-1.

The characterization of representative levels was complicated by the fact that the geologic history of the Pocatello area has created a variety of soil types throughout the EMF study area. The diversity of naturally occurring minerals has contributed to a range of concentrations of chemical elements within these soils, including those elements associated with the ore-processing operations at the EMF facilities.

In addition, the surface soils in the Pocatello area have been enriched with a number of constituents (e.g., phosphorus, lead) from a variety of historic land use practices unrelated to the EMF facilities, such as irrigation, application of soil amendments during agricultural use, and vehicle exhaust, as well as through natural soil development processes. Some of these chemical constituents are the same as those associated with EMF facilities operations. Consequently, it is important that this enrichment of surface soils be understood.

FMC and Simplot developed representative levels independent of EPA's development of the levels in Table 4.2.1-1. The Companies' levels and the approach used to develop the levels were presented in Section 4.1 of the EMF PSCS (Bechtel, 1994a). Separate sets of representative levels were developed for surface and subsurface soils. Some of the Companies' levels were

higher than those developed by EPA; some were lower. A comparison of the EPA and Company-developed levels is provided in Table 4.2.1-2.

In a letter to the Companies dated December 16, 1993, EPA indicated it would consider representative levels other than those it had developed if the Companies felt strongly that certain of EPA's values were biased or could significantly impact the screening results. The Companies provided a technical basis for alternative values for seven parameters (Cd, Cr, P, Zn, Pb-210, Po-210, and U-238) in a letter to EPA dated August 4, 1994. In a letter to the Companies dated September 20, 1994, EPA rejected these alternative values and repeated its intent to use values defined in its December 16, 1993, letter. Although the Companies have used EPA's levels in this RI report to assess potential EMF effects, the Companies reserve the right to reevaluate them should any difference between the Companies' and EPA's levels affect the scope of remedial action at the site.

4.2.2 Characterization of Simplot Potential Sources and Facility Soils

This section is organized into three major subsections. Section 4.2.2.1 describes the chemical composition of potential source materials that are part of the industrial operations at Simplot. Sections 4.2.2.2 and 4.2.2.3 describe the chemical composition of soils sampled to assess the nature and extent of constituents associated with potential releases from potential sources under present or prior plant operations. Soil quality associated with the use of facility by-products as fill or roadbed material is also discussed.

The potential sources addressed in this section do not include air emissions, which are addressed separately in RI Report Part III. Nevertheless, the chemical characterization of surface soils in this section may reflect the effects of air emissions in addition to contributions from other sources. The effects of air emissions on soils in the vicinity of the EMF facilities are more specifically addressed in Section 4.3.

Simplot areas described in this section are subdivided into:

- Active or formerly active areas not subject to a sustained hydraulic head except from natural precipitation (no sustained downward gradient or head due to aqueous streams from plant operations) (Section 4.2.2.2).
- Active or formerly active areas subject to a sustained hydraulic head from facility activities (i.e., a sustained downward gradient or head due to aqueous streams from plant operations) (Section 4.2.2.3).

The rationale for this subdivision follows from an initial assumption made during the development of the EMF RI/FS Work Plan that EMF-related constituents would likely be present in higher concentrations and at greater depths in soils beneath areas to which a sustained hydraulic head was or is applied as opposed to areas subjected only to natural precipitation.

In the Pocatello area, evaporation far exceeds precipitation. The annual mean precipitation at the Pocatello Municipal Airport is approximately 11 inches per year, with the greatest amount occurring from March through May. Mean evaporation is greatest in the summer, totaling 29.76 inches for the 3-month period from June through August. The annual mean evaporation at the Pocatello airport is 61.14 inches (NOAA, 1982). Consequently, areas that are only exposed to natural precipitation have low infiltration rates (i.e., low transport potential). This subject is further developed in Section 5.

Aqueous streams from plant operations can increase infiltration above that caused by natural precipitation. This increased infiltration in turn increases the potential for downward migration of constituents through the unsaturated zone. Downward migration may also be enhanced by the pH of the aqueous streams which are generally acidic (low pH) and contain high solute concentrations. The extent of potential EMF-related effects was evaluated by comparing the soil characterization data with the soil representative levels presented in Section 4.2.1.

The overall conclusions reached in this section are generally consistent with the division of site areas into those with and without a sustained hydraulic head. First, in the absence of a sustained hydraulic head, EMF-related constituents were generally not measured in native soils at concentrations in excess of soil representative levels. Second, in the presence of a sustained hydraulic head, EMF-related constituent concentrations were generally below soil representative levels within 20 feet of the source/native soil interface. Elevated concentrations of phosphorus, fluoride, and sulfate, however, were frequently measured at greater depths.

4.2.2.1 Simplot Potential Sources

To determine the potential constituents that may be released from Simplot sources, chemical analyses were performed on feedstock (ore), by-products (gypsum), and pond waters and sediments. Information gathered from these analyses was then compared with the chemical analyses of soil to determine the potential source of the constituents found in the soils. This section of the report discusses ore, by-products, and pond waters and sediments, with emphasis on the general characteristics and any unique characteristics that enable identification of the material.

Five Simplot source areas/materials were examined during Phases I and II to qualify the chemical composition of their matrices. The following general conclusions were reached:

- Phosphate ore, gypsum slurry, former east overflow pond water and sediments, water treatment pond water, and sediments from the unlined ditch formerly leading to the water treatment pond contain significantly higher concentrations of various trace metals and other constituents than do native soils and waters.
- The appearance of six characteristic constituents in all of the solid materials enables identification of the source material when it is mixed with native soils or sediments. These constituents are cadmium, chromium, fluoride, total phosphorus, vanadium, and zinc. [Note: When they occur as a group, they are underlined in the following text.]
- In addition to the six characteristic constituents, several of the above potential sources have elevated concentrations of other constituents that allow for their identification, provided they are mixed in a matrix (soil or sediment) in sufficient quantity (e.g., calcium and sulfate for the gypsum slurry).
- To a lesser extent than the solid matrices, the wastewaters associated with the gypsum slurry and the former east overflow pond also have enriched concentrations of various constituents that can be used to identify them as sources.

Ore Slurry

A dried time-composite sample of the ore slurry was collected and analyzed for the parameters listed in Table 2.1-1. This list is the same as that used for other potential source samples and was derived from known ore characteristics. Two methods of sample preparation were used. The

first was digestion using nitric acid (the EPA-recommended method); the second consisted of hydrofluoric and perchloric acid digestion. Only the second method is sufficiently aggressive to achieve the total breakdown of the ore matrix. The method is used by Simplot to assay ore. For this report, the samples analyzed using the nitric acid digestion method were used to compare soil samples that might contain ore since the soil samples were analyzed using the nitric acid digestion method, as well.

The results of both digestion methods are contained in Table 4.2.2-1. An examination of the data indicates a typical characteristic pattern of elements contained in the ore. Key elements of the ore are the major constituents of the phosphate mineral apatite: calcium (29 to 30 percent), fluoride (3.3 to 3.6 percent), and total phosphorus (7.4 to 13.6 percent). Other ore constituents present above representative levels for soil and, hence, that may be used for identifying potential EMF effects, include cadmium (109 to 111 mg/kg), chromium (404 to 476 mg/kg), copper (75.5 to 76.5 mg/kg), nickel (94.1 to 100 mg/kg), selenium (11.5 to 28.3 mg/kg), sodium (3,490 to 3,670 mg/kg), vanadium (701 to 732 mg/kg), and zinc (1,130 to 1,140 mg/kg).

Gypsum Slurry

Gypsum slurry is the primary by-product at the Simplot facility. It is discharged to the gypsum stacks. Two time-composite samples of gypsum slurry were collected and analyzed. Analytical results are presented in Table 4.2.2-1. The first sample was analyzed as a slurry using both the nitric acid and the hydrofluoric/perchloric acid digestion methods described for ore. The second sample was filtered and the filtrate analyzed to provide an estimate of the dissolved constituents available for potential migration.

The results of the gypsum slurry analyses indicate that the principal constituents are calcium (233,000 to 243,000 mg/kg), fluoride (6,900 to 7,650 mg/kg), total phosphorus (6,560 to 9,450 mg/kg), and sulfate (540,000 to 601,000 mg/kg). Cadmium (34.8 to 37.1 mg/kg), chromium (110 to 228 mg/kg), copper (38.6 to 43.1 mg/kg), nickel (25.5 to 42.3 mg/kg), selenium (15.6 to 23 mg/kg), sodium (2,090 to 2,400 mg/kg), vanadium (190 to 262 mg/kg), and zinc (211 to

227 mg/kg) are also found in the gypsum slurry at above-representative soil levels. The presence of sulfate at the levels shown is due to the addition of sulfuric acid to the ore to extract/replace the phosphate. Hence, the presence of sulfate in a soil sample in excess of 20 mg/kg may be an indication of gypsum slurry effects.

Since the pH of the slurry is under 2, solids stable at this pH are likely to remain solid as pH levels increase. Constituents available for migration would be found in the supernatant. Analysis of the supernatant indicates that it has been enriched by a number of constituents (Table 4.2.2-1). These include ammonia (318 mg/l), arsenic (0.205 mg/l), cadmium (2.5 mg/l), calcium (1,400 mg/l), chloride (162 mg/l), chromium (5.31 mg/l), fluoride (8,480 mg/l), lithium (0.354 mg/l), manganese (1.48 mg/l), nickel (1.68 mg/l), total phosphorus (2,460 mg/l), potassium (176 mg/l), sodium (768 mg/l), sulfate (4,480 mg/l), vanadium (3.81 mg/l), and zinc (12.6 mg/ l). Radionuclide activities were also enriched. Gross alpha was 644 ± 46.3 pCi/l; gross beta was 619 ± 31.1; radium-226 was 190 ± 4.26 pCi/l; and radium-228 was 1.9 ± 0.8 pCi/l

Former East Overflow Pond

The former east overflow pond was an unlined surface impoundment approximately 0.8 acre in size located near the northwestern corner of the lower gypsum stack (Figure 1.2-1). It was taken out of service in August 1993 when it was replaced with a new lined impoundment (called the Reclaim Water Pond #1) located nearby. It received surface water runoff as well as excess process water from the plant water reclaim system in the event of a power failure or other plant upsets, which occurred sporadically during normal plant operations. Reclaimed system water included gypsum filter wash water, scrubber water, and cooling tower water. Water collected in this pond was pumped back to the reclaim water system or the gypsum decant pond for later reuse.

A one time-composite water sample was collected from the pond and analyzed for the constituents in Table 4.2.2-2. The data from these analyses are summarized in Table 4.2.2-3.

Also, one sludge sample was collected from the pond and analyzed for gross alpha, gross beta, and the inorganic parameters in Table 2.1-1.

Analysis of chemical data from the sludge sample showed concentrations of cadmium (21.9 mg/kg), chromium (204 mg/kg), copper (77.6 mg/kg), fluoride (52,200 mg/kg), nickel (41.2 mg/kg), total phosphorus (6,160 mg/kg), vanadium (362 mg/kg), and zinc (298 mg/kg) above representative soil levels. Analysis of the pond wastewater indicated that arsenic (0.13 mg/l), cadmium (1.14 mg/l), chromium (1.18 mg/l), fluoride (6,380 mg/l), total phosphorus (563 mg/l), sulfate (746 mg/l), vanadium (3.39 mg/l), and zinc (6.01 mg/l), among others, were above representative groundwater levels (Section 4.4).

Water Treatment Ponds

A series of three lined ponds, north of the plant between Highway 30 and the Portneuf River, is used to treat noncontact cooling water, including boiler and cooling tower blowdown, compressor coolant water, demineralizer regeneration water, laboratory wastes, (i.e., acids, ammonia, and sodium hydroxide), and stormwater (Figure 1.2-1). Analytical parameters for water samples collected from these ponds are presented in Table 2.1-2. The analytical results for water from the Simplot water treatment ponds are summarized in Table 4.2.2-4. The highest concentrations of EMF-related parameters were found in the holding pond. These included arsenic (0.04J mg/l), cadmium (0.54J mg/l), chromium (0.42J mg/l), copper (0.15 mg/l), fluoride (26.6 mg/l), nickel (0.28 mg/l), total phosphorus (1,320 mg/l), sulfate (2,590 mg/l), vanadium (1.67 mg/l), and zinc (5.19 mg/l). Concentrations of the same parameters in the samples for the other two ponds were lower, as expected, due to pH adjustment of the holding pond water.

Former Unlined Ditch to Water Treatment Ponds

The former unlined ditch connected the facility drainage system to the water treatment ponds. It accepted the noncontact water from the facility drainage system through a pipe beneath Highway 30 as well as laboratory wastewaters. The water flowed from the plant through the pipe and into

the unlined ditch, eventually discharging to the water treatment ponds. Water now flows from the plant to the ponds in a closed pipe.

Sediment samples were collected at six locations along the ditch as shown in Figure 2.1-4. The samples were analyzed for gross alpha and gross beta, and the inorganic parameters listed in Table 2.1-1. The soil chemistry data from analyses of these samples are summarized in Table 4.2.2-5. Analysis of these data shows that a number of constituents were detected at levels above those expected for native soils. These included cadmium (14.1 to 108 mg/kg), chromium (363 to 2,350 mg/kg), copper (34.2 to 79.3 mg/kg), fluoride (1,230 to 25,900 mg/kg), mercury (<0.41 to 10.3 mg/kg), nickel (20.2 to 122 mg/kg), total phosphorus (17,900 to 123,000 mg/kg), selenium (4.2 to 61.2 mg/kg), silver (<0.83 to 33.7 mg/kg), vanadium (202 to 960 mg/kg), and zinc (231 to 1,400 mg/kg). [Note the presence of the characteristic constituents (underlined).]

Phase II Results for Former Unlined Ditch to Water Treatment Ponds. An additional six sediment samples were collected during Phase II to verify the presence of mercury in the ditch. Their locations are shown in Figure 2.1-4. Mercury concentrations were lower than those detected in the Phase I samples (range of 0.46 to 4.9 mg/kg). Results are provided in Table 4.2.2-6.

Simplot Potential Source Summary

In general, the industrial activities related to handling phosphate ore concentrate or disperse ore-related constituents in relatively unique ways. The primary constituents found in ore-related by-products or wastes are total phosphorus, fluoride, cadmium, chromium, vanadium, and zinc.

There are other trace metals, cations, and anions that allow individual source materials to be identified. However, the six parameters listed above are characteristic of all Simplot-related solid by-products and wastes. The following list presents distinguishing characteristics for ore and gypsum. The constituents which appear in boldface type are the most distinguishing characteristics. Figures 4.2.2-1 through 4.2.2-3 present the characteristics in graphic form.

- Ore:
  - **Greater than 70,000 mg/kg total phosphorus**
  - **Greater than 400 mg/kg chromium, vanadium, and zinc**
  - Greater than 200,000 mg/kg calcium
  - Greater than 20,000 mg/kg fluoride
  - Greater than 200 ρCi/g gross alpha
- Gypsum slurry solids:
  - **Greater than 500,000 mg/kg sulfate**
  - **Greater than 200,000 mg/kg calcium**
  - **Greater than 5,000 mg/kg total phosphorus and fluoride**
  - Greater than 100 mg/kg chromium, vanadium, and zinc
  - Less than 1 mg/kg arsenic
  - Greater than 200 ρCi/g gross alpha
  - Greater than 30 ρCi/g uranium-238

4.2.2.2 Simplot Facility Soils — Areas Without Sustained Hydraulic Head

This section discusses the results of the RI Phase I and Phase II facility soils investigation for areas without a sustained hydraulic head. Areas without sustained hydraulic heads include: product loadout areas, the phosphoric acid tank containment area, sulfuric acid plants, plant roads, bone yard, water reclaim area, former ore pile area, and former pillow tank area. The locations of the soil borings associated with each of these areas are shown in Figure 2.1-3.

Triple Superphosphate Plant Area

Triple superphosphate is a solid fertilizer product produced by a patented process. The production and railcar-loading areas are located directly to the west of the former east overflow pond. They are asphalt-paved areas. To investigate the potential effects of plant operations on soils within the triple super phosphate area, four borings, S050B, S051B, S052B, and S053B,

were located as shown in Figure 2.1-3, were advanced through the asphalt paving into the underlying soils. At each boring location, samples were collected from the soil surface (beneath the asphalt) and at a depth of approximately 2 to 2.5 feet below ground surface (bgs); they were then analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1.

Boring S050B contained gravel fill beneath the asphalt paving and tan silt at the 2-foot depth. Both samples were probably disturbed (graded and/or fill) and not representative of natural soils. A number of constituents were found at concentrations above representative levels in the surficial horizon (Table 4.2.2-7). These constituents included barium (210 mg/kg), boron (19.2 mg/kg), calcium (79,800 mg/kg), chromium (115 mg/kg), copper (350 mg/kg), fluoride (73,000 mg/kg), nickel (93.9 mg/kg), total phosphorus (2,130 mg/kg), vanadium (102 mg/kg), and zinc (291 mg/kg). Both gross alpha and gross beta activities were also above the representative levels (49.1 ± 25.8 pCi/g and 34 ± 15.14 pCi/g, respectively). In the 2-foot horizon, cadmium (9.9 mg/kg), calcium (82,100 mg/kg), manganese (729 mg/kg), nickel (45.6 mg/kg), total phosphorus (54,700 mg/kg), and zinc (187J mg/kg) were above representative levels. The mix and difference in concentrations between the two horizons indicate mechanical deposition rather than leaching. Gross alpha and gross beta values were within representative levels in the 2-foot horizon soils. The pH values were normal in the surficial sample (8.62) but indicated some facility influence in the 2-foot sample (6.52).

Boring S051B contained silt beneath the asphalt paving and brown sandy silt at the 2-foot depth. Both soil samples were probably disturbed (graded and/or fill) and not representative of natural soils. As with boring S050B, a number of constituents were detected at concentrations above those for representative soils. These included boron (60 mg/kg), cadmium (7.7 mg/kg) , calcium (208,000 mg/kg), chromium (254 mg/kg), copper (44.2 mg/kg), fluoride (14,500 mg/kg), nickel (35.5 mg/kg), total phosphorus (5,140 mg/kg), vanadium (238 mg/kg), and zinc (143 mg/kg). Both gross alpha and gross beta activities were also above the representative levels (136 ± 35.6 pCi/g and 57.7J ± 12.12 pCi/g, respectively). In the 2-foot horizon, cadmium

(4.9 mg/kg), chromium (51.6 mg/kg), copper (53.2 mg/kg), fluoride (2,300 mg/kg), nickel (23.5 mg/kg), total phosphorus (10,100 mg/kg), vanadium (54.5 mg/kg), and zinc (141J mg/kg) were above representative levels. Gross beta activities were within representative ranges, and gross alpha activities were slightly above representative ranges (27.2 ± 17.02 pCi/g). The pH values in both horizons in S051B were within the normal range (9.64 and 7.95, respectively). The high calcium values in the surficial horizon combined with the relatively low total phosphorus concentration indicate the presence of gypsum.

Boring S052B contained silt with fine gravel beneath the asphalt paving, and brown silt at the 2-foot depth. Both soil samples were probably disturbed (graded and/or fill) and not representative of natural soils. The elevated levels of calcium (160,000 mg/kg and 111,000 mg/kg, respectively) in these samples indicate the presence of gypsum. Other constituents that were detected at concentrations above the representative range included barium (713 mg/kg at 2 feet), boron (41.9 mg/kg at 0.5 feet), cadmium (6.1 and 30.4 mg/kg, respectively), chromium (196J and 103J mg/kg, respectively), copper (28.1J and 16.8J mg/kg, respectively), fluoride (11,600 and 4,800 mg/kg, respectively), mercury (0.81J and 2.1J mg/kg, respectively), nickel (31.2J and 19.4J mg/kg, respectively), total phosphorus (8,950 and 7,040 mg/kg, respectively), vanadium (183 and 154 mg/kg, respectively), and zinc (219 mg/kg at 0.5 feet). Both gross alpha and gross beta activities were also above the representative levels (133 ± 31.4 pCi/g and 52.3J ± 11.44 pCi/g at the 0.5-foot horizon and 49.1 ± 20.6 gross alpha at the 2-foot horizon).

Boring S053B contained silt with gravel beneath the asphalt paving and silty clay with gravel at the 2-foot depth. The 0.5-foot soil horizon contained a number of constituents that were above representative levels. This sample, however, was somewhat different from those found in the other boreholes as evidenced by the concentrations of arsenic (55J mg/kg), lead (2,370 mg/kg), and zinc (9,730 mg/kg). Other constituents that were above representative levels included boron (43.3 mg/kg), cadmium (14.1 mg/kg), calcium (137,000 mg/kg), chromium (199J mg/kg), copper

(36.8J mg/kg), fluoride (10,600 mg/kg), mercury (1.9 mg/kg), nickel (39.1J mg/kg), total phosphorus (3150 mg/kg), and vanadium (207 mg/kg). Gross alpha and gross beta activities were also above representative levels in the 0.5-foot sample (107J ± 29.6 ρCi/g and 54.6J ± 11.7 ρCi/g, respectively). There was a steep decline in the concentrations of most of these constituents in the 2-foot sample, with only arsenic (12.8J mg/kg), calcium (106,000 mg/kg), mercury (0.67 mg/kg), and total phosphorus (1,260 mg/kg) remaining above representative levels. This type of steep gradient pattern is indicative of mechanically placed fill. This is especially true when the 2-foot soil is a clay and would be expected to show higher concentrations in a downward migration scenario due to its higher adsorption capabilities.

In summary, the Phase I investigation of the superphosphate area consisted of four soil borings that were drilled and sampled at the top of the soil column beneath asphalt paving and approximately the 2-foot depth. Soil chemistry results met the objective of this sample program in this area, which was to determine the presence or absence of facility-related constituents in the near-surface soil horizons. All samples collected from the four borings display characteristics of some type of facility-affected soil or fill material. To further define the vertical extent of constituents in this area, an additional boring was drilled as part of the Phase II field investigation.

Phase II Results for Triple Superphosphate Plant Area. The Phase II field investigation consisted of drilling boring S098B, located as shown in Figure 2.1-3, between borings S051B and S052B, in the area of highest concentrations of constituents detected in the Phase I investigation. Samples were collected from the surface of the soil column beneath the asphalt paving and the 2.5-, 5-, 7.5-, and 10-foot depths; they were then analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. The surficial sample was also tested for PCBs. Boring S098B was advanced through asphalt and approximately 3.5 feet of fill. Silt (loess) was encountered at 3.5 feet bgs and extended to 10.5 feet bgs. The boring was advanced to a total depth of 11 feet bgs in gravelly sand. Groundwater was not encountered in this boring.

As would be expected, the surface sample (fill) contained the highest concentrations of EMF-related constituents (Table 4.2.2-7). Concentrations of barium (2020J mg/kg), boron (31.4 mg/kg), cadmium (26 mg/kg), chromium (159 mg/kg), copper (22.1 mg/kg), fluoride (7,820 mg/kg), mercury (1 mg/kg), nickel (37.6 mg/kg), total phosphorus (44,800 mg/kg), vanadium (274 mg/kg), and zinc (440 mg/kg) exceeded representative levels. Sulfate was elevated at 13,400 mg/kg. At no depth did gross alpha and gross beta activities exceed representative levels in this borehole, which demonstrates the variability of the distribution of constituents in the area. Most of the concentrations of constituents measured at above representative levels in the surficial sample decreased to levels below the representative range in the 2-foot horizon. However, concentrations were measured above representative levels in the 5-foot sample but below levels measured in the surficial sample. By the 10-foot horizon only mercury (0.35 mg/kg), orthophosphate (492 mg/kg), and total phosphorus (7,000 mg/kg) were above representative levels. Sulfate concentrations were elevated in samples throughout the borehole, ranging from 500 mg/kg in the 2-foot horizon to a high of 2,700 mg/kg in the 5-foot horizon. The 10-foot sample contained 1,380 mg/kg of sulfate. The pH measurements in this borehole indicate a EMF-related effect in the surficial soil (5.43), but in general were within expected limits for the remaining samples (7.22 to 7.65). No PCBs were detected in the surficial sample (detection limit of 0.2 mg/kg).

Summary – Triple Superphosphate Plant Area. Soil samples taken in the vicinity of the triple superphosphate plant area indicate that there is a shallow fill (0 to 3.5 feet) that contains EMF-related constituents at above-representative levels. Concentrations of most EMF-related constituents decreased to below-representative levels in soil samples collected below the 5-foot depth. The 5-foot sample was the shallowest non-fill sample collected. There was some evidence of facility effects at the 10-foot horizon by phosphates and sulfates; however, EMF-related metals are retained in the soil interval between the 5- and 7.5-foot samples, and other EMF-related constituents (e.g., fluoride) have not affected soils at this depth. There does not

appear, therefore, to be migration to depth of EMF-related constituents in the triple superphosphate plant area.

Former Phosphoric Acid Loading Railcar Cleaning Area

The railcar cleaning area is located directly south of the main office building. This area is also a former phosphoric acid loading area. To investigate the railcar cleaning area, two borings were planned as part of the Phase I field investigation, extending to a depth of 10 feet bgs or 5 feet below fill. One soil sample of black silty gravel, described as railroad fill, was collected from boring S056 at a depth of 0.5-foot bgs, but refusal at 2 feet bgs during the drilling of this boring, as well as refusal in other locations, prevented completion of the Phase I investigation. The soil chemistry data from this sample are summarized in Table 4.2.2-8.

An examination of the results of the analysis of the 0.5-foot soil (fill) sample taken at S056B indicates a number of constituents were above representative levels. These included cadmium (55.6 mg/kg), chromium (306 mg/kg), copper (20.5J mg/kg), fluoride (10,000 mg/kg), nickel (35.1 mg/kg), total phosphorus (45,400 mg/kg), vanadium (408J mg/kg), and zinc (485 mg/kg). Gross alpha and gross beta activities were also above representative levels (86.7 ± 26.8 pCi/g and 55.1 ± 14.52 pCi/g, respectively).

As part of the Phase II field investigation, an additional boring was planned to investigate the potential vertical extent of constituents at this area.

Phase II Results for Former Phosphoric Acid Loading/Railcar Cleaning Area. The Phase II field investigation consisted of boring S103B, located as shown in Figure 2.1-3. The boring, planned to a depth of 10 feet or 5 feet below fill, met refusal on three separate attempts. As a result, samples were collected from the surface and the 2-, 5-, and 7-foot depths; they were then analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. Boring S103B contained fill (including concrete aggregate) throughout its depth, and groundwater was not encountered. Analysis of the data from soil samples collected from these

borings indicates increasing concentrations of EMF-related constituents with depth (Table 4.2.2-8). These constituents included the following (values are for surficial and 7-foot horizons, respectively and are not necessarily the maximum) arsenic (3.7 to 25.9 mg/kg), barium (638 to 828 mg/kg), boron (15.8 to 63.8 mg/kg), cadmium (11.3 to 61.2 mg/kg), chromium (69.8 to 636 mg/kg), copper (18.8 to 137 mg/kg), fluoride (4,090 to 15,100 mg/kg), iron (11,100 to 58,500 mg/kg), lead (34.2 to 444 mg/kg), nickel (17.9 to 84.9 mg/kg), total phosphorus (17,500 to 65,400 mg/kg), sulfate (14,700 to 13,500 mg/kg), vanadium (113 to 1,100 mg/kg), and zinc (142 to 566 mg/kg). Gross alpha and gross beta activities followed the same trend, with gross alpha ranging from 31.1 ± 9.23 pCi/g to 156 ± 14.5 pCi/g and gross beta from 39.1 ± 7.32 pCi/g to 107 ± 7.18 pCi/g. The pH values also followed the same trend, ranging from 6.5 to 2.84.

Summary – Former Phosphoric Acid Loading/Railcar Cleaning Area. Most concentrations of EMF-related constituents increased with depth. Soil pH also decreased in soil samples collected at increasing depth. The deepest fill samples collected from the 7-foot depth contained the highest concentrations of EMF-related constituents. However, given the description of the fill in the drilling log, it is concluded that this fill was mechanically placed. The presence of both the concentration pattern and the mix of these constituents appears to be related to placement of different materials rather than infiltration from the surface. Because native soils were not encountered in this borehole, the depth of EMF-related constituents could not be determined. Additional drilling was not conducted in this area because access problems prohibit the introduction of a rig that is capable of drilling through the gravels and aggregate encountered in the fill.

Phosphoric Acid Tank Containment Area

The phosphoric acid tank containment area is designed to contain liquid product releases. Any leakage from phosphoric acid tanks or pipes in this area would flow over a paved surface to a concrete sump from which it is pumped back to the phosphoric acid reactor or filter.

Two borings, S054B and S055B, were advanced in this area (Figure 2.1-3). Boring S054B was advanced beneath the paving to a depth of 2.5 feet bgs and boring S055B to a depth of 6 feet beneath the paving. Soil samples were collected from boring S054B at 0.5 foot bgs and 2.5 feet bgs. The entire depth of boring S054B was in fill material. Boring S055B was advanced through fill to a depth of 4 feet bgs and silt from 4 feet to approximately 6 feet bgs. Groundwater was not encountered in these borings. Soil samples were collected from boring S055B at 0.5, 2.5, and 5 feet bgs. Soil samples from both borings were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1.

Boring S054B showed increasing concentrations of site constituents with depth from 0.5 foot bgs to 2.5 feet bgs. Examination of the boring log offers a rationale for this increase. The 0.5-foot sample is characterized as "pea gravel road base" whereas the 2.5-foot sample is a sandy gravel which grades to light gray silty sand and ends at 5 feet with what appears to be a gypsum fill. It appears that the upper layer is the cleaner fill, and that the lower portion contains increasing amounts of gypsum-based fill material that is naturally higher in plant-related constituents (Table 4.2.2-9). Constituents with concentrations above representative levels in the 2.5-foot soil sample included cadmium (7 mg/kg), chromium (63 mg/kg), fluoride (640 mg/kg), magnesium (22,700 mg/kg), manganese (711 mg/kg), nickel (121 mg/kg), total phosphorus (11,400 mg/kg), vanadium (69.8 mg/kg), and zinc (436 mg/kg). pH followed a similar trend decreasing with depth from 6.34 to 4.89. Since native soils were not encountered in this borehole, the vertical extent of potential impact was not determined.

Boring S055B generally showed decreasing concentrations of constituents with increasing depth. In the 5-foot sample, only orthophosphate (53.1 mg/kg) remained above the representative level. Comparison of chemical results with the boring log is also useful for explaining the constituent distribution in boring S055B. The upper 4 feet of this boring were logged as "road fill." The road fill ended at about 4 feet bgs. The soil beneath was logged as "yellowish brown silt," which is characteristic of naturally occurring site soils

Summary – Phosphoric Acid Tank Containment Area. Constituents found at concentrations above representative soil levels appear to be confined to existing fill layers (0 to at least 4 feet) in this area. From the available data, there does not appear to be any evidence of the downward migration of trace metals and other EMF-related constituents into the subsurface native soils.

Sulfuric Acid Plants #1 and #2

The former sulfuric acid plant #1 is located just west of the phosphoric acid tank containment area, and the former sulfuric acid plant #2 is located just west of sulfuric acid plant #1 (Figure 1.2-1). These plants are both areas where spillage is known to have occurred. As part of the Phase I field investigation, two borings each were drilled in the area of the former sulfuric acid plant #1 and former sulfuric acid plant #2.

Sulfuric Acid Plant #1. Soil borings S062B and S063B were drilled near the sulfuric acid plant #1 (Figure 2.1-3). Boring S062B was advanced to a depth of 9 feet bgs, and soil samples were collected from depths of 0.5, 2.5, 5, and 7.5 feet bgs. Boring S062B contained fill for the first 2 feet bgs, followed by a layer of silt from 2 to 6 feet bgs, and silty gravel from 6 feet bgs to completion at 9 feet bgs. Boring S063B was advanced to a depth of 7.5 feet bgs where cobbles caused refusal. At this depth, boring S063B still contained fill material. Soil samples were collected from depths of 0.5, 2.5, and 5 feet bgs. Soil samples from both borings were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. In addition, two samples from boring S063B collected at the surface and the 2.5-foot depth were analyzed for PCBs and total petroleum hydrocarbons. The chemical data from analysis of these samples are summarized in Table 4.2.2-10. Groundwater was not encountered in these borings.

An examination of the chemical data from analysis of soil samples from boring S062B indicates that a number of constituents were above the range for representative soils in the first soil horizon. These included barium (364 mg/kg), boron (34.8 mg/kg), cadmium (8.7 mg/kg), chromium (141 mg/kg), copper (184 mg/kg), fluoride (8,100 mg/kg), lead (52.3 mg/kg), nickel

(79.7 mg/kg), total phosphorus (9,060 mg/kg), vanadium (139J mg/kg), and zinc (314J mg/kg). These levels declined to near or below representative levels in the 2.5- and 5-foot horizons, which were described as being native silts. The sharp interface differential in constituent concentrations indicates that very little downward migration occurred in this borehole from the overlying material. The boring log at 7.5 feet bgs shows a return to what is probably fill as noted by the "light brownish gray" color description, which is not characteristic of the natural near-surface silts. In addition, this sample contained very low concentrations of aluminum (4,490 mg/kg), fluoride (140 mg/kg), and total phosphorus (130 mg/kg) that are also not indicative of the silts in general in this area. Coupled with these low concentrations of fluoride and total phosphorus are above-representative-levels of chromium (67.7 mg/kg), cobalt (103 mg/kg), copper (325 mg/kg), iron (14,930.2 mg/kg), nickel (168 mg/kg), and zinc (228 mg/kg). Gross alpha and gross beta activities were low (8.32 ± 4.66 ρCi/g and 14.2 ± 4.3 ρCi/g, respectively). The pH values in this horizon were normal (8.48). The profile presented in this borehole is one of mechanically deposed layers of fill and native soils. Since fill was the last material sampled, the vertical extent of EMF-related constituents was not established.

Boring S063B was drilled in fill for its total depth. Samples were collected at 0.5 foot, 2.5 feet, and 5 feet bgs. Above-representative levels of a number of constituents were encountered at all three sampling horizons. The constituents included barium (368 mg/kg at the surface), cadmium (9.5 to 2J mg/kg), chromium (47.9 mg/kg at the surface), copper (38.6 to 23 mg/kg), fluoride (6,200 to 650 mg/kg), lead (39 mg/kg at the surface), nickel (23.2 to 20.8 mg/kg), total phosphorus (8230 to 4,760 mg/kg), vanadium (74.8 mg/kg at the surface), and zinc (451 to 75.9 mg/kg). As can be seen, the trend is for diminishing concentrations with depth. Gross alpha and gross beta activities were above representative levels in the surficial sample only (46.7 ± 13.3 ρCi/g and 38.0 ± 8.41 ρCi/g). No PCBs were detected in either soil horizon at S063B. However, TPH was detected at 216 mg/kg in the surficial soils and at 20.8 mg/kg in the 2-foot horizon.

In summary, the concentrations of EMF-related constituents in soil samples from this area correlated with the presence of fill material. Concentrations of EMF-related constituents in natural soil samples taken from boring S062B were generally below representative levels. From these data, it appears that the distribution of EMF-related constituents in this area is due to mixing of fill materials with natural soil. The much lower concentrations of EMF-related constituents in natural soil samples taken from beneath areas of fill indicates that the EMF-related constituents have not migrated downward due to infiltration. Mechanical mixing of "fill" and "clean" material seems to control the spatial distribution of EMF-related constituents. However, the vertical extent of EMF-related constituents was not determined in Phase I.

Sulfuric Acid Plant #2. Soil borings S064B and S065B were drilled near the sulfuric acid plant #2 (Figure 2.1-3). Boring S064B was advanced to a depth of 7 feet bgs. Soil samples were collected from depths of 0.5 (sandy gravel), 2.5 (sandy gravel), and 5 (silt) feet bgs and analyzed for gross alpha, gross beta, and the inorganic parameters in Table 2.1-1. The surficial soil sample contained no constituents above representative levels; and, in fact, most constituents were well below representative levels (Table 4.2.2-10). Gross alpha and gross beta activities were within representative levels, and pH was normal (7.78). The soil sample taken in the 2.5-foot horizon showed slightly greater than representative levels of some constituents (barium, 554 mg/kg; chromium, 23.8 mg/kg; lead, 32 mg/kg; and mercury, 0.49 mg/kg) while containing less than representative levels of other constituents (iron, 4,510 mg/kg; manganese, 82.2 mg/kg; nickel, 4.8 mg/kg; total phosphorus, 230 mg/kg; and vanadium, 7.4 mg/kg). The pH of this sample was very low (1.89), but the gross alpha activity was not detectable and the gross beta activity was below its representative level. The 5-foot silt soil sample showed some evidence of attenuation from the overlying soil, with manganese (635 mg/kg), and total phosphorus (729 mg/kg) showing a decrease relative to their levels in the 2.5-foot sample. pH values in this sample are normal (8.5). Given the distribution of constituents in the three soil horizons, it is not clear whether there has been a downward migration into the subsurface or a mechanical

placement of unrelated materials. There is, however, sufficient evidence to conclude that the soils in this area have been affected by site activities, but that effect appears to be minimal.

Boring S065B was advanced to a depth of 9 feet bgs. It contained silty gravel from the surface to 2 feet, silt from 2 to 5 feet, and silty gravel from 5 to 9 feet bgs. Soil samples were collected from depths of 0.5 (silty gravel), 2.5 (silt), 5 (silty gravel), and 7.5 (silty gravel) feet bgs and analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. The surficial soil horizon contained a number of constituents whose concentrations were above levels for representative soil samples (Table 4.2.2-10). These constituents included barium (1930 mg/kg), cadmium (2.7 mg/kg), chromium (117 mg/kg), copper (73.1 mg/kg), fluoride (1600 mg/kg), iron (22800 mg/kg), lithium (19 mg/kg), nickel (72.1 mg/kg), total phosphorus (3450 mg/kg), vanadium (51.8 mg/kg), and zinc (277J mg/kg). Concentrations of these constituents in the subsurface samples were both lower than those found at the surface and erratic (i.e., no pattern given elements). The pH values were in the normal range throughout all tested soil horizons (7.5 to 9.41), and no radionuclide activities levels were above those for representative soils. While there has been some effect on the subsurface soils in S065B, it appears from the available data to have been minimal. However, depth of impact was not determined in this boring.

Phase II Results for Sulfuric Acid Plant #1. Because the depth of vertical impact was not determined in Phase I , the Phase II field investigation placed boring S104B in the vicinity of boring S062 (Figure 2.1-3). Of the borings drilled in this area, S062 contained the highest concentrations of above-representative level constituents. Samples were collected from the surface and the 5-, 10-, 15- and 20-foot depths; they were then analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. Boring S104B contained fill to approximately the 6-foot depth. Silty gravel extended from 6 to 15 feet bgs, changing to gravel, which extended from 15 feet bgs to the completion of the boring to 41.5 feet bgs. Groundwater was not encountered in this boring.

The first two horizons sampled were in fill. The surficial sample contained above-representative concentrations of cadmium (6.7 mg/kg), chromium (111 mg/kg), fluoride (4,750 mg/kg), total phosphorus (6,130 mg/kg), sulfate (13,600 mg/kg), vanadium (143 mg/kg), and zinc (137 mg/kg). Gross alpha and gross beta activities were also above representative levels (79.1 ± 12.0 ρCi/g and 41.5 ± 4.76 ρCi/g receptively). Only sulfate was enriched in the 5-foot sample. The remaining samples taken in this borehole were in native materials and did not contain any of the above constituents in excess of representative levels. The pH readings followed the same trend as constituent concentrations. The surficial sample had a pH of 5.38, increasing to above 8 in the remaining horizons. There was no evidence of subsurface impacts below the fill layer in this borehole.

Summary – Sulfuric Acid Plants #1 and #2. There is some facility effect on soil in the area of the sulfuric acid plants. The deepest effects measured were in the 7-foot horizon. These effects appear to be related more to fill placement than leaching. EMF-related constituents do not appear to have migrated into the subsurface. Sulfuric acid effects as measured by pH and sulfate content (S104B) are limited to surficial soils.

Phosphoric Acid Loading Dock

Boring S066B was attempted in this area, and drilling reached a depth of 7 feet bgs before refusal. This depth did not reach natural soil, ending in material logged as "road fill." Samples of this material were collected at 0.2 and 2.5 feet. A second boring, S067B, was attempted in the same area, before refusal at 2 feet. This boring was not logged, but a single sample was collected from a 0.5-foot depth. Soil samples were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. In addition, the surface sample from boring S067B was analyzed for PCBs and total petroleum hydrocarbons.

The surficial fill sample collected from boring S066B contained a number of constituents with concentrations above representative levels (Table 4.2.2-11). These included cadmium (7.7 mg/kg), chromium (118 mg/kg), copper (26.4 mg/kg), fluoride (6,000 mg/kg), nickel (48.3

mg/kg), total phosphorus (13,500 mg/kg), vanadium (126 mg/kg), and zinc (229 mg/kg). Gross alpha (43.9 ± 26.2 ρCi/g) and gross beta (31.1 ± 15.34 ρCi/g) activities were above representative levels. The pH was in the normal range (7.65). While several of the constituents detected at above-representative levels dropped to within the representative range in the 2.5-foot soil sample, fluoride (730 mg/kg), manganese (550 mg/kg), nickel (81.9 mg/kg), total phosphorus (12,400 mg/kg), and zinc (54.6 mg/kg) did not. The nature and vertical extent of EMF-related effects was not determined in this borehole.

It was only possible to take one sample from boring S067B. Analytical data from this soil horizon showed a number of constituents with concentrations above representative (Table 4.2.2-11). These included: cadmium (5.7 mg/kg), chromium (93.1 mg/kg), copper (146 mg/kg), fluoride (2,700 mg/kg), nickel (54.1 mg/kg), total phosphorus (7,940 mg/kg), vanadium (134 mg/kg), and zinc (207 mg/kg). Gross alpha activities (43 ± 26.2 ρCi/g) were also above those expected for representative soils. These values indicate that the surficial soils have been affected by facility activities. The depth of impact was not determined. Because of problems encountered by the laboratory, the PCB sample taken in the surficial horizon was rejected in the validation process. However, TPH was detected at 1054 mg/kg. Location S067B was resampled during Phase II and the soil sample was tested for PCBs. This analysis did not detect PCBs at a 0.2 mg/kg detection limit.

In summary, the surface soils/fill in this area have been influenced by site operations, with influences extending to the 2.5-foot bgs. Additional investigation was conducted in Phase II to determine the vertical extent of the affected fill.

Phase II Results for Phosphoric Acid Loading Dock. The Phase II field investigation consisted of one boring, S105B, located as shown in Figure 2.1-3, between borings S066B and S067B. Boring S105B contained silty sandy gravel for the first 3.5 feet; this was classified as fill. Gravelly silt extended from 3.5 to approximately 7.5 feet; this also was classified as fill. Silty sandy gravel predominates from 7.5 to 15 feet, and gravel from 15 feet to 25 feet.

Groundwater was not encountered in this boring. Samples were collected at five levels from the surface to the 10-foot depth and analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1.

Analysis of the data from the soil samples collected in the fill horizons (0.5, 2, and 5-feet) in S105B indicates a number of constituents with concentrations above representative levels (Table 4.2.2-11). The greatest concentrations were generally found in the fine-grained fill horizon (5 feet). These constituents included: barium (6,910 mg/kg), cadmium (6.4 mg/kg), chromium (49.8 mg/kg), fluoride (1,720 mg/kg), lead (54.8J mg/kg), manganese (875 mg/kg), nickel 23.1 mg/kg), total phosphorus (4,180 mg/kg), vanadium (86.1J mg/kg), and zinc (205 mg/kg). The sample taken in the silty sandy gravel at 7.5 feet was at the fill/native soil interface. Since there were fines present in this sample that would tend to attenuate materials migrating from the overlying fill, some constituents at concentrations above representative levels would be expected. However, this was not the case as all constituents in this soil sample were at or below representative levels. This borehole is another example of the steep concentration gradients that exist on the site between EMF-related fills and native soils where no liquid head has been applied. The sample taken at the 10-foot horizon also contained no constituents above representative levels, except orthophosphate, which was marginally above representative levels (4.17 mg/kg versus representative level of 3.7 mg/kg), indicating the lack of migration of EMF-related constituents from the overlying fills. Gross alpha activity in surficial soil sample (25 ± 6.18 pCi/g) was the only radionuclide activity detected above the representative levels in any of the samples tested. Soil pH was within the normal range for all samples tested in boring S105B.

Summary – Phosphoric Acid Loading Dock. From analysis of the data, it appears that the subsurface near the phosphoric acid loading dock contains a 7- to 8-foot fill layer. A number of EMF-related constituents were found at concentrations above representative levels. When native soils beneath the fill were tested, there appeared to be little to no migration of constituents

from the overlying materials. It can therefore be concluded that the extent of EMF effects in this area is confined to the fill layer.

Ammonium Phosphate Plant Areas

Ammonium phosphate is one of the solid products of the Simplot plant. There are two ammonium phosphate loadout areas: ammonium phosphate plant #1 and ammonium phosphate plant #2. Phase I sampling was performed to determine the existence of potential facility effects in these areas.

Ammonium Phosphate Plant #1. Eight surface (beneath asphalt) soil samples (S030B through S037B) and six samples from the 2-foot depth (S032B through S037B) were collected near the ammonium phosphate plant #1 (Figure 2.1-3). Refusal was met at a depth of 1.5 feet during the drilling of borings S030B and S031B. Samples collected just below the asphalt surface were fill material or gypsum. Samples from the 2-foot depth were silts (fill) in borings S032, S036, and S037B; sandy gravel (fill) in boring S033B; and silty sands (fill) in borings S034B and S035B. Soil samples were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1.

In the surface soil sample taken at S030B there were a number of constituents with concentrations above representative (Table 4.2.2-12). These included barium (332 mg/kg), boron (36.5 mg/kg), cadmium (17.4 mg/kg), calcium (84,500 mg/kg), chromium (180 mg/kg), fluoride (6,400 mg/kg), nickel (46.7 mg/kg), total phosphorus (20,900 mg/kg), vanadium (206 mg/kg), and zinc (331 mg/kg). Gross alpha was also above the representative level (34.4 ± 23.8 ρCi/g). The pH value was normal (7.29). The somewhat enriched calcium level suggests the soil here has been mixed with gypsum. The vertical extent of the both the fill and potential facility effects was not determined at this boring location.

Analytical results for the surface sample taken at S031B indicate that industrial activities have affected the soils in this area. A number of constituent concentrations were above representative

levels (Table 4.2.2-12). They included: cadmium (36.2 mg/kg), chromium (203 mg/kg), copper (25.8 mg/kg), fluoride (7,400 mg/kg), lead (39.0J mg/kg), nickel (73.1 mg/kg), total phosphorus (17,500 mg/kg), vanadium (248 mg/kg), and zinc (602 mg/kg). Gross alpha was also above the representative level (29.4 ± 19.78 ρCi/g). The pH value was slightly acidic (6.19). The vertical extent of the both the fill and potential facility effects was not determined at this boring location.

Soil samples were taken just beneath the asphalt surface and at the 2-foot horizon at S032B. Analytical results for the upper horizon indicated a number of constituents with concentrations above representative levels (Table 4.2.2-12). These included boron (68.7 mg/kg), cadmium (28 mg/kg), calcium (256,980 mg/kg), chromium (241 mg/kg), fluoride (19,200 mg/kg), total phosphorus (7,620 mg/kg), vanadium (222 mg/kg), and zinc (293 mg/kg). Gross alpha and gross beta activities were both above representative levels (242.0 ± 87.2 ρCi/g and 91.0 ± 25 ρCi/g respectively). The pH value was normal (8.91). Three constituents remained above representative levels in the 2-foot horizon. These were boron (16.2 mg/kg), total phosphorus (21,800 mg/kg) and zinc (54.2 mg/kg). Gross alpha and gross beta activities were within representative levels. However, pH, which was normal in the surficial sample, was slightly acidic in the 2-foot horizon (6.56). The slightly acidic pH coupled with only enriched levels of total phosphorus may indicate ammonium phosphate. The vertical extent of the both the fill and potential facility effects was not determined at this boring location.

As with S032B, soil samples were collected just beneath the asphalt surface and at the 2-foot horizons at S033B. Both samples were in fill. Analytical results for the upper horizon indicated a number of constituent concentrations above representative levels (Table 4.2.2-12). These included boron (32.5 mg/kg), cadmium (15.5 mg/kg), calcium (109,000 mg/kg), chromium (147 mg/kg), fluoride (6,900 mg/kg), lead (54 mg/kg), total phosphorus (8,560 mg/kg), vanadium (129 mg/kg), and zinc (589 mg/kg). Gross alpha and gross beta activities were both above representative levels (54.7 ± 30.2 ρCi/g and 33.4 ± 16.52 ρCi/g, respectively). The pH value was normal (8.64). While fewer constituents were measured above representative levels in the 2-foot

sample, several remained above these levels: boron (28.8 mg/kg), cadmium (41.9 mg/kg); chromium (99.5 mg/kg), fluoride (3,700 mg/kg), nickel (42.3 mg/kg), total phosphorus (26,700 mg/kg), vanadium (143 mg/kg), and zinc (143 mg/ Ci/g and 32.3 ± 10.08 ρCi/g respectively). The vertical extent of the both the fill and potential facility effects on soils was not determined at this boring location.

Soil samples were taken just beneath the asphalt surface and at the 2-foot horizon at S034B. Analytical results for the upper horizon indicated a number of constituents with concentrations above representative levels (Table 4.2.2-12). These constituents included cadmium (7.6 mg/kg), chromium (63.8 mg/kg), fluoride (1,790 mg/kg), total phosphorus (10,200 mg/kg), vanadium (93.7 mg/kg), and zinc (160 mg/kg). Gross alpha and gross beta activities were both above representative levels (27.2 ± 12.1 ρCi/g and 34.8 ± 9.62 ρCi/g, respectively). The pH value was slightly acidic (6.19). Only total phosphorus (1,150 mg/kg) remained above representative levels in the 2-foot horizon. Gross alpha and gross beta activities were within representative levels. The pH (8.41) was also normal. These values indicate very little effect on subsurface soils in the area of S034B. However, since both samples were taken in fill, the vertical extent of impact was not determined.

Analytical results for the upper soil sample taken at S035B indicated a number of constituents with concentrations above representative (Table 4.2.2-12). These constituents included barium (577 mg/kg), boron (20.4 mg/kg), cadmium (35.2 mg/kg), chromium (141 mg/kg), copper (24.2 mg/kg), fluoride (5,170 mg/kg), lead (72.8 mg/kg), nickel (40.0 mg/kg), total phosphorus (23,800 mg/kg), vanadium (202 mg/kg), and zinc (653 mg/kg). Gross alpha and gross beta activities were both above representative levels (57.0 ± 14.90 and 43.8 ± 8.52 ρCi/g, respectively). The pH value was slightly acidic (6.21). The somewhat elevated total phosphorus level (23,800 mg/kg) compared with levels of calcium (39,000 mg/kg in the soil sample versus the representative level of 75,800 mg/kg), and fluoride (5,170 mg/kg versus 600 mg/kg representative level) suggests the soil here has been affected by ammonium phosphate and not by

gypsum or ore. Both the upper and the 2-foot horizons in this borehole were silty sand fill. The same constituents that were above representative levels in the upper sample were above representative levels in the 2-foot sample but at lower values. However, while the gross alpha and gross beta activities were below representative levels in the 2-foot sample (14.9 ± 8.96 ρCi/g and 17.4 ± 5.7 ρCi/g), the soil remained slightly acidic (pH of 6.32). The vertical extent of the both the fill and potential facility-related effects was not determined at this boring location.

Soil samples were taken just beneath the asphalt and at the 2-foot horizon at S036B. Analytical results for the upper soil horizon indicated several constituents with concentrations above representative (Table 4.2.2-12). These constituents included cadmium (7.8 mg/kg), chromium (35.2 mg/kg), fluoride (1,000 mg/kg), total phosphorus (6,720 mg/kg), vanadium (61.2 mg/kg), and zinc (190 mg/kg). Gross alpha and gross beta activities were both below representative levels (11.3 ± 7.12 ρCi/g and 21.7 ± 6.48 ρCi/g, respectively). The pH value was slightly acidic (5.81). Only total phosphorus (3,420 mg/kg) and zinc (55.7 mg/kg) remained above representative levels in the 2-foot horizon. Gross alpha and gross beta activities rose above the representative range (44.5 ± 14.08 ρCi/g and 41.1 ± 8.68 ρCi/g respectively). The pH levels rose to the normal range (8.16). While there was a definite presence of EMF-related constituents in the upper soil horizon in this location, the concentrations found in the 2-foot silt indicate very little effect on subsurface soils in this area. However, since both samples were in fill, the vertical extent of EMF-related activities was not determined.

Soil samples were taken just beneath the asphalt and at the upper and 2-foot horizon at S037B. As with all samples in this area, analytical results for the upper soil horizon indicate a number of constituents with concentrations above representative (Table 4.2.2-12). These included boron (31.2 mg/kg), cadmium (12.6 mg/kg), calcium (82,100 mg/kg), chromium (119 mg/kg), fluoride (4,630 mg/kg), nickel (30.7 mg/kg), total phosphorus (16,050 mg/kg), vanadium (131 mg/kg), and zinc (289 mg/kg). Gross alpha and gross beta activities were both above representative levels (64.5 ± 17.18 ρCi/g and 37.4 ± 8.14 ρCi/g, respectively). The pH value was normal

(7.54). Three constituents remained above representative levels in the 2-foot horizon. These constituents were boron (18.8 mg/kg), fluoride (930 mg/kg), and total phosphorus (916 mg/kg). Gross alpha and gross beta activities were within representative levels. The pH (7.96) was also normal. While the concentrations of constituents fell in the 2-foot sample, the vertical extent of facility effects was not determined in S037B.

Phase I Summary – Ammonium Phosphate Plant #1. The area sampled along the front of ammonium phosphate plant #1 contained a variety of fill materials beneath the asphalt paving. These fills were at least 2 feet in depth. They contained a number of EMF-related constituents that were detected at concentrations above those found in representative soils. The mix of constituents varied both with horizontal and vertical location. While several locations appeared to have been affected with ammonium phosphate spills (S032B, S033B, and S035B), effects for the most part appeared to be associated with the fill material itself. Because the vertical extent of EMF-related effects was not determined in this area in Phase I, two borings were proposed in the Phase II Work Plan to determine the thickness of the fill and the extent of facility effects.

Phase II Results for Ammonium Phosphate Plant #1. The Phase II field investigation consisted of two borings advanced through the asphalt paving, S106B and S107B, located as shown in Figure 2.1-3. S106B was located near S035B, which contained elevated concentrations of site constituents; S107B was located near S033B, which showed higher concentrations of site constituents in the 2-foot sample. Samples were collected from the soil horizon beneath the asphalt paving and the 2-, 5-, 7-, and 10-foot depths and analyzed for gross alpha, gross beta and the inorganic parameters listed in Table 2.1-1. S106B contained fill to approximately the 5.5-foot depth. Silt extended from 5.5 to approximately 6.5 feet bgs, and sandy gravel extended from 6.5 feet to completion of the boring at 12 feet. S107B contained fill to approximately 8.5 feet, gravel from 8.5 to 10.5 feet, and sandy gravel from 10.5 to completion of the boring at approximately 13 feet bgs. Groundwater was not encountered in these borings.

The upper soil sample taken at S106B contained seven constituents at concentrations that were above representative soil levels (Table 4.2.2-12). These constituents were aluminum (16,300 mg/kg versus 13,900 mg/kg), boron (21.2 mg/kg versus 12.8 mg/kg), mercury (0.42 mg/kg versus 0.3 mg/kg for representative), orthophosphate (276 mg/kg versus 3.7 mg/kg), total phosphorus (1,800 mg/kg), potassium (3,760 mg/kg versus 3,562 mg/kg), and zinc (55.5 mg/kg). Sulfate was also elevated at 790 mg/kg. The underlying fill sample (2-foot) continued this pattern with the addition of fluoride. Concentrations found in this sample were aluminum (17,500 mg/kg), boron (15.2 mg/kg), fluoride (640 mg/kg), mercury (0.44 mg/kg), total phosphorus (1,950 mg/kg), potassium (4,680 mg/kg), sulfate (1,200 mg/kg), and zinc (73.8 mg/kg). This pattern continued through the 5-foot fill horizon (Table 4.2.2-12). There was a lithology change in the 7-foot sample to sandy gravel. The soil sample taken in this horizon contained only sulfate at elevated levels (6,030 mg/kg), and the pH was slightly acidic (6.94 down from 8 plus in the fills). The presence of elevated sulfate and the change in pH may indicate an old sulfuric acid effect. In the 10-foot sample, orthophosphate (37 mg/kg), and total phosphorus (1,150 mg/kg), were detected at levels above the representative soil range. Sulfate remained elevated at 1,790 mg/kg. The pH value of this soil was slightly acidic (6.76). Gross alpha and gross beta activities of all samples tested were within representative levels. Since the soils remained acidic in the 10-foot sample, the vertical extent of facility-related effects was not determined by S106B.

The upper sample taken in boring S107B contained several constituents that were above the range for representative soils. These constituents included nickel (25.4 mg/kg) and total phosphorus (22,000 mg/kg). Sulfate was also elevated at 870 mg/kg and remained elevated in all horizons sampled (10,300 mg/kg at 10 feet). The surficial sample was slightly acidic (6.54). The slightly acidic soil and the level of enrichment of phosphate relative to other constituents suggests that ammonium phosphate had been spilled in this area. The 2-foot fill sample contained a more normal suite of above-representative-level constituents. These included cadmium (4 mg/kg), chromium (31.5 mg/kg), fluoride (1,010 mg/kg), total phosphorus

(4,450 mg/kg), potassium (4,240 mg/kg), and zinc (92 mg/kg). The pH in this sample also rose to 7.32, which supports the hypothesis of a localized surficial release of ammonium phosphate. A 5-foot sample was not obtained. The 7-foot soil sample, also in fill, contained arsenic (8.2 mg/kg) and nickel (25.6 mg/kg) above representative levels, and elevated sulfate (11,500 mg/kg). Only orthophosphate (5.4 mg/kg) was at above-representative levels in the 10-foot soil horizon; sulfate was elevated at 10,300 mg/kg. Gross alpha and gross beta activities were within the representative ranges for all samples tested.

Summary – Ammonium Phosphate Plant #1. The Phase II investigation confirmed the presence of fills to depths of 8.5 feet. These fills varied widely in their chemical composition, suggesting mechanical placement. Constituent migration into the naturally occurring soils appeared to be restricted to sulfate and phosphate. Both these constituents were found at elevated or above-representative levels in the deeper soil horizons. The Phase II investigation did not determine the vertical extent of EMF-related effects but it appears to have been limited to these two constituents. Gross alpha and gross beta were rarely detected in Phase I or Phase II at elevated activities below the surficial soil horizon.

Ammonium Phosphate Plant #2. Seven samples (S038B and S040B through S045B) were collected just beneath the asphalt paving and five samples at 2-foot depths (S038B and S042B through S045B) in the vicinity of the ammonium phosphate plant #2 (Figure 2.1-3). Soil samples were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. The samples collected were composed of fill material.

Soil samples were taken beneath the asphalt and at the 2-foot horizon at S038B. Analytical results for the upper soil horizon indicated a number of constituents with concentrations above representative (Table 4.2.2-12). These constituents included cadmium (3.4 mg/kg), chromium (55.2 mg/kg), fluoride (1,400 mg/kg), total phosphorus (6,140 mg/kg), and zinc (93.8 mg/kg). Gross alpha and gross beta activities were both below representative levels (12.5 U pCi/g and 13.6 ± 12.48 pCi/g respectively). The pH value was normal (7.89). Two of these constituents

remained above representative levels in the 2-foot horizon. They were fluoride (660 mg/kg) and total phosphorus (49,700 mg/kg). Gross alpha and gross beta activities remained within the normal range, as did pH (7.02). These values indicate a slightly variable composition of the fill materials at S038B. The greater total phosphorus value relative to other constituents in the 2-foot sample, combined with a low pH, might indicate the presence of an old ammonium phosphate release. Since both samples were taken in fill, the vertical extent of impact was not determined during the Phase I investigation.

Boring location S040B was sampled only at the soil surface beneath the paving. Analytical results for this soil horizon indicated a number of constituents with concentrations above representative (Table 4.2.2-12). These constituents included cadmium (2.2 mg/kg), chromium (48.9 mg/kg), fluoride (1,200 mg/kg), and total phosphorus (6,770 mg/kg). Gross alpha and gross beta activities were both below representative levels (11.6U pCi/g and 19.8 ± 13.68 pCi/g, respectively). The pH value was normal (7.59). These values indicate the fill in the vicinity of S040B has been affected by facility-related activities. The vertical extent of the fill was not determined during the Phase I investigation.

Boring location S041B was also sampled only at the soil surface beneath the paving. Orthophosphate (1,570 mg/kg) and total phosphorus (6,600 mg/kg) were above representative levels (Table 4.2.2-12). Neither gross alpha nor gross beta activities were at detectable activities. The pH value was normal (8.70). These values indicate the fill in the vicinity of S041B has been minimally affected by facility activities. The vertical extent of the fill was not determined during the Phase I investigation.

Soil samples were taken at both the soil surface, just beneath the asphalt paving, and at the 2-foot horizon at S042B. Analytical results for the upper soil horizon indicate that four of the constituents measured had concentrations above representative levels. These constituents were chromium (34.4 mg/kg), orthophosphate (124 mg/kg), and total phosphorus (2,290 mg/kg) (Table 4.2.2-12). Gross alpha and gross beta activities were both below representative levels

(9.46 U ρCi/g and 12.9 ± 10.3 ρCi/g, respectively). The pH value was normal (7.63). Chromium was below its representative levels in the 2-foot horizon. The total phosphorus concentration (18,900 mg/kg) relative to the concentrations of other constituents, and a pH on the low end of normal (7.05), suggest the potential presence of ammonium phosphate in the 2-foot fill horizon of this boring. Since both samples were taken in fill, the vertical extent of impact was not determined during the Phase I investigation.

Boring S043B was sampled just beneath the asphalt and at and 2-foot horizon. Analytical results for the upper soil horizon indicated a number of constituents with concentrations above those expected in representative soils (Table 4.2.2-12). These constituents included cadmium (4.0 mg/kg), chromium (55.0 mg/kg), fluoride (3,000 mg/kg), total phosphorus (9,960 mg/kg), and zinc (83.0 mg/kg). Gross alpha and gross beta activities were both above representative levels (51.8 ± 21.6 ρCi/g and 33.4 ± 11.48 ρCi/g, respectively). The pH value was normal (8.46). Only total phosphorus (14,000 mg/kg) remained above representative levels in the 2-foot horizon. Gross alpha and gross beta activities fell below representative levels, and pH (7.62) remained within the normal range, albeit on the lower end. The high total phosphorus value relative to other constituents in the 2-foot sample, combined with a slightly lower pH, might indicate the presence of an old ammonium phosphate release. Since both samples were taken in fill, the vertical extent of impact was not determined during the Phase I investigation.

As with S043B, soil samples were taken just beneath the asphalt and at the 2-foot horizon at S044B. Both were in fill. Analytical results for the upper horizon indicated a number of constituents with concentrations above representative levels (Table 4.2.2-12). These constituents included cadmium (2.8 mg/kg), chromium (45.2 mg/kg), fluoride (1,300 mg/kg), total phosphorus (3,490 mg/kg), and zinc (56.1 mg/kg). Gross alpha and gross beta activities were both below representative levels (17.7 ± 11.58 ρCi/g and 15.3 ± 9.3 ρCi/g, respectively). The pH value was normal (8.21). The 2-foot soil horizon contained a larger number of constituents with concentrations above representative levels. These constituents included boron (19.6 mg/kg),

cadmium (7.3 mg/kg), chromium (56.6 mg/kg), fluoride (4,200 mg/kg), nickel (76.9 mg/kg), total phosphorus (30,400 mg/kg), vanadium (95 mg/kg), and zinc (211 mg/kg). The pH in this sample fell to 6.88. Both of these samples were taken in what appeared to be fill that may have been affected by more than the ammonium phosphate operations. Identification of the vertical extent of the fill and the vertical extent of the impact was not an objective at this borehole during Phase I.

Soil samples were taken just beneath the asphalt and at the 2-foot horizon at S045B. Analytical results for the upper horizon indicated a number of constituents at above-representative levels (Table 4.2.2-12). These constituents included cadmium (2.3 mg/kg), chromium (43.3 mg/kg), fluoride (2,500 mg/kg), total phosphorus (4,160 mg/kg), and zinc (58.1 mg/kg). Gross alpha and gross beta activities were both below representative levels. The pH value was within the normal range (7.98). Only two of the parameters remained above representative levels in the 2-foot horizon. They were fluoride (610 mg/kg) and total phosphorus (12,100 mg/kg). Gross alpha and gross beta activities remained within representative levels. The pH (8.61) was also normal. These values indicate a somewhat variable composition of the fill materials at S045B. Since both samples were taken in fill, the vertical extent of impact was not determined during the Phase I investigation.

Phase I Summary – Ammonium Phosphate Plant #2. All of the shallow soil samples taken in Phase I indicated some facility-related effects. Several of the 2-foot samples appeared to contain constituent levels characteristic of ammonium phosphate. These samples were generally not associated with above-representative levels of Simplot characteristic constituents found in other samples. The objective of assessing whether or not facility activities had any effect on soils in this area was achieved in Phase I. Phase II sampling was conducted in this area to investigate the vertical extent of EMF-related effects.

Phase II Results for Ammonium Phosphate Plant #2. The Phase II field investigation consisted of one boring, S108B, located as shown in Figure 2.1-3 between S043B and S044B.

Samples collected during the Phase I investigation from S043B and S044B contained the highest concentrations of site constituents. Samples from S108B were collected just beneath the asphalt paving and at the depths of 2-, 5-, 7-, and 10-feet and were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. Boring S108B contained fill to a 1.5-foot depth, silt (loess) from 1.5 to 5 feet, sandy gravel from 5 to 10 feet, and gravel from 10 feet to completion at 12 feet. Groundwater was not encountered in this boring.

The first sample taken in this boring was directly below a 3-inch-thick asphalt layer in a fill. Analytical results showed five constituents to be above representative levels. The five constituents were boron (15.1 mg/kg), calcium (109,000 mg/kg), mercury (0.42 mg/kg), orthophosphate (74.6 mg/kg), and total phosphorus (7,560 mg/kg). Sulfate was also elevated at 1,220 mg/kg and remained elevated in all horizons (3,530 mg/kg at 10-12 feet). The second soil sample was in a silt horizon and contained mercury (0.44 mg/kg), orthophosphate (40.7 mg/kg), and total phosphorus (2,150 mg/kg) above representative levels. In the third soil horizon (approximately 5-7 feet), only mercury (10.28 mg/kg) was above representative levels, as was the case in both the 7- to 9-foot sample (0.22 mg/kg) and the 10- to 12-foot sample (0.25 mg/kg). The pH values for each of the soil horizons sampled declined with depth from 7.73 at 2 feet to 6.43 at 10 feet. This decreasing pH trend, combined with sulfate as virtually the sole elevated constituent, would indicate that this area had experienced a sulfuric acid release at some time in the past. Since the lowest pH reading was in the 10-foot sample, the vertical extent of the impact was not determined.

Summary –Ammonium Phosphate Plant #2. Given the lithology and constituents found in boring S108B, it was probably not as representative of subsurface soil conditions as those seen in borings S106B and S107B. The average fill thickness in this area was probably slightly deeper than the 2-foot thickness found in S108B. On the other hand, none of the deeper borings drilled in the areas associated with the ammonium phosphate plants encountered large effects with depth. Given the levels of constituent concentrations observed in the deeper boreholes, it

would appear that, for the most part, facility-related effects are confined to the fill layers and probably do not extend much below 10 feet in depth.

Roads

Roads within the Simplot facility are constructed of either asphalt, local soils, or various other materials such as gravel or slag. Soil samples were collected along the roads throughout the Simplot facility to assess the extent of potential effects of oils and dust suppressant application throughout the facility's operational history. Twelve locations (S082B through S086B, S088B through S090B, and S093B through S096B) were sampled at the surface or, where there were roadbed materials, beneath roadbed materials at depths of 0.5 feet (surficial samples) and 2-feet. The locations of these sampling points and the material currently comprising the road surface where each sample was collected are shown in Figure 2.1-3. These samples were analyzed for gross alpha, gross beta, total petroleum hydrocarbons, PCBs, and the inorganic parameters listed in Table 2.1-1.

Sampling point S082B is located due west of the southwest corner of the lower gypsum stack (Figure 2.1-3). It was sampled at the 0.5- and 2-foot horizons. The 0.5-foot horizon was described as a tan silt and the 2-foot horizon as a brown-tan silt. The 0.5-foot soil sample showed several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents included boron (19.8 mg/kg), fluoride (3,200 mg/kg), total phosphorus (2,350 mg/kg), and zinc (56.5 mg/kg). The 2-foot sample also contained constituents with concentrations above representative levels. These constituents included arsenic (10.6 mg/kg), cadmium (2.6 mg/kg), copper (26.4 mg/kg), fluoride (2,600 mg/kg), total phosphorus (918 mg/kg), and zinc (52.7J mg/kg). Gross alpha activity (34.3 ± 17.82 pCi/g) was above representative levels in the 0.5-foot sample but not in the 2-foot sample. Gross beta activities were below representative levels in both soil horizons. No PCBs were detected in either soil horizon (detection limit of 0.065 mg/kg). Total petroleum hydrocarbons were not detected in the surficial sample (10 mg/kg detection limit) but were found at 47.6 mg/kg at the 2-foot horizon.

Sampling point S083B is located between the upper and lower gypsum stacks (Figure 2.1-3). It was sampled at the 0.5- and 2-foot horizons. Both the 0.5-foot and 2-foot horizons were described as tan-brown silts. In the 0.5-foot soil sample, several constituents had concentrations above representative levels (Table 4.2.2-13). These constituents included boron (20.5 mg/kg), fluoride (780 mg/kg), and total phosphorus (990 mg/kg). Only boron (19.8 mg/kg) and total phosphorus (1,050 mg/kg) were present at above-representative levels in the 2-foot soil sample. Gross alpha and gross beta activities were below representative levels in both soil horizons. No PCBs were detected in either soil horizon (detection limit of 0.065 mg/kg). No TPH were detected in either of the soil horizons (10 mg/kg detection limit).

Sampling point S084B is located to the east of the southeast corner of the lower gypsum stack (Figure 2.1-3). It was sampled at the 0.5- and 2-foot horizons. Both the 0.5-foot and the 2-foot horizons were described as light tan, fine silts. The 0.5-foot soil sample contained several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents included boron (26.1 mg/kg), cadmium (2.3J mg/kg), chromium (29.6 mg/kg), fluoride (2,700 mg/kg), total phosphorus (1,470 mg/kg), and zinc (68J mg/kg). In the 2-foot horizon, only boron (20.1 mg/kg) and total phosphorus (665 mg/kg) were above representative levels. Gross alpha and gross beta activities were below representative levels in both soil horizons. No PCBs were detected in either soil horizon (detection limit of 0.065 mg/kg). Total petroleum hydrocarbons were detected in the surficial sample (58.3 mg/kg), but were not detected at the 2-foot horizon (10 mg/kg detection limit).

Sampling point S085B is located near the railroad tracks to the west of the ammonium phosphate plant in the northwestern section of the plant (Figure 2.1-3). It was sampled at the surface and 2-foot horizons. The surficial horizon was described as a brown silty sand with gravel, and the 2-foot horizon as a tan-brown silt to silty, sandy gravel. The sample of the surficial soil contained several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents included barium (241J mg/kg), boron (26.1 mg/kg), cadmium (10.7 mg/kg),

chromium (78.1 mg/kg), copper (19.7 mg/kg), fluoride (4,700 mg/kg), nickel (19.4 mg/kg), total phosphorus (25,600 mg/kg), vanadium (91.8 mg/kg), and zinc (206 mg/kg). The 2-foot sample contained boron (13.9 mg/kg) and total phosphorus (758 mg/kg) at concentrations above representative levels. Gross alpha and gross beta activity (42.4 ± 20.20 ρCi/g and 37.5 ± 11.78 ρCi/g, respectively) were above representative levels in the surficial sample but not in the 2-foot sample. No PCBs were detected in the 2-foot horizon (detection limit of 0.065 mg/kg). However, the laboratory reported Aroclor 1260 at 0.0570 mg/kg in the surficial sample. Because of problems with the analysis of this sample for PCBs, some PCB results were rejected during the validation process and this location was resampled in Phase II. Total petroleum hydrocarbons were detected in the surficial sample (24.6 mg/kg) but were not detected at the 2-foot horizon (10 mg/kg detection limit).

Sampling point S086B is located west of the sulfuric acid loading dock in the southwestern section of the main plant area (Figure 2.1-3). It was sampled at the surface and 2-foot horizons. The surficial horizon was a tan-brown silt with a trace of gravel, and the 2-foot horizon was a tan silt. Analysis performed on the surficial soil showed several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents included chromium (32.3J mg/kg), copper (47.5 mg/kg), fluoride (1,200 mg/kg), mercury (0.59 mg/kg), nickel (3,400 mg/kg), total phosphorus (4,850 mg/kg), and zinc (60.8 mg/kg). In the 2-foot sample, total phosphorus (717 mg/kg) and nickel (20 mg/kg) were above representative levels. Gross alpha and gross beta activity were not above representative levels in either soil horizon. Aroclor 1248 was detected in the surficial soil sample at 0.132 mg/kg. No PCBs were detected in the 2-foot horizon (detection limit of 0.065 mg/kg). TPH was detected in the surficial sample (49.0 mg/kg) but was not found at the 2-foot horizon (10 mg/kg detection limit).

Sampling point S088B is located just east of the ammonium phosphate plants in the central portion of the main plant area (Figure 2.1-3). It was sampled at the 0.5- and 2-foot horizons. The 0.5-foot horizon was described as a red-brown sandy silt with gravel and the 2-foot horizon

as a brown silt. The 0.5-foot soil sample contained several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents included fluoride (910 mg/kg), nickel (22.1 mg/kg), total phosphorus (23,330 mg/kg), and zinc (60.8 mg/kg). The 2-foot sample also contained constituents with concentrations above representative levels. These constituents included: fluoride (610 mg/kg), nickel (16.2 mg/kg), and total phosphorus (20,600 mg/kg). The elevated total phosphorus values probably reflect the presence of spilled ammonium phosphate. Gross alpha and gross beta activity were not above representative levels in either soil horizon. No PCBs were detected in either soil horizon (detection limit of 0.065 mg/kg). However, there was a problem with the PCB data submitted by the laboratory for the 2-foot sample, and several aroclor nondetects were rejected during the validation process. This location was resampled during Phase II to confirm the absence of PCBs. TPH were detected in the surficial sample (104 mg/kg) but were not detected at the 2-foot horizon (10 mg/kg detection limit).

Sampling point S089B is east of the ammonium sulfate plant in the south-central section of the main plant area (Figure 2.1-3). It was only sampled at the surface. The horizon was described as a red-brown silty sand with gravel. The surficial soil sample contained several constituents at concentrations above representative levels (Table 4.2.2-13). These constituents included boron (18.2 mg/kg), cadmium (5.5 mg/kg), chromium (45.5 mg/kg), copper (20 mg/kg), fluoride (2,600 mg/kg), total phosphorus (4,220 mg/kg), vanadium (51.5 mg/kg), and zinc (164 mg/kg). Gross alpha and gross beta activity were within representative levels. No PCBs were detected (detection limit of 0.065 mg/kg). TPH were detected in the surficial sample (209 mg/kg).

Sampling point S090B is due east of the sulfuric acid loading area in the southwestern portion of the main plant (Figure 2.1-3). It was sampled at the 0.5- and 2-foot horizons. The 0.5-foot horizon was described a red-brown silt with a trace of gravel and the 2-foot horizon as a brown silt. The 0.5-foot soil sample contained several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents included fluoride (760 mg/kg), total phosphorus (1,070 mg/kg), and zinc (58J mg/kg). In the 2-foot sample, only zinc (61.2 mg/kg)

was above its representative level. Gross alpha activity (25.6± 15.02 pCi/g) was above representative levels in the soils found in the surficial sample but not in the 2-foot sample. Gross beta activities were below representative levels in both soil horizons. No PCBs were detected in either soil horizon (detection limit of 0.065 mg/kg). However, there was a problem with the PCB data submitted by the laboratory for the 0.5-foot sample and several aroclor nondetects were rejected during the validation process. This location was resampled during Phase II to confirm the absence of PCBs. Total petroleum hydrocarbons were not detected in either soil horizon (10 mg/kg detection limit).

Sampling point S093B is located to the west of the central portion of the lower gypsum stack (Figure 2.1-3). It was sampled at the surficial and 2-foot horizons. The surficial horizon was described as a brown silt with a trace of gravel and the 2-foot horizon as a tan silt. The surficial soil sample contained several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents included copper (39.3 mg/kg), fluoride (690 mg/kg), nickel (70.8 mg/kg), total phosphorus (924 mg/kg), and zinc (129 mg/kg). In the 2-foot horizon, no constituents concentrations were above representative levels. Gross alpha and gross beta activities were below representative levels in both soil horizons. No PCBs were detected in either soil horizon (detection limit of 0.065 mg/kg). TPH were not detected in either soil horizon (10 mg/kg detection limit).

Sampling point S094B is due east of the cooling tower area in the southeast corner of the main plant area (Figure 2.1-3). It was sampled at the 0.5-foot and 2-foot horizons. The 0.5-foot horizon was described as a gray gypsum and the 2-foot horizon as a tan-brown silt. The 0.5-foot sample contained several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents were barium (257 mg/kg), beryllium (1.7 mg/kg), boron (64.1 mg/kg), cadmium (14 mg/kg), calcium (214,000 mg/kg), chromium (219 mg/kg), copper (35 mg/kg), fluoride (16,700 mg/kg), nickel (28J mg/kg), total phosphorus (10,300 mg/kg), vanadium (204 mg/kg), and zinc (192 mg/kg). The 2-foot sample also contained a number of

constituents with concentrations above representative levels. These constituents were barium (218 mg/kg), fluoride (850 mg/kg), mercury (0.53J mg/kg), total phosphorus (1,260 mg/kg), and zinc (63.3 mg/kg). Gross alpha and gross beta activity (139 ± 30.60 ρCi/g and 54.2 ± 11.68 ρCi/g, respectively) were above representative levels in the 0.5-foot sample. Gross alpha (25.3 ± 13.96 ρCi/g) was above representative levels in the 2-foot horizon, but not gross beta. PCBs were reported as "not detected" at the 1.0 mg/kg level in the 0.5-foot sample and at the 0.065 mg/kg level in the 2-foot horizon. However, because of PCB analysis problems with the 0.5-foot sample, some PCB results were rejected during the validation process and this location was resampled in Phase II. Total petroleum hydrocarbons were not found in either soil horizon (20 mg/kg detection limit).

Sampling point S095B is located near the railroad tracks to the north of the triple superphosphate plant (Figure 2.1-3). It was sampled at the 0.5-foot and 2-foot horizons. The 0.5-foot horizon was described as a gravel and the 2-foot horizon as a tan silt. The 0.5-foot soil sample showed several constituents with concentrations at above-representative levels (Table 4.2.2-13). These constituents included barium (823J mg/kg), boron (33.4J mg/kg), cadmium (87.3J mg/kg), calcium (159,000J mg/kg), chromium (165J mg/kg), copper (32.2 mg/kg), fluoride (16,000 mg/kg), lead (49.3J mg/kg), nickel (20.8 mg/kg), total phosphorus (26,200 mg/kg), silver (16.1 mg/kg), vanadium (219J mg/kg), and zinc (2,440J mg/kg). The 2-foot sample contained only total phosphorus (746 mg/kg) above the representative level, indicating that there has been little or no migration of the EMF-related soil constituents into the subsurface at this location. Gross alpha and gross beta activities (115 ± 36.00 ρCi/g and 64.7 ± 15.34 ρCi/g, respectively) were above representative levels in the 0.5-foot soil sample. Neither gross alpha nor gross beta were above representative activities in the 2-foot horizon. No PCBs were detected in the 2-foot horizon (detection limit of 0.065 mg/kg). However, the laboratory reported Aroclor 1254 at 0.0470 mg/kg in the 0.5-foot sample. Because of problems with PCB analysis some PCB results were rejected during the validation process and this location was resampled in Phase II. TPH

was detected in the 0.5-foot sample (672 mg/kg) but was not found at the 2-foot horizon (10 mg/kg detection limit).

Sampling point S096B is located due south of the western plant area and west of the lower gypsum stack (Figure 2.1-3). It was sampled at the 0.5-foot and 2-foot horizons. The 0.5-foot horizon was described as tan-brown silt and the 2-foot horizon as a tan silt. The 0.5-foot soil sample contained several constituents with concentrations above representative levels (Table 4.2.2-13). These constituents included boron (21.1 mg/kg), cadmium (2.3 mg/kg), chromium (44.1 mg/kg), copper (19.4 mg/kg), fluoride (1,300 mg/kg), nickel (17.7 mg/kg), total phosphorus (1,650 mg/kg), and zinc (72.8 mg/kg). Boron (16.8 mg/kg), fluoride (630 mg/kg), and total phosphorus (832 mg/kg) were above representative levels in the 2-foot sample. Gross alpha and gross beta activity were not above representative levels in either soil horizon. No PCBs were detected in either soil horizon (detection limit of 0.065 mg/kg). TPH was not detected in either soil horizon (10 mg/kg detection limit).

Phase II for Roads. Locations S085B, S088B, S090B, and S094B were resampled at the surface during the Phase II field investigation. This resampling was done because the laboratory experienced some difficulties in its PCB analysis of Phase I samples collected at these locations, causing some results to be rejected during the validation process. The results of the resampling are provided in Table 4.2.2-14. PCBs were not detected in any sample (detection limit range of 0.2 to 2 mg/kg).

Summary – Roads. All near-surface road samples showed some facility-related inorganic constituent effects. For the most part, these diminished greatly or were not detected in the 2-foot soil horizons. Detectable concentrations of TPH were also primarily limited to surficial samples, with only one location (S082B) showing detectable concentrations of TPH in the 2-foot sample. PCBs were detected infrequently (twice) and then only in surficial samples at levels below 1 mg/kg.

Gross alpha and beta activities for surface samples from seven of ten locations exceeded representative levels. Gross alpha decreased in the 2-foot samples, falling below the representative level, with the exception of S082B. Soil from the 2-foot depth at location S089B was not analyzed for gross alpha or beta.

Gross beta was slightly above the representative level at six of ten locations. Gross beta activity decreased in the 2-foot samples, falling below the representative level, with the exception of S090B. Soil from the 2-foot depth at location S089B was not analyzed for gross alpha or beta.

Bone Yard

The location of the Simplot salvage and storage area bone yard is shown in Figure 1.2-1. Simplot has no records of any spillage or leakage in this area. Three sampling locations (S079B, S080B, and S081B) were randomly selected and sampled at the surface and at approximately 2 feet (Figure 2.1-3). Soil samples were analyzed for gross alpha, gross beta, TPH, PCBs, and the inorganic parameters listed in Table 2.1-1.

A soil sample was collected at the ground surface in a dark brown sandy silt at boring S079B. In this sample, a number of constituents were at concentrations above representative levels (Table 4.2.2-15). These constituents were barium (662J mg/kg), boron (22.9J mg/kg), cadmium (14.7 mg/kg), chromium (111 mg/kg), copper (25.5 mg/kg), fluoride (4,600 mg/kg), lead (31.4J mg/kg), nickel (26.3 mg/kg), total phosphorus (12,200 mg/kg) vanadium (132 mg/kg), and zinc (234 mg/kg). The 2-foot sample, which was taken in a silt, contained only total phosphorus (690 mg/kg) above the representative level. Gross alpha activity was above the representative level in the surficial sample (29.5 ± 16.18 pCi/g), but was below this level in the 2-foot sample. Gross beta activity was below representative levels in both soil horizons. TPH was not detected in either soil horizon (detection limits of 10 to 20 mg/kg). Although no PCBs were detected in either soil horizon at the 0.65 mg/kg detection limit, the laboratory experienced some difficulties

with PCB analysis of the surficial sample. This area was resampled in Phase II to confirm the absence of PCBs at the surface.

Boring S080B was sampled at the ground surface in a brown sandy silt horizon. In this soil sample, a number of constituents were at concentrations above representative levels (Table 4.2.2-15). These constituents included boron (21.5J mg/kg), cadmium (11.2 mg/kg), chromium (41.1 mg/kg), fluoride (1,900 mg/kg), nickel (40.1 mg/kg), total phosphorus (12,000 mg/kg), vanadium (84.5 mg/kg), and zinc (289 mg/kg). The 2-foot sample, taken in a silt, contained only total phosphorus (665 mg/kg) above the representative level. Gross alpha and gross beta activities were below representative levels in both samples. TPH were detected in the surficial sample at 56.5 mg/kg. They were not present (10 mg/kg detection limit) in the 2-foot soil sample. With the exception of Aroclor 1254 (0.025 mg/kg), no PCBs were detected in either soil horizon at the 0.65 mg/kg detection limit. However, the laboratory experienced some difficulties with PCB analysis of the surficial sample, so the area was resampled in Phase II to confirm the presence or absence of PCBs at the surface.

A soil sample was collected at the ground in a tan-brown silt at boring S081B. In this soil sample, a number of constituents were found at concentrations above representative levels (Table 4.2.2-15). These constituents were barium (248 mg/kg), boron (32.4 mg/kg), cadmium (13.9 mg/kg), chromium (74.9 mg/kg), copper (57.8 mg/kg), fluoride (2,700 mg/kg), lead (31.2 mg/kg), nickel (46.1 mg/kg), total phosphorus (5,500 mg/kg) vanadium (71.5 mg/kg), and zinc (221 mg/kg). The 2-foot sample, which was also taken in a silt, contained only total phosphorus (713 mg/kg) above the representative level. Gross alpha activity was above the representative level in the surficial sample (25.5 ± 15.52 pCi/g) but was below this level in the 2-foot sample. Gross beta activity was below the representative level in both soil horizons. Total petroleum hydrocarbons were detected in the surficial sample at 27.5 mg/kg. They were not detected (10 mg/kg detection limit) in the 2-foot soil sample. PCBs were detected in the surficial sample

(Aroclor 1242, 0.097J mg/kg) with a detection limit of 0.65 mg/kg. They were not detected in the 2-foot sample.

Phase II for the Bone Yard. Locations S079B and S080B were resampled at the ground surface during the Phase II field investigation, because the laboratory had experienced some difficulties in its PCB analysis and some of the results had been rejected during the validation process. The results of the resampling are provided in Table 4.2.2-16. PCBs were not detected in any samples (detection limit of 0.2 mg/kg for S079B and 1 mg/kg for S080B).

Summary – Bone Yard. The surface soils in the bone yard area appear to have been influenced by EMF-related activities. The spillage or mixing does not seem to have transported the EMF-related constituents to the soil samples collected from the 2-foot depth. Hence the vertical extent of EMF-related effects appears to be confined to the surficial soils.

Ammonium Sulfate Plant

Ammonium sulfate is among the solid products of the Simplot plant. Four locations (S046B-S049B) near the ammonium sulfate plant were sampled at 0.5 feet and at 2-feet below ground surface (Figure 2.1-3). Both the 0.5-foot and 2-foot samples were collected in fill consisting of gravel or a gravel/silt mixture. The eight samples were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1.

The 0.5-foot soil sample was collected in a dark brown sandy gravel at boring location S046B. This soil sample contained a number of constituents at concentrations above representative levels (Table 4.2.2-17). These constituents included barium (278J mg/kg), beryllium (1.5 mg/kg), boron (116 mg/kg), cadmium (18.1 mg/kg), chromium (165 mg/kg), copper (25.2 mg/kg), fluoride (8,800 mg/kg), lead (114J mg/kg), nickel (31.7 mg/kg), total phosphorus (25,000 mg/kg) vanadium (132 mg/kg), and zinc (429 mg/kg). The 2-foot sample, which was taken in a tan sandy gravel, contained only boron (16.2 mg/kg), and total phosphorus (2,550 mg/kg) concentrations above representative levels. Gross alpha and gross beta activities (29.5 ± 16.18

ρCi/g and 55.3 ± 14.62 ρCi/g, respectively) were above their representative levels in the 0.5-foot sample, but were below these levels in the 2-foot sample. Hence, there appears to have been very little migration of EMF-related materials into the subsurface.

Boring location S047B was sampled at the 0.5-foot depth in a dark brown silty gravel horizon and at the 2-foot depth in a sandy gravel. The 0.5-foot soil sample contained a number of constituents at concentrations above representative levels (Table 4.2.2-17). These constituents included barium (1,340J mg/kg), beryllium (1.6 mg/kg), boron (71.4 mg/kg), cadmium (43.2 mg/kg), chromium (267 mg/kg), copper (93.9 mg/kg), fluoride (12,800 mg/kg), lead (100 mg/kg), nickel (51.1 mg/kg), total phosphorus (6,180 mg/kg) vanadium (273 mg/kg), and zinc (1,010 mg/kg). Only boron (16.5 mg/kg), chromium (31.6 mg/kg), total phosphorus (2,430 mg/kg), and zinc (56.2 mg/kg) had concentrations above the representative level in the sandy gravel sample taken at the 2-foot horizon. Gross alpha and gross beta activities were above their representative levels in the 0.5-foot sample (80.7 ± 28.80 ρCi/g and 40.9 ± 12.78 ρCi/g), but were below these levels in the 2-foot sample. As with location S046B, there appears to have been very little migration of EMF-related materials into the subsurface. However, the vertical extent of both the fill layer and EMF-related constituents was not defined by this borehole.

Both the 0.5-foot and the 2-foot horizons sampled at boring location S048B were in a fill consisting of dark brown clayey silts with gravels. Both samples contained a number of constituents at concentrations above representative levels (Table 4.2.2-17). With the upper sample listed first unless otherwise indicated, these constituents were arsenic (11.6 mg/kg in the 0.5-foot sample), barium (1,080 and 310 mg/kg), boron (75 and 31.5 mg/kg), cadmium (58.3 and 12 mg/kg), chromium (285 and 91.6 mg/kg), copper (74.2 and 45.4 mg/kg), fluoride (14,400 and 2,090 mg/kg), lead (213 and 43.8 mg/kg), molybdenum (27.4 and 14.7 mg/kg), nickel (49.2 and 25.6 mg/kg), total phosphorus (62,230 and 15,100 mg/kg), vanadium (351 and 116 mg/kg), and zinc (1,200 and 403 mg/kg). Gross alpha and gross beta activities were above their representative levels in the 0.5-foot sample (133 ± 32.00 ρCi/g and 55.1 ± 10.70 ρCi/g), but were

below these levels in the 2-foot sample. The color of the soil and the mix of constituents and concentrations in these samples indicate the presence of some quantity of ore. The results for the 2-foot sample are similar to, but lower than, those of the 0.5-foot sample results. The vertical extent of EMF-related constituents was not defined by this borehole.

As in S048B, both the 0.5-foot and the 2-foot horizons of S049B were in a fill consisting of dark brown clayey silts with gravels. These soil samples contained a number of constituents at concentrations above representative levels (Table 4.2.2-17). With the upper sample listed first unless otherwise indicated, these constituents were barium (221 mg/kg in the 2-foot interval), boron (18.7 and 25 mg/kg), cadmium (4.3 and 5.5 mg/kg), chromium (37.7 and 44.5 mg/kg), copper (15.1 and 25.1 mg/kg), fluoride (2,990 and 2,140 mg/kg), nickel (16.8 and 19.5 mg/kg), total phosphorus (7,110 and 8,830 mg/kg), vanadium (50.9 and 66.6 mg/kg), and zinc (135 and 171 mg/kg). Gross alpha and gross beta activities were below their representative levels in the 0.5-foot sample, but above them in the 2-foot horizon (40.1 ± 8.96 ρCi/g and 49.1 ± 25.8 ρCi/g). Unlike the results found for the soil horizons in S048B, the 2-foot constituent concentrations were, in general, greater than those found in the surficial horizon. This result suggests a mechanical placement process. The vertical extent of both the fill layer and EMF-related constituents was not defined by this borehole.

Summary – Ammonium Sulfate Plant. Soil in this area contained fill materials affected by EMF-related constituents to at least the 2-foot depth. The varying relationship between constituent concentration and depth could indicate random mechanical mixing of the fill material. The areal extent of EMF-related constituent effects was relatively consistent. Since fill at the 2-foot depth has been affected by EMF-related constituents, additional definition of the vertical extent of contamination was addressed in Phase II of the RI.

Phase II Results for Ammonium Sulfate Plant. To investigate the vertical distribution of site constituents within the soil profile, one boring (S109B) was added in Phase II. It was located (as shown in Figure 2.1-3) near S048, which was the sample location in this area that

generally contained the highest concentrations of site constituents detected in the Phase I investigation. Samples were collected from the 0.5-foot and the 2-, 5-, and 10-foot depths and analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. S109B contained fill from the surface to 2 feet, a silty gravely sand from 2 feet to 3.5 feet, silt from 3.5 feet to 5 feet, and sandy gravel from 5 feet to completion of the boring at 21.5 feet. Groundwater was not encountered in this boring.

The 0.5-foot soil sample for S109B was collected in a silty gravel fill. It contained several constituents with concentrations above representative levels. These constituents were cadmium (5.2 mg/kg), chromium (35.8 mg/kg), fluoride (4,370 mg/kg), nickel (18.3 mg/kg), total phosphorus (10,300 mg/kg), and zinc (89.2 mg/kg). Sulfate was also elevated at 10,500 mg/kg. Gross alpha activity (44.8 ± 11.40 ρCi/g) was above representative level; gross beta activity (30.7 ± 6.48 ρCi/g) was near the representative level. With the exception of sulfate, which remained elevated throughout the soil column, an outlying lead value at 10 feet (41.7 mg/kg), a slightly elevated calcium value at 2 feet (79,200 mg/kg), and above-representative concentrations of iron at 5 feet (15,200 mg/kg) and orthophosphate at 10 feet (10.1 mg/kg), the constituents measured in all three intervals were within the representative range for soils. The persistent sulfate values may be associated with previous handling of ammonium sulfate before the area was paved. There does not appear to be any significant migration of other EMF-related constituents into the subsurface. However, it should be noted that the fill encountered in this borehole was not the same as that encountered in S048B and S049B and may not be representative of the depth or concentrations of these other types of fills.

Summary – Ammonium Sulfate Plant. The soils in the vicinity of the ammonium sulfate plant have a fill layer to a depth of at least 2 feet that contained above-representative concentrations of EMF-related constituents. Soil samples from a boring drilled to 10 feet did not detect migration into the subsurface of any constituent other than sulfate. The sulfate may be related to the plant operations before the area was paved. However, the presence of the other

constituents detected was likely associated with their prior presence in the fills placed in this area.

Sulfuric Acid Loading Dock

The sulfuric acid loading dock serves both trucks and railcars; sulfuric acid is transferred from both for use in the plant's phosphoric acid production process.

Four locations (S058B through S061B) were sampled near the sulfuric acid loading dock (Figure 2.1-3). Maximum depth of sampling extended from 5 feet to 10 feet, depending upon location. The samples were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. Groundwater was not encountered in any of these borings.

A soil sample was collected beneath asphalt paving in boring S058 at the 0.5-foot horizon in grayish, brown silty gravel fill. This sample contained above-representative concentrations of the following constituents: cadmium (8.9 mg/kg), chromium (78.6 mg/kg), copper (340J mg/kg), fluoride (1,300 mg/kg), lead (29.7 mg/kg), mercury (1.8 mg/kg), nickel (18.1 mg/kg), total phosphorus (4,620 mg/kg), vanadium (54.6J mg/kg), and zinc (398J mg/kg.). These constituents were not found at concentrations above representative levels in any of the subsurface intervals sampled (2.5, 5, and 7.5 feet) (Table 4.2.2-18). This result indicates little to no migration into the subsurface of EMF-related constituents at this boring location; pH was also within the normal range (7.27 to 8.14).

Soil samples were collected beneath asphalt paving in boring S059B at depths of 0.5, 2.5, 5, 7.5, and 10 feet. All samples collected below 0.5 feet were silt, whereas the material above 0.5 feet was a dark brown, silty gravel fill. The concentrations of many constituents in this 0.5-foot sample exceeded representative levels (Table 4.2.2-18). These constituents included cadmium (7.5 mg/kg), chromium (72.7 mg/kg), copper (21.6 mg/kg), fluoride (2,400 mg/kg), lead (35.2 mg/kg), nickel (18.7 mg/kg), total phosphorus (4,160 mg/kg), vanadium (59 mg/kg), and zinc (164 mg/kg). All declined to below-representative levels in the 2.5-foot sample, with the

exception of total phosphorus (914 mg/kg), which remained slightly above representative levels. The concentrations in the 5-foot sample were below representative levels for all site constituents. Several constituents showed enrichment in the 7.5-foot horizons. These constituents included aluminum (22,100 mg/kg), boron (18.7 mg/kg), copper (15.1 mg/kg), fluoride (650 mg/kg), iron (18,000 mg/kg), lithium (21.4 mg/kg), manganese (451 mg/kg), nickel (18.5 mg/kg), and zinc (68.3 mg/kg). The soil from the 10-foot-depth sample was below representative concentrations for all EMF-related constituents.

The mix of constituents found at the 7.5-foot horizon was somewhat different from that found in the 0.5-foot sample. It included enriched aluminum, manganese, and iron, which may indicate a more clayey silt than that found in the overlying soils. In addition, the absence of constituent enrichment in the 5-foot-horizon silt would argue against constituent migration from above. The fact that all of the soil horizons sampled in this borehole had high pH (8.83 to 9.38) lends further support to the argument that the constituents found in the 7.5-foot silt layer are probably naturally occurring, and that there has been no observable downward migration of EMF-related constituents in this borehole. Radionuclide activities were only above representative levels in the 0.5-foot sample, where gross alpha readings were 44.1 ± 19.14 ρCi/g.

Soil samples were collected beneath asphalt paving in boring S060B at depths of 0.5 feet (fill), 2.5 feet (silt), and 5 feet (silt). The 0.5-foot soil horizon sample contained a number of constituents whose concentrations exceeded the representative levels (Table 4.2.2-18). These constituents included copper (56.4J mg/kg), lead (44.7 mg/kg), total phosphorus (1,370 mg/kg), and zinc (59.8 J mg/kg). Gross alpha and gross beta activities also exceeded representative levels in this sample (51.1 ± 19.10 ρCi/g and 39 ± 15.04 ρCi/g, respectively). This sample horizon was the only horizon in which the radionuclide activities were above representative levels. Manganese (510 mg/kg) was above its representative level in the 2.5-foot silt; concentrations of barium (400J mg/kg), nickel (20.3 mg/kg), and zinc (64.1 mg/kg) exceeded representative levels in the 5-foot horizon soil sample. The lack of a mix pattern of common

EMF-related constituents in these deeper samples suggests that these elevated constituents are naturally occurring and have not been introduced as a result of migration from the overlying fill.

Soil samples were collected beneath asphalt paving in boring S061B at depths of 0.5 feet (fill), 2.5 feet (silt), 5 feet (silt), and 7.5 feet (gravel). As was true for the other boring locations, the 0.5-foot fill sample contained a number of constituents whose concentrations exceeded representative levels (Table 4.2.2-18). These constituents included chromium (31.6 mg/kg), copper (20.5 mg/kg), lead (50.2 mg/kg), mercury (18.5 mg/kg), total phosphorus (1,230 mg/kg), and zinc (55.2 mg/kg). Gross alpha and gross beta activities also exceeded representative values in this sample (100 ± 42.20 pCi/g and 51.1 ± 19.10 pCi/g, respectively). This sample horizon was the only horizon where the radionuclide activities were above representative levels. Several constituents had concentrations above representative levels in the remaining sampling intervals, but there was very little pattern to their occurrence. These constituents included aluminum (17,100 mg/kg at 5 feet), manganese (489 mg/kg at 2.5 feet and 756 mg/kg at 5 feet), nickel (28.5 mg/kg at 2.5 feet and 24.3 mg/kg at 5 feet), total phosphorus (960 mg/kg at 2.5 feet), and zinc (58 mg/kg at 5 feet and 60.2 mg/kg at 7.5 feet). There may be some movement of phosphorus into the subsurface from the overlying fill, but it appears to be the only constituent for which this is the case. The pH values for the soils in this borehole range from 7.13 at the surface to 8.72 at the 5-foot horizon.

Summary – Sulfuric Acid Loading Dock. A comparison of the distribution of site constituents among the four sample locations reveals a fairly consistent pattern of constituent mix in the 0.5-foot fill. There is a marked increase in the concentration of aluminum and iron in the 5-foot silts, but this does not necessarily parallel the enrichment of other constituents. The vertical distribution of constituents that may be related to facility activities is very random and, with the possible exception of total phosphorus, does not appear to be from migration from the overlying fill. However, the level at which total phosphorus is found in the silts is generally not much greater than the representative level. It can be concluded that very little, if any,

facility-related effects are seen in the subsurface soils beneath the 0.5-foot depth of fill in the vicinity of the sulfuric acid loading dock.

Water Reclaim Area

The location of the water reclaim area is shown in Figure 1.2-1. Some wetting of soils occurs in the water reclaim area as a result of pump and pipe leakage. The Phase I work to investigate the effects of these releases consisted of two soil borings (S072B and S073B), sampled at the surface (unpaved) and the 3- to 3.5-foot depth and analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1.

Soils at boring location S073B were sampled at two horizons. The surficial soil was a dark brown sand with gravel. The 3.5-foot horizon was a tan sandy silt. pH values for these two horizons were 5.8 and 6.21, respectively. Testing of the two soil horizons indicated both had concentrations of facility-related constituents that were above representative levels (Table 4.2.2-19). Listing the upper sample first, unless otherwise indicated, these constituents included barium (581 mg/kg at surface), boron (26.2 and 19.4 mg/kg), cadmium (37.3J and 33.8J mg/kg), calcium (120,000 and 111,000 mg/kg), chromium (128 mg/kg at the surface), copper (29.2 mg/kg at the surface), fluoride (21,000 mg/kg at the surface), nickel (36.4 and 47.3 mg/kg), total phosphorus (54,800 and 75,300 mg/kg), vanadium (207 mg/kg at the surface), and zinc (388J and 540J mg/kg). Gross alpha and gross beta activities were above their representative levels in the surficial sample (57.9 ± 23.80 ρCi/g and 40.7 ± 12.84 ρCi/g), but were below these levels in the 2-foot sample.

In summary, the Phase I investigation determined this area was affected by EMF-related constituents to at least the 3.5-foot depth. Since soil at the 3.5-foot depth has been influenced by EMF-related constituents, a boring was advanced as part of the Phase II field investigation to determine the vertical extent of this influence.

Phase II Results for Water Reclaim Area. The Phase II field investigation consisted of one boring, S102B, located as shown in Figure 2.1-3. The location was near S073B, the Phase I boring in this area that contained the highest constituent concentrations. Samples were collected from the surface and the 2-, 5-, 7-, 10-, 15-, and 20-foot depths and analyzed for gross alpha, gross beta, and the inorganic parameters given in Table 2.1-1. Boring S102B contained fill to approximately 3 feet, silt from 3 feet to 9 feet, sandy gravel from 9 feet to 14 feet, and various gravels to completion at 22 feet. Groundwater was not encountered in this boring.

The surficial sample was taken in a silty sandy gravel fill and contained the greatest concentrations of facility related constituents. These constituents included barium (733 mg/kg), boron (131 mg/kg), cadmium (37.7 mg/kg), calcium (181,000 mg/kg), chromium (193 mg/kg), copper (40.4 mg/kg), fluoride (45,400 mg/kg), mercury (.49 mg/kg), nickel (18.1 mg/kg), total phosphorus (41,700 mg/kg), vanadium (314 mg/kg), and zinc (218 mg/kg). Sulfate was also elevated at 12,900 mg/kg. Gross alpha and gross beta activities were above representative levels in the surficial sample (218 ± 40.40 pCi/g and 86.7 ± 14.70 pCi/g), but were below these levels for the rest of the boring. The pH in the surficial sample was measured at 4.01.

A gravelly sandy silt was sampled in the 2-foot horizon. This sample also contained facility-related constituents with concentrations above those expected for representative soils. However, there were fewer constituents above representative levels than there were in the surface soil sample. In addition, these constituents were generally detected at lower concentrations. They included barium (2,690 mg/kg), boron (21.3 mg/kg), cadmium (16.4 mg/kg), chromium (120 mg/kg), copper (19 mg/kg), fluoride (4,730 mg/kg), nickel (46.8 mg/kg), total phosphorus (37,000 mg/kg), sulfate (1,590 mg/kg), vanadium (225 mg/kg), and zinc (246 mg/kg). The pH was measured at 5.68.

The next sampled interval in the S102B borehole was at 7 feet in a silt. With the exception of orthophosphate (145 mg/kg) and total phosphorus (1090 mg/kg) all constituents were within representative levels. Sulfate continued to be elevated throughout the borehole depth. The pH

value returned to the normal range at 7 feet (7.82) and remained so in the subsequent three sampling intervals.

Summary – Water Reclaim Area. Soil samples collected from this boring indicate that there were EMF-related constituents above representative levels to approximately the top of the first silt (2-foot depth in the case of S102B). Elevated or above-representative concentrations of fluoride, phosphates, and sulfate were found in deeper samples, but the native silt soils apparently prevented migration of other site constituents below the 2-foot depth.

Former Ore Pile

Before the completion of Simplot's phosphate ore slurry pipeline, dry phosphate ore was stockpiled in the former ore pile area. For the Phase I field investigation, five sampling locations (S074B, S075B, S076B, S077B, S078B) were selected within the area. Samples were collected at the surface and at approximately a 2.5-foot depth. All samples were analyzed for gross alpha, gross beta, and the inorganics parameters listed in Table 2.1-1. The upper soil samples ranged from tan silts with gravel to dark red-brown silts with gravel, while the soils from the 2-foot horizon were tan or tan-brown silt.

Analysis of the data in Table 4.2.2-20 shows that all of the upper samples taken in the former ore pile area contained constituents with concentrations greater than representative levels. The soil texture, color, and suite of constituents indicate that the material was a mixture of native soils and ore. The following constituent concentration ranges were found: barium (123 to 847 mg/kg), boron (20.4 to 74.6 mg/kg), cadmium (7.5 to 61 mg/kg), calcium (64,400 to 209,000 mg/kg), chromium (74.6 to 387 mg/kg), copper (23.2 to 53.6 mg/kg), fluoride (14,800 to 19,900 mg/kg), nickel (20.1J to 83.1 mg/kg), total phosphorus (14,500 to 56,000 mg/kg), vanadium (83.4 to 758 mg/kg), and zinc (99.3 to 877 mg/kg). Gross alpha activities ranged from 61.5J ± 19.54 pCi/g to 143 ± 70.40 pCi/g. Gross beta activities ranged from 43.1 ± 10.64 pCi/g to

79.7 ± 24.40 pCi/g. Calcium, fluoride, mercury, orthophosphate, total phosphorus, and selenium were above representative levels in one or more of the 2-foot samples.

Summary – Former Ore Pile. The soil chemistry and radiological data collected in this area support a conclusion that the phosphate ore matrix is relatively insoluble and that the movement of residual phosphate ore-related constituents downward through the soils has been minimal. Above-representative concentrations of constituents characteristic of ore in surficial samples is a result of mechanical mixing of ore with site soils.

Former Pillow Tank Area

Until 1991, Simplot stored phosphoric acid and UAN-32 (urea and ammonium nitrate) products in thirteen 200,000-gallon pillow, or hypalon tanks in a series of cells carved out of native soils to a depth of approximately 8 feet bgs. Two locations (S010B and S011B) were selected to investigate potential leakage from the tank area (Figure 2.1-3). Samples were collected at depths from approximately 10 feet bgs to approximately 20 feet bgs. The rationale for selection of these boring depths was that effects associated with potential intermittent leakage should be detectable within this range of sampling depths. Samples were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. All soil samples collected were characterized as pale brown silt (loess).

Analysis of the data in Table 4.2.2-21 shows that the soil samples were generally below representative levels, even at the surface. Only orthophosphate was slightly above the representative level in the 10.5-foot samples in both S010B (12.9 mg/kg) and S011B (14.3 mg/kg).

Radiological activity in soils paralleled the relatively low chemical concentrations of EMF-related parameters. No gross alpha or gross beta activities exceeded representative levels.

Summary – Former Pillow Tank Area. The concentrations of constituents tested for in the pillow tank area were generally within the range of representative soil levels. Given the

available data, the soil samples show no indication of past leakage from tanks and reflect typical naturally occurring concentrations of constituents.

4.2.2.3 Simplot Facility Soils — Areas with Sustained Hydraulic Head

This section discusses the results of the RI Phase I and Phase II facility soils investigation for areas where there was a sustained hydraulic head over the underlying soils. Areas without sustained hydraulic head are discussed in Section 4.2.2.2.

The areas with former or current sustained hydraulic heads include: the former water treatment settling pond, dewatering pit, upper gypsum stack, lower gypsum stack, former cooling pond, cooling tower area, water treatment ponds, and the former unlined ditch to the water treatment ponds. The locations of the soil borings associated with each of these areas are shown in Figure 2.1-3.

Former Water Treatment Settling Pond

The former water treatment settling pond is located immediately east of the current settling pond (Figure 1.2-1). At one time the settling pond was approximately twice its current size, occupying its current location and the area immediately to the east. The water contained in this pond was of essentially the same quality as water transferred to the holding pond, and of poorer quality than water that enters the equalization pond.

As part of the potential source investigation, boring S007B (see Figure 2.1-3) was advanced to groundwater–a depth of 25 feet below ground surface (bgs). Soil samples were collected at three levels: at the ground surface, and at 15 and 25 feet bgs (surface elevation 4,406 feet above MSL); they were then analyzed for the inorganic parameters listed in Table 2.1-1 as well as gross alpha and gross beta to assess the effect of the pond on subsurface soils. The soil in this boring consisted of fill (gypsum below 2 feet) from the surface down to approximately 12 feet bgs, followed by 3 feet of gravel. The sample at 15 feet bgs was collected in silty sand that extended approximately 7 feet. Groundwater was encountered at 24 feet bgs, and the sample at 25 feet bgs

was collected in gravel. The 25-foot sample was a grab sample of drill cuttings from the bottom of the hole.

The soil chemistry of samples collected from this boring is summarized in Table 4.2.2-22. An examination of the data indicates that cadmium (5.1 mg/kg), chromium (37.5 mg/kg), fluoride (1,600 mg/kg), nickel (15.9 mg/kg), total phosphorus (3,230 mg/kg), and zinc (85.3 mg/kg) were above representative soil levels. Cadmium, chromium, fluoride, total phosphorus, and zinc remained above representative levels in the 15-foot sample. This finding is to be expected as this sample was taken at the top of the first fine-grained unit below the gypsum fill, and only 3 feet of gravel separates the two units. All parameters were below representative in the 25-foot sample. This result indicates there has been minimal migration into the subsurface from the overlying fill. None of the soil horizons sampled contained gross alpha or beta above the representative levels.

Summary – Former Water Treatment Settling Pond. Soil samples from borings in the area of the settling pond show evidence of some downward migration of EMF-related constituents. Constituents found in the fill layer, which extends to 12 feet, have been attenuated by a 7-foot-thick fined-grained unit. This attenuation is evident in the soil sample taken at 15 feet–the top of the fine-grained unit. A sample taken below the fine-grained unit did not show evidence of EMF-related constituents.

Dewatering Pit

The dewatering pit is located directly to the west of the settling pond (Figure 1.2-1). Boring S008B was drilled from the bottom of the pit to groundwater (Figure 2.1-3). The soil in this boring consisted of pond sediment from the surface to approximately 2.5 feet bgs. The soil in the remainder of the boring consisted of sand (2.5 to 4 feet bgs) and gravel (4 to 27 feet bgs). Soil samples were collected at the surface and from depths of 2.5, 10, 20, and 26 feet bgs (surface elevation 4,409 feet above MSL). They were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1 to assess the effect of the pond on subsurface soils. Groundwater was encountered at 26 feet bgs.

The soil chemistry of samples collected from this boring is summarized in Table 4.2.2-22. An examination of the results of the chemical analysis indicates that the sediment sample contained above-representative concentrations of a number of constituents. These constituents include arsenic (15 mg/kg), beryllium (5.2 mg/kg), cadmium (131 mg/kg), chromium (2,710 mg/kg), copper (116 mg/kg), fluoride (30,000 mg/kg), lead (81.6 mg/kg), nickel (154 mg/kg), total phosphorus (51,300 mg/kg) vanadium (1,290 mg/kg), and zinc (3,510 mg/kg). With the exception of fluoride (710 mg/kg), all constituents were at or below representative levels in the 2.5-foot soil sample. Chromium and nickel showed some increase in the 10- and 20-foot samples (30.9 to 31.1 mg/kg and 34.4 to 37.6 mg/kg, respectively) but since these increases were not accompanied by increases in any other parameter, they are probably not EMF-related.

As with the inorganic parameters, gross alpha and gross beta activities were above representative levels in the sediment sample (406 ± 81.2 and 138 ± 21 ρCi/g, respectively). The native soil samples from 2.5 feet and below were all below representative levels.

Summary – Dewatering Pit. EMF-related constituents were found in the sediment sample taken in the dewatering pit at concentrations above representative levels. Other than fluoride in the 2.5-foot horizon, there was no evidence of migration of these constituents into the subsurface soils.

Former East Overflow Pond

During the RI field activities, the former east overflow pond was active, which precluded drilling within its boundaries. As a surrogate to investigate subsurface soil conditions, boring S099B was located immediately against the northeastern berm. This location was selected to detect any belling effects from leachate migrating from the unlined pond. Soil samples were taken at the 0-, 10-, 30-, and 50-foot horizons and tested for gross alpha, gross beta, and the inorganic parameters shown in Table 2.1-1.

The surficial sample is described as containing fill materials including gypsum. This description was confirmed in the analytical results where a number of constituent concentrations were above representative levels (Table 4.2.2-23). These constituents included: boron (26.4 mg/kg), cadmium (71J mg/kg), calcium (247,000 mg/kg), chromium (50.1 mg/kg), fluoride (9,250 mg/kg), mercury (1.2 mg/kg), and total phosphorus (3,960 mg/kg). Sulfate was also elevated at 15,300 mg/kg, and remained elevated in all horizons sampled (420 mg/kg at 50 feet). Gross alpha activity was also elevated (49.8 pCi/g), but gross beta activity (9.82 pCi/g) was well below the representative level. Aluminum (1,310 mg/kg) and iron (397 mg/kg) concentrations were depleted compared with representative levels.

The next two soil samples were taken in sandy gravels. Fluoride (7,030 and 9,480 mg/kg), and total phosphorus (1,360 and 4,230 mg/kg) were above representative levels; most of the remaining constituents were at or below representative levels. The exceptions were barium (396 mg/kg at 10 feet) and chromium (37.5 mg/kg at 30 feet).

The last sample was taken at 50 feet in a gravel approximately 4 feet above the water table. Again, fluoride (4,310 mg/kg) and total phosphorus (2,780 mg/kg) were above representative levels. Cadmium at 2.9 mg/kg, orthophosphate at 41.8 mg/kg, and zinc at 64.7 mg/kg also exceeded representative levels in this sample.

An examination of the pH levels recorded for each soil horizon (4.04, 5.57, 4.95, and 5.62) indicates that all horizons have been affected by EMF activities. The pond is known to have managed acidic materials.

Summary – Former East Overflow Pond. The boring placed next to the former east overflow pond showed evidence of effects from the pond. These effects are manifested in the elevated or above-representative levels of fluoride, total phosphorus, and sulfate, and in the reduced pH found in all tested soil horizons.

Upper and Lower Gypsum Stacks

The gypsum produced from the phosphoric acid process is slurried (28 to 32 percent solids) and pumped to the top of the gypsum stacks. The solids settle out of the water in this pond, and some of the water is recycled for further use in plant processes. Percolation of water placed at the top of the stacks is relatively slow due to the nature of the gypsum. As the stacks have grown, the settled material has become compacted into a dense silt with a permeability between 10^{-5} and 10^{-6} cm/sec. The upper gypsum stack (the southernmost stack) has been in operation since 1966. The lower gypsum stack (the northernmost stack) is the original gypsum stack and is again in use. Four borings were drilled through the upper gypsum stack to groundwater, and two borings were drilled through the top of the lower gypsum stack to groundwater.

Upper Gypsum Stack. Borings S003B, S004B, S005B, and S006B were drilled through the north face of this stack (Figure 4.2.2-4). Each boring was advanced to groundwater. Soil samples were collected at the interface between the gypsum and native soil and then collected approximately every 10 feet until the termination of the boring. To assess the effect of the stack on subsurface soils, soil samples were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1. The soil chemistry of samples collected from these borings is summarized in Table 4.2.2-24.

The soils in borings S003B, S004B, and S005B are predominantly silt. Boring S004B contained a band of light gray tuff from approximately 115 to 130 feet bgs that did not appear in borings S003B and S005B. The tuff is a fine sand. Soils in borings S003B, S004B, and S005B are characteristic of loess, silty alluvium, or colluvium derived from loess. Boring S006B appeared to have been drilled in an alluvial or colluvial soil that is predominantly sand and gravel, with bands of silt from 72 to 78 feet bgs and 94 to 119 feet bgs. Groundwater was encountered at 160 feet bgs in borings S003B and S004B and at 212 feet bgs in boring S005B. Groundwater depth was not logged in boring S006B. Ground surface was defined as the top of the gypsum stack at the time of boring. Gypsum thicknesses varied from 38 to 66 feet.

The soil chemistry of samples collected from borings S003B through S006B is summarized in Table 4.2.2-24. The first sample to be taken in S003B was approximately 10 feet below the gypsum/native soil interface in a silt. The overlying material between the silt and the gypsum was a gravel. The sample was described as wet. The analytical results indicate that arsenic, boron, cobalt, nickel, total phosphorus, and iron were above representative soil levels. There were intermittent exceedances of representative soil concentrations for several parameters for the next 30 feet but with no apparent pattern. With the encountering of a clayey sand at 135 feet, fluoride (1,100 mg/kg), lithium (29.7 mg/kg), total phosphorus (2,660 mg/kg), and zinc (80.8 mg/kg) were found at levels above the representative range. With the exception of total phosphorus, these parameters remained above representative levels in the 145-foot sample. Aluminum values for the 135- and 145-foot samples were also relatively high (26,200 and 25,200 mg/kg, respectively), indicating the potential for a high clay content.

The distribution of constituents throughout the S003B borehole column is not characteristic of a downward migration pattern. Rather, the silts through the first 40 feet of soils sampled beneath the gypstack displayed little indication of EMF-related constituents, suggesting that the constituents found in the clays in the 135 to145-foot depth range were either naturally occurring or were the result of attenuation of constituents from groundwater flow whenever levels rise to permit saturation or capillary action. Groundwater in this area is known to be affected by EMF-related constituents. Gross alpha and gross beta activities were within the representative range in all samples except in the clayey sands found at 135 and 145 feet where they were slightly above representative levels (26.4 ± 15.78, 34 ± 18.5 and 33.9 ± 11.6, 32.9 ± 11.44 pCi/g, respectively). This distribution pattern of the radionuclides also supports the interpretation that the constituents found in the clays were naturally occurring or derived from the underlying groundwater, not from infiltration from above.

The first sample taken in S004B was at the gypsum/native soil interface in the silt (53 feet). Analytical results indicate that a number of constituents were above representative levels. These

constituents included arsenic (13.2 mg/kg), beryllium (3.6 mg/kg), boron (42 mg/kg), cadmium (85.1 mg/kg), calcium (117,000 mg/kg), chromium (300 mg/kg), copper (454 mg/kg), fluoride (103,000 mg/kg), mercury (0.97 mg/kg), total phosphorus (29,200 mg/kg), selenium (27.8 mg/kg), vanadium (1,360 mg/kg), and zinc (551 mg/kg). With the exception of orthophosphate (250 mg/kg), and total phosphorus (1,190 mg/kg), all constituents were within representative levels in the next soil sample taken at the 60-foot horizon. Soil samples taken in the 70-, 80-, 90-, 100-, and 110-horizons in silts generally maintained this pattern. The 120-foot soil horizon was a tuff, and the total phosphorus concentration fell to well below representative (153 mg/kg), while the only constituents above representative levels were the gross alpha and gross beta activities (55.7 ± 32.4 and 46.4 ± 16.8 ρCi/g). The higher radionuclide readings are expected in this volcanic material and are likely naturally occurring. In the silty sand immediately below the tuff, several constituents were found at above-representative levels– aluminum (30,400 mg/kg), beryllium (2.6 mg/kg), boron (14.4 mg/kg), cobalt (8.2 mg/kg), copper (53.8 mg/kg), fluoride (610 mg/kg), iron (21,300 mg/kg), lithium (32.4 mg/kg), and zinc (155 mg/kg). These values were accompanied by low values of calcium (2,240 mg/kg), chromium (10.5 mg/kg), total phosphorus (291 mg/kg), vanadium (21.1 mg/kg), and gross alpha (9.25 +/-13.2 UJ ρCi/g). Attenuation of EMF-related constituents was not observed in the silts immediately above the tuff and the suite of above-representative level constituents in the soil below the tuff did not include several key EMF-related constituents (e.g., sulfate). In addition, these silts contained high levels of unrelated aluminum and iron. Thus, it can be concluded that the constituents found in the silty sand at 130 feet were probably naturally occurring.

In the brown silt beneath the sand in the samples from 150 and/or 160-foot depth, aluminum, beryllium, barium, cobalt, copper, fluoride, iron, lithium, mercury, nickel, orthophosphate, and zinc were above representative levels; all other constituents were below representative levels. The absence of elevated calcium and total phosphorus from the suite of constituents detected in these silts tends to confirm the interpretation that these constituents are naturally occurring.

The first soil horizon sampled in S005B was at 40 feet. This depth is about 3 feet below the gypsum/native silt interface. The following constituents were found to be above representative levels: cadmium (92.5 mg/kg), fluoride (1,600 mg/kg), nickel (30.8 mg/kg), orthophosphate (808 mg/kg), total phosphorus (14,100 mg/kg), and zinc (481 mg/kg). Gross alpha and gross beta activities were within representative levels. In the next soil horizon sampled (50 feet), only orthophosphate (179 mg/kg) and total phosphorus (8,070 mg/kg) were above representative levels. Samples taken at the 60-, 70-, 80-, 90-, 100-, 110-, and 120-foot horizons contained no constituents above representative levels, with some minor exceptions (manganese, 520 mg/kg at 110 feet; nickel, 15.8 mg/kg at 120 feet; cobalt, 10.2 mg/kg at 110 feet; lithium (16.4 mg/kg at 120 feet), and iron, 16,200 mg/kg at 110 feet). The geologic log indicates an increase in trachyandesite content in the soil horizons at 110 and 120 feet, which may account for the slight exceedances found in these horizons. There was a distinct change in lithology at 130 feet with an increase in sand content. The grains and accompanying gravels were described as being quartzitic and basaltic, the latter having a greenish hue. This change in lithology was paralleled by an increase in the aluminum content of the soil samples; aluminum increased to the 15,000 to 20,000 mg/kg range from under 10,000 mg/kg in the overlying soils. Nickel content also increased (range of 14.7 to 16.4 mg/kg), as did zinc (range of 45.2 to 63.2 mg/kg). These increases were probably due to a change in native soil composition rather than any effects attributable to the gypsum stacks. For the most part, constituents in the soil horizons from 120 feet to 220 feet remained within representative levels. The only exceedances for radionuclide activities occurred with gross beta at 190 feet (33.1 ± 11.8 pCi/g) and at 220 feet (32.7 ± 11.24 pCi/g).

The first sample taken in S006B was at the gypsum/native soil interface (44.6 feet). The native soils in this borehole were primarily silty sandy gravels. This sample contained a number of constituents at above-representative levels. The next sample down (55 feet) was also taken in a sandy silty gravel and also contained above-representative levels of a number of constituents. The relative value of these constituents suggest that the samples were switched at the laboratory

as the deeper samples have, in general, greater concentrations of gypsum stack-related constituents than the shallower sample, including a much lower soil pH (5.8) than the upper sample (7.04). Nevertheless, both samples show EMF-related effects. Constituents that were above representative levels include cadmium (25.8 mg/kg at 44.6 feet and 17.8 mg/kg at 55 feet), copper (18.1 mg/kg at 55 feet and 5.1 mg/kg at 44.6 feet), fluoride (310 mg/kg at 44.6 feet and 4,000 mg/kg at 55 feet), nickel (34.1 mg/kg at 44.6 feet and 29.8 mg/kg at 55 feet), total phosphorus (16,300 mg/kg at 44.6 feet and 5,540 mg/kg at 55 feet), and zinc (52.5 mg/kg at 44.6 feet and 150 mg/kg at 55 feet). Gross alpha and gross beta activities exceeded representative values in the 55-foot sample (69.4 ± 28.4 ρCi/g and 44.4 ± 12.88 ρCi/g, respectively). With several exceptions, concentrations of constituents detected in the soil samples taken at the 65-, 70-, 85-, 105-, 115-, 125-, 135-, 145-, 165-, and 169-foot horizons were within the range expected for representative soils. The exceptions were calcium at 115 feet (122,000 mg/kg), iron at 85 and 165 feet (17,400 and 17,100 mg/kg, respectively), arsenic at 165 feet (12.3 mg/kg), beryllium at 165 feet (1.1 mg/kg), and total phosphorus at 70, 115, 165, and 169 feet (1,180, 908, 2,300, and 839 mg/kg, respectively). Orthophosphate exceeded its representative level in all of the samples, except that collected at 125 feet. Gross alpha and gross beta activities were also intermittently above representative levels. With the exception of total phosphorus, these exceedances are probably not related to the gypsum stacks.

Summary – Upper Gypsum Stack. The native soils immediately below the gypsum stack contained concentrations of constituents that are related to the gypsum stack operation above representative levels. In most instances these concentrations returned to representative levels in the next sampling interval (10 feet into the native subsurface). In all instances they returned to representative levels by the 20-foot horizon. There were several constituents that were above representative levels in deeper samples. The subsurface concentrations of most constituents did not appear in a pattern indicative of downward migration from the gypsum stack. However, groundwater data suggest that a number of constituents (e.g., arsenic, lithium, and common ions) are not attenuated by the soils beneath the gypsum stack and therefore, likely pass through these soils.

There are changes in the lithology of the subsurface that could be responsible for these minor variations with depth.

Lower Gypsum Stack. Borings S001B and S002B were drilled through the top of this stack (Figure 4.2.2-4). Each boring was advanced to groundwater, and soil samples were collected beginning with the gypsum/native soil interface and then approximately every 10 feet until the termination of the boring.

The soils in borings S001B and S002B are a heterogeneous mixture of silt layers and sand and gravel layers, characteristic of the alluvial or colluvial soils in the EMF study area. Both borings were advanced through gypsum before encountering the native soil at approximately 65 feet bgs. Ground surface was measured from the top of the gypsum stack at the time of the boring. Both contained about 20 feet of silt from the gypsum/soil interface (65 feet bgs) to approximately 85 bgs. Boring S001B contains 20 feet of sandy gravel from 83 feet to 113 feet bgs, then another silt layer from 113 to 132 feet bgs, becoming more sandy from 132 to 137 feet bgs, and finishing in sand and gravel from 137 to 145 feet bgs. Groundwater was encountered in boring S001B at 138 feet bgs. The lithology in boring S002B is more variable, with silty gravel from 88 to 100 feet bgs, changing to sandy gravel from 100 to 116 feet bgs. Boring S002B contained another silt layer from 116 to 123 feet bgs, sand and sandy gravel from 123 to 148 feet bgs, and more silt from 138 to completion at 142 feet bgs. Groundwater was encountered in boring S002B at 136 feet bgs. Soils in borings S001B and S002B resemble those in boring S006B (upper gypsum stack).

The first sample taken in S001B was taken at the 65-foot horizon in a dark grayish brown silt. The large calcium (209,000 mg/kg), fluoride (13,180 mg/kg), and total phosphorus (4,000 mg/kg) values coupled with very low iron (605 mg/kg) and aluminum (3,070 mg/kg) values indicate that this sample contained a preponderance of gypsum (Table 4.2.2-25). Other constituents that were found to be above representative levels included cadmium (14.8J mg/kg), chromium (286 mg/kg), copper (111 mg/kg), mercury (26.6 mg/kg), selenium (8.9J mg/kg),

vanadium (314 mg/kg), and zinc (73 mg/kg). Gross alpha (68.8 ± 29.6 ρCi/g) and gross beta (43.3 ± 13.04 ρCi/g) activities were also above representative levels. In the next soil horizon (75 feet) most constituents returned to levels at or below representative levels. The exceptions were fluoride (580 mg/kg), orthophosphate (701 mg/kg), and total phosphorus (7,450 mg/kg). Also in this sample, cobalt (13.8 mg/kg), manganese (591 mg/kg), and nickel (50.6 mg/kg) increased to above-representative levels. This increase may indicate attenuation of these elements in the higher pH soil (6.94 versus 3.32 at 65 feet). No sample was recovered in the gravels at 85 feet. However, most constituents tested for in the 95-foot sample were within representative levels. The gravel layer underlying the initial silt was approximately 30 feet thick. A sample taken approximately 2 feet into the underlying silt indicated that there had been some migration of EMF-related constituents into it. Fluoride (1,500 mg/kg), potassium (4,010 mg/kg), sodium (985 mg/kg), and zinc (58.4 mg/kg) were detected at above-representative levels. All constituents except orthophosphate (12.8 mg/kg) and total phosphorus(800 mg/kg) were again at representative levels in the 125-foot sample.

The 65-foot soil sample taken in S002B was described as pinkish-gray fill. There were a number of constituents whose concentrations were above representative levels in this sample. As with the first sample collected in S001B, the high calcium (223,000 mg/kg), fluoride (6,920 mg/kg), and total phosphorus (3,410 mg/kg) concentrations and the low aluminum (1,710 mg/kg) and iron (790 mg/kg) concentrations indicated a large proportion of the sample was gypsum (Table 4.2.2-25). Other constituents with concentrations above representative levels included barium (680 mg/kg), boron (33.3 mg/kg), cadmium (6.5 mg/kg) chromium (207 mg/kg), copper (95.9 mg/kg), mercury (6.2 mg/kg), selenium (21.1 mg/kg), and vanadium (234 mg/kg). Gross alpha and gross beta activities were also above representative levels (150 ± 39.8 ρCi/g and 31.5 ± 7.3 ρCi/g, respectively). The brown silt in the 75-foot soil horizon also appeared to have been strongly affected by gypsum as it, too, had high calcium (265,000 mg/kg), fluoride (2,470 mg/kg), and total phosphorus (4,150 mg/kg) levels and low aluminum (624 mg/kg) and iron (274 mg/kg) levels. Both the 65-foot horizon and the 75-foot horizon had very low pH

values (3.24 and 3.29, respectively). The pH values in the brown silt in the 85-foot soil sample returned to near normal (7.32). At this soil horizon, there was a strong return of manganese (421 mg/kg from 7.1 in the 75-foot sample), nickel (33.1 mg/kg from 5.8U), and zinc (66.3 mg/kg from 13.5). This result suggests that these constituents were leached in the acidic soil conditions and attenuated in the higher-pH soils. Total phosphorus levels were intermittently above representative levels for the remainder of the borehole. The higher values are directly correlated with silt layers and represent attenuation of total phosphorus. Because of the absence of a thick silt layer in this borehole immediately below the gypsum, several trace metals may have migrated to deeper depths than found in other boreholes. For example, cadmium was found at 4.1 mg/kg in the first silt (120 feet) underlying the first gravel but was below representative levels in the 130- and 140-foot soil horizons. There were several elevated metals in the 140-foot silt sample. These constituents included chromium (22.3 mg/kg), copper (12.1 mg/kg), iron (16,100 mg/kg), manganese (524 mg/kg), and zinc (105 mg/kg). Since these constituents were not found at elevated levels in the silt immediately overlying them, it is unlikely that they were introduced through downward migration. Since this silt was below the groundwater table and the groundwater was affected by low levels of these constituents, it is possible that the levels detected represent attenuation of the metals from the groundwater. Other than in the first sample taken, gross alpha and gross beta activities were below representative levels in all samples tested.

Summary – Lower Gypsum Stack. In general, the observed pattern found in the upper gypsum stack of trace metal attenuation in the silts immediately underlying the stack was also seen in the lower stack area. However, where these silts are thin, such as is the case in S002B, there was evidence of some migration into the lower subsurface. This migration was reflected in higher concentrations of several trace metals in underlying silt layers than would be expected in natural silts. Total phosphorus was the only constituent to be found above representative levels in a generally top-down migration pattern that extended to the groundwater. This finding is

expected since it is not as strongly adsorbed by silts as are metals. There was no observed migration of radionuclides into the subsurface.

Former Cooling Pond

The former cooling pond location is shown in Figure 1.2-1. This unlined pond received cooling tower blowdown water discharged from the cooling tower during normal plant operations. Two borings, S070 and S071, were advanced in the area to a depth of 11 feet bgs during Phase I of the RI. Soil samples were collected from these borings at the surface, and at 2.5-, 5-, 7.5-, and 10-foot depths. The soil was analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1.

An examination of the chemical data from analysis of soil samples from boring S070B shows a pattern of layering consistent with mechanical placement of fill. For example, cadmium was at 28.1 mg/kg in the surficial sample (a sandy gravel), at 0.52U mg/kg in the 2.5-foot sandy gravel, at 53.5 mg/kg in the 5-foot silty sand, 1.4 mg/kg in the 7.5-foot silty sand, and to 44.1 mg/kg in the 10-foot silt. These sharp breaks indicate little soluble migration since the high and low concentrations do not correlate with either depth or texture (i.e., sands have both high and low concentrations, as do gravels). The soil column contained a number of other constituents that were above representative levels. These constituents included barium (825 mg/kg and 98.2 mg/kg), beryllium (0.57 mg/kg and 1.4 mg/kg), boron (152 mg/kg and 15.8 mg/kg), cadmium (28.1 mg/kg and 44.1 mg/kg), chromium (291 mg/kg and 17.8 mg/kg), copper (59.5 mg/kg and 8.4 mg/kg), fluoride (8,220 mg/kg and 850 mg/kg), nickel (28.1 mg/kg and 18.8 mg/kg), total phosphorus (49,000 mg/kg and 20,600 mg/kg), vanadium (455 mg/kg and 28.7 mg/kg), and zinc (273 mg/kg and 1,420 mg/kg) (Table 4.2.2-26). The above-representative level concentrations were detected in the surficial samples and in the 10-foot horizon (bottom of the borehole) and were not necessarily the highest concentrations encountered. The pH values also showed EMF-related effects ranging from 2.67 at the top of the soil column to 5.94 at 10 feet. The depth of impact was not determined in this borehole during Phase I.

The lithology in boring S071B was slightly different than that found in S070B, insofar as the first 5 feet was described as a black silt fill. The two soil samples (surface and 2.5-foot) collected in this material were found to have various constituents at concentrations above representative levels (Table 4.2.2-26). These constituents included barium (290 and 460 mg/kg), boron (151 and 156 mg/kg), cadmium (8.7 and 5.2 mg/kg), chromium (165 and 43.9 mg/kg), fluoride (123,000 and 177,000 mg/kg), mercury (5.4 mg/kg at 2.5 feet), total phosphorus (13,200 and 35,500 mg/kg), selenium (26.4 mg/kg at 2.5 feet), vanadium (165 mg/kg), and zinc (110J and 73.3 mg/kg).

The 10-foot soil horizon (red sand) continued to show some EMF-related effects. Above-representative level concentrations of barium (303 mg/kg), boron (92.6 mg/kg), fluoride (47,200 mg/kg), and total phosphorus (1,720 mg/kg) were evident. The pH remained low throughout the sampled soil column (range of 1.77 to 2.66). Gross alpha and gross beta were both above representative levels in the 2.5- and 5-foot soil samples (364 ± 71.2 and 111 ± 23.2 pCi/g at 2.5 feet and 160 ± 30.2 and 71.7 ± 12.96 pCi/g, respectively). However, radionuclide activities declined with depth. The vertical extent of EMF-related effects was not determined in this borehole during Phase I.

Phase II Results for Former Cooling Pond. To determine the vertical extent of impact of the former cooling pond, boring S100B was drilled during the Phase II field investigation. It was located as shown in Figure 2.1-3. Samples were collected from the surface and the 2-, 5-, 7-, 10-, 12-, 15-, 25-, 45-, 55-, 65-, and 80-foot depths. Groundwater was encountered at 74 feet bgs.

The first 14 feet of soils in this borehole were visually identified as fill. The analytical results for the five soil samples taken in this horizon confirm this, with widely varying constituent concentrations that range from well below to well above representative levels with little discernible pattern. Radiological activities were above representative values in all cases. These results (Table 4.2.2-26) are indicative of mechanically placed fill. Below the 13-foot mark is an

approximately 40-foot-thick sandy gravel. This borehole displayed no intervening native silt between the fill layer and the gravels. The geologic log indicates that there were occasional thin silt layers within the gravels; these might act as attenuating media for trace metals.

Concentrations of constituents found in the first two gravel horizons (15 and 25 feet) showed little pattern but many were above representative levels. These constituents included beryllium (2.2 mg/kg at 15 feet), boron (31.7J and 28.6J mg/kg, respectively), cadmium (143 mg/kg at 15 feet), chromium (91.4 mg/kg at 25 feet), fluoride (13,100 and 17,400 mg/kg, respectively), total phosphorus (23,100 and 5,060 mg/kg, respectively), vanadium (114 mg/kg at 15 feet), and zinc (1,130 mg/kg at 15 feet). Sulfate was also elevated at 1,960 and 20,400 mg/kg, respectively. Boron (25J mg/kg), chromium (38.3 mg/kg), fluoride (17,400 mg/kg), molybdenum (3.2 mg/kg), orthophosphate (71.6 mg/kg), and total phosphorus (1,980 mg/kg) were above representative levels in the 45-foot gravel. The 55-foot sample, which is the first silt sampled in the borehole, contained above-representative values of fluoride (980 mg/kg), manganese (605J mg/kg), nickel (61.7 mg/kg), and total phosphorus (23,700 mg/kg). Iron, while not above representative levels (12,900 mg/kg), was also enriched in this sample. The 55-foot sample was also the first one in which pH values approached neutral (6.57); the pH of the samples above 55 feet ranged from 2.47 (10 feet) to 5.75 (surface). The 65-foot sandy gravel horizon, with a pH of 9.01, contained no constituents above representative levels. The last sample in this borehole was taken at 80 feet in a clayey silt. This sample was approximately 5 feet below the water table. Several facility-related constituents were either enriched or above the representative level in this sample. They included copper (13.6 mg/kg), lithium (20.1 mg/kg), nickel (22.1 mg/kg), total phosphorus (718 mg/kg), sulfate (2,930 mg/kg), and zinc (67.8 mg/kg). Iron (21,800 mg/kg) was also above representative levels. Copper, nickel, and zinc are somewhat mobile trace metals that are occasionally found at slightly elevated levels in the groundwater beneath the Simplot facility. It is likely that their slightly enriched levels in this saturated clayey silt are due to attenuation from groundwater affected by upgradient sources. Likewise, lithium, total phosphorus, and sulfate are associated with affected groundwater and their presence in this sample is also likely to be

associated with groundwater affected from upgradient sources. The pH of the soil in this sample was basic (8.2).

Summary – Former Cooling Pond. The subsurface in the former cooling pond area consists of a 10- to 15-foot-thick fill layer with variable, but above-representative, levels of various EMF-related constituents. Effects of the cooling pond extended to at least 55 feet as evidenced by pH levels and above-representative concentrations of fluoride and total phosphorus. The silt layer at 55 feet appears to have formed an attenuating barrier to further downward migration. There was some evidence of EMF-related effects in the clayey silt sample taken at 80 feet. However, since this sample was below the groundwater table and the sample immediately above showed no EMF-related effects, it is likely that the constituents found in the 80-foot sample were due to attenuation from groundwater affected by upstream sources. Radiological parameters were only above representative levels in the fill areas. There was no evidence of their migration into the native soils.

Cooling Tower Area

The objective of the soil investigation in the cooling tower area was to determine if the soil in this area has been affected by cooling tower blowdown water spray from the cooling tower plant operations. Two borings, S068B and S069B, were drilled in this area (Figure 2.1-3). Boring S068B was advanced to a depth of 9 feet bgs; because of gravel content, boring S069B could not be advanced beyond the 2-foot depth. Groundwater was not encountered in these borings. Soil samples were collected from boring S068B at the surface and at the 2.5-, 5-, and 7.5-foot depths. Soil samples were collected from boring S069B at the surface and the 0.5-foot depth. The samples collected from both borings S068B and S069B were characterized as fill material. These samples were analyzed for gross alpha, gross beta, and the inorganic parameters listed in Table 2.1-1.

An examination of the chemical data from analysis of soil samples from borings S068B and S069B indicates that samples taken in the first 5 feet of the subsurface contain concentrations of

constituents that were above levels for representative soils (Table 4.2.2-27). The greatest values were generally found in the surficial soils and included boron (92.9 mg/kg and 122 mg/kg, respectively), cadmium (23.4 and 28.2 mg/kg, respectively), chromium (174 and 225 mg/kg, respectively), copper (38.8 and 39.7 mg/kg, respectively), fluoride (80,000 and 76,000 mg/kg, respectively), total phosphorus (14,300 and 11,500 mg/kg, respectively), vanadium (238 and 257 mg/kg, respectively), and zinc (174 and 230 mg/kg, respectively). Gross alpha and gross beta activities were above representative levels in this interval, with the greatest values occurring in the surficial sample at S068B (146 ± 34.6 ρCi/g and 55.9 ± 11.98 ρCi/g) and in the 0.5-foot sample in S069B (205 ± 46.8 ρCi/g and 77 ± 15.04 ρCi/g). Only soils in S068B were sampled at the 7.5-foot horizon. In this silty sand, only orthophosphate (849 m/kg), total phosphorus (8,730 mg/kg), and nickel (30.6 mg/kg) were above representative levels. While the total depth of impact was not determined during Phase I, it would appear that there is a distinct trend of decreasing impact with depth.

Phase II Results for Cooling Tower Area. The Phase II field investigation consisted of one boring, S101B, located as shown in Figure 2.1-3. Samples were collected from the surface and the 2-, 5-, 7-, 10-, 12-, 15-, and 17-foot depths. Boring S101B contained fill material to 3.8 feet bgs; it was primarily gravel to a total depth of 22 feet bgs with the exception of a thin silt layer from 10.8 to 11.2 feet bgs. Groundwater was not encountered in this boring.

The pattern observed in S068B was repeated in S101B regarding the fill layer. Above-representative concentrations of constituents in the first 3 feet included (maximum) barium (330 mg/kg), beryllium (1.7 mg/kg), boron (128 mg/kg), cadmium (18.5 mg/kg), calcium (192,000 mg/kg), chromium (239 mg/kg), fluoride (62,000 mg/kg), total phosphorus (33,700 mg/kg), potassium (6,570 mg/kg), vanadium (239 mg/kg), and zinc (227 mg/kg). Sulfate was also elevated at 730 mg/kg. These concentrations declined steeply in the 5-foot sample, which was below the fill area. Constituents above representative values in the 5-foot soil sample were fluoride (1,330 mg/kg), mercury (0.22 mg/kg), nickel (20.6 mg/kg), orthophosphate

(1110 mg/kg), total phosphorus (3,690 mg/kg), and zinc (117 mg/kg). The silt layer reported at the 10 to 11-foot horizon showed an attenuation of EMF-related constituents, reflected in the values of cadmium (2 mg/kg), fluoride (620 mg/kg), manganese (476 mg/kg), nickel (33.7 mg/kg), total phosphorus (2,560 mg/kg), sulfate (220 mg/kg), and zinc (155 mg/kg). While there was an occasional outlier, the only constituents consistently above representative levels in the 12-, 15-, and 17-foot soil horizons were orthophosphate, total phosphorus and zinc. The pH at the 17-foot horizon was 7.11, a value indicative of slight EMF-related effects. Gross alpha and gross beta activities were not above representative levels in this borehole except in the designated fill horizons.

Summary – Cooling Tower Area. Soil samples collected from borings in this area indicate fill layers up to 7.5 feet. These fill layers contain concentrations of EMF-related constituents that are above the representative range. Once below the fill layers, concentrations of EMF-related constituents declined rapidly. While there was some evidence of minor EMF-related effects at 17 feet (e.g., pH not above 8; zinc at marginally elevated levels–55.9 mg/kg compared to 52.4 mg/kg for representative), it is unlikely that major effects would be observed below this depth.

Water Treatment Ponds

A series of three lined ponds, located north of the main plant between Highway 30 and I-86, is used to treat noncontact cooling water, including boiler and cooling tower blowdown, compressor coolant water, demineralizer regeneration water, aqueous laboratory wastes (i.e., acids, ammonia, and sodium hydroxide), and stormwater, as well as emergency overflow from the former east overflow pond (Figure 1.2-1). Because the water treatment ponds are active, lined units, it was not practical to sample the soil beneath the ponds to assess the possibility of pond leakage. As an alternative, groundwater monitoring data were evaluated from wells located upgradient and downgradient of the ponds. The evaluation of water quality from these wells is discussed in Section 4.4.

Former Unlined Ditch to Water Treatment Ponds

The unlined ditch connected the facility drainage system to the water treatment ponds. It accepted the noncontact water from the facility drainage system through a pipe beneath Highway 30 as well as aqueous laboratory wastes. Water flowed from the plant through the pipe and into the unlined ditch, eventually discharging to the water treatment ponds. (Currently, water flows from the plant all the way to the ponds via closed pipe.)

To assess the effects of these discharges on soils beneath the unlined drainage ditch, soil samples were collected at six locations along the ditch as shown in Figure 2.1-4. At each sampling location, samples were collected at the bottom of the ditch and, for locations UDP01, UDP02, UDP03, and UDP04, approximately 2 feet below the ditch bottom. The samples were analyzed for gross alpha and gross beta activities as well as the inorganic parameters listed in Table 2.1-1. The soil chemistry data from analyses of these samples are summarized in Table 4.2.2-5. The findings for the surficial or sediment layer are discussed in Section 4.2.2.1, Simplot Potential Sources.

All four of the 2-foot soil samples contained concentrations of constituents above those for representative soils. These constituents included barium (276 to 7,850 mg/kg), cadmium (6.1 to 51.3 mg/kg), chromium (138 to 1,470 mg/kg), copper (14.7 to 57.6 mg/kg), fluoride (935 to 13,100 mg /kg), lead (17.1 to 83.4 mg/kg), mercury (1.4 to 47.2 mg/kg), nickel (14.4 to 50.1 mg/kg), total phosphorus (7,130 to 60,500 mg/kg), vanadium (150 to 496 mg/kg), and zinc (115 to 665 mg/kg). Gross alpha activity ranged from 38.9 ± 8.6 ρCi/g to 227 ± 23.2 ρCi/g. Gross beta activity ranged from 31.3 ± 5.96 ρCi/g to 150 ± 11.86 ρCi/g.

In summary, all samples collected from the unlined ditch evidenced EMF-related effects. Since the soils at the 2-foot depth were influenced by EMF-related constituents, additional vertical definition of the extent of contamination was addressed in Phase II of the RI.

Phase II Results for Unlined Ditch to Water Treatment Ponds. The Phase II field investigation consisted of two parts: completion of one boring, S097B, and collection of six sediment samples (SSODP01 through SSSODP06) and four subsurface samples (SBSODP01 through SBSODP04) at the 2-foot depth collected from the unlined ditch, located as shown in Figure 2.1-4. The 10 ditch samples were collected to verify high mercury concentrations in unlined ditch samples collected during the Phase I investigation. As a result, the ditch samples were analyzed for total mercury only. The results of the analysis of the sediment samples are discussed in the potential source section above.

While mercury concentrations were found to be lower in the Phase II 2-foot ditch samples compared to those in Phase I samples, the analyses did confirm the presence of mercury in the soils at above-representative levels. The highest mercury concentration in the Phase II ditch samples was SBSODP01, a 2-foot sample containing 7.2 mg/kg of mercury. Results are provided in Table 4.2.2-6.

Boring S097B was advanced to a depth of 33 feet bgs (Figure 2.1-3). Soil samples were collected at the surface and the 2-, 5-, 7-, 10-, 15-, 20-, and 25-foot depths. They were analyzed for gross alpha and gross beta and the inorganic parameters listed in Table 2.1-1. Soils from this boring were all gravel (a silty sandy gravel from the surface to approximately 25 feet bgs, and alluvial gravel from 25 to 33 feet bgs). Groundwater was encountered at 25 feet bgs. Analysis of the data from soil samples collected from these borings indicates that there is no consistent pattern of EMF-related effects on the soils in this borehole (Table 4.2.2-28). Although several constituents were found at concentrations above those for representative soils, the differences were generally very small. For example, total phosphorus was found only in the surficial and 15-foot samples at concentrations above representative levels (1,230 and 815 mg/kg versus the representative level of 672 mg/kg). Zinc was above representative levels at the 15-foot horizon (87.3 mg/kg) but at no other horizon. Fluoride was not detected above representative levels, nor

were chromium and vanadium. There does not appear to be any ditch or EMF-related effect on the subsurface soils in this borehole.

4.2.2.4 Simplot Facility Summary

The following summary discussion of the Simplot potential source and facility soil investigation is divided into two parts: the first part addressing areas not subjected to a sustained hydraulic head, and the second part addressing areas to which a sustained hydraulic head has been or is applied. Data from both sets of areas indicate that a large portion of the main Simplot plant area has been graded with fills. In general, these fills contain native soils mixed with EMF-related materials. The depth of the fill layer rarely exceeds 8 feet. The fill materials themselves often contain a number of constituents with concentrations in excess of soil representative soil levels.

The investigation of areas where there has not been a sustained hydraulic head has led to the following observations:

- When native soils are encountered beneath fill, trace metals are generally only measured at concentrations above soil representative levels in the first several feet of native soil.
- Radioactivity as measured in terms of gross alpha and gross beta tended to follow the same pattern as the trace metals. It is generally associated only with fills.
- In a number of samples, total phosphorus, fluoride and sulfate exceeded representative levels to depths below the fill/native soil interface of 10 feet or slightly more.
- Samples taken at or below road surfaces generally exhibited EMF-related effects in the surficial horizon; very little to no effects were observed in the 2-foot horizon.
- TPH were detected in several locations near the surface and on the roads. They were not detected at depth.
- PCBs were detected at levels below 1 mg/kg in several surficial samples. However, most samples analyzed for PCBs did not contain any at detectable levels. PCBs were not detected in any sample at depth.

These observations support the general conclusion that the main plant area has widespread surficial effects due to EMF-related activities in particular due to the use of EMF-related materials for fill. Even so, many of the surficial soils are beneath asphalt or concrete, and, in the absence of a sustained hydraulic head, there has been little effect on the subsurface native soils.

The investigation of areas where an artificial hydraulic head had been applied by an industrial activity (e.g., the gypsum stacks, east overflow pond) has led to the following observations:

- Trace metal concentrations are generally below soil representative levels within 20 feet of the source/native soil interface. In some areas where there is little to no silt horizon until some depth (northern portions of the facility), trace metals exceed representative levels at greater depths. Figures 4.2.2-5 and 4.2.2-6, which show cross-sections of the upper and lower gypsum stacks, respectively, illustrate these points for cadmium, lead and vanadium. (Cross section locations are shown on Figure 4.2.2-4.) Figures 4.2.2-7 (upper gypsum stack) and 4.2.2-8 (lower gypsum stack) depict arsenic, chromium and copper data. Some EMF-related constituents may be present in the soils at concentrations too low to enable distinguishing the constituents from their naturally occurring equivalents.
- Total phosphorus, fluoride and sulfate exceeded representative levels through most, if not all, of the soil column, in some but not all, areas with a sustained hydraulic head. Figures 4.2.2-9 and 4.2.2-10, which show cross-sections of the upper and lower gypsum stacks, respectively, illustrate this point for fluoride and phosphorus.

4.2.3 Characterization of Potential Sources and FMC Facility Soils

This section is organized into three major subsections. Section 4.2.3.1 describes the chemical composition of potential source materials that are part of the industrial operations at FMC. Sections 4.2.3.2 and 4.2.3.3 describe the chemical composition of soils sampled to assess the nature and extent of constituents associated with potential releases from these potential sources under present or prior plant operations. They also describe soil quality associated with the use of facility by-products as fill or roadbed material.

The potential sources addressed in this section do not include air emissions, which are addressed separately in RI Report Part III. Nevertheless, the chemical characterization of surface soils in

this section may reflect the effects of air emissions in addition to contributions from other sources. The effects of air emissions on soils in the vicinity of the EMF facilities are more specifically addressed in Section 4.3.

FMC areas described in this section are subdivided into:

- Active or formerly active areas not subject to a sustained hydraulic head except from natural precipitation (no sustained downward gradient or head due to aqueous streams from plant operations) (Section 4.2.3.2).
- Active or formerly active areas subject to a sustained hydraulic head from facility activities (i.e., to a sustained downward gradient or head due to aqueous streams from plant operations) (Section 4.2.3.3).

The rationale for this subdivision follows from an initial assumption made during the development of the EMF RI/FS Work Plan that EMF-related constituents would likely be present in higher concentrations and at greater depths in soils beneath areas to which a sustained hydraulic head was or is applied as opposed to areas subjected only to natural precipitation.

In the Pocatello area, evaporation far exceeds precipitation. The annual mean precipitation at the Pocatello Municipal Airport is approximately 11 inches per year, with the greatest amount occurring from March through May. Mean evaporation is greatest in the summer, totaling 29.76 inches for the 3-month period from June through August. The annual mean evaporation at the Pocatello airport is 61.14 inches (NOAA, 1982). Consequently, areas that are only exposed to natural precipitation have low infiltration rates (i.e., low transport potential). This subject is further developed in Section 5.

Aqueous streams from plant operations can increase infiltration above that caused by natural precipitation. This increased infiltration in turn increases the potential for downward migration of constituents through the unsaturated zone. Downward migration may be enhanced by the pH of the aqueous streams which are generally acidic (low pH) and contain high solute

concentrations. The extent of potential EMF-related effects was evaluated by comparing the soil characterization data with the soil representative levels presented in Section 4.2.1.

The overall conclusions reached in this section are generally consistent with the division of site areas into those with and without a sustained hydraulic head. First, in the absence of a sustained hydraulic head, EMF-related constituents were generally not measured in native soils at concentrations in excess of soil representative levels. Second, in the presence of a sustained hydraulic head, EMF-related constituent concentrations were generally below soil representative levels within 20 feet of the source/native soil interface. Elevated concentrations of phosphorus, fluoride, potassium and zinc, however, were frequently measured at greater depths.

4.2.3.1 FMC Potential Sources

To determine the potential constituents that may be released from FMC, chemical analyses were performed on feedstock (ore and pond sediment from coke-washing), coproducts (ferrophos), by-products (slag), and wastewater streams (phossy water/solids, precipitator slurry, calciner water/solids, and IWW ditch water/solids). Standing water and sediments in the railroad swale were also collected and analyzed. Information gathered from these analyses was then compared with the chemical analyses of soil samples to determine the potential source of the constituents found in the soils. This section of the report discusses ore, by-products, and wastestreams, with emphasis on the general characteristics and any unique characteristic that may enable an analyst to uniquely identify the material.

Nine FMC source areas/materials were examined during Phases I and II to ascertain the chemical composition of their matrices. The following general conclusions were reached:

- Phosphate ore, slag, precipitator dust, phossy water/solids, ferrophos, and calciner water/fines contain significantly higher concentrations of various trace metals and other constituents than do the native soils and waters.
- There are six constituents that appear in all of the solid materials that enable the source material to be identified when it is mixed with native soils or sediments. These

characteristic constituents are fluoride, total phosphorus, cadmium, chromium, vanadium, and zinc. [Note: When they occur as a group, they are underlined in the following text.]

- In addition to the six characteristic constituents, each of the above materials has unique concentrations of other constituents that allow for its identification, provided it is mixed in a matrix (soil or sediment) in sufficient quantity. For example, a soil with ferrophos mixed with it can be distinguished from a soil in which precipitator dust is present based on the relative levels of arsenic, iron, or potassium.
- To a lesser extent than the solid matrices, the wastewaters associated with phossy wastes, precipitator slurry, and calciner slurry also have enriched concentrations of various constituents that can be used to identify them as sources. These sources can be distinguished by the relative amount of arsenic, chloride, fluoride, total phosphorus, potassium, sodium, and sulfate.
- The railroad swale contains identifiable constituents of phosphate ore.
- The IWW ditch sediments contains constituents identified with precipitator dust and phosphate ore.
- The coke settling pond does not appear to have any constituents in it that could affect the composition of the native soils.

This subsection describes the analytical results for samples of the feedstocks, by-products, and wastewaters, as well as the samples from the railroad swale. This information is summarized at the end of the subsection.

FMC Phosphate Ore

One composite ore sample was taken from the FMC ore piles during the RI and analyzed for inorganic and radiological parameters. The sample was prepared using a nitric acid digestion method. As stated in the discussion of Simplot ore presented in Section 4.2.2, this method of digestion is less aggressive than the hydrofluoric and perchloric acid digestion method typically used by the phosphorus chemical industry. Consequently, the reported concentrations of various constituents of the ore composite sample are lower than they would have been had the sample been analyzed by the more aggressive technique.

Table 4.2.3-1 presents the analytical results for the ore sample. Constituents which exceeded soil representative levels are arsenic (14.6 mg/kg), cadmium (77.8 mg/kg), chromium (822 mg/kg), copper (104 mg/kg), fluoride (13,200 mg/kg), nickel (126 mg/kg), total phosphorus (65,900 mg/kg), vanadium (996 mg/kg), and zinc (991 mg/kg). Duplicate samples were analyzed for gross alpha and gross beta. Activities were greater than 200 ρCi/g for gross alpha and about 100 ρCi/g for gross beta (Table 4.2.3-2). A further distinguishing characteristic of the ore is its light reddish brown color.

Slag

Six composite samples of slag were taken during the RI and tested for inorganics and radioactivity (Table 2.1-1). The results indicated a calcium silicate base with fluoride and other impurities (Table 4.2.3-1). Of particular interest in making native soil/slag comparisons were the following: arsenic (not detected), cadmium (not detected to 32.4 mg/kg), calcium (255,000 to 290,000 mg/kg), chromium (172 to 290 mg/kg), fluoride (12,400 to 17,800 mg/kg), total phosphorus (1,610 to 5,680 mg/kg), potassium (6,780 to 8,220 mg/kg), vanadium (150 to 250 mg/kg), and zinc (36.4 to 450 mg/kg). Gross alpha activity ranged between 179 ± 22.4 ρCi/g and 240 ± 37 ρCi/g, and gross beta activity ranged between 74.7 ± 9.34 ρCi/g and 102 ± 9.74 ρCi/g) (Table 4.2.3-2). These activities are relatively high compared to natural soils and can be further utilized to identify a material that contains slag. Uranium-238 was detected in the slag samples, but lead-210 was not (Table 4.2.3-2). A further characteristic of slag is its dull gray color. Note the presence of the six characteristic constituents (underlined).

Ferrophos

Three ferrophos composite samples collected during the RI were analyzed for inorganics and radioactivity (Table 2.1-1). Ferrophos, as analyzed by nonstandard EPA methods, was approximately 50 to 60 percent iron, 25 to 30 percent total phosphorus, 4 to 5.5 percent vanadium, 3.5 to 4.5 percent chromium, 0.5 to 4.5 percent silicate, plus impurities (Table 4.2.3-1). The

material has a slight gloss when first produced but oxidizes to a dull light gray with time. Note the presence of three of the six characteristic constituents (underlined).

The results reported by the laboratory utilizing standard EPA methods (Table 4.2.3-1) indicated an iron, chromium-, and vanadium-rich material with noticeably (compared to native soils) high levels of copper (4..04 to 851 mg/kg), molybdenum (90.6 to 151 mg/kg), and nickel (535 to 1,150 mg/kg). Leachable (by nitric acid digestion) quantities of total phosphorus and potassium were relatively low (1,070 mg/kg and 603 mg/kg, respectively). Gross alpha activities were high compared with soils but low compared with slag (24.8 ± 11.98 ρCi/g to 70.4 ± 32.8 ρCi/g) (Table 4.2.3-2). Gross beta activities ranged from 22.5 ± 8.46 ρCi/g to 55.4 ± 15.12 ρCi/g.

Phossy Water and Solids

A composite sample of a phossy wastewater stream was taken during the RI. The results are displayed in Table 4.2.3-3. Of interest were the levels of the following trace metals: arsenic (0.145 mg/l), cadmium (0.023 mg/l), chromium (0.41 mg/l), vanadium (0.37 mg/l), and zinc (41.8 mg/l). Potassium (2,890 mg/l), total phosphorus (1,370 mg/l), and fluoride (436 mg/l) were also detected. Because this sample was not filtered, the results represent both dissolved-phase and solid-phase constituents. Note the presence of all six characteristic constituents (underlined).

Composite sediment samples were also collected from four phossy wastewater ponds (8S, 11S, 12S, and 15S). The results of analyses of these samples are presented in Table 4.2.3-1. There were a number of enriched trace metals and other constituents. Those trace metals and other constituents of interest included arsenic (20.4 to 256 mg/kg), cadmium (1,100 to 2,040 mg/kg), chromium (71.6 to 133 mg/kg), copper (41.7 to 74.9 mg/kg), fluoride (8,600 to 17,100 mg/kg), lead (185 to 386 mg/kg), total phosphorus (21,300 to 28,000 mg/kg), potassium (7,910 to 20,100 mg/kg), selenium (10.8 to 49.6 mg/kg) , silver (106 to 199 mg/kg), vanadium (42.9 to 93.4 mg/kg), and zinc (10,400 to 26,600 mg/kg). Note the enriched presence of all six characteristic constituents (underlined). The pH at which these solids exist within the ponds is in

the acidic range (less than 5.5). It is doubtful that they would be soluble in a higher pH environment. Phossy solids are gray to dark gray in color.

Comparison of the concentrations found in the pond sediment versus those detected in the wastestream indicated that the values found in the wastewater were probably contributed by constituents present in the solid phase, rather than in the dissolved phase.

Gross alpha and gross beta activities for phossy wastewater indicated enriched levels of gross beta (Table 4.2.3-3). The levels detected for one composite were 21.8 ± 26.2 ρCi/l for gross alpha and 2,420 ± 37.1 ρCi/l for gross beta. While a portion of the gross beta can be attributed to the presence of naturally occurring potassium-40 in the potassium-rich wastewater, there were other unidentified beta emitters contributing to this total. Radium-226 was also detected at 1.9 ± 0.56 ρCi/l.

The gross alpha and gross beta activities in the sediment samples were enriched (Table 4.2.3-2). Gross alpha values ranged from 71.1 ± 21.6 ρCi/g to 289 ± 39.8 ρCi/g. Gross beta ranged from 254 ± 26.2 ρCi/g to 783 ± 44.4 ρCi/g. Lead-210 was also analyzed in these samples and the range detected was from 204 ± 53.8 ρCi/g to 465 ± 117 ρCi/g. Uranium-238 was not detected.

Precipitator Slurry

A composite sample of precipitator slurry was taken from the pipeline transporting slurry to Pond 8E. The sample was not filtered and contained a considerable amount of suspended solids. The concentrations detected of note were cadmium (1.66 mg/l), chromium (2.03 mg/l), fluoride (1,510 mg/l), mercury (0.00027 mg/l), nickel (2.45 mg/l), total phosphorus (7,680 mg/l), potassium (9,890 mg/l), silver (2.45 mg/l), and zinc (5,210 mg/l). Full analytical results are presented in Table 4.2.3-3. Note the presence of five of the six characteristic constituents (underlined).

A composite sample of sediments from Pond 9E was collected during Phase I and analyzed for inorganics and radioactivity (Table 2.1-1). As can be seen in Table 4.2.3-1, the sample was

enriched in all trace metals that are associated with the ore, with some being at greatly increased concentrations. Of particular note were the concentrations of cadmium (2,410 mg/kg), fluoride (16,100 mg/kg), lead (338 mg/kg), total phosphorus (33,500 mg/kg), selenium (45.3 mg/kg), silver (218 mg/kg), vanadium (169 mg/kg), and zinc (21,400 mg/kg). Precipitator slurry is dark gray to black in color.

In Pond 8E wastewater, gross alpha and gross beta activities were elevated relative to representative groundwater values (Table 4.2.3-3). The values detected were 668 ± 122 pCi/l and 6,480 ± 136 pCi/l, respectively. While radium-228 was not detected, radium-226 was present at 103 ± 4.48 pCi/l. No other radionuclides were analyzed.

The sediments from Pond 9E contained 120 ± 26 pCi/g of gross alpha and 579 ± 33.4 pCi/g of gross beta (Table 4.2.3-2). Unlike the phossy waste, no lead-210 was detected in the precipitator slurry sediments. The uranium-238 activity was 8.36 ± 5.32 pCi/g.

Calciner Pond Wastewater and Sediment

In 1987, FMC changed the operation of its calciner unit to enable recycling of the scrubber water. This change in process also changed the composition of the wastewater by concentrating the dissolved solids. Wastewater released from the former, unlined calciner ponds would have had a composition somewhat different than that now found in the double-lined ponds. The available chemical composition (FMC, 1993) of the scrubber water in 1987 before the change was fully implemented indicates that the following constituents were present: fluoride (148 to 964 mg/l), chloride (149 to 1,175 mg/l), orthophosphate (140 to 4,300 mg/l), sulfate (250 to 1,250 mg/l), and cadmium (656 to 5,268 mg/l). These values are somewhat different from those detected in samples collected from the calciner ponds during the period of the RI (Table 4.2.3-3). In these more recent samples, the following constituents were detected: fluoride (134 mg/l), chloride (3,750 mg/l), orthophosphate (3,930 mg/l), sulfate (19,800 mg/l), cadmium (0.818 mg/l), arsenic (4 mg/l), total phosphorus (5,340 mg/l), potassium (19,330 mg/l), selenium (2.785 mg/l), vanadium (1.14 mg/l), and zinc (10.13 mg/l).

Calciner pond sediments, as shown both in a sample collected from an active pond (Table 4.2.3-1) and from samples of the sludges removed from the ponds for storage to the south of the ponds near borings F050B and F051B (Table 4.2.3-3), were enriched with a variety of constituents. Of special note for identification and evaluation purposes were cadmium (426 mg/kg), calcium (284,000 mg/kg), chromium (531 mg/kg), fluoride (191,000 mg/kg), total phosphorus (91,000 mg/kg), potassium (79,800 mg/kg), selenium (3.8 mg/kg), sodium (20,300 mg/kg), vanadium (607 mg/kg), and zinc (6,000 mg/kg) in the sediment sample from an active calciner pond. The characteristic constituents are underlined. In the samples of the calciner sludges, selenium values ranged from 0.94 to 47.5 mg/kg. The selenium concentration in the pond sediment sample was less than the levels of selenium present in calciner sediment found in the calciner sediment storage areas. Calciner sludges have a reddish gray to reddish brown color, depending upon the amount of weathering that has occurred.

Gross alpha was detected at 225 ± 33.6 pCi/g and gross beta at 111 ± 10.88 pCi/g in the active pond sediment sample. The latter value is considerably less than the activity found in the liquid sample. Given the amount of potassium in the sample, the gross beta value reported here is probably understated. Neither lead-210 nor uranium-238 was detected in the sediment sample.

IWW Ditch Water

The IWW Ditch conveys noncontact cooling water to the FMC outfall at the Portneuf River. Groundwater extracted by FMC production well FMC-3 is used to supply water to the IWW system. Samples from monitoring well 125, which is near production well FMC-3 and is not affected by EMF releases, are characteristic of the water used for noncontact cooling. (See Section 4.4 for monitoring well 125 water quality data.)

A grab sample of IWW ditch water was taken during Phase I and analyzed for inorganics and radiological parameters (Table 2.1-2). The results of these analyses indicated that the ditch water contained a number of constituents above representative groundwater and upstream river water concentrations (Table 4.2.3-3). These constituents included arsenic (1.76 mg/l), cadmium

(0.034 mg/l), copper (0.163 mg/l), fluoride (61.6 mg/l), total phosphorus (2,590 mg/l), potassium (7,470 mg/l), selenium (4.2 mg/l), sulfate (8,400 mg/l), and zinc (5.25 mg/l). Note the presence of four of the six characteristic constituents (underlined).

Gross alpha and gross beta activities were both elevated in the Phase I water sample (155 ± 95.9 pCi/l and 6,890 ± 145 pCi/l).

Phase II Results for IWW Ditch Water. During Phase II, 14 time-composite samples were collected from the ditch water over a 2-week period; the six samples obtained during the three highest periods of flow and the three lowest periods of flow were sent to the laboratory for analyses. The results of these analyses indicate a significantly different water quality than that found in the ditch in Phase. For the most part, all six samples had the same water quality as that found in monitoring well 125. Gross alpha activities in the Phase II samples were either not detected (2 pCi/l) or were within the representative groundwater levels. Gross beta activities were also low. However, there was one sampling event in Phase II (July 29, 1993-sample IWG) where radium-228 was detected at 6.5 ± 0.8 pCi/l.

FMC conducted an IWW ditch study to investigate the differences in water quality between the Phase I and Phase II IWW ditch water samples. The findings of the study are provided in Appendix L. The study indicates that the time composite samples collected during Phase II are more representative of ditch water quality than the sample collected in Phase I.

IWW Ditch Sediment

Six sediments samples were taken along the length of the IWW ditch during Phase I (Figure 2.1-2) and analyzed for inorganics and radioactivity. The composition of the soil matrix among these samples was varied, as seen by the range in calcium concentrations (72,800 to 161,000 mg/kg) (Table 4.2.3-3). All six samples contained above-representative levels of a number of constituents related to EMF industrial activities. Using the characteristic constituent scheme presented in the summary above, it appears that the soil matrices contained varying percentages of

precipitator dust and ore. The presence of ore in the ditch sediments was not unexpected because the ditch runs immediately to the east of the FMC ore piles. The presence of precipitator dust was unexpected because the IWW wastewater consists of groundwater used for noncontact cooling. However, as will be described in the sediments section of this report (Section 4.5), microscopic analysis of thin sections made from river sediments taken at the mouth of the ditch, as compared with samples of ore, slag, and precipitator dust, indicated that the matrix contained ore and precipitator dust.

Gross alpha and gross beta levels were also obtained for the ditch sediments (Table 4.2.3-3). As would be expected for materials that contain ore and precipitator dust, both gross alpha and gross beta activities were enriched. The range for gross alpha was 116 ± 16.72 ρCi/g to 299 ± 32.8 ρCi/g. The range for gross beta was 73.4 ± 7.98 ρCi/g to 134 ± 19.44 ρCi/g.

Railroad Swale

One sample of standing water in the railroad swale was analyzed for inorganics and radionuclides. Because the aluminum concentration found in this sample was elevated (9.83 mg/l), it is likely that the parameters found in the water are more reflective of suspended sediments than the dissolved fraction. Compared with surface water or representative groundwater concentrations, this sample contained elevated levels of a number of EMF-related constituents. These constituents included cadmium (0.152 mg/l), copper (0.139 mg/l), fluoride (4.2 mg/l), total phosphorus (21.3 mg/l), vanadium (0.77 mg/l), and zinc (1.58 mg/l) (Table 4.2.3-3). Note the presence of five of the six characteristic constituents (underlined).

Analysis of a sediment sample collected from the bottom of the swale revealed a number of constituents whose concentrations were above those found in representative soils (Table 4.2.3-3). An examination of the individual constituent concentrations and their relative abundance indicates that this sample contained a substantial amount of ore. This is not surprising given that the swale is approximately 500 feet from the ore piles and ore handling facilities.

Gross alpha (155 ± 25.6 ρCi/g) and gross beta (72 ± 8.94 ρCi/g) activities were above their representative levels in soils (Table 4.2.3-3). This is not unexpected if the swale sediment sample contains an ore fraction. In the ore sample, the ratio of gross alpha to gross beta was about 2 to 1; the same ratio was found in the swale sediment.

Coke Settling Pond

A sediment sample was collected during Phase I from the concrete-lined coke settling pond (Figure 2.1-2). This sample was tested for inorganics and radioactivity (Table 2.1-1). The results indicate a mineral-poor matrix with only cadmium (2.6 mg/kg), molybdenum (3.6 mg/kg), orthophosphate (15.9 mg/kg), and zinc (67.4 mg/kg) slightly above -soil representative levels (Table 4.2.3-3).

No detectable levels of gross alpha or gross beta were found in the coke-settling pond sediment sample (Table 4.2.3-2).

FMC Potential Source Summary

In general, the ore processing operations concentrate or disperse ore-related constituents in relatively unique ways. The primary constituents found in ore-related coproducts, by-products or wastes are total phosphorus, fluoride, cadmium, chromium, vanadium, and zinc.

There are other trace metals and cations that allow individual source materials to be identified. The following list presents distinguishing characteristics for each of the examined materials. The constituents which appear in boldface type are the most distinguishing characteristics. Figures 4.2.3-1 through 4.2.3-3 present the following characteristics in graphic form.

- Ore:
  - **Greater than 60,000 mg/kg total phosphorus**
  - **Greater than 500 mg/kg chromium, vanadium, and zinc**
  - **Greater than 10 mg/kg arsenic**

- Greater than 200,000 mg/kg calcium
- Greater than 10,000 mg/kg fluoride
- Greater than 200 ρCi/g gross alpha
- Approximately 400 ρCi/g gross beta

- Slag:
  - **Greater than 200,000 mg/kg calcium**
  - **Less than 10 mg/kg lead and arsenic**
  - **Up to 500 mg/kg vanadium and zinc**
  - Greater than 6,000 mg/kg potassium
  - Greater than 10,000 mg/kg fluoride
  - Between 180 and 240 ρCi/g gross alpha
  - Between 75 and 100 ρCi/g gross beta
- Ferrophos:
  - **Greater than 2,000 mg/kg vanadium and chromium**
  - **Greater than 30,000 mg/kg iron**
  - Less than 10 mg/kg arsenic and lead
  - Greater than 50 mg/kg molybdenum
  - Greater than 500 mg/kg nickel
  - Less than 2,000 mg/kg total phosphorus and potassium
  - Less than 70 ρCi/g gross alpha
  - Less than 55 ρCi/g gross beta
- Phossy solids:
  - **Greater than 20,000 mg/kg zinc**
  - **Greater than 1,500 mg/kg cadmium**
  - **Greater than 200 ρCi/g lead-210**

- Less than 100 mg/kg vanadium and silver
- Greater than 15,000 mg/kg potassium
- Greater than 20,000 mg/kg total phosphorus
- Greater than 20 mg/kg arsenic
- Greater than 200 mg/kg lead
- Between 70 and 300 ρCi/g gross alpha
- Between 250 and 770 ρCi/g gross beta

• Precipitator slurry/dust:

- **Greater than 10,000 mg/kg zinc**
- **Greater than 100 mg/kg silver**
- **Greater than 10,000 mg/kg potassium**
- **No lead-210**
- Greater than 200 mg/kg arsenic
- Greater than 20,000 mg/kg total phosphorus
- Approximately 2,410 mg/kg cadmium
- Approximately 120 ρCi/g gross alpha
- Approximately 580 ρCi/g gross beta

• Calciner pond sediments

- **Greater than 100,000 mg/kg fluoride and calcium**
- **Greater than 20,000 mg/kg potassium**
- **Up to 800 mg/kg selenium**
- Greater than 15,000 mg/kg total phosphorus and sodium
- Greater than 2,000 mg/kg zinc
- Greater than 600 mg/kg vanadium
- Greater than 300 mg/kg cadmium
- Greater than 20 mg/kg silver
- Approximately 225 ρCi/g gross alpha

— Approximately 110 ρCi/g gross beta

— No lead-210 or uranium-238

4.2.3.2 FMC Facility Soils — Areas without Sustained Hydraulic Head

This section discusses the results of the RI Phase I and Phase II soil investigation for areas without sustained hydraulic head. Where appropriate, results from the 1990 FMC Facility Assessment (FFA) are also included. Areas without sustained hydraulic heads include: the PCB storage shed; phossy waste/precipitator slurry pipeline cleanout areas; FMC septic drainfields; tree-line area adjacent to former Pond 7S; long-term phosphorus storage area; railcar loading/unloading area; secondary condenser area; former transformer salvage area; Bannock Paving Company area; chemical laboratory drain pit; paved area north of the furnace building; area west of the mobile shop; phos dock area; shale ore handling area; roads; waste oil storage area; 9S storage area; active landfill; and 8S recovery process. The locations of soil borings associated with each of these areas are shown on Figure 2.1-1.

Former PCB Storage Shed

The PCB storage shed was a concrete structure formerly used to store drums of transformer oil that contain concentrations of PCBs in excess of 50 mg/kg. Three borings (F043B, F044B, and F045B) were advanced in the former PCB storage shed area (Figure 2.1-1). Five soil samples were taken at approximately 2.5-foot intervals in each borehole and tested for inorganic parameters and PCBs. The EPA-approved work plan indicated that the first sample in each borehole should be taken just below the fill and native soil interface. Hence, no samples were taken at the surface in this area.

The first sample at boring F043B was obtained at a depth of 17 feet in a dark, yellowish brown silt; the overlying material. Examination of the analytical data indicates concentrations of several constituents above representative levels in the first 5 feet below the fill/native soil interface (Table 4.2.3-5). These constituents included barium (223 mg/kg at 17 feet) and zinc (71 mg/kg and 55.6 mg/kg at 17 feet and 19.5 feet, respectively). Mercury was above representative levels in

the 22-foot sample (0.79 mg/kg), and sodium concentrations increased with depth to above-representative levels (1,000 to 1,550 mg/kg). The mercury value appears to be isolated and is likely to be a laboratory artifact. While there were several constituents above representative levels at the interface, there did not appear to be any penetration into the subsurface of the trace metals, nor were the characteristic constituents of the site present at above-representative levels.

Radioactivity levels in F043B were generally within representative levels (Table 4.2.3-6). The one exception was gross alpha (25.3 ± 10.76 ρCi/g) in the 27-foot soil horizon. This is just above representative levels (24.7 ρCi/g). Given the high uncertainty value, this sample may be within the representative level range.

The first sample at boring F044B was collected at 2 feet in a very dark grayish brown silt. This color pattern was in the next two samples (4.5 feet and 7 feet). Surficial soils having a grayish hue were generally linked with fill materials. This link was confirmed by the analytical data for these three samples (Table 4.2.3-5). Thus, the samples collected at 2, 4.5, and 7 feet are fill material and not native soils. All contained significantly elevated concentrations of trace metals, calcium, fluoride, and total phosphorus. For example, high values for the FMC characteristic constituents were 229 mg/kg of cadmium, 834 mg/kg of chromium, 19,800 mg/kg of fluoride, 84,000 mg/kg of total phosphorus, 881 mg/kg of vanadium, and 1,610 mg/kg of zinc. However, the 9.5- and 12-foot samples were yellowish brown silts, which is typical of native soils. In these horizons, the trace metal levels fell to representative levels (except zinc, which was slightly above the representative level [60.9 mg/kg]), and fluoride and total phosphorus, which were close to representative levels (630 and 1,400 mg/kg, respectively). This abrupt break in concentration levels indicates that there was little or no subsurface migration of these constituents from the fill into the natural soils.

Both gross alpha and gross beta readings were above representative levels for the first three sample horizons in boring F044B (Table 4.2.3-6). The 9.5-foot sample also contained

above-representative levels of gross alpha (81.6 ± 23.4 ρCi/g) and gross beta (45 ± 10.1 ρCi/g). This indicates that there has been some radionuclide migration into the native soils. However, the depth of migration was limited, because soil samples taken at 12 feet (19.9 ± 10.72 ρCi/g for gross alpha and 26.1 ± 8.34 ρCi/g for gross beta) were within representative levels.

The first sample in boring F045B was taken at 3 feet. Further samples were collected at 5.5, 8, 10.5, and 13 feet below the ground surface. However, while the entire sampled column was a yellowish brown silt, it was also a fill, as seen by examination of the chemical analysis data. Concentrations of boron, cadmium, potassium, total phosphorus, and zinc fluctuated above representative levels for much of the sample intervals (Table 4.2.3-5). By the 10.5-foot horizon, all constituents were close to representative levels and at 13.5 feet were below representative levels. The area sampled by this boring appeared to be a mixture of predominantly native silts with some EMF-related by-product. The observed distribution of constituents indicated mechanical mixing rather than leaching, which would have resulted in a more linear, vertical gradient.

Gross alpha activities were within the representative level (Table 4.2.3-6) for the 3-, 5.5-, and 10.5-foot horizons. They were well below the representative level in the 13-foot sample. Gross beta activity was slightly above the representative level in the 5.5-foot soil horizon (32.6 ± 5.2 ρCi/g) but below the representative level in all others.

The PCB Aroclor 1260 was detected in boring F044 at 2 feet (0.58 mg/kg), 4.5 feet (0.03 mg/kg), and 7 feet (0.01 mg/kg). All three samples were taken in fill. No other soil samples tested for PCBs had detectable quantities (at a 0.65 mg/kg detection level). Hence, there did not appear to have been any movement of PCBs into the native subsurface soil.

Summary – Former PCB Storage Shed. Fill was found in all three boreholes. It ranged from 7.5 feet to 17 feet deep. All three fills sampled at this location showed some facility effects. Native soils sampled beneath the fills indicated that little to no migration of trace metals,

radionuclides, or other inorganics had occurred. Low levels of PCBs were detected in three of 15 soil samples taken in the subsurface at the former PCB storage shed. The three affected samples were in fill. There was no evidence of movement into the native soils below the fill.

Phossy Waste/Precipitator Slurry Pipeline Cleanout Areas

As was discussed in Sections 1 and 2, the pipelines leading from the production area to the surface impoundments in the western portion of the facility require periodic maintenance. To assess whether previous maintenance activities might have led to releases of small amounts of waste-related materials to the ground in the vicinity of maintenance access ports, ten areas were selected for investigation. As with the former PCB storage shed investigation, the intent was to advance borings into the first native soil encountered and take two samples. Soil samples were tested for inorganics and radioactivity (Table 2.1-1).

As discussed above, precipitator slurry and phossy water/solids were elevated in cadmium, copper, lead, silver, and zinc, and also contained other FMC-related trace metals and inorganics. These data were used in the analysis described below to determine if there was any effect from releases of precipitator slurry or phossy water/solids.

Boring F070B was located just to the north of Pond 8E (Figure 2.1-1). Two samples were taken at depths of 3 and 5 feet below ground surface. The materials sampled were a brown and brown-tan silt. Native silts in this area and at those depths would be expected to be yellowish brown. Therefore, it is likely that the materials sampled were a mixture of fill and native soils. This is borne out by the chemistry results of the two samples (Table 4.2.3-7). The following constituent concentrations were above representative levels: cadmium (1.9 to 8.3 mg/kg); fluoride (720 to 1,090 mg/kg); total phosphorus (1,030 to 2,020 mg/kg); and zinc (88.8 to 209 mg/kg). The lower values were all from the 5-foot horizon. Gross alpha was above the representative level in both samples (high of 31.9 ± 18.28 pCi/g in the 5-foot horizon) (Table 4.2.3-6). Gross beta was also above the representative level in the 5-foot sample. However, all of the radiologic analyses had relatively high uncertainty levels, and given the relative degree of elevation of the inorganic

parameters, it is likely that the reported radioactivity readings are biased high. A suite of constituents characteristic of precipitator slurry or phossy water/solids was not apparent at this location. Depth of facility effects was not determined at this boring.

Two samples were taken from boring F071B at depths of 5 and 7 feet below ground surface. Boring F071B is located just to the east of the mobile shop (Figure 2.1-1). The materials sampled were brown silt with a trace of slag and a gray gravelly silt. Native silts in this area and at those depths should be yellowish brown. Therefore, it is likely that the material sampled was primarily fill. However, the enrichment in these samples of FMC-related parameters was relatively low (Table 4.2.3-7). The following constituent concentrations were above representative levels: boron (20.6 mg/kg at 5 feet); cadmium (2.3 mg/kg at 5 feet); fluoride (750 mg/kg at 5 feet); mercury (0.4 mg/kg at 5 feet); total phosphorus (1,140 to 1,700 mg/kg at 7 and 5 feet, respectively); and zinc (58.2 to 85 mg/kg at 7 and 5 feet, respectively). Both gross alpha and gross beta were within representative levels (Table 4.2.3-6). A suite of constituents characteristic of precipitator slurry or phossy water/solids was not apparent in these samples. While the vertical extent of EMF-related effects was not determined at this boring, it appeared to decline with depth.

Boring F072B was sampled at two depths (8 and 10 feet). Slag fill was encountered above 8 feet. The borehole is located to the south of F071B (Figure 2.1-1). The samples were brown silt with a trace of slag and brown silt. Neither of these samples was from native soils. The analytical results indicated some EMF-related effects (Table 4.2.3-7). Concentrations of constituents above representative levels included boron (21.2 mg/kg at 8 feet); cadmium (4.1 mg/kg at 8 feet); chromium (43.5 mg/kg at 8 feet); fluoride (840 to 2,450 mg/kg at 10 and 8 feet, respectively); total phosphorus (1,020 to 1,150 mg/kg at 8 and 10 feet, respectively); and zinc (71.3 to 199 mg/kg at 10 and 8 feet, respectively). Both gross alpha (33.3 ± 11.52 pCi/g) and gross beta (33.7 ± 7.36 pCi/g) were above representative levels in the 8-foot sample (Table 4.2.3-6). A suite of constituents characteristic of precipitator slurry or phossy water/solids was not apparent at the

depths sampled at this location. While the vertical extent of EMF effects was not determined at this boring, it appeared to decline with depth.

Boring F073B was located approximately 300 feet to the west of boring F072B. It was sampled at two depths (14 and 16 feet). Slag fill was encountered above these depths. The top 3 inches of the 14-foot sample was a brown silt mixed with slag, whereas the remainder of the sample was a brown silt. The analytical results indicated some EMF effect (Table 4.2.3-7) in the upper sample that contained the slag; constituent concentrations above representative levels included cadmium (11.6 mg/kg); fluoride (740 mg/kg); total phosphorus (2,620 mg/kg); and zinc (316 mg/kg). Constituents at the 16-foot horizon were within representative levels with the exception of antimony (19.6 mg/kg); mercury (0.44 mg/kg), which was not detected in the 14-foot sample; orthophosphate (416 mg/kg); and total phosphorus (2,160 mg/kg). While the vertical extent of facility-related effects with respect to total phosphorus was not determined, elevated levels of the remaining constituents appeared to be confined to the 14-foot level or above. Gross alpha and gross beta were below representative levels in both soil samples (Table 4.2.3-6). A suite of constituent concentrations characteristic of precipitator slurry or phossy water/solids was not apparent at the depths sampled at this location.

Boring F074B was located just south of boring F073B (Figure 2.1-1). It was also sampled at two depths (10 and 12 feet). Slag fill was encountered above these depths. The textures of the two samples were gravel/slag fill and brown silt, respectively. The analytical results confirmed the presence of slag in the top sample and showed some EMF-related effects in the lower sample (Table 4.2.3-7). Constituents at above-representative levels for the slag/gravel sample included cadmium (32.3 mg/kg); fluoride (2,690 mg/kg); lead (84.5 mg/kg); mercury (0.33 mg/kg); total phosphorus (12,000 mg/kg); vanadium (52.9 mg/kg); and zinc (3,750 mg/kg). As is true with most slag/natural soil interfaces, there was little evidence of downward migration of trace metals. With the exception of boron (20.5 mg/kg) and zinc (59.4 mg/kg), which were just their respective representative levels, all other trace metals were at or below representative levels in the silt. The

only other constituents found at above-representative levels in the lower sample were orthophosphate (575 mg/kg), and total phosphorus (2,320 mg/kg). A suite of constituents characteristic of precipitator slurry or phossy water/solids was not apparent at this location.

Gross alpha activity was above the representative level in the 12-foot sample taken in boring F074B (71.8 ± 16.04 ρCi/g) (Table 4.2.3-6). Gross beta was also above the representative level for the 12-foot sample (77.8 ± 10.2 ρCi/g). They were both reported as being below representative levels in the 10-foot sample. At the EMF facilities, radioactivity levels should be proportional to the degree of enrichment of other EMF-related constituents. In other words, a soil affected by EMF-related inorganics, such as found at 10 feet in F074B, should also contain enriched levels of radionuclides. Since this does not appear to be the case here, there is strong reason to believe the sample results were switched.

Boring F075B was approximately 200 feet southeast of boring F074B. It was sampled at two depths (5 and 7 feet). Slag fill was encountered above these depths. The samples were brown silt with a trace of gravel. The analytical results indicate that these samples were not affected by facility activities.(Table 4.2.3-7). While the concentration of zinc in the upper sample (65 mg/kg) was above its representative level (52.8 mg/kg), other constituents characteristic of precipitation slurry and phossy water (e.g., elemental cadmium or potassium) were not elevated above representative levels. This suggests that EMF effects at this boring extended only to the depth of the overlying slag.

Gross alpha was above the representative range in the sample taken at 7 feet (31.1 ± 17.56 ρCi/g) (Table 4.2.3-6). Gross beta was below the representative level in both samples. The gross alpha measurements had a relatively high uncertainty level. Given the absence of enrichment of the inorganic parameters, it is likely that the reported radioactivity is biased high.

Two samples were taken at boring F076B (15 and 17 feet). Slag fill was encountered above these depths. Both samples were brown silt. This boring was located approximately 300 feet west of

F075B. The soil in the upper sample contained levels of constituents within representative levels (Table 4.2.3-7), with the exception of boron (23.1 mg/kg), orthophosphate (353 mg/kg), potassium (7400 mg/kg), and total phosphorus (1,470 mg/kg). The lower sample also indicated EMF-related effects. Constituent concentrations found at above-representative levels in the deeper sample included boron (26.1 mg/kg); cadmium (3.3 mg/kg); fluoride (820 mg/kg); total phosphorus (4,760 mg/kg); and zinc (139 mg/kg). The analytical results indicated the potential for mechanical mixing (i.e., these two samples are fill, not native soils). A leaching migration pattern from overlying materials should leave some evidence of the metals in the upper sample. This did not appear to be the case. Gross alpha levels were higher in the upper sample than in the lower (Table 4.2.3-6).

Boring F077B was located approximately 100 feet to the northeast of F076B (Figure 2.1-1). It was sampled at two horizons (5 and 14 feet). Slag fill was encountered above 5 feet. The samples were brown sandy silt with gravel and brown silt to gravel, respectively. It is possible that the gravels described in the boring log were slag; the analytical results support the presence of slag in both samples (Table 4.2.3-7). Slag is a calcium silicate that is also rich in fluoride with impurities. The very high value of calcium detected in this sample (196,000 mg/kg) coupled with the relatively high fluoride value (12,600 mg/kg) indicated a high percentage of slag matrix. Other constituent concentrations found at above-representative levels for the 5- and 14-foot samples included the typical suite of EMF-related elements: cadmium (14.2 and 98.2 mg/kg, respectively); chromium (124 and 208 mg/kg, respectively); fluoride (12,600 and 2,660 mg/kg, respectively); lead (106 mg/kg in the 14-foot horizon); total phosphorus (5,840 and 9,960 mg/kg, respectively); vanadium (114 and 211 mg/kg, respectively); and zinc (302 and 5,080 mg/kg, respectively). In general, the 14-foot sample contained higher concentrations of EMF-related elements than did the 5-foot sample. The suite of constituents in the lower sample indicates the presence of more than slag. The elevated levels of zinc, nickel (48.2 mg/kg), silver (32.4 mg/kg), and lead suggest the presence of phossy water/solids or precipitator slurry components.

Boring F078B, just to the west of Pond 8S, was also sampled at two depths (25 and 27 feet). Slag fill was encountered above 25 feet. The samples were tan silt and brown silt. The following constituents were present above representative levels: fluoride (800 mg/kg), mercury (0.63 mg/kg), orthophosphate (20.2 mg/kg), and total phosphorus (1,140 mg/kg) at the 25-foot horizon, and total phosphorus (1140 mg/kg) alone at the 27-foot (Table 4.2.3-7). Gross alpha and gross beta were within representative levels for both sample horizons (Table 4.2.3-6). Parameters directly traceable to precipitator slurry or phossy water/solids were not apparent at this location.

Boring F079B was located to the north of the 8S recovery process (Figure 2.1-1). This boring was located in the area of former Pond 6S. It was sampled at 5 and 7 feet below the ground surface. Slag fill was encountered above 5 feet. The samples were red-brown clayey silt and red-brown silt, which are not naturally occurring colors in FMC near-surface soils. The analytical results indicated a potential precipitator slurry or phossy water/solids effect in both soil samples (Table 4.2.3-7). This indication was given by the elevated levels of boron (18.8 and 35.4 mg/kg, respectively); cadmium (121 and 231 mg/kg, respectively); copper (20.9 mg/kg at the 7-foot horizon); fluoride (1,730 and 3,650 mg/kg, respectively); lead (28.8 and 84.1 mg/kg, respectively); silver (5.8 and 25.3 mg/kg, respectively); and zinc (1,960 and 6,960 mg/kg, respectively) and relatively low levels of calcium. Both the 5-foot and the 7-foot samples contained above-representative levels of gross alpha and gross beta (Table 4.2.3-6). There were a number of other parameters also above representative levels, as shown in Table 4.2.3-7. However, precipitator slurry and/or phossy water solids are generally not reddish in color, so there is the possibility that this was another EMF-related material. Since the 7-foot sample was affected and contained elements at higher concentrations than those found in the 5-foot sample, the vertical extent of the impact was not determined at this location.

Summary – Phossy Waste/Precipitator Slurry Pipeline Cleanout Areas. Ten locations along the pipelines leading from the plant to the surface impoundments that carry phossy water/solids and precipitator slurry were sampled to investigate the presence of releases from

these two potential sources. Two locations (borings F077B and F079B) were found to have evidence of releases associated with pipeline operations. The vertical extent of the impact was not determined during Phase I or Phase II. However, neither location was sampled at a substantial depth (greater than 10 feet) into the naturally occurring soils.

Effects related to other site activities, such as mechanical placement of fill, were evident in most of the locations sampled. The depth of visually recognizable fill, which generally contained slag and other EMF-related materials, varied considerably (3 to 25 feet) across the locations sampled. For the most part, when native subsurface soils were sampled, EMF-related parameters did not appear to have migrated into them from the overlying fill.

Septic Drainfields

Four locations (F046B, F047B, F048B, and F049B) were sampled in the area of the septic drainfields east of the facility main gate. This area is irrigated with water reclaimed from the IWW system. Each boring was advanced to between 10 and 11 feet, and three to five soil samples were taken at each location. The samples were analyzed for the normal suite of inorganic parameters plus gross alpha and gross beta (Table 2.1-1).

Three soil samples were collected at depths of 0, 7.5, and 10 feet at boring F046B (Figure 2.1-1). The three samples were topsoil (fill), slag gravel, and dark yellowish brown silt, respectively. The uppermost sample contained slightly elevated concentrations of fluoride (640 mg/kg), nickel (17 mg/kg), total phosphorus (844 mg/kg), potassium (4,290 mg/kg), sodium (939 mg/kg), and zinc (59.2 mg/kg) (Table 4.2.3-8). The fill sample taken at the 7.5-foot horizon also contained slightly above-representative values for orthophosphate (8.2 mg/kg) and total phosphorus (867 mg/kg). Fluoride was present at 1,160 mg/kg, about twice the representative range; all other parameters were within the representative range. The 10-foot sample, which was taken in natural soils, contained only orthophosphate (9.5 mg/kg) and total phosphorus (764 mg/kg) at concentrations slightly above-representative levels. No above-representative activities of gross alpha or gross

beta were detected in any of the samples (Table 4.2.3-6). There is no evidence of migration from the overlying fill of materials other than phosphorus compounds into the subsurface natural soils.

Boring F047B was advanced to 10 feet and samples taken at 2.5-foot intervals (total of five). The surficial topsoil sample had above-representative levels of cadmium (2.7 mg/kg), copper (20.1 mg/kg), fluoride (700 mg/kg), nickel (17 mg/kg), total phosphorus (1,200 mg/kg), potassium (5,270 mg/kg), and zinc (90.4 mg/kg) (Table 4.2.3-8). With the exception of fluoride (610 mg/kg) and total phosphorus (784 mg/kg) in the 2.5-foot horizon and orthophosphate (7.2 mg/kg) and total phosphorus (706 mg/kg) in the 5-foot sample, no constituent was at above-representative levels in the 2.5- and 5-foot samples. These soils were dark yellowish-brown silts. There was a slight change in soil color at 7.5 feet to a dark brown silt, and with it appeared above-representative levels of cadmium (4.4 mg/kg), fluoride (800 mg/kg), nickel (14.3 mg/kg), total phosphorus (1,320 mg/kg), and zinc (89.8 mg/kg). Since the horizon immediately above did not contain above-representative levels of any of these constituents, except total phosphorus which was only slightly above its representative level in the 5-foot sample, it can be concluded either that they are naturally occurring or that the soils have been laid down mechanically by site personnel. Concentrations of constituents in the soil sample at the 10-foot horizon, with the exception of total phosphorus (873 mg/kg), returned to representative levels. Therefore, there does not appear to have been any migration of trace metals from the overlying soil horizons into the subsurface. Gross alpha activities were below representative levels in all (Table 4.2.3-6). Gross beta activities were below representative levels for all horizons.

Like boring F047B, F048B was advanced from the surface to 10 feet, with soil samples taken at 2.5-foot intervals. Of the characteristic trace metals tested for, only zinc was above the representative level, and that was in the surficial sample. The uppermost sample was a dark brown topsoil fill; the remaining four were yellowish brown silts. Fluoride was above its representative level at the surface (1,690 mg/kg) Potassium exceeded the representative level in the 1.5-foot (3,610 mg/kg), 4-foot (4,080 mg/kg), and 9-foot (3,580 mg/kg) samples. Total

phosphorus exceeded representative levels in the 1.5-foot (881 mg/kg), 9-foot (732 mg/kg), and 11.5-foot (734 mg/kg) samples (Table 4.2.3-8). The surficial sample had elevated levels of gross alpha (85.8 ± 25.6 ρCi/g) and gross beta (36.5 ± 8.26 ρCi/g) (Table 4.2.3-6). However, gross alpha and gross beta in the remaining soil horizons were all below representative levels.

Finally, samples were taken at five horizons in boring F049B. The first horizon sampled was at a 1.5-foot depth below paving. All five intervals were yellowish to light yellowish-brown silts. Fluoride was elevated above representative levels in the 1.5-foot sample (650 mg/kg), 9-foot (1,240 mg/kg), and 11.5-foot sample (930 mg/kg horizons. Mercury was present above representative levels in all five soil samples, ranging from 2 mg/kg in the 1.5-foot sample to 0.28 mg/kg in the 11.5-foot sample (Table 4.2.3-8). The remaining constituents were generally below representative levels. Gross alpha (54.8 ± 19.38 ρCi/g) and gross beta (37 ± 8.3 ρCi/g) were above representative levels in the surficial soil sample (Table 4.2.3-6). As with boring F048B, the remaining sample horizons did not contain above-representative levels of radioactivity. Since fluoride, potassium, and mercury are generally associated with the other EMF-related constituents, their source in this borehole is unknown. It is possible that constituents such as orthophosphate have been introduced episodically through the irrigation water.

Summary – Septic Drainfields. The septic drainfield area had trace metals, anions (fluoride and total phosphorus), gross alpha, and gross beta in the surficial topsoils and near-surface soil above representative levels. With a few exceptions, the concentrations of these parameters do not persist with depth. The effect of EMF-related activities has been minimal in the area. As of April 1, 1995, all septic wastes are routed to the Pocatello sewage treatment plant (STP).

Tree-Line Area Adjacent to Former Pond 7S

Former Pond 7S was used for impounding precipitator slurry. The tree-line area lies just to the east along an access road. Three sample points were located between the trees and the pond itself

(Figure 2.1-1). Soils taken from this area were tested for inorganics, gross alpha, gross beta, and PCBs.

Boring F055B was advanced to 5 feet, and two samples were taken at the 3- and 5-foot horizons. The samples were a brown silty material. The 3-foot soil sample contained several trace metals (cadmium, chromium, copper, lead, nickel, silver, vanadium, and zinc) and fluoride and total phosphorus (Table 4.2.3-9) considerably above representative levels. While chromium, lead, silver, and vanadium values returned to representative levels at the 5-foot horizon, the remaining constituents did not. This is not surprising as the samples were probably within the pond area and consisted of slurry mixed with fill. No PCBs were detected at this location. Gross alpha and gross beta activities were above the representative levels in the 5-foot sample (46 ± 19 ρCi/g, and 42 ρCi/g, respectively) (Table 4.2.3-6).

Boring F056B was advanced to 7 feet, and two samples were taken at the 5- and 7-foot horizons. The samples were a tan-brown silt and a tan to black silt, respectively. The 5-foot soil sample contained above-representative levels of several trace metals, including cadmium (33.7 mg/kg), chromium (114 mg/kg), copper (21.3 mg/kg), nickel (31.6 mg/kg), vanadium (148 mg/kg), and zinc (437 mg/kg) (Table 4.2.3-9). Fluoride (2,630 mg/kg) and total phosphorus (9,530 mg/kg) were also above the representative range. The sample taken at the 7-foot horizon appeared to have been made up almost entirely of pure precipitator dust. Above-representative concentrations of constituents encountered in this sample included 5,610 mg/kg of cadmium, 242 mg/kg of chromium, 221 mg/kg of copper, 44,800 mg/kg of fluoride, 1,300 mg/kg of lead, 24.4 mg/kg of selenium, 786 mg/kg of silver, and 499,000 mg/kg of zinc. No PCBs were detected at this location. As would be expected with the levels of EMF-related constituents detected, gross alpha and gross beta were above the representative range (Table 4.2.3-6). The 7-foot sample had the higher levels of the two (1,530 ± 199.8 ρCi/g and 1,070 ρCi/g, respectively).

Boring F057B was advanced to 7 feet, and two samples were taken at the 5- and 7-foot horizons. The samples were a tan silt and a tan sand/silt with gray clay, respectively. The 5-foot soil sample

contained above-representative levels of several constituents, including cadmium (27.1 mg/kg), chromium (33.7 mg/kg), silver (2.1 mg/kg), and zinc (485 mg/kg). Fluoride (890 mg/kg)and total phosphorus (2,230 mg/kg) were also above the expected representative range (Table 4.2.3-9). The sample taken at the 7-foot horizon appears to contain precipitator dust, supported by its gray clay description. Above-representative concentrations of constituents encountered in this sample included 235 mg/kg of cadmium, 109 mg/kg of chromium, 28.3 mg/kg of copper, 3,330 mg/kg of fluoride, 56.9 mg/kg of lead, 9.1 mg/kg of selenium, 30 mg/kg of silver, and 3,860 mg/kg of zinc. No PCBs were detected at this location. Both samples had above-representative activities of gross alpha and gross beta (Table 4.2.3-6).

Summary – Tree-lined Area Adjacent to Former Pond 7S. The stated purpose for sampling in this area was to determine the presence or absence of PCBs. In addition, inorganics and radioactivity were measured to characterize the levels of constituents in the area of former Pond 7S. There was no intention to determine the depth of potential impact, and, hence, no further activities were conducted in this area during Phase II. The sampling confirmed the absence of PCBs and the presence of precipitator dust in the subsurface to a depth of at least 7 feet.

Long-Term Phosphorus Storage Area

Elemental phosphorus product is stored in tanks in this location. Two borings were drilled in the area to investigate subsurface soil conditions (Figure 2.1-1). The soil samples were analyzed for inorganic and radiological parameters (Table 2.1-1).

Boring F062B was advanced to 3 feet, and soil samples were taken at the 1- and 3-foot horizons (Figure 2.1-1). Both soil samples were described as tan-brown silts. Fluoride (1,500 and 1,010 mg/kg, respectively), total phosphorus (8,880 and 3,070 mg/kg, respectively), and zinc (58.9 and 55.9 mg/kg, respectively) were found above representative levels (Table 4.2.3-10). Boron was detected in the 1-foot sample at an estimated value of 24.7 mg/kg, which is above the

representative concentration of 12.8 mg/kg. Gross alpha and gross beta were within representative levels in both soil horizons (Table 4.2.3-6).

Boring F063B was advanced to 7 feet, and soil samples were taken at the 5- and 7-foot horizons. Both soil samples were described as brown silts. Several trace metals were detected in these soil horizons at above-representative levels (Table 4.2.3-10): chromium (47.2 and 126 mg/kg, respectively), copper (15.1 and 23.3 mg/kg, respectively), nickel (18.8 and 36.1 mg/kg, respectively), vanadium (59.2 and 131 mg/kg, respectively), and zinc (59 and 57.3 mg/kg, respectively). Fluoride and total phosphorus, generally strong indicators of EMF-related effects, were barely above representative levels in the 5-foot horizon (600 mg/kg and 855 mg/kg, respectively). Fluoride was below its representative level in the 7-foot horizon. In addition, iron was above representative levels in both horizons. The mix of above-representative constituents, representative constituents, and below-representative constituents is not typical of FMC wastewaters or by-products, and, while these are impacted soil horizons, the source is not clear. Values in the 7-foot soil horizon were generally greater than those found in the 5-foot horizon. Similarly, gross alpha and gross beta activities were above representative levels in the 7-foot-horizon but within representative levels in the 5-foot sample (Table 4.2.3-6). These observations may be an indication of downward migration. The vertical extent of impact was not determined at this location.

Summary – Long-Term Phosphorus Storage Area. The investigation at the long-term phosphorus storage area indicates that subsurface soils in some parts of the area have been affected. The extent of the effect is to at least 7 feet. The source of the effect has not been identified.

Railcar-Loading and -Unloading Area at Bannock Paving Company

Bannock Paving Company has historically loaded railcars with ferrophos and slag for offsite shipment. Soil conditions in the area of this railcar-loading area were investigated during Phase I.

Two borings were placed in this area and soil samples tested for TPH, PCBs, and inorganic parameters. (Figure 2.1-1.)

Boring F083B was advanced to 9 feet, and two samples were taken at the 5- and 9-foot horizons. The 5-foot sample was a tan-brown silt, and the 9-foot sample was a brown silt. Of the constituents measured, the following constituents were slightly above the representative range (Table 4.2.3-11): cadmium (1.3 mg/kg at 9 feet), zinc (54.4 mg/kg at 5 feet), aluminum (15,900 mg/kg at 5 feet), iron (15,000 mg/kg at 5 feet), selenium (4.5 mg/kg at 5 feet), total phosphorus (776 mg/kg at 9 feet), and mercury (0.57 mg/kg at 9 feet). Fill material (generally slag) was encountered above 5 feet.

Boring F084B was advanced to 7 feet, and two samples were taken at the 5- and 7-foot horizons. The 5-foot sample was a tan-brown silt with slag; the 7-foot sample was a brown silt. The sample containing slag had above-representative concentrations of cadmium (3.1 mg/kg), fluoride (1,680 mg/kg), mercury (0.38 mg/kg), total phosphorus (1,900 mg/kg), potassium (5,080 mg/kg), and zinc (207 mg/kg). The 7-foot sample had lower levels of fluoride, total phosphorus, potassium, and zinc. However, these values were still above representative levels. Mercury values remained nearly the same (0.42 mg/kg), and cadmium values were below representative levels (Table 4.2.3-11). Fill material was encountered above 5 feet.

No PCBs or TPH were detected in any of the samples from F083B or F084B. Gross alpha and gross beta activities were also within representative levels in these boreholes (Table 4.2.3-6).

Summary – Railcar-Loading and -Unloading Area at Bannock Paving Company. The subsurface in the vicinity of the Bannock railcar-loading area appears to have a fairly uniform 5-foot-thick slag fill layer. There is evidence that material from this fill has been mixed into the underlying soils to a minor degree. This mixing zone is to at least 7 feet in some areas.

Secondary Condenser Area

The secondary condenser is used to remove elemental phosphorus from furnace exhaust gases. It is in the same location as the former fluid bed drier which was used to dry and oxidize precipitator slurry. Subsurface conditions in this area were investigated by advancing two boreholes to a depth of 20 feet (Figure 2.1-1). Soil samples taken from these boreholes were tested for inorganic and radiological parameters.

Boring F052B was advanced beneath 0.5 feet of concrete to 20 feet and sampled at 2.5-foot intervals starting at 10 feet. The material above the 10-foot horizon was identifiable fill. The soil is a yellowish-brown silt. The soil at the 15-foot horizon also contained a trace of gravel. The samples taken in the first two intervals contained slightly above- or near-representative concentrations of cadmium (1.7 mg/kg and 1.6 mg/kg, respectively), zinc (47.9 mg/kg and 53 mg/kg, respectively), and total phosphorus (896 mg/kg and 914 mg/kg, respectively). Fluoride values for these samples (1,390 mg/kg and 1,140 mg/kg, respectively) were clearly above representative levels. In general, fluoride values declined with depth (Table 4.2.3-12). While several of the above constituents were present at above-representative concentrations in the deeper zones, there does not appear to be any overall evidence of migration, especially of trace metals. Like the trace metals, gross alpha activities were above representative levels in the 10- and 12.5-foot horizons but with depth (Table 4.2.3-6). Gross beta activities were at or near the high end of the representative level range for the 10-, 12.5-, and 15-foot horizons. They were well below representative levels in the 17.5- and 20-foot horizons.

Boring F053B was also advanced beneath 0.5 feet of concrete to 20 feet and sampled at 2.5-foot intervals starting at 10 feet. The material above the 10-foot horizon was identifiable fill. The soil is a uniformly dark brown silt. The sample taken at the 10-foot horizon contained no constituents above representative levels. However, the 12.5-foot samples contained a suite of constituents above representative levels that suggest slag particulate was part of the soil matrix (Table 4.2.3-12). This conclusion was reached because of the high levels of calcium (120,000 mg/kg),

coupled with elevated levels of boron (35.9 mg/kg), cadmium (4.1 mg/kg), chromium (91.9 mg/kg), fluoride (6,530 mg/kg), total phosphorus (1,760 mg/kg), vanadium (84.6 mg/kg), and zinc (79.1 mg/kg). The presence of particulate suggests there may have been some mechanical mixing of the natural soils in this area before fill placement. Soil horizons below 12.5 feet do not have these characteristics. However, there is some evidence of migration of zinc, fluoride, and phosphate into the deeper soil horizons. The same pattern is observed with gross alpha. The highest activity was at the 10-foot horizon (43.4 ±7.34 pCi/g). Gross alpha activity declined to below representative levels at 15 feet, but returned to an above-representative level activity at 17.5 feet. The 20-foot sample was once again below representative levels. This pattern suggests a downward migration of gross alpha emitters to at least 17.5 feet. The fall in activity at 15 feet can be attributed to a small gravel zone. Gross beta activities were only above representative levels at the 10-foot horizon (43.5 ± 4.87 pCi/g) (Table 4.2.3-6).

Summary –Secondary Condenser Area. Some evidence of EMF-related effects was found below the fill/native soil interface. However, the constituents encountered appeared to be related to slag rather than precipitator slurry. Also, there was evidence that the native soils had been disturbed by mechanical mixing of the soil with the fill probably before or during the placement of the 10-foot-thick slag-fill overburden. Some migration of zinc, fluoride, and phosphate, as well as alpha emitters, was also evident.

Former Transformer Salvage Area

The former transformer salvage area was used for storage of used transformers. Transformers are no longer stored there, and the area has been cleaned and graded. It is located near former Pond 1S. Subsurface conditions in this area were investigated by advancing two boreholes to a depth of approximately 12 feet (Figure 2.1-1). The soil taken from these borings was tested for inorganic, radiological, and PCB parameters (Table 2.1-1).

Boring F035B was advanced to 12 feet, and samples were taken at 2.5-foot intervals starting at the 2-foot horizon. The first sample was a slag fill; the remaining soil samples were reddish

yellow silts. The first two sample horizons contained above-representative levels of boron (50.1 mg/kg at 2 feet), cadmium (135 mg/kg and 81.7 mg/kg, respectively), chromium (94.6 mg/kg at 4.5 feet), copper (26.3 mg/kg at 4.5 feet), fluoride (1,330 mg/kg and 3,620 mg/kg, respectively), lead (98.7 mg/kg at 4.5 feet), nickel (45.4 mg/kg at 4.5 feet), total phosphorus (33,400 mg/kg and 49,900 mg/kg, respectively), potassium (13,600 mg/kg and 8,670 mg/kg), silver (26.8 mg/kg at 4.5 feet), vanadium (90.8 mg/kg at 4.5 feet), and zinc (19,300 mg/kg and 4,250 mg/kg, respectively) (Table 4.2.3-13). The high zinc values and the presence of above-representative levels of copper, silver, and nickel combined with the absence of high calcium values indicate the presence of precipitator dust or phossy water solids in these samples. The soil sample taken at 7 feet had a sharp break in constituent concentrations, with all but potassium, orthophosphate, and total phosphorus being at representative levels. This result indicates that there has been no downward migration of the trace metals. Both potassium and phosphorus continued to be found at above-representative levels in the 9.5-foot horizon. However, the remaining constituents were below representative levels. All constituents were below representative levels in the 12-foot horizon.

Radioactivity levels in boring F035B exceeded representative levels in the slag fill sample (Table 4.2.3-6). Gross alpha in this sample was 311 ± 25 pCi/g; gross beta was 187 ± 8.6 pCi/g. There was no migration into the subsurface from the fill. This result demonstrates both the association of radionuclides with slag material and their immobility in its matrix. Analyses of the soil samples taken from F035B for PCBs did not detect any PCBs at a 0.65 mg/kg level of detection. However, there were problems with the laboratory analysis of particular Aroclors, and resulting values were rejected during the validation process. New samples taken during Phase II were submitted to the laboratory. The results of these analyses were less than a detection limit of 0.2 mg/kg.

Boring F036B was advanced to 11 feet, and samples were taken at 2.5-foot intervals starting at the 1-foot horizon. All samples were light brown silts. The first four sample horizons all showed

evidence of facility effects. The horizon containing the highest concentrations of constituents was at 6 feet. This soil sample contained above-representative levels of cadmium (118 mg/kg), chromium (47.3 mg/kg), copper (25.2 mg/kg), fluoride (2,700 mg/kg), lead (69.7 mg/kg), nickel (19.5 mg/kg), total phosphorus (7,160 mg/kg), silver (21 mg/kg), vanadium (59.3 mg/kg), and zinc (2,740 mg/kg) (Table 4.2.3-13). This suite of constituents is usually associated with precipitator dust or phossy water solids. The lack of a discernible leach pattern (e.g., high concentrations tapering off with depth) indicates that the soils are probably not in their native state and are, instead, native silts that have been mechanically mixed with small amounts of precipitator dust or phossy water solids. This condition would explain the apparent random distribution of the various concentrations. All constituents except potassium, orthophosphate, and total phosphorus were within representative levels in the 11-foot sample.

Gross alpha and gross beta activities mimic the inorganic trends (Table 4.2.3-6). Both measurements exceeded representative levels in the 1-foot horizon, fell in the 3.5-foot-horizon, rose again in the 6-foot horizon, and reached their lowest point in the 11-foot horizon, again, demonstrating the radionuclides' association with EMF-related material and their lack of mobility. No PCBs were detected in the samples taken from this borehole (0.65 mg/kg detection limit).

Summary – Former Transformer Salvage Area. Soils in the vicinity of the transformer storage area have been affected by site activities. For at least the first 6 to 10 feet, native soils appear to have been mechanically mixed with precipitator dust or phossy solids either during grading or placement. There is no evidence of trace metals migration. Phosphorus and potassium, however, do appear to have moved downward into the subsurface. No PCBs were detected in the soil samples. Gross alpha and gross beta activities were above representative levels in several samples. However, their presence and mobility appeared to be similar to those of the trace metals.

Bannock Paving Area

In the past, Bannock Paving Company purchased slag from FMC for use in paving operations. This slag was stored in piles at various locations throughout the leased area. Three shallow boreholes were drilled in the area and sampled to investigate subsurface conditions (Figure 2.1-1). The soil samples were tested for inorganic, radiological, , TPH, and PCB parameters.

Boring F080B was advanced to 7 feet. Soil samples were taken at the 5- and 7-foot horizons. The overlying material was visually determined to be fill. Both of the soils taken from this borehole were tan-brown silts. Slightly above-representative values of lithium (18 mg/kg) and zinc (60.2 mg/kg) were found in the soil at the 5-foot horizon. Above-representative levels of chromium (33.9 mg/kg), fluoride (760 mg/kg), total phosphorus (934 mg/kg), and zinc (61.6 mg/kg) were found in the 7-foot interval (Table 4.2.3-14). The absence of any other associated parameters and the levels encountered in this borehole suggest that some minor leaching of constituents may have occurred from the overlying fill.

Boring F081B was advanced to 7 feet. Soil samples were taken at the 4- and 7-foot horizons. The overlying material was visually determined to be fill. As with F080B, both of the samples taken from this borehole were tan-brown silts. Constituents above representative levels in the 4-foot sample include mercury (0.26 mg/kg), orthophosphate (9.7 mg./kg,) fluoride (670 mg/kg), and potassium (4,520 mg/kg (Table 4.2.3-14). These constituents drop to levels very near or below representative levels in the 7-foot sample. The absence of any other associated constituents and the levels encountered in this borehole suggest that some minor leaching of constituents may have occurred from the overlying fill.

Boring F082B was advanced to 9 feet. Soil samples were taken at the 5- and 9-foot horizons. The overlying material was visually determined to be fill. Soils in the 5-foot interval were tan-brown sandy silts; soils at the 9-foot horizon were tan silt with sand. Barium and total phosphorus were slightly above representative levels in the 5-foot sample; aluminum was slightly above representative levels in the 9-foot soil sample (Table 4.2.3-14). All other constituents were

below representative levels. The absence of any other associated constituents suggests that there were no EMF-related effects in the samples taken in this borehole.

Gross alpha and gross beta activities were below representative levels for all samples tested (Table 4.2.3-6). Results for TPH were less than the a detection limit of 10 mg/kg. No PCBs were detected below a 0.65 mg/kg level of detection. However, there were problems with the laboratory analysis of particular aroclors, and these values were rejected during the validation process. New samples taken during Phase II were submitted to the laboratory. The results of these analyses were below a detection limit of 0.2 mg/kg.

Summary – Bannock Paving Area. Minor leaching from overlying fill was observed in soils taken from two of the three boreholes drilled in this location. There does not appear to be any significant EMF-related effects at the 5-foot horizon under the Bannock Paving Company operation.

Chemical Laboratory Seepage Pit

Prior to 1980, inorganic and organic chemical waste from the laboratory was disposed of in the laboratory seepage pit. (The chemical laboratory seepage pit will be plugged and abandoned during the summer of 1995.) Two boreholes were advanced beneath asphalt to 70 feet and the soils sampled at 10-foot intervals (with the exception of the 40- and 50-foot horizons where no samples were obtained in gravelly materials) to investigate subsurface conditions in this area (Figure 2.1-1). The soils were tested for a suite of inorganic and organic parameters as well as gross alpha and gross beta (Table 2.1-1).

The surficial sample at borehole location F028B contained slag. The analytical results indicated calcium (149,000 mg/kg), chromium (95.7 mg/kg), copper (17 mg/kg), total phosphorus (3,810 mg/kg), potassium (5,650 mg/kg), silver (2.3 mg/kg), and vanadium (99.5 mg/kg) were above representative levels (Table 4.2.3-15). Orthophosphate (4.8 mg/kg) and total phosphorus (952 mg/kg) were detected above representative levels at 20 feet. Total phosphorus (825 mg/kg)

was detected above representative levels at 30 feet, and aluminum (14,600 mg/kg), iron (15,200 mg/kg), lithium (17.7 mg/kg),and nickel (15.6 mg/kg) were detected at above representative levels at 70 feet. No other constituents were detected above representative levels at any of the other remaining four sample horizons. As would be expected with a sample containing slag, gross alpha and gross beta activities were above representative levels in the surficial sample (78.21 ± 6.97 ρCi/g and 45.82 ± 3.15 ρCi/g, respectively) (Table 4.2.3-6). Gross alpha and beta in all other soil horizons were below representative levels.

Two semivolatile compounds were detected in the soil samples in F028B. These compounds were bis(2-ethylhexyl)phthalate and di-n-butyl phthalate. Since they were always at levels below 1 mg/kg and are common analytical artifacts associated with sample handling and analysis, they are not considered to be a result of facility-related activities. Carbon disulfide was detected in several soil samples. This compound is a commonly used laboratory extractant. It is also very reactive and unlikely to be found in the environment in its free state. Acetone was detected in the sample taken at 10 feet. It was also detected in the laboratory method blank. Since it was not detected above or below the 10-foot horizon and was in the laboratory method blank, it is probably a laboratory artifact. Xylene was detected (0.008 mg/kg) in the surficial sample but not in any others. If it is present in this location, it is only surficial. Toluene, however, was detected at low levels (0.031 mg/kg to 0.159 mg/kg) in all soil horizons tested. Toluene is a chemical used by the laboratory. It is probably related to site activities. There was 1,1,1-trichloroethane (TCA) detected at the 70-foot horizon (0.006 mg/kg), but not at any shallower depth. This result suggests that its source, if it is present at all, is not from the shallower depths. Since this sample was taken where groundwater was encountered, the source of the TCA may be the groundwater. (See Section 4.4 for discussion of organics in groundwater.) No other volatile organic was detected at F028B.

The first soil-sampling interval at boring F029B was at 1 foot. The sample was a yellowish brown gravelly silt. From the constituents detected at above-representative levels, it appears that

the soil was mixed with some precipitator dust or phossy water solid (Table 4.2.3-15). Constituents above-representative levels included cadmium (7.3 mg/kg), chromium (30.7 mg/kg), fluoride (1,560 mg/kg), lead (56.4 mg/kg), total phosphorus (5,460 mg/kg), silver (9.8 mg/kg), and zinc (1,390 mg/kg). A 10-foot soil sample was not taken. However, soil from the 20-foot horizon contained above-representative levels of mercury (0.21 mg/kg), orthophosphate (12.3 mg/kg), total phosphorus (1,100 mg/kg), and zinc (57.3 mg/kg. Mercury (0.19 mg/kg) and total phosphorus (730 mg/kg) continued to exceed representative levels in the 30-foot sample, but were below representative levels in samples from greater depths. The gross alpha and gross beta readings were above representative levels in the 1-foot sample (33.09 ± 4.34 ρCi/g and 33.5 ± 3.01 ρCi/g, respectively) and, like the trace metals, declined with depth (Table 4.2.3-6).

As with F028B, bis(2-ethylhexyl)phthalate and di-n-butyl phthalate were detected. These compounds are not likely related to site activities as explained above. Carbon disulfide was also detected and, as explained above, is probably not related to site activities. Toluene and xylenes were found at low levels in the surficial and 20-foot samples. They did not appear in the 30- and 60-foot samples. However, xylenes and ethylbenzene were present (0.018 mg/kg and 0.004 mg/kg, respectively) in the 70-foot sample. The organic compounds detected in the 10- and 70-foot samples are probably unrelated. No other volatile organic compounds were detected.

Summary – Chemical Laboratory Seepage Pit. Surficial samples at the two locations chosen to investigate the chemical laboratory seepage pit showed evidence of facility effects with reference to inorganic parameters. However, this soil horizon is not sufficiently deep to reflect effects of the drain pit. The deeper horizons in one borehole showed no evidence of EMF effects, and those in the other borehole indicated slight downward migration of phosphate and zinc to a depth of 30 feet. Deeper soils did not show evidence of EMF effects. Above-representative levels of gross alpha and gross beta were confined to the first sample taken in both boreholes. The level of activity correlated well with the presence of other EMF-related parameters. There was no evidence of vertical migration.

Toluene was found at low levels in most soil samples taken in F028B and several samples taken in F029B. Its presence in the subsurface is probably related to site activities. Several volatiles (TCA, xylenes, ethylbenzene) found in low concentrations at depth near the groundwater table may be related to groundwater contamination from a source other than the one investigated here. (See Section 4.4 for discussion of organics in groundwater.) Other semivolatile and volatile organics found in the two boreholes are probably artifacts of the sampling and analysis process.

Paved Area North of the Furnace Building

Subsurface conditions beneath four paved areas north of the furnace building were investigated during Phase I. Two soil samples were taken in each borehole and tested for inorganic parameters and gross alpha and gross beta (Table 2.1-1).

Boring F066B was advanced beneath asphalt to 5 feet. Soil samples were taken at the 3- and 5-foot horizons. The overlying material was visually determined to be fill. Soils in the 3-foot interval were tan-brown silt and sand; soils at the 5-foot horizon were tan-brown silt and sand with slag. Since slag was visibly identified in the lower sample, neither of these horizons can be considered undisturbed native soils. Orthophosphate 3.8 mg/kg) slightly exceeded its representative level in the first horizon, and the only evidence of slag in the second was slightly elevated levels of total phosphorus (860 mg/kg) and zinc (56.1 mg/kg) (Table 4.2.3-16). Gross alpha and gross beta activities in the upper sample were well below their representative levels (Table 4.2.3-6). However, as would be expected with the presence of slag, gross alpha in the 5-foot sample as close to its representative limit (23.2 ± 7.57 ρCi/g versus representative level of 24.7 ρCi/g). EMF-related effects to 5 feet in this area were minimal.

Boring F067B was advanced beneath asphalt to 9 feet. Soil samples were taken at the 5- and 9-foot horizons. The overlying material was visually determined to be fill. However, soils in both the 5-foot and 9-foot intervals were tan-brown silt with slag. Since slag was visibly identified in both samples, neither of these horizons can be considered undisturbed native soils. The 5-foot interval showed definite chemical evidence of the presence of slag (Table 4.2.3-16).

This soil sample contained above-representative levels of cadmium (8.5 mg/kg), calcium (85,400 mg/kg), chromium (48.9 mg/kg), fluoride (4,300 mg/kg), mercury (1.1 mg/kg), total phosphorus (1,440 mg/kg), vanadium (54.6 mg/kg), and zinc (199 mg/kg). However, even though slag was visually seen in the second interval, the analytical results showed no constituents above representative levels other than orthophosphate (3.8 mg/kg) which was just slightly above its representative level of 3.7 mg/kg. This same pattern is repeated for the gross alpha and gross beta activities (Table 4.2.3-6). The upper sample was above representative levels for both gross alpha (32 ± 9.14 ρCi/g) and gross beta (36.6 ± 3.82 ρCi/g). Activities in the lower soil sample were well within representative levels. Visual classification of the lower sample as containing slag may be incorrect.

Boring F068B was advanced to 5 feet. Soil samples were taken at the 3- and 5-foot horizons. The overlying material was visually determined to be fill. Soils in the 3-foot interval were red-brown silt; soils at the 5-foot horizon were tan-brown silt. Aluminum (16,100 mg/kg at 3 feet, 15,000 mg/kg at 5 feet), mercury (0.39 mg/kg at 5.3 feet, 0.37 mg/kg at 5 feet), iron (14,800 mg/kg at 5 feet), and lithium (17.3 mg/kg at 5 feet) were the only constituents above representative levels in the two horizons (Table 4.2.3-16).

Boring F069B was advanced to 5 feet. Soil samples were taken at the 3- and 5-foot horizons. The overlying material was visually determined to be fill. Soils in the 3-foot interval were brown silt; soils at the 5-foot horizon were tan-brown fine silt. Aluminum (14,300 and 14,400 mg/kg), mercury (0.23 and 0.19 mg/kg), and total phosphorus (737 and 711 mg/kg) were slightly above representative levels in both horizons (Table 4.2.3-17). Gross alpha, was at its representative level in the 5-foot sample (24.1 ± 6.92 ρCi/g); gross beta activity was slightly greater than its representative level for the same sample (32.1 ± 5.31 ρCi/g) (Table 4.2.3-6).

Summary – Paved Area North of the Furnace Building. In general, this area contained a fill layer of varying depth that showed some evidence of the presence of EMF-related parameters. Effects, however, appeared to be limited to 3 to 5 feet.

Area West of the Mobile Shop

The mobile shop is thought to be built over or near the former precipitator dust Ponds 0S and 00S. It handles oils and lubricants. Two shallow borings were drilled to the west of the shop to investigate subsurface conditions. Soil samples were tested for inorganic parameters, TPH, PCBs, gross alpha, and gross beta (Table 2.1-1).

Soil samples were taken at 1 and 2 feet in borehole F060B. The top sample was described as a dark brown silt with gravel. The bottom sample was described as a dark brown to black sandy silt with gravel. Both of these samples are probably fill. Both of these samples contained a substantial amount of slag with precipitator dust or phossy water solids (Table 4.2.3-17). Constituents with concentrations above representative levels included cadmium (82.1 mg/kg), chromium (281 mg/kg), fluoride (12,210 mg/kg), lead (122 mg/kg), silver (28.8 mg/kg), and zinc (4,690 mg/kg).

Gross alpha and gross beta activities were above representative levels in both soil samples tested at F068B. The greatest activities were in the 2-foot sample (135 ± 17.5 ρCi/g and 79.1 ± 6.94 ρCi/g, respectively) (Table 4.2.3-6). No PCBs were detected at the 0.65 mg/kg level of detection. However, there were problems with the laboratory analysis of particular aroclors, and these values were rejected during the validation process. New samples taken during Phase II were submitted to the laboratory. The results of these analyses were below at a detection limit of 0.2 mg/kg. TPH was detected in both soil horizons. The value for the surficial sample was 9,025 mg/kg; the 2-foot sample concentration was 2,262 mg/kg. The vertical extent of affected soils was not determined in this borehole.

Soil samples were taken at 1 and 2 feet in borehole F061B. The top sample was described as a dark brown sandy silt with gravel. The bottom sample was described as a gray-black silty sand with gravel. Both of these samples are probably fill. As with location F060B, analytical results indicated that both of these samples contained a substantial amount of slag with precipitator dust (Table 4.2.3-17). Constituents with concentrations above representative levels included cadmium (446 mg/kg), chromium (241 mg/kg), fluoride (9,280 mg/kg), lead (420 mg/kg), silver (124 mg/kg), and zinc (20,400 mg/kg).

Gross alpha and gross beta activities were above representative levels in both soil samples tested at F068B. The greatest activities were in the 2-foot sample (192 ± 20.6 ρCi/g and 145 ± 9.75 ρCi/g, respectively) (Table 4.2.3-6). No PCBs were detected at a 0.65 mg/kg level of detection. However, there were problems with the laboratory analysis of particular aroclors, and the resulting values were rejected during the validation process. New samples taken during Phase II were submitted to the laboratory. The results of these analyses were below at a detection limit of 0.2 mg/kg. TPH was detected in both soil horizons. The value for the surficial sample was 162 mg/kg, while the 2-foot sample concentration was 33.6 mg/kg.

Summary – Area West of the Mobile Shop. Soils in the shallow subsurface in the vicinity of the mobile shop have been heavily affected by facility activities. These soils appeared to be fill. Native soil was not encountered at the 2-foot mark.

Phos Dock Area

Elemental phosphorus is handled in the paved phos dock area. Two borings were planned for this location, but because of the presence of numerous overhead lines, only one was actually drilled (Figure 2.1-1). The soils were tested for inorganics and gross alpha and gross beta (Table 2.1-1).

Boring F064B was advanced to 4.5 feet. Two soil samples were taken at the 2.5- and 4.5-foot horizons. The 2-foot sample was described as a brown sandy silt with a trace of slag. The 4.5-foot sample was described as a brown silt with a trace of gravel. Both samples appeared to be

fill and contained above-representative levels of various constituents: chromium (29.8 mg/kg and 31.5 mg/kg, respectively), fluoride (2,520 mg/kg and 3,860 mg/kg, respectively), mercury (0.72 mg/kg and 1.4 mg/kg, respectively), total phosphorus (17,100 mg/kg and 15,600 mg/kg, respectively), and zinc (150 mg/kg and 157 mg/kg, respectively) (Table 4.2.3-18). Since total phosphorus and fluoride were relatively elevated and calcium was not, the above-representative constituents do not appear to be associated with slag.

Gross alpha and gross beta activities were below representative levels in the 2.5-foot horizon, although the gross beta activity (30.4 ± 5.18 ρCi/g) approached its representative level of 31.4 ρCi/g. Gross alpha was above its representative level (Table 4.2.3-6). The activities mimicked the pattern observed for the inorganics (i.e., the deeper sample–which contained higher concentrations of inorganic parameters–also contained higher activities of gross alpha and gross beta).

Summary – Phos Dock Area. Both soil samples taken in the phos dock area contained above-representative levels of parameters generally associated with materials handled by the facility. The soils were apparently from a fill zone. Native soils were not sampled. Hence the area can be said to contain affected fill to a depth of at least 4.5 feet.

Shale Ore Handling Area

Shale ore is dumped into a below-ground hopper where it is placed on the stockpile by conveyers and other specialized equipment. Five locations were selected to investigate the effect of these activities on the subsurface soils (Figure 2.1-1). The soil samples were to analyzed for inorganics, TPH, and PCBs (Table 2.1-1).

Soil samples were taken at 3 and 5 feet in borehole F090B. The top sample was described as a dark brown silt with a trace of gravel. The bottom sample was described as a dark brown silt. Representative levels were exceeded for a number of constituents in both sample horizons

(Table 4.2.3-19). An evaluation of the constituents and concentrations suggests that both samples are primarily ore.

No PCBs were detected in either soil horizon at F090B (detection limit of 0.65 mg/kg). In the surficial sample, 96.2 mg/kg of TPH were detected. This value fell to 37.4 mg/kg in the deeper sample. Soils in both the 3- and 5-foot horizons contained above-representative levels of gross alpha and gross beta activities (Table 4.2.3-6). The greater of the two was 262 ± 28.7 ρCi/g for gross alpha in the 5-foot horizon and 84 ± 6.16 ρCi/g in the 3-foot sample. The activities are consistent with those found in the potential source investigation of the ore.

Soil samples were taken at the surface and at 2 feet in borehole F091B. The surface sample was described as a tan-red-brown silt with a trace of gravel. The 2-foot sample was described as a brown silt with gravel. Representative levels were exceeded for a number of parameters in both sample horizons (Table 4.2.3-19): cadmium (7.1 mg/kg and 3 mg/kg, respectively); chromium (66.1 mg/kg and 36.9 mg/kg, respectively), fluoride (1,060 mg/kg and 1,030 mg/kg, respectively), total phosphorus (5,080 mg/kg and 2,770 mg/kg, respectively), vanadium (86.3 mg/kg and 52.6 mg/kg, respectively), and zinc (123 mg/kg and 73.9 mg/kg, respectively). These samples appear to be affected fills.

No PCBs were detected in either soil horizon at F091B (detection limit of 0.65 mg/kg).

TPH was also below detection limits in both samples taken from F091B (detection limit of 10 to 20 mg/kg). Gross alpha and gross beta followed the same pattern as the inorganics, with the greater activities being found in the upper sample. Gross alpha exceeded its representative level in the surficial sample (186 ± 20.3 ρCi/g), but not in the 2-foot sample. Gross beta was also above its representative level in the surficial sample (65.1 ± 5.09 ρCi/g), but slightly below it in the 2-foot sample (Table 4.2.3-6).

Soil samples were taken at the surface and at 2 feet in borehole F092B. The surface sample was described as a red-brown to light tan silty sand. The 2-foot sample was described as a brown silt

with gravel. Representative values were exceeded for a number of constituents in the surface sample (Table 4.2.3-19): arsenic (15.2 mg/kg), cadmium (83.3 mg/kg), calcium (212,000 mg/kg), chromium (689 mg/kg), fluoride (18,500 mg/kg), lead (32.2 mg/kg), total phosphorus (68,700 mg/kg), vanadium (848 mg/kg), and zinc (1,220 mg/kg). The relatively high values of arsenic, cadmium, calcium, fluoride, total phosphorus, vanadium, and zinc, along with the relatively low values of lead, potassium, selenium, and silver, suggest that the above-representative level constituents are associated ore. Most parameters in the 2-foot sample are at or near the representative levels, indicating little downward migration.

TPH was detected in the surficial soil sample (384 mg/kg), but not in the 2-foot sample (10 mg/kg detection limit). No PCBs were detected in either sample.

Borehole F093B was advanced to 5 feet and soil samples taken at the 3- and 5-foot horizon. The 3-foot sample was described as a brown/red-brown silt. The 5-foot sample was a red-brown silt. Representative levels were exceeded for several constituents in the 3-foot sample (Table 4.2.3-19): cadmium (2.4 mg/kg), chromium (29.5 mg/kg), fluoride (2,070 mg/kg), mercury (2.5 mg/kg), total phosphorus (5,160 mg/kg), and zinc (76.7 mg/kg). Most constituents in the 5-foot sample were at or near their representative levels, indicating little downward migration.

No PCBs were detected in either soil horizon at F093B (detection limit of 0.65 mg/kg). TPH was also below detection limits in both samples taken from F093B (detection limit of 10 mg/kg).

Borehole F094B was advanced to 8 feet and soil samples taken at the 6- and 8-foot horizons. The 6-foot sample was a dark brown to tan silt/sand. The 8-foot sample was described as a dark brown silt. Orthophosphate (317 mg/kg) and total phosphorus (1570 mg/kg) exceeded representative levels in the 6-foot sample (Table 4.2.3-19). With the exception of mercury (1.3 mg/kg), orthosphosphate (21.4 mg/kg), and zinc (56.1 mg/kg), all constituents were within their representative levels in the soil sampled at 8 feet. These constituents in the 8-foot sample may not

be EMF-related, and the absence of fluoride and total phosphorus as well as other EMF-related parameters suggests that there is no downward migration in this area.

As with boring F093B, no PCBs were detected in either soil horizon at F094B (detection limit of 0.65 mg/kg). TPH was also below detection limits in both samples (detection limit of 10 mg/kg).

There appears to have been a problem with sample labeling or analysis for gross alpha and gross beta in samples taken for F092B and F093B (Table 4.2.3-6). An evaluation of the relative activities found in these samples with the relative levels of inorganics found in their corresponding sample horizons suggests that the sample labeled F092B was, in fact, F093B and that the sample labeled F093B was actually F092B. The surficial sample in F092B appears to contain an ore, which would place its expected gross alpha activity in excess of 200 ρCi/g, not the 35.9 ρCi/g reported. On the other hand, F093B, while an affected soil, has relatively low levels of EMF-related parameters that are much more in line with a gross alpha reading of 35.9 ρCi/g than the 222 ρCi/g reported.

Summary – Shale Ore Handling Area. Ore-related materials can be found to at least 5 feet in some parts of the phosphate ore handling area. Where native soils were encountered, there was little to no evidence of downward migration of ore-related constituents.

Roads

There are over 15 miles of roads at FMC and Bannock Paving. Most of these are constructed from slag materials. Dust suppressants that may have included waste oils were historically applied, but the practice has been discontinued. Twenty-three locations were sampled during Phase I. The sampling routine was to bore to what appeared to be materials below the road base (not necessarily native soil), and then to collect a soil sample at the interface and another sample 2 feet below the first. The soil samples were tested for inorganics, TPH, PCBs, gross alpha, and gross beta (Table 2.1-1). The locations where the road samples were taken are shown in Figure 2.1-1.

Boring 101B is located in the far southwest area of the FMC facility near former Pond 6E. It was advanced to 7 feet and soil samples were taken at the 5- and 7-foot horizons. The 5-foot sample is a brown silt with slag gravel. The 7-foot sample is a brown silt. For the most part, constituents in both these samples were within the representative range, indicating little to no downward migration of facility-related constituents (Table 4.2.3-20).

Gross alpha and gross beta activities were above representative levels in the 5-foot sample (94.1 ± 27 ρCi/g and 47.5 ± 11.86 ρCi/g, respectively). These values fell to just below representative levels in the 7-foot sample (Table 4.2.3-6). No PCBs were detected at a detection limit of 0.65 mg/kg. However, there were problems with the laboratory analysis of particular aroclors, and resulting values were rejected during the validation process. New samples taken during Phase II were submitted to the laboratory. The results of these analyses were less than a detection limit of 0.2 mg/kg. TPH was not detected in either soil horizon.

Boring 101R was advanced to 1.5 feet and samples were taken at the 0.5- and 1.5-foot horizons. This boring was located next to boring F101B. The 0.5-foot sample was a dark brown silty sand with a trace of gravel. The 1.5-foot sample was a gray sandy silt with a trace of gravel. Both of these samples contained a number of constituents above representative levels: cadmium (340 mg/kg and 204 mg/kg, respectively), chromium (108 mg/kg and 141 mg/kg, respectively), copper (22 mg/kg and 19.7 mg/kg, respectively), fluoride (12,380 mg/kg and 12,890 mg/kg, respectively), lead (69.9 mg/kg and a nondetect at a detection limit of 41 mg/kg, respectively), total phosphorus (11,800 mg/kg and 6,850 mg/kg, respectively), silver (35.2 mg/kg and 22.4 mg/kg, respectively), vanadium (105 mg/kg and 134 mg/kg, respectively) and zinc (8,020 mg/kg and 5,180 mg/kg, respectively) (Table 4.2.3-20). The suite of above-representative constituents suggests that the 0.5-foot sample was mixed primarily with precipitator dust, while the 1.5-foot sample contained both precipitator dust or phossy solids and slag.

Gross alpha and gross beta activities were above representative levels in both soil horizons (Table 4.2.3-6). The greatest readings were found in the 1.5-foot horizon (182 ± 65 ρCi/g and

81 ± 19.52 pCi/g, respectively). These readings are not unusual for slag or precipitator slurry or phossy water solids. No PCBs were detected at a 0.65 mg/kg detection limit in either sample, nor was TPH present (10 mg/kg detection limit).

The near-surface soils in the vicinity of boring 101 were mixed with precipitator dust or phossy solids and slag. The fill layer extended to at least 5 feet in depth in the immediate vicinity of 101B. Constituents do not appear to have migrated beyond 7 feet into the subsurface.

Boring F102B was advanced to 5 feet and soil samples taken at the 3- and 5-foot horizons. This boring is located on the northern side of Bannock Paving. Both the 3-foot and 5-foot samples were tan-brown silts. The 3-foot sample contained above-representative levels of cadmium (2.2 mg/kg), chromium (38.6 mg/kg), fluoride (970 mg/kg), nickel (16 mg/kg), vanadium (48.3 mg/kg), and zinc (79.5 mg/kg). With the exception of zinc (53.4 mg/kg), all constituents were within representative levels in the 5-foot sample (Table 4.2.3-20). This finding suggests little to no downward migration of EMF-related constituents into the subsurface.

Neither soil horizon in F102B contained above-representative levels of gross alpha or gross beta activity (Table 4.2.3-6). TPH was not detected (10 mg/kg detection limit) in either sample, nor were PCBs (0.65 mg/kg detection limit).

Boring F103B was advanced to 5 feet, and soil samples were taken at the 3- and 5-foot horizons. This boring is located on the northern side of Bannock Paving, just to the east of F102B. Both soil samples were tan-brown silts. The 3-foot sample contained above-representative levels of in fluoride (600 mg/kg), mercury (1.1 mg/kg), total phosphorus (855 mg/kg), and zinc (55.9 mg/kg). Of these constituents, only total phosphorus (775 mg/kg) remained above its representative level in the 5-foot sample (Table 4.2.3-20). This finding suggests little to no downward migration of EMF-related constituents into the subsurface.

Neither soil horizon in F103B contained above-representative levels of gross alpha or gross beta activity (Table 4.2.3-6). TPH was detected at 61.4 mg/kg in the 3-foot sample but was not detected in the 5-foot sample (10 mg/kg detection limit). No PCBs were detected (0.65 mg/kg detection limit) in either sample, indicating that while the road may have been oiled for dust control in this area, the oil apparently did not contain PCBs.

Boring 104R, adjacent to a ferrophos storage pile, was advanced to 1.5 feet, and samples were taken at the 0.5- and 1.5-foot horizons. Both samples were described as gray slag. Both samples contained a number of constituents at above-representative levels (Table 4.2.3-20): cadmium (12.6 mg/kg and 5.5 mg/kg, respectively), calcium (253,000 mg/kg and 192,000 mg/kg), chromium (820 mg/kg and 2,830 mg/kg, respectively), copper (84.3 mg/kg and 348 mg/kg, respectively), fluoride (17,260 mg/kg and 14,540 mg/kg, respectively), iron (39,100 mg/kg in the 1.5-foot sample), nickel (139 mg/kg and 641 mg/kg, respectively), total phosphorus (3,490 mg/kg and 4,100 mg/kg, respectively), silver (6 mg/kg and 17.8 mg/kg, respectively), vanadium (757 mg/kg and 2,620 mg/kg, respectively), and zinc (200 mg/kg and 452 mg/kg, respectively). The suite of above-representative constituents suggests that both samples contained with a mixture of slag and ferrophos. This conclusion was reached by examining the levels of calcium, fluoride, and total phosphorus, which are indicative of slag, and the levels of iron, chromium, nickel, and vanadium, which are indicative of ferrophos. The lower levels of arsenic, cadmium, lead, and zinc ruled out the presence of precipitator dust or ore. Native soils were not encountered at this location, and the vertical extent of the fill is not known.

Gross alpha and gross beta activities were above representative levels in both soil horizons that were sampled (Table 4.2.3-6). The highest activities occurred in the soil from the 0.5-foot horizon (177 ± 63 pCi/g and 82.4 ± 24.8 pCi/g, respectively). TPH was detected in both samples (702 mg/kg and 300 mg/kg, respectively). No PCBs were detected in either sample although the 1.5-foot sample had a slightly higher detection limit (1 mg/kg compared to 0.65 mg/kg).

Boring F105B is located just south of the former PCB storage shed. It was advanced to 3 feet, and soil samples were taken at the 1- and 3-foot horizons. Both horizons were described as dark grayish brown silt fill. Both of these samples contained the following constituents above representative levels: arsenic (54.2 mg/kg and 13.7 mg/kg, respectively), cadmium (159 mg/kg and 106 mg/kg, respectively), calcium (223,000 mg/kg and 192,000 mg/kg, respectively), chromium (622 mg/kg and 269 mg/kg, respectively), copper (86 mg/kg and 37.9 mg/kg, respectively), fluoride (19,700 mg/kg and 14,100 mg/kg, respectively), lead (44 mg/kg and 51 mg/kg respectively), nickel (134 mg/kg and 50.3 mg/kg, respectively), total phosphorus (103,000 mg/kg and 35,800 mg/kg, respectively), silver (6.4 mg/kg and 11.7 mg/kg, respectively), vanadium (724 mg/kg and 311 mg/kg, respectively), and zinc (1,400 mg/kg and 1,290 mg/kg, respectively) (Table 4.2.3-20). The suite of above-representative constituents suggests that both samples contained a mixture of slag and other EMF-related materials. Native soils were not encountered.

As would be expected given the concentrations of detected inorganic parameters, gross alpha and gross beta activities were at above-representative levels in both sample horizons (Table 4.2.3-6). The highest activity was at the 1-foot horizon (281 ± 52.2 ρCi/g and 108 ± 13.88 ρCi/g, respectively). The 1-foot sample contained 2,134 mg/kg TPH. TPH, however, fell to 92 mg/kg by 3 feet, which indicates limited downward migration. Aroclor 1260 was detected at 0.069 mg/kg in the 1-foot horizon and again at 0.018 in the 3-foot horizon. There was some difficulty with the 1-foot sample at the laboratory, and this location was resampled during Phase II. The re-analysis did not detect any aroclors (0.2 mg/kg detection limit) in the 1-foot sample. The results of the PCB analysis indicate the presence of insignificant levels of PCBs in the near-surface soils. Their presence does not appear to be widespread nor does there appear to be significant vertical migration.

Boring F106B was advanced to 3 feet and soil samples taken at the 1- and 3-foot horizons. This boring is located in the southern part of the site on the road running between the slag piles. The

soil sample taken at 1 foot was a tan-brown silt. The sample taken at 3 feet was a tan silt. The 1-foot sample contained above representative levels of cadmium (5.4 mg/kg), chromium (36.2 mg/kg), fluoride (2,050 mg/kg), and zinc (93.6 mg/kg) (Table 4.2.3.2-20). The suite and level of above-representative parameters indicate minor mixing with slag. All of these parameters were within the representative range in the 3-foot sample. This finding suggests little to no downward migration of EMF-related constituents into the subsurface beneath the road.

Both gross alpha and gross beta readings were within their representative levels for the two soil sample horizons (Table 4.2.3-6). No PCBs were detected in either of the soil horizons (0.65 mg/kg detection limit). TPH was detected in the 1-foot soil sample at 78.4 mg/kg. The 3-foot sample did not contain detectable TPH (detection limit of 10 mg/kg). This finding suggests that no downward migration is occurring.

Boring F107R is located just north of former Pond 3S. It was advanced to 1.5 feet, and soil samples were taken at the 0.5- and 1.5-foot horizons. The 0.5-foot sample was a slag gravel. The 1.5-foot sample is a slag/gravel/brown silt mixture. As expected, both of these samples contained a number of constituents above representative levels (Table 4.2.3-20). The suite of above-representative constituents suggests that both samples contained with a mixture of slag and other EMF-related materials. Native soils were not encountered.

As expected, given the concentrations detected for inorganic parameters, gross alpha and gross beta activities were above representative levels in both sample horizons (Table 4.2.3-6). The highest activity was at the 0.5-foot horizon (234 ± 71.6 pCi/g and 88.4 ± 25.6 pCi/g, respectively). The 0.5-foot sample contained 1,462 mg/kg TPH. TPH, however, fell to 28.2 mg/kg by 1.5 feet, indicating limited downward migration. No PCBs were detected in either soil horizon. However, the detection limit for the 0.5-foot sample was 1 mg/kg compared to the 0.65 mg/kg detection limit for the 1.5-foot sample.

Boring F108B is located between the eastern slag pile and the calciner sludge drying area (Figure 2.1-1). It was advanced to 2.5 feet and soil samples taken at the 0.5- and 2.5-foot horizons. The 0.5-foot sample was a tan silt with gravel. The 2.5-foot sample was a dark tan silt. Both of these samples contained a number of constituents above representative levels (Table 4.2.3-20). The suite of above-representative constituents suggests that they contained slag. Native soils were not encountered.

Gross alpha and gross beta activities indicate some slag enrichment (Table 4.2.3-6). The greatest readings were in the 2.5-foot soil horizon with gross alpha at 57.2 ± 18.2 ρCi/g and gross beta at 38.5 ± 9.14 ρCi/g. No PCBs were detected in either sample nor were any TPH detected.

Boring F109B is located at the southeastern boundary between FMC and Simplot. This area is roughly between the gypsum stack to the east and calciner sludge piles to the west (Figure 2.1-1). It was advanced to 2.5 feet and soil samples taken at the 0.5- and 2.5-foot horizons. The 0.5-foot sample was a road-surface combination of gypsum, slag, and gravel. The 2.5-foot sample was a tan silt. Both of these samples contained a number of constituents above representative levels (Table 4.2.3-20). The suite of above-representative constituents indicates that the samples contained small amounts of either gypsum or calciner fines. Native soils were not encountered.

Gross alpha and gross beta were detected slightly above representative levels in the 0.5-foot sample (30.2 ± 11.44 ρCi/g and 32.4 ± 8.08 ρCi/g, respectively). Gross alpha and beta were within representative levels in the 2.5-foot sample (Table 4.2.3-6). No PCBs were detected in either sample nor were any TPH detected.

Boring F110B is located between the IWW basin and the silica pile (Figure 2.1-1). It was advanced to 2.5 feet and soil samples taken at the 0.5- and 2.5-foot horizons. The 0.5-foot sample was a dark brown to black silt with gravel. The 2.5-foot sample was a brown-black silt with a trace of gravel. Both of these samples contained a number of constituents above representative levels (Table 4.2.3-20). The suite of above-representative constituents indicates the samples

contained varying amounts of slag and ore. While constituent concentrations were generally lower at a depth of 2.5 feet, the 2.5-foot sample still contained above-representative levels of most of the EMF-related constituents. Native soils were not encountered.

Gross alpha and gross beta activities were above representative levels for both sample horizons (Table 4.2.3-6). The highest activities were found in the 2.5-foot sample: 90.3 ± 22.8 ρCi/g gross alpha and 53.3 ± 10.62 ρCi/g gross beta. No PCBs were detected in either sample tested. However, while the 0.5-foot sample did not contain any detectable TPH (10 mg/kg detection limit), the 2.5-foot sample did (1,115 mg/kg). This finding suggests the soils were laid down in lifts, since oils could not have traveled from top to bottom without affecting the soils through which they passed. In other words, the 2.5-foot sample contained TPH when it was laid down or, alternatively, was covered by newer soils at a later date.

Boring F111R is located on the slag haul road just north of the slag piles (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the 0.5- and 2-foot horizons. Both samples were gray silts with slag. Both samples contained a number of constituents above representative levels (Table 4.2.3-20). The deeper sample was more enriched with trace metals. The suite of above-representative constituents is characteristic of slag. Native soils were not encountered.

As expected, given the concentrations of inorganic parameters detected, gross alpha and gross beta activities were above representative levels in both sample horizons (Table 4.2.3-6). The highest activity was at the 0.5-foot horizon (334 ± 94.2 ρCi/g and 125 ± 26.2 ρCi/g, respectively). The 0.5-foot sample contained 109 mg/kg TPH. TPH, however, had fallen to 52 mg/kg by 2 feet, indicating limited downward migration. No PCBs were detected in either soil horizon. However, the detection limit for the 0.5-foot sample was 2 mg/kg compared to 1 mg/kg in the 2-foot horizon.

Boring F112R is located on the road just east of the slag pit (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the 0.5- and 2-foot horizons. Both samples are gray silts with

slag. Both contained a number of constituents above representative levels (Table 4.2.3-20). The deeper sample was more enriched with trace metals. Native soils were not encountered.

Gross alpha and gross beta activities were above representative levels for both sample horizons (Table 4.2.3-6). The highest activity was at the 2-foot horizon (188 ± 33.4 ρCi/g and 107 ± 12.92 ρCi/g, respectively). The 0.5-foot sample contained 51.3 mg/kg TPH. TPH, however, had fallen to 30.1 mg/kg by 2 feet. No PCBs were detected in either soil horizon (0.65 mg/kg detection limit).

Boring F113R is located on the road south of the furnace building (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the 0.5- and 2-foot horizons. The 0.5-foot sample was a dark brown/gray sand/silt with a trace of gravel. The 2-foot sample was a tan-brown sandy silt. The 0.5-foot sample contained a suite of parameters that are characteristic of slag and ore (Table 4.2.3-20). The concentrations of most EMF-related parameters found in the 2-foot sample, while at above-representative levels, indicate decreasing concentrations with depth. Native soils were not encountered.

Gross alpha and gross beta activities were above representative levels in both soil samples (Table 4.2.3-6). However, there was a marked decline in both parameters between the 0.5-foot horizon (145 ± 27.8 ρCi/g and 79.8 ± 10.52 ρCi/g, respectively) and the 2-foot sample (28.6 ± 19.26 ρCi/g and 33.5 ± 13.8 ρCi/g, respectively). This pattern follows that noted above for the inorganic parameters. No TPH were detected in either sample. However, Aroclor 1260 was detected in the 2-foot sample at 0.018 mg/kg. The presence of an aroclor at a low level in a deeper sample without a corresponding TPH value is suspect and is probably a laboratory artifact.

Boring F114R is located on the road south of the calciner building (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the 0.5- and 2-foot horizons. The 0.5-foot sample was a dark brown/gray sand/silt with a trace of gravel. The 2-foot sample was a brown sandy silt. The 0.5-foot sample contained a mix of constituents characteristic of slag and ore

(Table 4.2.3-20). The concentrations of most EMF-related constituents above representative levels in the 2-foot sample, decreased with depth. Native soils were not encountered at this location.

Gross alpha and gross beta activities were considerably above representative levels in the 0.5-foot sample and declined to near or below representative levels in the 2-foot sample (Table 4.2.3-6). No PCBs were detected (0.65 mg/kg detection limit), nor were any TPH (detection limit of 20 to 21 mg/kg).

Boring F115R is located on the road east of the calciner complex (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the 0.5- and 2-foot horizons. The 0.5-foot sample a dark brown sandy silt. The 2-foot sample was a tan-brown silt. The 0.5-foot sample contained a suite of constituents characteristic of ore (Table 4.2.3-20). The concentrations of most EMF-related constituents above representative levels in the 2-foot sample, decreased with depth. Native soils were not encountered at this location.

As would be expected in an ore sample, gross alpha and gross beta activities were considerably above representative levels (151 ± 27 ρCi/g and 81.4 ± 10.72 ρCi/g) in the 0.5-foot horizon. These values, like the inorganic parameters in the sample, declined to near or below representative levels in the 2-foot sample (Table 4.2.3-6). No PCBs were detected (0.65 mg/kg detection limit), nor were any TPH (detection limit of 20 mg/kg).

Boring F119R is located on the road just west of the ore pile (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the 0.5- and 2-foot horizons. Both samples were described as ore. The analytical results for both samples supported this description (Table 4.2.3-20). Native soils were not encountered at this location.

The values obtained for gross alpha and gross beta in this borehole, like the inorganic parameters, were indicative of ore (226 ± 77.8 ρCi/g and 153 ± 89 gross alpha in the 0.5- and 2-foot horizons, respectively, and 96 ± 26.6 ρCi/g and 85.1 ± 38.4 ρCi/g gross beta in the 0.5- and 2-foot horizons,

respectively) (Table 4.2.3-6). No PCBs were detected (0.65 mg/kg detection limit) in either sample. However, TPH were detected at 270 mg/kg in the 0.5-foot sample. By the 2-foot sample, TPH had declined to 27.8 mg/kg, indicating attenuation with depth.

Boring F121R is located by the railroad track north of the silica pile (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the 0.5- and 2-foot horizons. The 0.5-foot sample was a gray silt slag. The 2-foot sample was a gray silt slag with gravel. Both samples contained a suite of constituents characteristic of slag (Table 4.2.3-20). The concentrations of most EMF-related constituents found above representative levels in the 2-foot sample decreased with depth. Native soils were not encountered at this location.

Both samples in this borehole contained above-representative gross alpha and gross beta activities (Table 4.2.3-6). Both parameters were at about the same level (129 ± 26.6 ρCi/g and 126 ± 22.8 ρCi/g gross alpha and 65.6 ± 9.78 ρCi/g and 69.6 ± 9.82 ρCi/g gross beta). No PCBs were detected in either sample (detection limit of 0.65 mg/kg). TPH were detected in the 0.5-foot sample at 27.6 mg/kg but were not detected in the 2-foot sample.

Boring F122R is located southwest of the slag pit and east of the old PCB transformer storage area (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the surface and 2-foot horizons. The texture of the samples was a brown silt fill. The surficial sample contained above-representative levels of cadmium (6 mg/kg), chromium (42.6 mg/kg), fluoride (1,250 mg/kg), total phosphorus (4,320 mg/kg), vanadium (54.3 mg/kg), and zinc (169 mg/kg). The 2-foot sample contained constituents at greatly reduced levels, but still contained above representative levels of fluoride (620 mg/kg), total phosphorus (876 mg/kg), and zinc (81.6 mg/kg) (Table 4.2.3-20). Native soils were not encountered at this boring.

Gross alpha and beta were above representative levels in the surficial sample but declined to below representative levels in the 2-foot sample (Table 4.2.3-6). Gross alpha activity was at 38.2 ± 17.34 ρCi/g and gross beta at 34.1 ± 10.28 ρCi/g in the surficial sample. No PCBs were

detected (0.65 mg/kg detection limit). However, TPH were found at 51.8 mg/kg in the surficial sample and at 32.8 mg/kg in the 2-foot sample, indicating some migration.

Boring F123B is located just north of the western slag pile (Figure 2.1-1). It was advanced to 4 feet and soil samples taken at the 2- and 4-foot horizons. The 2-foot sample was a brown sandy silt with a trace of gravel. The 4-foot sample was a brown silt. With the exception of potassium (3,990 mg/kg) and orthophosphate (143 mg/kg), constituent concentrations in the 2-foot sample were within representative levels (Table 4.2.3.-20). The 4-foot sample contained above-representative levels of fluoride (900 mg/kg) and total phosphorus (871 mg/kg), indicating some minor migration of these two constituents from the sandy silt into the silt. All other constituents were within representative levels.

Gross alpha was slightly above its representative level in the 2-foot sample (25.8 ± 15.78 ρCi/g). All other gross alpha and gross beta measurements were within representative limits (Table 4.2.3-6). No PCBs were detected in the Phase I sampling (detection limit of 0.65 mg/kg). However, several PCB results were rejected in the data validation process. Soils in the area of F123B were resampled in Phase II and submitted for PCB analysis. The new analysis results were less than a 0.2 mg/kg detection limit. TPH were not detected in the surficial soil sample (10 mg/kg detection limit), but were detected at 34.8 mg/kg in the subsurface sample.

Boring F124B is located just north of Pond 8S (Figure 2.1-1). It was advanced to 12 feet and soil samples taken at the 10- and 12-foot horizons. The 10-foot sample was described as a slag/gravel. The 12-foot sample was a tan-brown silt/sandstone. The 10-foot sample contained above-representative concentrations of constituents indicative of slag (Table 4.2.3.-20). The 12-foot sample contained constituents indicative of precipitator slurry or phossy water solids. These materials are found in Pond 8S. Since the color and texture of the sample were not those of either of these two materials, the above-representative levels of constituents may be the result of contact with liquids associated with one or the other of the two wastestreams.

Gross alpha and gross beta activities were above representative levels in both sample horizons (Table 4.2.3-6). No PCBs were detected in either sample (detection limit 0.65 mg/kg). TPH were also not detected in the two soil samples at F124B (detection limit 10 mg/kg).

Boring F125B is located about 100 feet to the east of Pond 8S (Figure 2.1-1). It was advanced to 3 feet and soil samples taken at the 1- and 3-foot horizons. The 1-foot sample is a tan fine silt. The 3-foot sample is a brown silt. The following constituents exceeded representative levels: cadmium (2.6 mg/kg and 3.2 mg/kg, respectively), chromium (30.6 mg/kg at the 3-foot horizon), fluoride (2,180 mg/kg and 2,580 mg/kg, respectively), total phosphorus (1,340 mg/kg and 1,150 mg/kg, respectively), and zinc (113 mg/kg and 97.2 mg/kg, respectively) (Table 4.2.3-20). The lack of a clear-cut high-to-low or low-to-high migration pattern indicates these samples are probably samples of a EMF-affected fill.

Gross alpha activities were above representative levels in the 1-foot sample (29.9 ± 19.34 pCi/g) but fell to below representative levels in the 3-foot horizon (Table 4.2.3-6). Gross beta activities for both the 1-foot and 3-foot horizons were below the gross beta representative level. No PCBs were detected in either sample (detection limit of 0.65 mg/kg). TPH were also not detected in the two soil samples at F125B (detection limit of 10 mg/kg).

Boring F126B is located to the south of Pond 8S (Figure 2.1-1). It was advanced to 2 feet and soil samples taken at the surface and 2-foot horizons. Both samples were tan silts with gravel. Both contained concentrations of EMF-related constituents above the representative range (Table 4.2.3-20). These samples are probably samples of an EMF-affected fill.

Gross alpha activities for boring F126B were below representative levels (Table 4.2.3-6). Gross beta activity was slightly above the gross beta representative level in the surficial sample (33.2 ± 11.42 pCi/g), but was below the representative level in the 2-foot sample. Gross alpha and beta activities in this borehole did not track well with the concentrations reported for the inorganics.

No PCBs were detected in either sample (detection limit of 0.65 mg/kg). TPH were also not detected in the two soil samples at F126B (detection limit of 10 mg/kg).

Phase II Results for Roads. To determine the depth of impact at the location of boring 112R, boring F129B was placed in the general area during Phase II and advanced to 26 feet. The drilling log described a 0.3-foot-thick asphalt layer, followed by 3.7 feet of light olive-gray gravelly sand, with the remaining texture a moderately yellowish brown silty sand to silt. The descriptions of the two boring subsurfaces illustrate the spatial variability of the soils at the FMC facility. Soil samples were taken at the 0.5-, 5-, 10-, 15-, 20-, and 25-foot horizons and tested for inorganics and radiological parameters (Table 2.1-1).

The 0.5-foot sample contained a number of constituents at above-representative levels: cadmium (10.6 mg/kg), calcium (213,000 mg/kg), fluoride (13,500 mg/kg), total phosphorus (4,390 mg/kg), potassium (6,520 mg/kg), vanadium (190 mg/kg), and zinc (137 mg/kg) (Table 4.2.3-20). This suite of constituents indicates that the sample was a mixture of soils and slag. With the exception of total phosphorus, which was present at concentrations just above the representative level throughout the borehole, these parameters were below representative levels in all of the remaining samples, suggesting there has been no subsurface migration of EMF-related materials in this borehole.

Gross alpha and gross beta activities exhibited the same pattern of results (Table 4.2.3-6). Gross alpha and beta were above representative levels in the surficial sample (62.4 ± 11.6 pCi/g and 35.3 ± 5.29 pCi/g, respectively). However, activities in the remaining five samples were all within representative levels.

Summary – Roads. With few exceptions, all of the road samples taken at FMC indicated that the roads were constructed from EMF-related fill materials (generally slag, but in some cases ore and/or native soils mixed with EMF-related materials). These materials, by their very nature, contained above-representative levels of inorganics and radionuclides. However, samples

collected below the fill materials provided very little to no migration of the bed constituents. The constituents for which some mobility was most often evidenced were phosphates, fluoride, potassium, and to some, extent zinc. The radionuclides and other trace metals were immobile.

PCBs and TPH were also extensively measured in the road samples. While TPH were occasionally observed at very elevated levels (hundreds of mg/kg), PCBs were rarely detected, and then at less than 1 mg/kg. This observation coincides with observations from other soil sampling at the site.

Waste Oil Storage Area

The waste oil storage area was constructed in 1990 for drummed waste oils. This storage area overlies former Pond 2S, a phossy water pond. One of the two originally planned borings was drilled in this area to investigate subsurface soil conditions. During the drilling operations, elemental phosphorus was encountered several times, forcing the relocation of the borehole. The soil samples were tested for inorganics, gross alpha and beta, PCBs, and TPH (Table 2.1-1).

Boring F037B was advanced through a fill related to Pond 2S to a depth of 20 feet. A soil sample was taken at 20 feet just below the fill soil interface. This sample was a white silt that was possibly fill. Above-representative levels of boron (33.9 mg/kg), fluoride (1,550 mg/kg), lithium (19.2 mg/kg), total phosphorus (8,020 mg/kg), potassium (9,490 mg/kg), and zinc (449 mg/kg) were detected. No PCBs or TPH were detected in this sample (Table 4.2.3-21). Gross alpha and gross beta were both above representative levels (32.6 ± 14.96 ρCi/g and 62.7 ± 10.12 ρCi/g, respectively). The gross beta activity was probably due to the levels of potassium in the sample. Since no further samples were taken, the depth of migration of these materials is unknown.

Gross alpha and gross beta activities in the 20-foot sample were above representative levels (32.6 ± 14.96 ρCi/g and 62.7 ± 16.12 ρCi/g, respectively) (Table 4.2.3-6). This finding was expected given the above-representative levels of the inorganics. No PCBs or TPH were detected in this sample.

Summary – Waste Oil Storage Area. The subsurface in the vicinity of the waste oil storage area contains materials related to Pond 2S to a depth of at least 20 feet. Evidence of elemental phosphorus was found in the subsurface. No organics were detected at 20 feet, although a number of inorganic concentrations and gross alpha and gross beta activities were above representative levels. The depth of impact of the pond (not materials from the waste storage area) was not determined.

9S Storage Area

Area 9S has been used as a storage area for dried precipitator dust. It is an unlined excavated area covering approximately 3 acres. Soils in the eastern portion of the area were tested during the 1990 FFA investigation. The results of these analyses are discussed below along with the Phase I data. To further characterize the area, one boring was drilled in the western portion of 9S, and the soil samples were tested for inorganic and radiological parameters.

In 1990, boring B-2 was advanced to 11.5 feet, and three soil samples were taken at the 0.5-, 6.5-, and 11.5-foot horizons. The first sample was a dark gray to black slag fill. The second was an olive-gray silty sand taken at the fill/soil interface. The 11.5-foot sample was a moderate yellowish brown silt. The fill sample contained above-representative levels of a number of constituents, which suggests it was precipitator dust (Table 4.2.3-22). Of special note were cadmium (4,150 mg/kg), lead (574 mg/kg), potassium (50,800 mg/kg), silver (69.9 mg/kg), and zinc (52,600 mg/kg). However, by 6.5 feet, only potassium (7,110 mg/kg), total phosphorus (1,970 mg/kg), and zinc (180 mg/kg) were above representative levels. These same constituents persisted at above-representative levels into the 11.5-foot sample, but at lower levels. While the depth of impact of all constituents was not determined in this borehole, the available data suggest that trace metal migration has not occurred.

Boring F034B was advanced to 20 feet, and four soil horizons were sampled. The 5- and 10-foot horizons were characterized as pale brown silts. The 15- and 20-foot horizons were reddish yellow, sandy gravel. The 5-foot soil sample contained above-representative concentrations of

the following constituents: cadmium (25.1 mg/kg), fluoride (1,980 mg/kg), lithium (18 mg/kg), total phosphorus (2,730 mg/kg), potassium (7,870 mg/kg), and zinc (366 mg/kg) (Table 4.2.3-22). The cadmium is unexpected, but otherwise, these elements are, as described above, the more mobile of the constituents found in precipitator dust. In the 10-foot sample, all but lithium were still at above-representative, but reduced, levels (Table 4.2.3-22). At the 20-foot horizon, all constituents were within representative levels.

Gross alpha and gross beta activities were above representative levels (32.1 ± 11.54 ρCi/g and 47.3 ± 9.36 ρCi/g, respectively) in the 5-foot sample (Table 4.2.3-6). These levels fell considerably in the 10-foot silt but were again above representative levels in the first of the sandy gravels. Gross alpha and gross beta activities were well below representative levels in the 20-foot sample.

Summary – 9S Storage Area. About a 5-foot-deep fill layer was encountered in borings in the eastern and western sections of the 9S storage area. This fill appeared to be a mixture of slag and precipitator dust. Below this depth, most trace metals (with the exception of zinc) do not appear to have migrated into the subsurface. There is evidence of fluoride, phosphate, potassium, and zinc migration to 10 to 15 feet below the land surface. However, in the 20-foot boring all constituents were within representative levels.

Active Landfill

The active landfill is located south of the slag pile. To assess subsurface conditions, one borehole was drilled just to the north (downgradient) side. The plan was to drill to groundwater or bedrock, whichever came first. During the 1990 investigation, boring 138 located downgradient of the landfill, was advanced to 168 feet after encountering weathered tuff at 140 feet. No groundwater was encountered. Boring F027B encountered weathered tuff at 138 feet and, as previously determined, no groundwater was present. Soil samples were taken at 10-foot intervals to 120 feet and analyzed for inorganic, radiological, and volatile and semivolatile organic parameters (Table 2.1-1).

The soil texture for most samples was a brownish yellow (10-, 20-, 30-, 40-, and 50-foot horizons) to yellowish brown (70-, 80-, 90-, 100-, 110-, and 120-foot horizons) silt. The two exceptions were the surficial soil horizon (brown silt) and the sample taken at 60 feet, a yellowish brown gravelly silt. For the most part, all inorganic parameters were near or below representative levels (Table 4.2.3-23). There were several exceptions such as sodium (1,010 mg/kg) and potassium (3,760 mg/kg) at 30 feet, and zinc (53.4 mg/kg and 55.2 mg/kg) at the surface and 110-foot horizons, respectively. Other than zinc, no other trace metals were above representative levels. Total phosphorus appeared fairly consistently at above-representative levels throughout the borehole.

An evaluation of the gross alpha and gross beta results obtained for all sample intervals in F027B indicates that none were above-representative levels (Table 4.2.3-6).

One semivolatile compound was detected in the 60-foot soil sample: bis (2ethylhexyl)phthalate at 25 mg/kg. Since it was not detected in any other sample and is a recognized artifact in sample handling and analysis, its presence in this sample is assumed to be an artifact of the handling procedures. A number of volatile organics were reported in various soil horizons at very low levels. All of them, except ethylbenzene (0.003 mg/kg in the surficial sample and 0.002 mg/kg in the 100-foot sample), are associated with laboratory contamination. They include carbon disulfide (0.001 to 0.002 mg/kg), 2-butanone (0.018 in the surficial sample and 0.0175 in the 130-foot sample), toluene (0.002 to 0.175 mg/kg), xylenes (0.005 to 0.016 mg/kg), and acetone (0.087 to 0.380 mg/kg). The toluene range was much narrower than appeared, in that the 0.175 mg/kg sample was surficial and the remaining samples all contained less than 0.005 mg/kg. The acetone samples were frequently accompanied by a laboratory qualifier (B) signifying that the laboratory blank was also contaminated with acetone. Given the random occurrence of the volatiles and their low concentrations in the samples, there does not appear to be a measurable volatile organic problem in the soils taken from this borehole.

Summary – Active Landfill. Analyses of the soil samples taken from this borehole indicate little to no EMF effects with regard to inorganic or radiological parameters. There were a number of volatile organics detected in a random fashion within the borehole. For the most part these organics appear to be associated with laboratory-introduced contamination. There does not appear to be a clear association with site landfill activities.

8S Recovery Process

The 8S recovery process was built in 1983 and operated as a test facility to recover elemental phosphorus from Pond 8S. The processing equipment was located on a concrete pad within a dike near Pond 8S. The 8S recovery process was closed and dismantled under RCRA Subtitle C requirements during the summer of 1993. Two borings (F058B and F059B) were drilled to the north and west of the recovery process, respectively, to assess subsurface conditions (Figure 2.1-1). Soil samples were tested for inorganic, radiological, TPH, and PCB parameters.

Boring F058B was advanced to 9 feet, and soil samples were taken at the 7- and 9-foot horizons. The 7-foot sample is a black-gray gravel/slag sludge. The 9-foot sample is a black-gray sludge to dark brown silt. Both of these soil samples contained numerous constituents at above-representative concentrations (Table 4.2.3-24). Examination of the relative levels of the constituents detected indicates the presence of phossy water solids or precipitator dust. Since the 8S recovery process was constructed in the vicinity of former Pond 6S, which contained phossy water solids and precipitator slurry, it is probable that the sludge encountered in F058B was, in fact, from the bottom of former Pond 6S and not related to 8S recovery process operations. The vertical extent of impact from facility operations was not determined in this borehole.

Boring F059B was advanced to 10 feet, and one sample taken at the 10-foot horizon. The texture was a black-gray slag. Evaluation of the chemical analysis of the sample indicates a preponderance of precipitator slurry/phossy water solids material. This material appears to be a northward continuation of the sludge found in F058B and supports the theory that the materials

encountered were from the sludge-filled bottom of former Pond 6S. Native soils were not encountered.

Samples from both boreholes had above-representative levels of gross alpha (143 ± 49.2 ρCi/g to 1,660 ± 149 ρCi/g) and gross beta (81.7 ±21.6 ρCi/g to 1,220 ± 59.6 ρCi/g). These values are consistent with those expected for precipitator slurry/phossy water solids. Most of the gross beta can be accounted for by the high potassium content of the samples (Table 4.2.3-6).

No PCBs were detected in any of the samples tested. TPH, however, were found in the F059B sample at 13.5 mg/kg.

Summary – 8S Recovery Process. Borings drilled to the west and north of the recovery process encountered fill to at least 9 feet. Analysis of the lower reaches of this fill indicated elevated levels of trace metals, fluoride, total phosphorus, and gross alpha and beta that are associated with precipitator slurry and phossy water solids. These sludges are believed to be associated with former Pond 6S rather than the recovery process operations. The vertical depth of the impact was not determined.

4.2.3.3 FMC Facility Soils–Areas with Sustained Hydraulic Head

This section discusses the results of the RI Phase I and Phase II onsite soils investigation for areas with a sustained hydraulic head over the underlying soils. Areas without a sustained hydraulic head are discussed in Section 4.2.3.2.

Areas investigated with previously sustained hydraulic head include: former Pond 1E; former Pond 4E; former Pond 5E; former Pond 6E; former Pond 7E; former Pond 8S, the railroad swale; IWW basin and ditch; former calciner ponds; and the former kiln scrubber overflow pond. Pond 8S was in use (i.e., had a sustained hydraulic head) during the RI period of investigation. The IWW basin and ditch are the only areas with current sustained hydraulic head. The locations of the soil borings associated with each of these areas are shown on Figure 2.1-1.

Former Pond 8S

Pond 8S was an active, unlined phossy waste surface impoundment during the period of investigation. In 1994, the pond was removed from operation, and a temporary cover was installed. Since it was active during the period of investigation, no borings could be drilled into it. However, three borings (B150, B12, and B13) were located near it and advanced to groundwater. Boring B150 was subsequently converted to groundwater monitoring Well 150. Soil samples taken from the boreholes were analyzed for inorganic and radiological parameters (Table 2.1-1).

Boring B150 was located to the north of Pond 8S (Figure 2.1-1) and is the closest to the pond. It was sampled at 10-foot intervals to 90 feet. The first sample contained above-representative levels of cadmium (13.5 mg/kg), calcium (211,000 mg/kg), chromium (178 mg/kg), copper (13.9 mg/kg), fluoride (11,400 mg/kg), total phosphorus (4,080 mg/kg), potassium (6,880 mg/kg), vanadium (157 mg/kg), and zinc (239 mg/kg) (Table 4.2.3-25). This suite of constituents is indicative of slag. This conclusion was expected since the boring was located near the toe of a slag dike. Concentrations of all constituents decreased with depth. At 20 feet, only orthophosphate (118 mg/kg), total phosphorus (1,630 mg/kg), potassium (4,550 mg/kg), and zinc (64.3 mg/kg) remained above representative levels. Copper, total phosphorus, and zinc remained near or above representative levels throughout the entire soil column. Other constituents were generally near or below representative levels. Gross alpha and gross beta were also measured in samples from this borehole (Table 4.2.3-6). With the exception of the slag sample at 10 feet (gross alpha of 172 ± 11.72 ρCi/g and gross beta of 84 ± 7.28 ρCi/g), all gross alpha and gross beta results were within representative levels.

Boring B-12 was located to the southwest of Pond 8S. It was closer to former Pond 2E than to Pond 8S. Soil samples were taken at 10-foot intervals (starting at 10 feet) to 90 feet below the ground surface. The description of the soil column above the 10-foot horizon indicated fill. The 10-foot soil sample contained a number of constituents above representative levels: cadmium

(535 mg/kg), calcium (83,900 mg/kg), chromium (154 mg/kg), copper (40.8 mg/kg), fluoride (7,030 mg/kg), lead (137 mg/kg), nickel (35.7 mg/kg), total phosphorus (9,980 mg/kg), silver (56 mg/kg), vanadium (138 mg/kg), and zinc (10,800 mg/kg) (Table 4.2.3-25). This suite of constituents indicates the presence of precipitator dust or phossy water solids. At 20 feet, all but fluoride (784 mg/kg), total phosphorus (1,610 mg/kg), potassium (6,410 mg/kg), and zinc (96 mg/kg) were within representative levels. Total phosphorus and zinc consistently above representative levels throughout the soil column. Potassium returned to above-representative levels in the 70- and 80-foot horizons.

Gross alpha and gross beta activities were only above representative levels in the 10-foot sludge sample (143 ± 21.8 pCi/g for gross alpha and 117 ± 13.46 pCi/g for gross beta). However, the gross alpha activities were somewhat higher in the 80- and 90-foot samples than they were in the shallower samples (Table 4.2.3-6). This finding may be indicative of alpha emitters in the groundwater. (See Section 4.4 for discussion of radiological measurements in groundwater.)

Boring B-13 was located east of Pond 8S. It was sampled at 10-foot intervals to 90 feet. Groundwater was encountered at 98 feet. The first 14 feet of the boring appeared to be a fill. The soil sample at 10 feet was just above a material similar to the 10-foot sample at B-12; however, this material immediately below the 10-foot horizon was not sampled. The 10-foot sample contained above-representative levels of cadmium (15.2 mg/kg), total phosphorus (3,250 mg/kg), and zinc (637 mg/kg) (Table 4.2.3-25). The 20-foot soil horizon contained above-representative concentrations of total phosphorus (992 mg/kg) and zinc (52.7 mg/kg), while in the 30-foot sample, zinc (111 mg/kg) and total phosphorus (797 mg/kg), but not cadmium, were above representative levels. The distribution of zinc in the subsurface did not follow either a leachate pattern (high-to-low or low-to-high) or a soil texture pattern (sands low, silts/clays high). Zinc levels may or may not be entirely related to site activities. Regardless, the available data there do not provide any evidence of migration of trace metals from the surface or the subsurface in this

borehole. Gross alpha and gross beta activities were within representative levels for all samples taken (Table 4.2.3-6).

Summary – Former Pond 8S. Former Pond 8S is surrounded by a fill layer of variable depth (10 to 14 feet). To the north is a slag layer and to the south is a black clayey material with the constituents of phossy water solids or precipitator dust. The fill in general contains above-representative levels of various constituents associated with site activities. Beneath this fill there is little evidence of downward migration of any constituents other than total phosphorus, fluoride, and zinc. The zinc occurs with such persistence relative to other sampling locations that it is not possible to determine whether it is naturally occurring or EMF-related. These three borings may have been close enough to one or both of the unlined ponds 8S or 2E to have been slightly influenced by belling from their contents. Gross alpha and gross beta activities were above representative levels only in identifiable fill horizons.

Former Pond 1E

Former Pond 1E is located in the southwestern portion of FMC (Figure 2.1-1). It was unlined and received phossy water/solids and precipitator slurry. The subsurface was initially investigated in 1990 with boring B-1. These results are presented below. In Phase I, an additional boring was drilled in the pond and four soil samples taken at approximately 5-foot intervals. These samples were analyzed for the presence of inorganics and radioactivity (Table 2.1-1).

In 1990, boring B-1 was advanced to 31 feet and samples taken at the 0.5-, 6.5-, 11.5-, and 31-foot horizons. The drilling log indicates that the first 4 feet consisted of fill, while the remaining depth was a very pale orange silt. The 0.5-foot sample contained above-representative levels of cadmium (5,110 mg/kg), chromium (278 mg/kg), copper (155 mg/kg), lead (683 mg/kg), potassium (66,300 mg/kg), selenium (77.6 mg/kg), silver (79.6 mg/kg), vanadium (234 mg/kg), zinc (69,800 mg/kg), and total phosphorus (86,000 mg/kg) (Table 4.2.3-26). By the 6.5-foot horizon the only constituents that were above representative levels were potassium (9,295 mg/kg), zinc (1,590 mg/kg), orthophosphate (269 mg/kg), and total phosphorus (5,770 mg/kg). These

same constituents were still above representative levels in the 31-foot horizon, albeit at reduced levels. This pattern is one that can be observed in most of the former pond areas in the southwestern area of FMC.

In Phase I of the RI, boring F033B was advanced to 19.5 feet and sampled at the 4.5-, 9.5-, 14.5-, and 19.5-foot horizons. The soil texture was a brownish yellow silt for all horizons. The first 4.5 feet of the boring were slag fill. The 4.5-foot sample, which was taken at the fill/soil interface, contained above-representative levels of boron (50.6 mg/kg), cadmium (485 mg/kg), chromium (51.8 mg/kg), copper (22.9 mg/kg), fluoride (4,130 mg/kg), lead (79.6 mg/kg), total phosphorus (6,410 mg/kg), potassium (15,900 mg/kg), silver (46.1 mg/kg), vanadium (55 mg/kg), and zinc (7,320 mg/kg) (Table 4.2.3-26). By the 9.5-foot horizon, all trace metals except for zinc (295 mg/kg) were within representative levels. The deepest sample horizon (19.5 feet) still contained above-representative levels of fluoride (1,210 mg/kg), total phosphorus (1,630 mg/kg), potassium (4,740 mg/kg), and zinc (75.7 mg/kg).

In F033B, above-representative levels of both gross alpha (114 ±22.4 pCi/g) and gross beta (152 ± 15.2 pCi/g) were measured in the 14.5-foot horizon (Table 4.2.3-6). However, gross alpha activities were below its representative level in the remaining three horizons. Gross beta, on the other hand, reflecting the above-representative levels of potassium, remained above its representative level for all sampling intervals.

Summary – Former Pond 1E. Investigation of former Pond 1E revealed precipitator slurry dust and/or phossy water solids to a depth of at least 4.5 feet in some areas of the former pond. These materials contained elevated levels of trace metals, fluoride, total phosphorus, and gross alpha/beta. Analytical results for soil samples taken beneath the fill area indicated, with the exception of zinc, little to no migration of any trace metals into the soils. There is evidence of the continued migration to depth of fluoride, total phosphorus, potassium, and to a lesser extent zinc. It appears that the natural attenuation properties (calcareous and alkaline) of the soils in the area combined with the solubility of the deposited solids preclude migration of measurable quantities

of most of the constituents into the subsurface. Measurable is defined here as the ability to distinguish between representative and above-representative concentrations of a given constituent in the soil.

Former Pond 4E

Former Pond 4E, which has been partially covered by active Pond 11-14S construction, is located in the southwestern portion of FMC. It lies just to the west of 1E (Figure 2.1-1). Pond 4E received phossy water/solids, precipitator slurry, and dried precipitator dust and slag. This pond was not investigated in 1990. One boring was advanced in Pond 4E to groundwater during Phase I to investigate subsurface conditions. Soil samples taken in this boring were analyzed for inorganics and radiological parameters (Table 2.1-1).

Boring F024B was advanced 75 feet to groundwater. Samples were taken at 10-foot intervals at the following horizons: 0, 10, 20, 30, 40, 50, 60, 70, and 75 feet. The boring log described the first 11 feet as fill with the top 6 inches called out as slag. The 20-, 30-, 40-, and 50-foot horizons were brown silt. The material changed to a silty gravel between 56 and 60 feet. At 60 feet, the texture changes again to a brown, coarse, sandy gravel. At 73 feet, a light yellowish brown silt was encountered. Analytical results for the 0.5-foot sample indicate that the material was affected primarily by precipitator dust or phossy solids (Table 4.2.3-27). This conclusion is evident from the relatively high values of cadmium (918 mg/kg), lead (157 mg/kg), potassium (15,700 mg/kg), silver (87.1 mg/kg), and zinc (15,200 mg/kg), and the relatively low levels of calcium and molybdenum.

All trace metals except zinc (85.3 mg/kg) were within representative levels in the 10-foot horizon. However, above-representative levels of fluoride (1,510 mg/kg), total phosphorus (1,640 mg/kg), and potassium (8,000 mg/kg) were present. This pattern persisted throughout the soil column to 75 feet. There was an abrupt increase in iron content at the 40-foot horizon that continued to at least the 70-foot horizon (through two soil textures). This increase was accompanied by an

increase in sodium and nickel concentrations. These latter changes are probably not related to site activities.

Gross alpha and beta patterns were somewhat similar to the inorganic pattern described above (Table 4.2.3-6). The 0.5-foot sample contained above-representative activities of both gross alpha (95.3 ±22.2 ρCi/g) and gross beta (113 ± 13.32 ρCi/g). Given the presence of precipitator dust and/or phossy solids, these results were not unexpected. Constituents in the 10- through 50-foot-horizon samples were all well within representative levels. At the 60-foot horizon there was a change in lithology to gravel, and at this change, radioactivities also increased to levels at or slightly above representative levels. These activities returned to representative levels in the 75-foot silt. The higher activities the gravels are probably native in origin and not a result of facility activities.

Summary – Former Pond 4E. As with former Pond 1E, the investigation of former Pond 4E yielded evidence of precipitator slurry dust and/or phossy water solids in the near-surface soils of the former pond. These materials contained elevated levels of trace metals, fluoride, total phosphorus, and gross alpha/beta. Analytical results for soil samples taken beneath the fill area indicated that with the exception of zinc, little to no migration of trace metals into the soils has occurred. There is evidence of the continued migration to depth of fluoride, total phosphorus, potassium, and to a lesser extent zinc. It appears that the natural attenuation properties (calcareous and alkaline) of the soils in the area combined with the solubility of the deposited solids preclude migration of measurable quantities of most of the constituents into the subsurface. There was a change in lithology from silt to gravel at approximately 55 feet, with a corresponding increase in radioactivity. This increase is believed to be naturally occurring in origin.

Former Pond 5E

Former Pond 5E is located in the southwestern portion of FMC (Figure 2.1-1). It was unlined and received primarily phossy water/solids. It is now partially overlain by Pond 15S. The subsurface was initially investigated in 1990 with boring 114. These results are presented below. In Phase I,

an additional boring (F025B) was drilled in the pond to groundwater (approximately 71 feet below ground surface). Samples taken in this boring were analyzed for inorganic and radiological parameters (Table 2.1-1).

In 1990, boring 114 was drilled to 141 feet and completed as a groundwater monitoring well. Soil samples were taken at the 5.5-, 21-, 51-, 71-, 96-, and 141-foot horizons. Soils in the first 5 feet of the boring were slag gravel fill. The 5.5-foot horizon was grayish brown silt, an indication of the presence of dark gray to black phossy solids. The soil samples taken at 21 and 51 feet were dark yellowish brown silts. The 71-foot sample was taken at the interface of a dark yellowish brown silt and a dusky yellow-brown gravel with sand. Both the 96-foot and the 141-foot horizons were dark yellowish brown silts.

Analytical results for the 5.5-foot sample indicated it had been affected by site activities. The constituents detected above representative levels included cadmium (21.7 mg/kg), potassium (6,170 mg/kg), total phosphorus (3,400 mg/kg), and zinc (1,720 mg/kg). At the next sampled horizon (21 feet), all constituents were within representative levels except potassium, orthophosphate (270 mg/kg), and total phosphorus (Table 4.2.3-28). These three constituents remained above representative levels to groundwater. The last sample, which was taken at approximately 26 feet below the water table, contained only orthophosphate (9 mg/kg) and total phosphorus (720 mg/kg) above representative levels.

Boring F025B was advanced to groundwater (approximately 70 feet). Soil samples were taken at the 5-, 10-, 20-, 30-, 60-, and 70-foot horizons. The first two samples were a dark olive-gray silt. Their color indicated the potential effects of phossy water solids. The 20-foot sample was a yellowish brown silt. The remaining three samples were brown sandy gravels to brown gravelly silts. The analytical results indicated that the 5- and 10-foot samples were affected by site activities (Table 4.2.3-28). The 10-foot sample appeared to contain a substantial percentage of phossy solids. The above-representative level constituents included cadmium (2,080 mg/kg), chromium (108 mg/kg), fluoride (35,000 mg/kg), lead 360 (mg/kg), total phosphorus

(33,600 mg/kg), potassium (23,700 mg/kg), silver (152 mg/kg), vanadium (78 mg/kg), and zinc (200,000 mg/kg).

The 20-foot soil sample contained no trace metals (including zinc) above representative levels. However, above-representative levels for fluoride, potassium, and total phosphorus remained. Not unexpectedly the sandy gravel at 30 feet did not have a high mineral content, as even the concentrations of potassium, fluoride, and total phosphorus were well below representative levels. However, with the return of silts at greater depths, these three constituents, but no others, again exceeded representative levels to groundwater.

As expected, gross alpha and gross beta activities were above-representative levels in the 5- and 10-foot samples (Table 4.2.3-6). The higher activities were found at 10 feet (302.95 ± 17.78 ρCi/g gross alpha and 265 ± 14.44 ρCi/g gross beta), which is also the depth at which trace metal concentrations were highest. Gross alpha was also slightly above its representative level at the 20-foot horizon (26.39 ± 4.05 ρCi/g). The remainder of the sampling intervals were at or below representative levels for both gross alpha and gross beta. The above-representative gross alpha activity at 20 feet is indicative of some mobility of an alpha-emitting radionuclide.

Summary – Former Pond 5E. Investigation of former Pond 5E yielded evidence of phossy water solids to a depth of at least 10 feet in some areas of the former pond. These materials contained elevated levels of trace metals, fluoride, total phosphorus, and gross alpha/beta. Analytical results for soil samples taken beneath the fill area indicate little to no migration of any trace metals into the soils has occurred. There is evidence of the continued migration to depth of fluoride, total phosphorus, and potassium. It appears that the natural attenuation properties (calcareous and alkaline) of the soils in the area combined with the solubility of the deposited solids preclude migration of measurable quantities of most of the constituents into the subsurface.

Former Pond 6E

Former Pond 6E is located in the southwestern portion of FMC (Figure 2.1-1). It was unlined and received primarily phossy water/solids. It is now partially overlain by Pond 15S. The subsurface was initially investigated in 1990 with boring 130. These results are presented below. In Phase I, an additional boring (F026B) was drilled in the pond to groundwater (approximately 60 feet below ground surface). Samples taken in this boring were analyzed for inorganic and radiological parameters (Table 2.1-1).

Boring 130, which was drilled in 1990, is located in the far eastern corner of the pond. It was drilled to 180 feet and sampled at the 16-, 41-, and 71-foot horizons. Groundwater was encountered at approximately 70 feet. The 16- and 41-foot horizons were yellowish to moderately yellowish brown silts. The 71-foot sample was pale yellowish brown silty sand. Of the trace metals, only zinc (66.5 mg/kg) was above its representative level in the 16-foot sample (Table 4.2.3-29). Also at above-representative levels were total phosphorus (1,700 mg/kg), and potassium (6,250 mg/kg). With the exception of arsenic (8.5 mg/kg at 71 feet) and copper (13.9 mg/kg at 71 feet) which were only slightly above their representative levels, trace metals were below representative levels in the 41- and 71-foot horizons. However, as with other subsurface pond samples, total phosphorus, and potassium remained at above-representative levels to groundwater.

Boring F026B was advanced to groundwater, and three samples were taken at the surface, 10-foot, and 60-foot horizons. It was located in the central portion of the pond to the west of boring 130. The surficial and 10-foot samples were light yellowish brown silt. The 60-foot sample was a light yellowish brown gravelly silt. No samples were taken between 20 and 60 feet because of the inability of the split spoon to penetrate the gravelly silt. Field notes indicate 50 blow counts with no advance of the spoon. The only trace metal parameter found above the expected representative range in the surficial sample was zinc (53.8 mg/kg). As is usual for these ponds, fluoride (1,610 mg/kg), total phosphorus (1,400 mg/kg), and potassium (3,820 mg/kg)

were also found at above-representative levels (Table 4.2.3-29). In the 10-foot sample, zinc was below representative levels, but fluoride, total phosphorus, and potassium remained at elevated levels. At 60 feet, a depth below the water table, the level of total phosphorus was 13,900 mg/kg, compared with a concentration of only 1,640 mg/kg at 10 feet. This rise in total phosphorus was accompanied by a rise in potassium and fluoride levels, as well as boron, lithium, and sodium. However, trace metal levels did not show an increase. Since this sample was taken in the saturated zone, these results may indicate an accumulation of mobile ions in the saturated silts below the unit. The absence of trace metals also reflects their relative immobility.

Gross alpha and beta were within representative levels for all three soil horizons (Table 4.2.3-6). These results indicate that there has been little to no radionuclide migration from this pond into the subsurface.

Summary –Former Pond 6E. Although drilled into the center of former Pond 6E, F026B encountered no visible fill layer. There was no evidence of facility-related sludges in the surficial sample. However, the distribution of fluoride, total phosphorus, potassium, and zinc suggested a migration of these constituents from FMC phossy water/solids or precipitator slurry ponds. As was also expected beneath these ponds, there was no evidence of trace metal migration in the subsurface, other than zinc.

Former Pond 7E

Former Pond 7E is located in the western portion of FMC (Figure 2.1-1). It was unlined and received primarily phossy water/solids. The subsurface was investigated in June 1994 with boring F162B. Samples taken in this boring were analyzed for the inorganic and radiological parameters (Table 2.1-1).

The location of boring F162B is shown on Figure 2.2-1. It was drilled to 70 feet and sampled at the 16-, 26-, 46-, and 66-foot horizons. Groundwater was encountered at 68 feet. The 16-foot

sample was a pale, yellowish-brown, gravelly sand. The 26- and 46-foot samples were moderately yellowish-brown silts. The 66-foot sample was a pale, yellowish-brown clay.

Nickel was above its representative level (15.5 mg/kg) in all but the 46-foot sample, ranging in concentration from a high of 43.4 mg/kg in the 26-foot sample to a low of 19.9 mg/kg in the 66-foot sample. Fluoride and orthophosphate were at or above their representative levels in the first two samples (620 mg/kg and 78.4 mg/kg, respectively, in the 16-foot sample; and 1,360 mg/kg and 337 mg/kg, respectively, in the 26-foot sample), but were below representative levels in the remaining, deeper samples. Total phosphorus also exceeded its representative level (672 mg/kg) in the 26-foot sample (983 mg/kg). The only other representative-level exceedances in samples from this boring were chromium (36.1 mg/kg versus a representative level of 26.5 mg/kg) and lithium (17.4 mg/kg versus a representative level of 16.1 mg/kg) in the 66-foot horizon. Gross alpha and beta were within representative levels in all samples.

Summary –Former Pond 7E. Investigation of former Pond 7E revealed relatively little evidence, if any, of effects from FMC facility operations. This conclusion is based on the relatively small number of constituents that exceeded representative levels, the relatively small margin by which they exceeded representative levels, and the relatively small number of characteristic constituents which exceeded representative levels. If the constituents which exceeded representative levels are in fact indicative of EMF effects, they, in any case, fell to near or below representative levels at depth.

Railroad Swale

The railroad swale occupies an area approximately 30 feet wide and 1,000 feet long. It has been partially excavated by FMC, and the excavated zone has been filled with slag to create a drainage trench. On December 3, 1993, the swale was partially lined with HDPE as a temporary measure to minimize the potential for discharge to groundwater. It receives surface water runoff principally from the main plant area. Four boreholes (F039B, F040B, F041B, and F042B) were used to investigate subsurface conditions in this area during Phase I (Figure 2.1-1). An additional

boring (F131B) was drilled to groundwater (80 feet) near F042B during Phase II. The samples were tested for inorganics and radioactivity (Table 2.1-1).

Boring F039B was advanced to 10 feet and soil samples were collected at 2.5-foot intervals. The first three samples were dark, yellowish brown, silty gravel fill. The remaining two samples were grayish brown silt. The soil samples taken at the surface and 2.5-foot horizon contained elevated concentrations of both trace metals, (e.g., cadmium at 104 mg/kg and 103 mg/kg, nickel at 163 mg/kg and 155 mg/kg) and fluoride (17,500 mg/kg and 15,400 mg/kg) and total phosphorus (81,400 mg/kg and 76,000 mg/kg) (Table 4.2.3-30). A comparison of the metals suite found in these two horizons with that characteristic of slag, ferrophosphorus, precipitator dust, and ore indicates that the majority, if not all, of the enrichment is attributable to the presence of phosphate ore. Grayish-brown silt generally indicates some EMF-related effects (mixing) since the native silts are yellowish brown to brown. The sample from the 5-foot horizon also contained constituents above representative levels (e.g., chromium at 71.8 mg/kg; total phosphorus at 1,860 mg/kg), but unlike the overlying samples, did not contain elevated levels of cadmium, fluoride, and nickel. The soil samples taken in the lower two horizons (7.5 and 10 feet) are both grayish in hue and displayed an elevation of trace metals (e.g., cadmium at 3.4 and 2.6 mg/kg, nickel at 19.6 mg/kg in both samples), total phosphorus (3,930 mg/kg and 2,730 mg/kg), and fluoride (1,900 mg/kg and 890 mg/kg), but at distinctly lower concentrations. Gross alpha and gross beta activities were above representative levels for both the surficial and 2.5-foot horizons. The highest levels (280 ± 57 ρCi/g for gross alpha and 82.2 ± 12.92 ρCi/g for gross beta) were at 2.5 feet (Table 4.2.3-6). Radioactivity in the remaining samples was within representative levels. This indicates that little to no migration from the upper layers had occurred. Since there is no definitive high-to-low gradient between the two horizons across all parameters, it is not clear whether the levels found in the 10-foot-horizon soils are attributable to their presence within the fill at the time of placement or from leaching of materials when the swale contained water. The vertical extent of EMF effects was not reached at this boring.

Two soil samples were taken in boring F040B at depths of 14 and 16.5 feet below the soil surface. The first 14 feet of the boring was in slag. The samples are a yellowish brown silt, the color of native representative soils. An evaluation of the analytical results for the 14-foot-horizon sample indicates that, with the exception of total phosphorus (1,450 mg/kg), constituent concentrations were within representative levels (Table 4.2.3-30). However, the 16.5-foot sample contained above-representative levels of cadmium (13.4 mg/kg), chromium (35.2 mg/kg), fluoride (1,260 mg/kg), nickel (15.5 mg/kg), orthophosphate (12.8 mg/kg), total phosphorus (2,450 mg/kg), and zinc (232 mg/kg). Gross alpha and gross beta activities were within the representative range for the 14-foot sample (Table 4.2.3-6). An insufficient quantity of sample was obtained at the 16.5-foot horizon to allow for a radioactivity analysis. This was due to refusal in a sandy gravel at 17 feet. Since these levels were not present in the overlying sample, it appears that there has been some mechanical mixing at this location during construction of the swale. The vertical extent of EMF effects was not determined in this borehole.

Three samples were collected at F041B at depths of 7.5, 10, and 12.5 feet. The first (top) sample was slag fill and the two remaining were black silt (fill). The upper sample contained a number of constituents above representative levels (Table 4.2.3-30): arsenic (21.1 mg/kg), cadmium (282 mg/kg), chromium (988 mg/kg), copper (125 mg/kg), fluoride (13,300 mg/kg), nickel (188 mg/kg), total phosphorus (53,600 mg/kg), selenium (17.5 mg/kg), silver (17.7 mg/kg), vanadium (1,290 mg/kg), and zinc (4,210 mg/kg). The suite of constituents indicates that the slag was probably mixed with ore. There was a sharp break in constituent concentrations between the slag and the silt fill, with most constituents in the silt being well within representative levels. Gross alpha and gross beta activities were above representative levels in the 7.5-foot sample (96.91 ± 22 ρCi/g and 62.62 ± 11.7 ρCi/g, respectively). However, both were within representative levels for the 10- and 12.5-foot horizons (Table 4.2.3-6). These results further demonstrate that the EMF-affected fills are associated with above-representative levels of radioactivity and that these radionuclides are not particularly mobile in the subsurface. Since the boring did not penetrate to native soils, the vertical extent of potential impact was not defined in this location. However, it

can be observed that there was little to no migration of constituents from the affected upper horizons into the lower zones.

Boring F042B was advanced to 12.5 feet below ground surface. Soil samples were collected at 7.5, 10, and 12.5 feet. All three soil samples were brown silts. Several constituents in the 7.5-foot sample (beryllium, chromium, fluoride, total phosphorus, vanadium, and zinc) were slightly above their representative levels (Table 4.2.3-30). This sample was taken at the slag/soil interface. However, in the 12.5-foot horizon, all constituents (except beryllium at 1.5 mg/kg versus 1.2 mg/kg representative) were within representative levels. Gross alpha and gross beta activities were within representative levels for all three samples (Table 4.2.3-6). Since these samples appear to have been collected in native soil, the depth of impact has been determined at this location.

Phase II Results for the Railroad Swale. Because only one of the Phase I sample locations in this area characterized the depth of impact during Phase II boring F131B was advanced to 80 feet near the location of F040B. Groundwater was encountered at 67 feet. The first 18 feet of the borehole were in slag and no samples were collected. Due to the high gravel content of the horizon between 18 and 37 feet, no samples were recovered within this interval. The first sample collected was at the 40-foot horizon. It was as a medium- to coarse-grained sand. Mercury (0.72 mg/kg), orthophosphate (14.4 mg/kg), and total phosphorus were the only constituents detected at concentrations above representative levels (Table 4.2.3-30). Gross alpha and gross beta were within representative levels in this horizon (Table 4.2.3-6).

The next horizon sampled was a yellowish-brown clayey silt at 60 feet. In this sample, only orthophosphate and total phosphorus were above representative concentrations (11.5 and 880 mg/kg, respectively). At 70 feet, a fatty, pale, olive-gray clay was sampled. This clay contained above-representative levels of calcium (107,000 mg/kg), fluoride (648 mg/kg), and mercury (4.8 mg/kg). Aluminum (14,800 mg/kg), boron (13 mg/kg), iron (15,100 mg/kg), lithium (16.4 mg/kg), orthophosphate (11.7 mg/kg), and total phosphorus (811 mg/kg) slightly exceeded

their representative levels. The last sample taken was at 80 feet, where all constituents were within representative levels, except arsenic (7.8 mg/kg vs. 7.7 mg/kg) representative level and copper (28.9 mg/kg). The first opportunity to determine if there was measurable migration of EMF-related constituents into the subsurface was at 60 feet, where the first fine-grained horizon was encountered. Since only orthophosphate and total phosphorus exceeded representative levels, it can be concluded that there has been no deep migration of measurable quantities in this subsurface. The above-representative constituents found in the fatty clay appear to be naturally occurring, although the presence of orthophosphate and total phosphorus suggests infiltration from the overlying materials. No EMF-related effect is apparent in the 80-foot horizon sample.

Summary – Railroad Swale. Borings in the area of the railroad swale encountered slag and fill layers from 7.5 to 18 feet thick. Samples taken within these layers contained above-representative concentrations of EMF-related constituents, which include gross alpha and gross beta. These concentrations were observed to decrease with depth. In two borehole locations, soil samples were taken at depths greater than 2.5 feet below the fill/native soil interface. Samples taken at these depths showed little to no effect from EMF-related activities. However, the presence of elevated orthophosphate and total phosphorus in a sample from 70 feet may be an indication of infiltration.

IWW Basin and Ditch

The IWW basin and ditch transport noncontact cooling water from the plant to an NPDES outfall on the Portneuf River. The water and the ditch sediments were discussed in Section 4.2.3.1, Potential Sources. To investigate the potential effect this unlined ditch may have had on subsurface soils, a boring was located directly on its bank and advanced to groundwater. It was thought that by locating the boring on the immediate bank, it would be sufficiently close to the waterflow to intercept any liquids which may have seeped from the bottom of the ditch into the subsurface. Soil samples were tested for inorganic and radiological parameters (Table 2.1-1).

Boring F030B was advanced to a depth of 75 feet (Figure 2.1-1). Soil samples were taken at the surface, 10-, 20-, 30-, 40-, 50-, 65-, and 75-foot horizons. Samples taken at 0, 10, and 20 feet were brown clayey silt. The 30- and 40-foot horizons were yellowish brown gravel and sandy silt. The 50-foot sample was a brown silty sand, and the 65-foot sample was a dark brown silty sand. Gravel was encountered at 75 feet. The surficial sample contained constituents generally associated with phosphate ore (Table 4.2.3-31). The 10-, 20-, and 30-foot samples all contained constituents within representative levels. At the 40-foot horizon, which is in the middle of a gravel and sandy silt zone, arsenic (9.5 mg/kg), chromium (34.4 mg/kg), and iron (15,300 mg/kg) all increased to above-representative levels; fluoride (170 mg/kg), total phosphorus (268 mg/kg), potassium (870 mg/kg), and zinc (27 mg/kg) all fell to very low levels. Because the increase in arsenic and chromium does not appear to be associated with any other facility-related parameters, the arsenic and chromium are probably natural components of the gravel at the 40-foot horizon. Mercury was found at above-representative concentrations in this borehole at 20 feet (1.7 mg/kg), 30 feet (1 mg/kg), and 50 feet (1.1 mg/kg). With the exception of sodium at 65 feet, no other constituents were above representative levels.

Gross alpha was above representative levels in two soil horizons, 171.19 ± 24.6 ρCi/g in the surficial sample and 96.96 ±12.5 ρCi/g in the 30-foot soil sample (Table 4.2.3-6). The surficial sample appears to be associated with ore which contains above-representative levels of gross alpha. There were no EMF-related constituents above-representative levels in the 30-foot sample. Gross alpha was well within its representative level in both the 20-foot silt and the 40-foot gravel below. Hence this gross alpha exceedance was either a laboratory error or was related to the type of gravel encountered in the upper gravel zone. As with gross alpha, gross beta was above its representative level elevated in the surficial soil sample (67.26 ± 7.8 ρCi/g). However, it was at representative levels in the 30-foot sample.

Summary – IWW Basin and Ditch. There was no evidence of the migration of EMF-related parameters into the subsurface at the IWW ditch, not even for the more mobile cations and anions.

Calciner Ponds and Calciner Pond Sediments

The new lined calciner ponds occupy a large portion of the same area formerly occupied by the unlined calciner ponds. There is, however, an uncovered section to the southwest of the new ponds that was part of one of the former ponds. To investigate the potential effect the unlined ponds had on the subsurface, one boring was located in this area and advanced to groundwater. In addition to the ponds themselves, two areas were investigated where calciner pond sediments have been placed to dry. One of these areas (F050B) lies just to the south of the active ponds and is herein after referred to as calciner pond sediment storage area A. The other investigated area (F051B) was approximately 1,400 feet further to the south of the ponds (Figure 2.1-1) and is herein after referred to as the calciner pond sediment storage area B. Soil samples taken from these borings were tested for inorganic and radiological parameters (Table 2.1-1).

Boring F023B was advanced to 60 feet. Soil samples were taken at the 0-, 10-, 20-, 30-, 40-, 50-, and 60-foot horizons. The surficial sample was a light brown sandy silt. The 10-, 20-, and 30-foot horizons were dark, yellowish brown clayey silts. The remaining horizons were dark, yellowish brown sandy gravels. The gravels became coarser and more permeable with depth. The surficial sample contained a number of trace metals, as well as fluoride and total phosphorus above representative levels (Table 4.2.3-4). The above-representative level constituents included cadmium (36.2 mg/kg), chromium (141 mg/kg), mercury (1.8 mg/kg), nickel (24.8 mg/kg), total phosphorus (13,800 mg/kg), potassium (5,590 mg/kg), selenium (47.5 mg/kg), vanadium (146 mg/kg), and zinc (328 mg/kg). Many of the trace metals were lower in concentration, in the 10-foot horizon and in many cases below representative levels, indicating that little to no migration of these elements has occurred. Concentrations of fluoride and total phosphorus, which are fairly mobile, were also high. In the 30-foot sample, only nickel (27 mg/kg), fluoride

(690 mg/kg), orthophosphate (183 mg/kg), and total phosphorus (1,410 mg/kg) remained substantially above representative levels. As would be expected in a sandy gravel, there were little to no EMF-related constituents in the next three horizons.

Gross alpha in boring F023B was above its representative level in the surficial sample (53.12 ± 11.86 pCi/g) and also in all three of the gravel zones (Table 4.2.3-6). This same pattern was observed for gross beta. The levels detected in the surficial sample were probably related to site influences. However, these levels detected in the volcanic gravels were more likely naturally occurring. The lack of above-representative levels in the silts suggests that the alpha and beta emitters have low mobility.

Storage Area A. Boring F050B was drilled approximately 200 feet to the east of F023B (Figure 2.1-1). It was drilled to a depth of 10 feet into a sludge storage area. Soil samples were collected at 0, 2, 5, 7, and 10 feet. All five samples were described as red-brown clay with silt. This description is consistent with that of calciner sludge. The analytical results confirm this assumption as all five samples contained above-representative levels of constituents associated with calciner pond sediment (Table 4.2.3-32). Native soils were not encountered in this boring, so migration potential could not be assessed. Above-representative levels of gross alpha and gross beta were also detected in all five samples taken in this boring (Table 4.2.3-6).

Storage Area B. Boring F051B was advanced to 17 feet. It was sampled at five horizons: 5, 7, 9, 11, and 14 feet. The texture of all the samples was red-brown to tan silty sand. All the samples appeared to be a mixture of calciner fines and fill. All the samples contained calciner-related constituents above representative levels. The highest concentrations were generally found in the surficial sample: cadmium (261 mg/kg), calcium (280,000 mg/kg), chromium (328 mg/kg), copper (76.1 mg/kg), fluoride (54,400 mg/kg), nickel (120 mg/kg), total phosphorus (85,800 mg/kg), selenium (805 mg/kg), vanadium (390 mg/kg), and zinc (1,250 mg/kg) (Table 4.2.3-33). All but one of the samples had gross alpha activities above representative levels (Table 4.2.3-6). Gross alpha was not above its representative level in the 9-foot horizon (22.3 ± 14.62 pCi/g), but

the measurement is suspect given the magnitude of the uncertainty or accuracy value associated with the result. The actual gross alpha level in the sample is in all likelihood, above representative levels. Gross beta was also above its representative level in all but the 9-foot horizon sample. No native soils were sampled in this borehole.

Phase II Results for Calciner Ponds and Calciner Pond Sediments. To investigate the vertical extent of the impact of the calciner ponds and fines areas two boreholes were drilled during Phase II. One was located near F050B and the other in the vicinity of F051B. Soil samples taken from these borings were analyzed for inorganics, gross alpha, and gross beta (Table 2.1-1).

Storage Area A. Boring F128 was located in the vicinity of boring F050B and advanced to 100 feet. Groundwater was not encountered. Soil samples were taken for analysis at the 0-, 10-, 20-, 30-, 40-, 50-, 60-, 70-, 80-, and 100-foot horizons. The surficial sample contained above-representative level concentrations of constituents associated with calciner fines, including cadmium (68.1 mg/kg), chromium (334 mg/kg), fluoride (62,600 mg/kg), total phosphorus (15,100 mg/kg), potassium (18,400 mg/kg), selenium (73.9 mg/kg), and zinc (389 mg/kg) (Table 4.2.3-32). At the 30-foot horizon, cadmium remained high (82.4 mg/kg) as did zinc (851 mg/kg), but fluoride (2,090 mg/kg), total phosphorus (2,510 mg/kg), and potassium (3,430 mg/kg) were considerably lower. The depth of penetration of cadmium in this borehole suggests that a hydraulic head greater than that provided by drying sludges may have been applied in this area. The 40-foot soil sample was a sandy gravelly silt. It had a high manganese and nickel content. The mobile cations (calcium, 71,300 mg/kg, and potassium, 4,280 mg/kg) and anions (fluoride, 3,030 mg/kg, and total phosphorus, 8,470 mg/kg) continued to be above representative levels Zinc was above its representative level in several of the remaining gravel samples (50-, 60-, and 70-foot horizons), but it does not appear to be related to the calciner sludges. At the 100-foot horizon, the soil texture changed to a moderately dense to dense silt. In this silt, constituents that had migrated through the gravel zone were once again attenuated. Six constituents were detected

above representative levels in this zone: calcium (78,500 mg/kg), fluoride (890 mg/kg), orthophosphate (243 mg/kg), total phosphorus (31,800 mg/kg), potassium (3,870 mg/kg), and selenium (11.4 mg/kg). Selenium and nickel the latter of which was just above its representative level of 15.5 mg/kg, were the only trace metals above representative levels in this horizon, indicating that the trace metals have not migrated to this depth in measurable quantities.

Gross alpha in this borehole was above or near its representative levels in the surficial sample and in the samples taken at 60 and 70 feet. The activity in the surficial sample is likely related to site activities. The samples taken at 60 and 70 feet were in rhyolitic gravels. Volcanic rhyolites are known to be enriched in radioisotopes. Gross beta was above representative levels in several samples (Table 4.2.3-6).

Storage Area B. To determine to what depth the impact of the calciner pond sediments in storage area B extended, boring F127B was drilled northwest of boring F051B (Figure 2.1-1). Rhyolitic bedrock was encountered 38 feet below the surface. Five horizons were sampled in the boring. The first horizon was calciner sludge. The remaining four (5, 15, 25, and 35 feet) were a yellowish brown silt. The first sample, as expected, contained above-representative levels of constituents associated with calciner sludges (Table 4.2.3-33). The silt in the 5-foot horizon contained above representative level concentrations of boron (15.2 mg/kg), orthophosphate (348 mg/kg), total phosphorus (1,850 mg/kg), potassium (4,790 mg/kg), thallium (1.8 mg/kg), and zinc (63.5 mg/kg). No other constituents were above representative levels in this horizon, indicating little to no migration of trace metals. Only two constituents–orthophosphate (61.2 mg/kg at 15 feet) and potassium (4,840 mg/kg at 15 feet) significantly exceeded representative levels in the remaining soil sample horizons.

Gross alpha and beta only exceeded representative levels in the sludge (Table 4.2.3-6).

Summary – Calciner Pond and Calciner Pond Sediments. Calciner sediments were found in the bed of the former pond. By the 10-foot level, most of the trace metals were within

representative levels. The exceptions, which appeared consistently at deeper horizons in all of the calciner areas, were cadmium, nickel, and zinc. Given the general immobility of cadmium, its presence at depth (30 feet) was unexpected. By 40 feet, all EMF-related trace metals with the exception of zinc were within representative levels. However, the more mobile cations (calcium and potassium) and anions (total phosphorus and fluoride) remained above representative levels. Radionuclides, as evidenced by above-representative levels of gross alpha/beta, were only associated with sludge samples and do not appear to be mobile.

Former Kiln Scrubber Overflow Pond

The former kiln scrubber overflow pond is the only remaining accessible member of the kiln scrubber ponds. The other ponds are now covered by calciner #2. The former kiln scrubber overflow pond is presently located under an area used to store calciner fines (not calciner pond sediments, which are stored elsewhere). To assess the potential effect of the unlined former pond, a 10-foot boring was drilled beneath the silica pile. Five soil samples were taken and analyzed for inorganic and radiological parameters (Table 2.1-1).

Sampling began in boring F054B at 40 feet, the base of the storage pile. Five samples were taken at the 0-, 2.5-, 5-, 7.5- and 10-foot horizons. The boring log indicated all of these samples were reddish yellow silts. A number of trace metals were detected in all five horizons at concentrations above representative levels (Table 4.2.3-34). The same was true for fluoride and total phosphorus. The constituents present at highest concentrations were cadmium (355 mg/kg at 2.5 feet), fluoride (2,700 mg/kg at 0 feet), nickel (26 mg/kg at 0 feet), total phosphorus (2,580 at 0 feet), selenium (21.8 mg/kg at 2.5 feet), vanadium (174 mg/kg at 0 feet), and zinc (1,100 mg/kg at 2.5 feet). With the exception of the 7.5-foot sample which contained gross alpha (29.3 ± 7.66 ρCi/g) and gross beta (41 ± 5.8 ρCi/g) above representative levels, the remaining contained gross alpha and beta within representative levels (Table 4.2.3-6). The vertical extent of the impact of the scrubber overflow pond was not determined in this borehole.

Phase II Results for Former Kiln Scrubber Overflow Pond. During Phase II, a second borehole (F130) was advanced through the silica pile to 90 feet below the ground surface. Groundwater was encountered at 80 feet. Soil samples were taken at 10-foot intervals beginning with the silica pile/soil interface. The interface sample contained above-representative levels of cadmium (77.7 mg/kg), calcium (264,000 mg/kg), chromium (304 mg/kg), copper (77.7 mg/kg), fluoride (37,400 mg/kg), mercury (1 mg/kg), nickel (75.4 mg/kg), total phosphorus (69,300 mg/kg), vanadium (281 mg/kg), and zinc (605 mg/kg) (Table 4.2.3-34). This sample was a dark yellowish brown silt. The above-representative level constituents found in it indicated it was a silt mixed with ore.

The soil sample from the 10-foot horizon contained above-representative levels of arsenic (11.3 mg/kg), cadmium (281 mg/kg), fluoride (3,380 mg/kg), nickel (22 mg/kg), total phosphorus (3,150 mg/kg), selenium (11.6 mg/kg), vanadium (155 mg/kg), and zinc (823 mg/kg). Above-representative concentrations of cadmium and zinc persisted to 50 feet. For the most part, the other constituents were within representative levels by either the 30- or 40-foot horizons. The first retentive soil zone below the gravels was encountered at 70 feet. In this zone, trace metal, fluoride, and total phosphorus concentrations were higher than they were in the gravel areas, possibly indicating some migration and attenuation.

Gross alpha and gross beta activities were within representative levels for boring F054B (Table 4.2.3-6). Above-representative level activities (126 ± 19.6 pCi/g gross alpha and 59.5 ± 8.36 gross beta) were present in the surficial sample in boring F130B. These results are attributable to ore. Samples below the surface did not contain above-representative levels of gross alpha or gross beta. Hence, migration of radionuclides does not appear to be an issue in this location.

Summary – Former Kiln Scrubber Overflow Pond. Two borings were advanced into the subsurface at the former kiln scrubber pond. Boring F054B encountered 10 feet of EMF-affected soils. The predominant above-representative level constituents were cadmium, fluoride, total phosphorus, and zinc. While there was some decrease in constituent concentrations with depth,

the zinc and cadmium levels remained elevated. In F130, this same pattern was observed, with cadmium and zinc remaining above-representative levels though diminishing to 50 feet. Concentrations of most of the trace metals and anions were within representative levels by 30 feet. There was little to no evidence of soil effects near the groundwater table. Gross alpha and beta were only detected above representative levels in the surficial ore layer in boring B130. There was no evidence of their migration into the deeper subsurface.

4.2.3.4 FMC Facility Summary

The following summary discussion of the FMC potential source and facility soil investigation is divided into two parts: the first part addressing areas not subjected to a sustained hydraulic head, and the second part addressing areas to which a sustained hydraulic head has been applied. Data from both sets of areas indicate that a large portion of the FMC facility, as well as Bannock Paving, has been graded with fills composed of native soils and facility-related materials (primarily slag). The depth of the fill layer ranges from several feet to over 30 feet. The fill materials themselves often contain a number of constituents with concentrations that exceed representative soil levels. This is a result of on-site storage of feedstocks, coproducts and by-products, and the use of some by-products, primarily slag, as fill material.

The investigation of areas where there has not been a sustained hydraulic head has led to the following observations:

- When native soils are encountered beneath fill, trace metals are generally only measured at concentrations above soil representative levels in the first several feet of native soil. This observation is illustrated with chemical data from borings 103, 119 and 120, which were drilled in areas where no hydraulic head has been applied, in Figures 4.2.3-4 and 4.2.3-5. (The boring locations and sections lines are shown in Figure 4.2.2-4.)
- Radioactivity as measured in terms of gross alpha and gross beta tended to follow the same pattern as trace metals.
- In a number of samples, total phosphorus, fluoride, potassium, sodium and to lesser extent zinc, exceeded representative levels to depths of 10 feet below the fill/native soil

interface. Fluoride, phosphorus and zinc data for borings 103, 119 and 120, which were drilled in areas where no hydraulic head has been applied, are illustrated in Figure 4.2.3-6.

- Samples taken at or below road surfaces generally exhibited EMF-related effects in the surficial horizon; very little to no effects were observed in the 2-foot horizon.
- Volatile organic compounds (primarily xylenes and toluene) were found near detection limits in the boreholes drilled in the chemical drain field and near the active landfill. No EMF-related semivolatile organics were detected in any sample.
- TPH were detected in several locations near the surface and on the roads. They were not detected at depth.
- PCBs were detected at levels below 1 mg/kg in several road samples as well as in surficial soil samples. However, most samples analyzed for PCBs did not contain any at detectable levels. PCBs were not detected in any sample at depth.

These observations support the general conclusion that the site has widespread surficial effects due to EMF-related activities including the use of EMF-related materials for fill. However, in the absence of a sustained hydraulic head there has been little effect on the subsurface native soils.

The results of the investigation of areas where an artificial hydraulic head had been applied by an industrial activity (e.g., unlined impoundments or ditches and sludge drying areas) has led to the following observations:

- Trace metals are generally below soil representative levels within 20 to 30 feet of the source/native soil interface. The general exception is zinc, which was detected above representative levels at still greater depths. Some EMF-related constituents may be present in the soils at concentrations too low to enable distinguishing the constituents from their naturally occurring equivalents.

  Cadmium, lead, and vanadium concentrations in borings in the southwest pond and calciner pond areas are shown on Figures 4.2.3-4 and 4.2.3-7. Note the generally steep decline in concentrations from the surface in the sludge/fill to the native soils at 20 feet. Figures 4.2.3-5 and 4.2.3-8 depict arsenic, chromium and copper data for the southwest pond and calciner pond area. The same general pattern of high surficial values and

rapidly declining concentrations with depth is observed for these constituents. Selenium (not shown) exhibits the same pattern as arsenic.

- Total phosphorus, fluoride, sodium, potassium and zinc were, in many borings, observed throughout the entire soil column at above-representative levels.

  Figures 4.2.3-6 and 4.2.3-9 display data for fluoride, total phosphorus and zinc in the southwest pond and calciner pond areas. While the concentrations in the surficial samples are elevated relative to those in the subsurface, the concentrations generally remain above representative levels at depth.

4.2.4 POTENTIAL SOURCE AND FACILITY SOILS INVESTIGATION AND CONCLUSIONS

An examination of the potential source data shows that the phosphate ore contains a variety of trace metals as well as common cations (e.g., calcium and sodium) and anions (fluoride and phosphate). The various methods used in processing the ore at the two facilities both concentrate and disperse these materials into various coproducts, by-products and wastestreams. These coproduct, by-products and wastestreams, as well as the ore, can be identified by a suite of characteristic constituents. These were described in Sections 4.2.2.1 (Simplot) and 4.2.3.1 (FMC). The primary constituents found in the solid fraction of these materials at both FMC and Simplot are cadmium, chromium, fluoride, total phosphorus, vanadium and zinc. There are also enriched levels of silver, lead, copper and other parameters in some materials, but at least four of the six primary constituents are present in all. Four or more of these six characteristic constituents were usually among the predominant constituents detected in fill material or EMF-affected facility soils.

An examination of the facility soil data indicates that there has been widespread use of facility by-products as fill for grading in some portions of the EMF facilities. Fill extends to depths of up to 8 feet at the Simplot facility and up to 30 feet at FMC. The fill materials contain concentrations of various constituents above soil representative levels.

The areas investigated at the EMF facilities were grouped into areas with or without a sustained hydraulic head. A summary of the areas is provided in Table 4.2.4-1. For each area, the summary lists the associated soil boring numbers, approximate depth of fill and the primary

EMF-related constituents observed. The table was assembled from the individual area summaries provided in Sections 4.2.2 (Simplot) and 4.2.3 (FMC).

The overall conclusions drawn from analysis of areas with no sustained hydraulic head are as follows:

- EMF-related constituent concentrations were generally less than soil representative levels in native silts or clays beneath fill materials. Elevated constituents in the silts or clays were generally limited to fluoride, total phosphorus, sulfate (Simplot), potassium (FMC), sodium (FMC) and, to a lesser extent, zinc (FMC). Constituents concentrations greater than soil representative levels were generally not found in excess of 10 feet below the source or fill and native soil interface.
- PCBs were detected in scattered locations across both facilities at concentrations of less than 1 mg/kg. However, most of the samples analyzed for PCBs did not contain any at detectable levels. There was no evidence of vertical migration.
- TPH were detected in several locations near the surface and on roads. They were not detected at depth.
- Volatile organic compounds (primarily xylenes and toluene) were found near detection limits in the boreholes drilled in FMC's chemical laboratory drainfield and near the active landfill. No EMF-related semivolatile organics were detected in any sample.
- Gross alpha and gross beta activities in excess of representative levels were generally confined to fill materials. There was no evidence of radionuclide migration into the native soils in areas lacking a sustained hydraulic head.

The above conclusions support the more general conclusion that the main facility areas have widespread surficial effects due to EMF-related activities, in particular due to the use of EMF-related materials for fill. Even so, many of the surficial soils, particularly at Simplot, are beneath asphalt or concrete, and, in the absence of a sustained hydraulic head, there has been little effect on the subsurface native soils.

The conclusions drawn from evaluation of the areas that had or have a sustained hydraulic head are as follows:

- Most trace metals are below representative levels in the first 10 to 20 feet of native soil where the soil is a clay or silt. Clay or silt predominate in the western and central pond area of the FMC facility and beneath the upper gypsum stack at the Simplot facility.
- In areas underlain by few fine-grained soils, metals such as zinc and nickel exceed representative levels to depths greater than 20 feet. However, they are rarely above representative levels near the water table. These conditions are generally confined to the northern portion of the Simplot facility and the eastern part of the FMC facility.
- Gravels and fines derived from volcanic rocks have constituent levels characteristic of these materials. In the EMF study area, volcanic rocks (basalts and rhyolites) are present throughout the Bannock Range and its foothills. Alluvial materials derived from these rocks underlay much of the upland areas of the EMF facilities. Basaltic materials contain more iron and magnesium-rich minerals, while rhyolitic materials contain relatively more aluminosilicates and uranium-238 series radionuclides. The loess within the study area contains approximately 50% calcium carbonate; loess would contain less gamma radioactivity compared with the rhyolitic materials. The basaltic materials would also contain relatively higher levels of metals such as cadmium, chromium, vanadium, compared with loess.
- In some of the areas to which a sustained hydraulic head was or is applied, fluoride, total phosphorus, sulfate and potassium exceed representative levels throughout the soil column.

Surface and Subsurface Characterizations
Tables for Section 4.2

TABLE 4.2.1-1
CONCENTRATIONS DEFINING THE UPPER REPRESENTATIVE LIMITS IN CHEMICALS IN SOIL

Parameter	Representative Levels (mg/kg)
Aluminum	13,900
Antimony	14.3
Arsenic	7.7
Barium	188
Beryllium	1
Boron	12.8
Cadmium	1.9
Calcium	75,800
Chromium	27.5
Cobalt	7.6
Copper	12.6
Fluoride	600
Iron	14,400
Lead	29.1
Lithium	16.1
Magnesium	22,000
Manganese	482
Mercury	0.16
Molybdenum	2.15
Nickel	15.5
Orthophosphate	3.7
Total Phosphorus	672
Potassium (a)	3562
Sodium (a)	970.7
Selenium	3.05
Silver	1.9
Thallium	0.27
Vanadium	45.4
Zinc	52.8
Lead-210	3.03
Polonium-210	3.58
Potassium-40	20.5
Uranium-238	3.88
Gross Alpha (a)	24.7
Gross Beta (a)	31.4

Notes: (a) Representative level developed by the Companies.
No representative level provided by EPA.

TABLE 4.2.1-2
COMPARISON OF EPA AND COMPANY-PROPOSED UPPER REPRESENTATIVE LIMITS IN SOIL

Parameter	EPA Representative Levels[1] (mg/kg)	Company Representative Levels (mg/kg)[2]	
		Subsurface	Surface
Aluminum	13,900	14,600	16,000
Antimony	14.3	30.9	10.4
Arsenic	7.7	8.48	6.66
Barium	188	203	206
Beryllium	1	1.16	1.45
Boron	12.8	18.1	17.4
Cadmium	1.9	1.17	4.88
Calcium	75,800	65,600	NC
Chromium	27.5	27.0	53.0
Cobalt	7.6	8.72	7.79
Copper	12.6	15.2	17.2
Fluoride	600	559	656
Iron	14,400	14,900	17,100
Lead	29.1	26.1	35.8
Lithium	16.1	17.8	19.3
Magnesium	22,000	18,700	8,720
Manganese	482	476	909
Mercury	0.16	0.33	0.23
Molybdenum	2.15	5.23	2.13
Nickel	15.5	14.9	18.6
Orthophosphate	3.7	8.88	21.8
Total Phosphorus	672	840	1,510
Potassium	NC	3,560	4,930
Selenium	3.05	6.53	1.23
Silver	1.9	2.00	1.04
Sodium	NC	971	NA
Thallium	0.27	20.4	0.33
Vanadium	45.4	52.6	35.5
Zinc	52.8	52.4	89.7
Lead-210	3.03	5	7.5
Polonium-210	3.58	4.6	5.2
Potassium-40	20.5	21.9	29.5
Uranium-238	3.88	5.3	5
Gross Alpha	NC	24.7	NA
Gross Beta	NC	31.4	NA

Notes: NA = Not analyzed
NC = Not calculated due to insufficient sample size
[1] Derivation explained in E&E 1995
[2] Derivation explained in Bechtel 1994a

TABLE 4.2.2-1
CHEMICAL DATA FOR ORE/GYPSUM SLURRY

Parameter	Ore Slurry – S304OR1 (mg/kg)				Gypsum Slurry – S304GP1 (mg/kg)				Gypsum Slurry Liquid (mg/l)	
	HNO_3		HF/Perchlor		HNO_3		HF/Perchlor		SGSFEF01	
Aluminum	4,800.00		7,240.00		1,180.00		3,240.00		51.0000	
Ammonia	NA		NA		NA		NA		318	
Antimony	3.80	U	6.00		3.80	U	23.40	U	0.0892	UJ
Arsenic	5.30		5.40		0.72		0.94	U	0.2050	
Barium	51.20		72.60		39.70		53.70		0.6640	
Beryllium	1.90		2.30		0.23		2.80		0.0199	
Boron	225.00		12.50	J	14.00		6.00	UJ	10.0000	J
Cadmium	109.00		111.00	J	34.80		37.10	J	2.0000	
Calcium	302,000.00		292,000.00	J	233,000.00		243,000.00	J	1,400.0000	
Chloride	NA		NA		NA		NA		162	
Chromium	404.00		476.00	J	110.00		228.00	J	5.3100	
Cobalt	0.39	UJ	0.48	U	0.39	UJ	2.40	U	0.0379	
Copper	75.50		76.50		38.60		43.10		0.7700	
Fluoride	33,300.00		35,700.00	J [a]	6,900.00		7,650.00	J [a]	8,480.0000	J
Iron	2,980.00		3,090.00	J	480.00		711.00	J	32.4000	
Lead	8.60		5.40		5.40		7.30		0.0086	J
Lithium	3.70		4.70		0.39		2.40	U	0.3540	
Magnesium	1,550.00		1,580.00		213.00		301.00		55.5000	
Manganese	37.00		39.70		4.90		4.70		1.4800	
Mercury	0.46	U	0.12	U	0.38	U	0.11	U	0.0002	U
Molybdenum	14.00		18.80	J	5.30		7.80	J	0.0742	
Nickel	94.10		100.00	J	25.50		42.30	J	1.6800	
Phosphorus, Total	74,300.00		136,000.00		6,560.00		9,450.00		2,460.0000	
Potassium	2,120.00		3,130.00		1,300.00		2,160.00		176.0000	
Selenium	11.50	J	28.30	J	15.60	J	23.00	J	0.0451	
Silver	10.00		12.30	J	7.30		6.20	J	0.0084	UJ
Sodium	3,490.00		3,670.00		2,090.00		2,400.00		768.0000	
Sulfate	NA		NA		540,000.00		601,000.00		4,480.0000	
Thallium	3.30	J	0.10	R	0.64	J	0.10	R	0.0251	J
Vanadium	701.00		732.00	J	190.00		262.00	J	3.8100	
Zinc	1,140.00		1,130.00	J	211.00		227.00	J	12.6000	

Parameter	Ore Slurry – S304OR1 (pCi/g)	Gypsum Slurry – S304GP1 (p/Ci/g)	Gypsum Slurry Liquid (pCi/l)
Gross alpha	567	81.7	644
Gross beta	184	40.2	619

Notes: J = Estimated.
NA = Not analyzed.
R = Rejected.
U = Not detected.
[a] Hydroxide fusion digestion rather than HF/perchloric

TABLE 4.2.2-2
WASTEWATER ANALYTICAL PARAMETERS

Alkalinity, bicarbonate	Lithium, total
Alkalinity, carbonate	Magnesium
Aluminum, total	Manganese, total
Ammonia (NH_3 as N)	Mercury, total
Antimony, total	Molybdenum, total
Arsenic, total	Nickel, total
Barium, total	Nitrate (NO_3 as N)
Beryllium, total	Orthophosphate (PO_4 as P)
Boron, total	Phosphorus, total
Cadmium, total	Potassium
Calcium	Selenium, total
Chloride	Silver, total
Chromium, total	Sodium
Cobalt, total	Sulfate
Copper, total	Thallium, total
Fluoride	Total dissolved solids
Iron, total	Vanadium, total
Lead, total	Zinc, total

TABLE 4.2.2-3
CONCENTRATIONS OF PARAMETERS IN THE FORMER EAST OVERFLOW POND

CHEMICAL NAME	SLUDGE FROM FORMER EAST OVERFLOW POND, SSDEOP01 (mg/kg, dry weight basis)[a]	WATER FROM FORMER EAST OVERFLOW POND, SWWEOP01 (mg/l)[b]	GROUNDWATER FROM WELL 318, 9209415 (mg/l)[b]
Alkalinity, bicarbonate	NA	1 UJ	1 U
Alkalinity, carbonate	NA	1 UJ	1 U
Aluminum, dissolved	NA	NA	215.4
Aluminum, total	7820 J	14.56 J	311
Ammonia (NH_3 as N)	NA	4.9	15.7
Antimony, dissolved	NA	NA	0.06 U
Antimony, total	12.4 U	0.06 UJ	0.06 UJ
Arsenic, dissolved	NA	NA	0.3833
Arsenic, total	8.1 U	0.1309 J	0.3138
Barium, dissolved	NA	NA	0.34
Barium, total	202 J	0.23	0.43
Beryllium, dissolved	NA	NA	0.031
Beryllium, total	0.94 U	0.009	0.026
Boron, total	74.9	0.43	0.364
Cadmium, dissolved	NA	NA	3.45
Cadmium, total	21.9 J	1.14 J	0.27 R
Calcium	122000 J	192 J	478 J
Calcium, dissolved	NA	NA	660
Chloride	NA	142	132
Chromium, dissolved	NA	NA	3.91 J
Chromium, total	204 J	1.1777 J	3.97 J
Cobalt, dissolved	NA	NA	0.128 U
Cobalt, total	0.65 UJ	0.031 U	0.129
Copper, dissolved	NA	NA	0.68899
Copper, total	77.6 J	0.469	0.836
Fluoride	52200	6380	2730
Gross alpha	131 (pCi/g) J	360 (pCi/l)	959 (pCi/l)
Gross beta	64 (pCi/g)	272 (pCi/l)	1180 (pCi/l)
Iron, dissolved	NA	NA	101.8
Iron, total	2620 J	12.39 J	97.1
Lead, dissolved	NA	NA	0.01175 J
Lead, total	7.3 J	0.0245 J	0.0142 J
Lithium, dissolved	NA	NA	0.32 J
Lithium, total	1.3 U	0.093	0.363
Magnesium	423 J	44 J	149.9 J
Magnesium, dissolved	NA	NA	210
Manganese, dissolved	NA	NA	6.5
Manganese, total	5.2 J	0.336	8.34 J

Notes: [a] Results are expressed in mg/kg, unless otherwise indicated
[b] Results are expressed in mg/l, unless otherwise indicated
J = Estimated R = Rejected U = Not detected NA = Not Analyzed

TABLE 4.2.2-3 (*continued*)
CONCENTRATIONS OF PARAMETERS IN THE FORMER EAST OVERFLOW POND

CHEMICAL NAME	SLUDGE FROM FORMER EAST OVERFLOW POND, SSDEOP01 (mg/kg, dry weight basis)[a]	WATER FROM FORMER EAST OVERFLOW POND, SWWEOP01 (mg/l)[b]	GROUNDWATER FROM WELL 318, 9209415 (mg/l)[b]
Mercury, dissolved	NA	NA	0.00033 UJ
Mercury, total	0.2 U	0.0001	0.0002 U
Molybdenum, dissolved	NA	NA	0.19
Molybdenum, total	9.3	0.08 U	0.14 U
Nickel, dissolved	NA	NA	2.132
Nickel, total	41.2 J	0.555	2.4
Nitrate (NO_3 as N)	NA	0.29	1.25 U
Orthophosphate (PO_4 as P)	6960	607	2460
pH (pH units)	NA	0.6	1.69
Phosphorus, total	6160	563	2250
Potassium	1290 J	24.3 J	172.9 J
Potassium, dissolved	NA	NA	258.4
Radium-226	NA	29 (pCi/l) J	0.14 (pCi/l) UJ
Radium-228	NA	1.9 (pCi/l) U	7 (pCi/l)
Selenium, dissolved	NA	NA	0.03064
Selenium, total	1.2 U	0.0296 J	0.0172 J
Silver, dissolved	NA	NA	0.002 UJ
Silver, total	8.2	0.005 U	0.0016 U
Sodium	1790 J	106.1 J	249 J
Sodium, dissolved	NA	NA	158
Specific conductance, at 25°C	NA	14300 (µmhos/cm)	11147 (µmhos/cm)
Sulfate	NA	746	2090
Temperature (°C)	NA	26.22	19.4
Thallium, dissolved	NA	NA	0.0122
Thallium, total	0.65 UJ	0.0075 J	0.0114 J
Total dissolved solids	NA	3140	12100 J
Vanadium, dissolved	NA	NA	13.12
Vanadium, total	362 J	3.39	13.77
Zinc, dissolved	NA	NA	17.41
Zinc, total	298 J	6.01	19.63

Notes: [a] Results are expressed in mg/kg, unless otherwise indicated
[b] Results are expressed in mg/l, unless otherwise indicated
J = Estimated R = Rejected U = Not detected NA = Not Analyzed

TABLE 4.2.2-4
CONCENTRATIONS OF PARAMETERS IN WATER TREATMENT PONDS AT SIMPLOT

CHEMICAL NAME	HOLDING POND SWWWP101 (mg/l)[a]	SETTLING POND SWWWP201 (mg/l)[a]	EQUALIZATION POND SWWWP301 (mg/l)[a]
Alkalinity, bicarbonate	1 UJ	52 J	145 J
Alkalinity, carbonate	1 UJ	1 UJ	40 J
Aluminum, total	7.59 J	0.16 J	0.13 J
Ammonia (NH3 as N)	36.9	25.1	34.8
Antimony, total	0.06 UJ	0.06 UJ	0.15 UJ
Arsenic, total	0.03823 J	0.01082 U	0.00238 UJ
Barium, total	0.2	0.11	0.1
Beryllium, total	0.006	0.001 UJ	0.004
Boron, total	0.51	0.46	0.49
Cadmium, total	0.54 J	0.0104 J	0.00241
Calcium	188 J	90.1 J	82.4 J
Chloride	68.2	57.9	58.6
Chromium, total	0.42 J	0.00591 J	0.01204 J
Cobalt, total	0.024 U	0.026 U	0.024 U
Copper, total	0.145	0.01	0.018 U
Fluoride	26.6	2.3	2.3
Gross alpha	158 (pCi/l)	7.43 (pCi/l)	6.03 (pCi/l)
Gross beta	119 (pCi/l)	12.4 (pCi/l)	9.12 (pCi/l)
Iron, total	38.3 J	0.605 J	0.353 J
Lead, total	0.01338 J	0.00168 U	0.001 UJ
Lithium, total	0.105	0.064	0.068
Magnesium	42.7 J	27.2 J	24 J
Manganese, total	0.303	0.018 U	0.016 U
Mercury, total	0.00026	0.00036	0.00028
Molybdenum, total	0.13 U	0.03 U	0.017 U
Nickel, total	0.283	0.007 UJ	0.007 UJ
Nitrate (NO_3 as N)	0.92	3.54	4.22
Orthophosphate (PO_4 as P)	1330	4.83	2.64
pH (pH units)	1.91	6.02	8.6
Phosphorus, total	1320	4.82	3.06
Potassium	15.5 J	7.1 J	7.5 J
Radium-226	4.27 (pCi/l)	0.9 (pCi/l) UJ	0.3 (pCi/l) UJ
Radium-228	0.5 (pCi/l) U	0.8 (pCi/l) U	5.5 (pCi/l) U
Selenium, total	0.118 J	0.00515 J	0.18 J
Silver, total	0.003 U	0.004 U	0.004 U
Sodium	137.3 J	73.9 J	71.1 J
Specific conductance, at 25°C	4410 (µmhos/cm)	1070 (µmhos/cm)	330 (µmhos/cm)
Sulfate	2590	416	270
Temperature (°C)	26.5	20.11	24.78
Thallium, total	0.0053	0.001 UJ	0.001 UJ
Total dissolved solids	4220	930 J	800
Vanadium, total	1.67	0.015 U	0.015 U
Zinc, total	5.19	0.317	0.374

Notes: [a] Results are expressed in mg/l, unless otherwise indicated
J = Estimated U = Not detected

TABLE 4.2.2-5
CONCENTRATIONS OF PARAMETERS IN SOIL IN THE FORMER UNLINED DITCH TO WATER TREATMENT PONDS

Parameter	SSSUDP01[a]	SBSUDP01[b]	SSSUDP02	SBSUDP02	SSSUDP03	SBSUDP03	SSSUDP04	SBSUDP04	SSSUDP05	SSSUDP06
Aluminum	4080	7390	6370	8490	2960	5180	4610	7010	7270	8800
Antimony	10.2	9.3	12.9	10.3	10.3	10.9	10.2	12.2	16.0	15.1
Arsenic	<7.9	<5.8	<8.1	<5.8	<6.6	<7.5	<8.7	<9.4	<9.5	13.0
Barium	60.1	276.0	212.0	961.0	10,800.0	7,850.0	1,020.0	2,970.0	1,820.0	633.0
Beryllium	2.1	2.0	2.5	1.1	0.5	0.9	2.4	2.0	2.0	2.4
Boron	193	20.6	45	15	12.9	14.4	43.4	33.6	26.3	43.3
Cadmium	103.0	51.3	108.0	7.4	14.1	6.1	80.6	31.1	27.0	91.1
Calcium	571,000	99,100	273,000	9,560	12,200	8,910	201,000	66,900	58,600	171,000
Chromium	363.0	476.0	584.0	138.0	1,260.0	853.0	447.0	1,470.0	2,350.0	705.0
Cobalt	0.53	2.4	1.3	2.3	3.2	3.3	0.72	3.0	4.1	6.5
Copper	64.0	52.5	79.3	14.7	34.2	29.9	64.8	57.6	76.4	165.0
Fluoride	25,900	10,800	18,300	935	1,230	1,230	16,100	13,100	3,530	8,800
Iron	2,570	9,710	5,840	7,540	21,000	18,900	4,780	22,500	20,500	16,400
Lead	15.3	42.0	23.5	17.1	119.0	43.9	16.8	83.4	67.8	89.1
Lithium	4.7	4.5	7.0	5.0	2.0	3.2	6.2	4.5	5.2	7.9
Magnesium	2,120	2,020	3,860	1,620	661	945	2,830	1,680	1,970	5,480
Manganese	55.5	74.1	336.0	63.1	93.1	38.6	54.1	72.8	115.0	649.0
Mercury	<0.41	4.50	<0.72	3.40	1.20	1.40	<0.45	47.20	10.30	3.80
Molybdenum	11.9	13.7	18.4	1.9	12.5	12.1	16.3	23.6	16.3	17.2

Notes: Results are in mg/kg.
[a] SS prefix refers to surface sample.
[b] SB prefix refers to subsurface sample (2 feet bgs).

TABLE 4.2.2-5 *(continued)*
CONCENTRATIONS OF PARAMETERS IN SOIL IN THE FORMER UNLINED DITCH TO WATER TREATMENT PONDS

Parameter	SSSUDP01[a]	SBSUDP01[b]	SSSUDP02	SBSUDP02	SSSUDP03	SBSUDP03	SSSUDP04	SBSUDP04	SSSUDP05	SSSUDP06
Nickel	86.6	45.6	122.0	14.4	20.2	12.3	94.4	50.1	60.8	133.0
Orthophosphate	2,670	4,350	2,750	1,370	1,370	1,850	917	1,200	1,730	2,730
Phosphorus, total	123,000	60,500	114,000	7,130	17,900	8,550	81,600	46,900	30,100	61,000
Potassium	1,970	1,850	2,670	2,120	1,330	1,980	2,130	2,530	1,960	2,430
Selenium	46.5	8.0	61.2	2.6	4.9	<2.2	46.3	8.3	4.2	11.4
Silver	13.2	2.4	7.4	<0.53	33.7	6.5	5.4	2.6	<0.83	4.2
Sodium	3,920	1,710	3,900	553	613	562	3,760	1,460	1,250	2,330
Thallium	4.3	0.49	10.0	0.53	0.54	0.57	9.3	0.63	0.83	0.69
Vanadium	685.0	496.0	960.0	150.0	202.0	192.0	917.0	433.0	350.0	616.0
Zinc	1,080.0	665.0	1,400.0	147.0	231.0	115.0	1,100.0	419.0	435.0	1,370.0

Notes: Results are in mg/kg.
[a] SS prefix refers to surface sample.
[b] SB prefix refers to subsurface sample (2 feet bgs).

TABLE 4.2.2-6
CONCENTRATIONS OF MERCURY DETECTED IN SOIL
ALONG THE FORMER UNLINED DITCH TO THE WATER TREATMENT PONDS

Former Station ID	Concentration Detected (mg/kg)
SBSODP01	7.2
SBSODP02	3.2
SBSODP03	2.3
SSSODP01	0.46
SSSODP02	3.9
SSSODP03	4.9
SSSODP04	2
SSSODP05	3
SSSODP06	1.2

Notes: Samples taken at surface and 2-foot depth.

Table 4.2.2-7
Concentrations of Parameters in Soil in the Triple Superphosphate Area

S050B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Black/gray silty gravel	11100	7.7 UJ	1.9 UJ	210	0.79	19.2 J	1.8	79700	115 J	8.5	350	73000	8460	4.3
2	Tan silt	10500	9.3 UJ	3.9 UJ	101	0.48	13.4 J	9.9	82100	15.8 J	3	6.6	510	8840	3.7 UJ
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Black/gray silty gravel	9	4510	200 J	0.81 U	3.5	93.9	4.9	2130	2.7 UJ	1.9	12 U	102	291 J	49.1	34
2	Tan silt	9.1	4220	729 J	0.24 U	1.6 U	45.6	909	54700	2.3 UJ	0.48 U	14.4 U	21.6	187 J	11.2 UJ	21.1
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

S051B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown silt with trace fine gravel	22100 J	8.5 U	2.3 J	183	1.7	60	7.7	208000	254 J	6.3	44.2 J	14500	5950	3.4 U
2	Brown sandy silt/gravel	7380 J	7.9 U	4.1 J	124	0.43	10.4	4.9	38200	51.6 J	8.1	53.2 J	2300	9270	6.7
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark brown silt with trace fine gravel	15.3	5100 J	220	0.11 UJ	2.9	35.5 J	15	5140	3.9	4.1 J	13.2 U	238	143	136 J	57.7 J
2	Brown sandy silt/gravel	6.4	3160 J	183	1.3 J	1.3 U	23.5 J	65.7	10100	0.86 U	0.41 UJ	12.3 U	54.5	141	27.2	28.3
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

S052B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Brown silt with fine gravel	17500 J	7.9 U	2.6 J	170	1.3	41.9	6.1	160000	196 J	5.6	28.1 J	11600	5680	20.9
2	Brown silt	8150 J	8.3 U	5.7 J	713	0.66	18.4	30.4	111000	103 J	0.46	16.8 J	4800	6800	7.5
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Brown silt with fine gravel	12.1	3780 J	181	0.81 J	2.3	31.2 J	15.3	6950	3.1	2.7 J	12.4 U	183	219	133 J	52.3 J
2	Brown silt	3.2	2510 J	142	2.1 J	1.4 U	19.4 J	1580	7040	1 U	1.3 J	0.13 U	154	19.9	49.1 J	29.7 J
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet

J - Estimated value.

U - Not detected.

NS - Not sampled.

Table 4.2.2-7 (continued)
Concentrations of Parameters in Soil in the Triple Superphosphate Area

S053B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown silt with gravel	14600 J	28.4	55 J	145	1.2	43.3	14.1	137000	199 J	10.7	36.8 J	10600	5180	2370
2	Tan silty clay with gravel	10500 J	11.6	12.8 J	176	0.45	17	0.75	106000	12.7 J	4.9	7.7 J	530	10000	4.8
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark brown silt with gravel	10.5	3740 J	184	1.9 J	5.2	39.1 J	314	3150	2.6	3.1 J	12.1 U	207	9730	107 J	54.6 J
2	Tan silty clay with gravel	12	13800 J	249	0.67 J	1.5 U	14.8 J	118	1260	0.31 U	0.82 J	14.1 U	22.9	50.4	17.7 J	15.2 J
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S098B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Sandy gravel	10700	4.6 UJ	7.2	2020 J	1.2	31.4	26 J	78800	159 J	1.2	22.1	7820	9910	18.1	5.8
2	Gravelly clayey silt	9410	4.6 UJ	4.2	133 J	0.86	10	0.35 U	65600	12.6 J	5.6	7.1	540	11600	8.3	13.1
5	Yellowish-brown silt	12300	4.5 UJ	5.1	572 J	0.75	29.7	3.6 J	69700	32.6 J	5.4	15.7	1770	11900	38.6	14.1
7	Yellowish-brown silt	11500	4.5 UJ	4.4	235 J	0.87	13.9	0.37 J	44500	19.3 J	5.6	9.2	570	12100	8.2	10.7
10	Yellowish-brown silt	9940	4.7 UJ	7.5	98.4	0.52	9.6	0.36 U	42700	17.3 J	4.6	8.2	450	11800	16.7	9.2 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Sandy gravel	4740	205	1.00	2.7 U	37.6	1710	44800	2930	0.87	0.35 U	0.12 UJ	274 J	440 J	14.2	23.2
2	Gravelly clayey silt	17000	303	0.04 U	1.5 U	11.7	34.4	879	2190	0.58 U	0.35 U	0.14 J	17.1 J	43.6 J	18.6	24.2
5	Yellowish-brown silt	12100	321	0.04 U	2.0 U	16.6	70.6	2210	3350	0.88	0.35 U	0.51 J	47.2 J	162.0 J	17.7	24.6
7	Yellowish-brown silt	14500	335	0.06	1.5 U	14.0	565.0	2960	2550	0.59 U	0.35 U	0.12 UJ	26.8 J	49.3 J	NA	NA
10	Yellowish-brown silt	14000	440	0.35	1.6 U	11.6	492	7000	2010	0.61 U	0.36 U	0.12 U	24.9	40.9 J	6.94	17.1
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:
Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.
Depths are in feet
J - Estimated value.
U - Not detected
NS - Not sampled
NA - Not analyzed

Table 4.2.2-8

Concentrations of Parameters in Soil in the Former Phosphoric Acid Loading Area/Railcar Cleaning Area

S056B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium	Magnesium
0.5	Black silty gravel (Railroad fill)	10500 J	6.1 UJ	5.4 U	89.2 J	0.97	19	55.6	63400 J	306 J	0.95	20.5 J	10000	11600 J	16	4.4	3650 J
Representative		13,900	14.3	7.7	186	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1	23,000

Sample Depth	Sample Description	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Black silty gravel (Railroad fill)	154 J	0.19 U	7.3 U	35.1	10400	45400	3.4 U	1.2	12.6 U	408 J	485 J	86.7	55.1
Representative		482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

S103B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium	Magnesium
0	Sandy Gravel	9260	4.4 UJ	3.7	638	0.68	15.8	11.3	35900	69.8	2.1	18.8	4090	11100	34.2	6.2	4320
2	Sandy Gravel	6870	4.4 UJ	3.7	481	0.57	12	10.2	38600	61.8	1.5	14.8	3870	7450	134	4.2	3650
5	Gravelly silt	10200	4.4 UJ	4.4	1040	0.77	32.6	11.2	39100	76.5	2.4	51.2	4810	10900	154	6.2	4340
7	Gravelly silt	18100	4.6 UJ	25.9	828	2	63.8	61.2	77800	636	0.48 U	137	15100	58500	444	4	1930
Representative		13,900	14.3	7.7	186	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1	23,000

Sample Depth	Sample Description	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Sandy Gravel	159 J	0.72	1.6	17.9	514	17500	2320	0.56 U	0.34 U	14700	0.43	113	142	31.1	39.1
2	Sandy Gravel	136 J	0.83	2	17.3	643	13200	1890	0.57 U	0.34 U	10300	0.11 U	97.8	138	27	37.9
5	Gravelly silt	152 J	0.16 U	3.9	20.9	829	18500	2640	0.58 U	0.34 U	11300	0.3	128	149	20.8	32.7
7	Gravelly silt	339 J	2.1	22.8	84.9	6360	65400	3650	0.9 U	0.38 U	13500	0.77	1100	588	158	107
Representative		482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	NC	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg except for gross alpha and gross beta, which are in pCi/g

Depths are in feet.

J - Estimated value

R - Rejected value

U - Not detected

NC- Not calculated

Table 4.2.2-9
Concentrations of Parameters in Soil in the Phosphoric Acid Tank Containment Area

S054B

Sample Depth	Sample Description	Aluminum		Antimony		Arsenic		Barium		Beryllium		Boron	Cadmium	Calcium		Chromium		Cobalt	Copper		Fluoride	Iron		Lead	
0.5	Pea gravel (road base)	1820	J	7.8	UJ	0.51	U	45.2	J	0.51	U	2.6	0.76	2650	J	14.4	J	1.3	4.8	J	670	5230	J	3.2	U
2.5	Sandy gravel (road base)	13100	J	9.1	UJ	7.1	U	107	J	1.8	U	19.8	7	31500	J	63	J	11.9	9.9	J	640	11700	J	4.7	
Representative		13,900		14.3		7.7		188		1		12.8	1.9	75,800		27.5		7.6	12.6		600	14,400		29.1	

Sample Depth	Sample Description	Lithium		Magnesium		Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Selenium		Silver		Thallium		Vanadium		Zinc		Gross Alpha		Gross Beta
0.5	Pea gravel (road base)	0.8	U	424	J	30.8	J	0.05	U	1.3	U	3	45.5	1970	0.99	U	0.41	U	12.2	U	13.2	J	17.3	J	8.07	UJ	13
2.5	Sandy gravel (road base)	6.3		22700	J	711	J	0.06	U	3.5	U	121	5690	11400	1.3	U	0.47	U	14.1	U	69.6		436	J	NA		NA
Representative		16.1		22,000		482		0.16		2.15		15.5	3.7	672	3.05		1.9		0.27		45.4		52.8		24.7		31.4

S055B

Sample Depth	Sample Description	Aluminum		Antimony		Arsenic		Barium		Beryllium		Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Brown silty gravel (road fill)	4740		7.7	UJ	2.9		102	J	0.35		3.7	U	2.6		22100	25.7	3.5	10.8	1600	10200	7.2
2.5	Brown silty gravel (road fill)	4840		7.9	UJ	2.7		117	J	0.3		3.7	U	2.3		18000	19.9	3.7	8.1	1100	9250	7.6
5	Yellowish-brown silt	10800		8.5	UJ	7.3		113	J	0.61		8.9	U	0.55	U	49100	14.2	4.9	7.8	380	11100	6.4
Representative	Groundwater not encountered	13,900		14.3		7.7		188		1		12.8		1.9		75800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Selenium		Silver		Thallium		Vanadium		Zinc	Gross Alpha	Gross Beta
0.5	Brown silty gravel (road fill)	5	4940	179	0.15	U	1.3	U	11.4	148	3930	1.7	U	1.4		12	U	33.7		70.4	21.3	28
2.5	Brown silty gravel (road fill)	5.9	2980	162	0.12	U	1.3	U	9.2	110	2310	0.73	U	0.41	U	12.3	U	22.8		51.2	10.6	13.5
5	Yellowish-brown silt	13.1	12600	290	0.12	U	1.4	U	9.7	53.1	786	1.7	U	0.44	U	13.2	U	24.1		34.1	12.6	22.5
Representative	Groundwater not encountered	16.1	22,000	482	0.16		2.15		15.5	3.7	672	3.05		1.9		0.27		45.4		52.8	24.7	31.4

Notes:
Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.
Depths are in feet.
J - Estimated value
U - Not detected.
NS - Not sampled.
NA - Not analyzed.

Table 4.2.2-10
Concentrations of Parameters in Soil in the Sulfuric Acid Plants #1 and #2

Sulfuric Acid Plant #1

S062B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0.5	Very dark grayish-brown silty sand (backfill)	10600 J	8 UJ	3.2 U	364 J	1.1	34.8	8.7 J	94500 J	141	7.1	164	8100	11600 J	52.3 J	6.9
2.5	Light yellowish-brown silt	11400 J	8.7 UJ	6.1 U	274 J	0.85 U	20.2	0.56 UJ	32800 J	15.4	10	23.3	480	12100 J	11.1 J	14.2
5	Light yellowish-brown silt	11200 J	9.2 UJ	4.8	121 J	0.68	20.2	0.6 U	39000 J	14.4	5.2	9.8	500	11900 J	9.5	12.7
7.5	Very pale brown silty gravel	4490 J	7.8 UJ	5.7	47.6 J	0.34	19.2	0.51 U	7620 J	67.7	103	325	140	32900 J	3.2 U	5.5
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Very dark grayish-brown silty sand (backfill)	2740 J	122 J	0.44	11.5	79.7	62.9	9060	2.5	1.3 J	12.4 U	139 J	314 J	60.8	37.9
2.5	Light yellowish-brown silt	8900 J	385 J	0.12 U	1.5 U	15.9	40.1	657	0.65	0.45 UJ	13.5 U	21.3 J	56.5 J	7.8 UJ	19.3
5	Light yellowish-brown silt	14900 J	320 J	0.1 U	1.6 U	10.7	44.7	921	1.4 U	0.48 U	14.4 U	23.7	38.8	35.6	33.0
7.5	Very pale brown silty gravel	2910 J	382 J	0.08 U	15.7	168	3.9	130	1 U	0.41 U	21.1	11.7	228	8.32 UJ	14.2
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	9.27	45.4	52.8	24.7	31.4

S063B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Dark brown sandy gravel	8390	8.1 U	4.1 U	368	0.5	11.9 J	9.5	26800	47.9	5.1	38.6	6200	14000	39	7.9
2.5	Dark brown sandy gravel	7110 J	8.6 U	4	96.4 J	0.66 U	6.6 UJ	6.9 J	36600 J	31.9 J	15 J	19.2	1600	12900 J	4.5 J	6.9
5	Dark brown sandy gravel	5560 J	8.2 U	3.1	173 J	0.62 U	3.5 UJ	2 J	35700 J	16.7 J	7.6 J	23	650	12100 J	6.6 J	5.5
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Dark brown sandy gravel	4320	216	0.14 U	1.4 U	23.2	850	6230	2.9 U	0.42 UJ	12.6 U	74.8	451 J	46.7	38.0
2.5	Dark brown sandy gravel	6050 J	318 J	0.14 U	1.4 U	27.9	1160	10500	3.4	0.45 U	13.4 U	47.7 J	136 J	12.6 UJ	11.9 UJ
5	Dark brown sandy gravel	5280 J	254 J	0.07 U	1.4 U	20.8	846	4760	0.67	0.42 U	12.7 U	20.5 J	75.9 J	13.5 UJ	15.2 UJ
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	9.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet

U - Not detected

J - Estimated value.

NC - Not calculated.

Table 4.2.2-10 (continued)
Concentrations of Parameters in Soil in the Sulfuric Acid Plants #1 and #2

Sulfuric Acid Plant #2

S064B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Brownish-yellow sandy gravel	5430	7.7 U	4.3 U	55.2	0.26	6.7 UJ	0.5 U	17300	9.1	4.3	7.2	200	10500	4.5	6.9
2.5	Brownish-yellow sandy gravel	7070	9.4 U	2.9 U	554	0.12 U	4.6 UJ	0.61 U	63600	23.8	1.4	9.3	320	4510	32	2.3
5	Brown silt	9560	9.6 U	7.2 U	104	0.53	7.7 UJ	0.62 U	51800	9.6	4.6	7	580	10300	3.8 U	11.2
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Brownish-yellow sandy gravel	5610	177	0.06 U	1.3 U	11	25.6	407	1.8 U	0.4 UJ	12 U	10.9	25.5 J	7.64 UJ	17.6
2.5	Brownish-yellow sandy gravel	1770	82.2	0.49	1.7	4.8	117	230	2.6 U	0.49 UJ	14.7 U	7.4	29.5 J	7.99 UJ	11.3 UJ
5	Brown silt	18100	635	0.12 U	1.8 U	12.2	6.5	729	2.1 U	0.5 UJ	14.9 U	20.6	36.5 J	11.3 UJ	23.5 UJ
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S065B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0.5	Dark yellowish-brown silty gravel	9740	8.5 U	5.5 U	1930	0.47	16.4 J	2.7	32200	117	6.9	73.1	1600	22800	22.5	19
2.5	Light yellowish-brown silt	14300	9.3 U	6.6 U	193	0.71	15.2 J	0.6 U	57300	14.3	3.8	13.4	590	13900	16.2	15.8
5	Dark yellowish-brown silty gravel	12900	13.4	5.1 U	142	0.66	12.2 J	0.64	32500	14.4	5.7	11.4	470	12900	9.6	13.7
7.5	Dark yellowish-brown silty gravel	5350	7.7 U	5.4 U	504	0.24	5 UJ	0.5 U	10400	12.6	13.6	47	170	13700	17.2	6.9
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark yellowish-brown silty gravel	4300	204	0.31 U	9.3	72.1	7.7	3450	1.8 U	0.44 UJ	13.2 U	51.6	277 J	20.3	21.6
2.5	Light yellowish-brown silt	14700	399	0.11 U	1.6 U	9.9	10.8	604	1.5 U	0.48 UJ	14.5 U	25.2	59.5 J	4.27 UJ	10.7 UJ
5	Dark yellowish-brown silty gravel	12500	939	0.11 U	1.6 U	10.4	2.1	534	1.8 U	0.48 UJ	14.4 U	24.1	69.8 J	19.7 UJ	21.4
7.5	Dark yellowish-brown silty gravel	2740	186	0.08 U	1.3 U	20.6	1.8	148	2 U	0.4 UJ	12.1 U	10.6	53.8 J	14.9 UJ	15.6
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet

U - Not detected

J - Estimated value.

NC - Not calculated.

Table 4.2.2-10

Table 4.2.2-10 (continued)
Concentrations of Parameters in Soil in the Sulfuric Acid Plants #1 and #2

Sulfuric Acid Plant #2

S104B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium		Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper		Fluoride	Iron	Lead		Lithium	
0.5	Silty sandy gravel (fill)	7900	12.1	3.1	190	J	0.84	12.4	J	6.7	J	51600	111	2.3	18.1	J	4750	14800	20.2	J	5.1	
5	Silty sandy gravel to gravelly silt (fill)	10400	6.2	4.9	126	J	0.57	9.7	J	0.49	J	70900	14.6	5.2	6.2	J	450	11500	8.6	J	11.4	
10	Gravelly silt (fill)	3670	8.4	1.9	52.1	J	0.31	3.3	J	0.31	U	6000	10.2	4.3	8.3	J	130	13100	1.6	J	3.7	U
15	Silty sandy gravel	3940	7.0	2.3	49.9	J	0.31	2.6	J	0.31	U	5810	9.2	4.3	12.3	J	143	9390	2.6	J	4.0	U
20	Silty sandy gravel	3590	12.5	4.0	65.8	J	0.28	4.8	J	0.3	U	7530	9.1	5.7	112	J	100	13400	4.7	J	4.1	U
Representative		13,900	14.3	7.7	188		1	12.8		1.9		75,800	27.5	7.6	12.6		600	14,400	29.1		16.1	

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Phosphorus, Total	Potassium	Selenium		Silver		Sulfate	Thallium		Vanadium		Zinc		Gross Alpha	Gross Beta
0.5	Silty sandy gravel (fill)	2670	145	0.21		5.3	U	19.7	468	6130	1640	0.69		0.41	U	13600	0.11	R	143	J	137	J	79.1	41.5
5	Silty sandy gravel to gravelly silt (fill)	17500	305	0.04	U	1.6	U	12.2	10.6	624	1990	0.6	U	0.48	U	690	0.21	J	18.7	J	40.1	J	18.2	18.2
10	Gravelly silt (fill)	1890	158	0.05	U	1.3	U	10.3	5.06	184	945	0.52	U	0.48		140	0.1	R	7.4	J	22.5	J	8.59	19.6
15	Silty sandy gravel	2660	148	0.03	U	1.3	U	13.4	4.4	45.2	706	0.51	U	0.41	U	70	0.09	R	6.5	J	28.4	J	10	18.8
20	Silty sandy gravel	2460	189	0.04	U	1.3	U	12.1	4.71	122	655	0.49	U	0.79		160	0.09	R	9.1	J	28.6	J	NA	NA
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		NC	0.27		45.4		52.8		34.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

U - Not detected

J - Estimated value.

NC - Not calculated

NA - Not analyzed.

Table 4.2.2-11
Concentrations of Parameters in Soil in the Phosphoric Loading Dock Area

S066B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.2	Dark brown silty gravel (road fill)	9150	6.2 U	4 U	149	0.74	13.6 J	7.7	30500	118	7.3	26.4	6000	11500	11.2
2.5	Dark brown silty gravel (road fill)	12100	9.2 U	5.3 U	129	0.58	12.4 J	0.59 U	48800	15.7	7.2	8.1	730	12100	7.4
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	800	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.2	Dark brown silty gravel (road fill)	5.1	3410	224	0.25	6.1 U	48.3	422	13500	1.9 U	0.43 UJ	12.8 U	126	229 J	43.9	31.1
2.5	Dark brown silty gravel (road fill)	9.5	13600	550	0.08	1.5 U	61.9	1060	12400	1.1 U	0.46 UJ	14.3 U	34.2	54.6 J	14.7 UJ	17.8
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

S067B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Brown silty gravel	8280	8 U	4.1 U	166	0.62	18.5 J	5.7	48500	93.1	7.6	146	2700	9760	7.4
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	800	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Brown silty gravel	4.7	2280	270	0.11 U	3.9	54.1	104	7940	2.1 U	0.41 UJ	12.4 U	134	207 J	43	29.1
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

S105B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0.5	Silty sandy gravel (fill)	10100	4.9 U	4.8	295 J	0.52	14.5 J	1.2 J	42600	17	5.8	8.9 J	470	14200	9.3 J	10
2	Gravelly silt (fill)	13400	10.7	5.1	182 J	0.73	12.8 J	7.5 J	32100	29.7	5.9	12.6 J	760	16300	11 J	12.7
5	Tan silt (fill)	17700	8.6	6.1	6910 J	1.1	18.2 J	6.4 J	29000	49.8	5.9	16.9 J	1720	15400	54.8 J	15.9
7.5	Silty sandy gravel	6100	8.3	6.4	86.5 J	0.37	3.3 J	0.31 U	16900	12.4	5	7 J	210	14300	3.6 J	9.8
10	Sandy gravel	2880	7.8	3	45 J	0.25	3.4 J	0.3 U	62600	8	2.7	5.8 J	190	9760	4.2 J	4 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	800	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Silty sandy gravel (fill)	11300	292	0.04 U	1.4 U	13.6	7.78	730	1970	0.55 U	0.44 U	460	0.19 J	21.5 J	55.1 J	25	21.8
2	Gravelly silt (fill)	9550	316	0.04 U	1.4 U	17.4	38.7	2100	3080	0.54 U	0.63	390	0.24 J	39.4 J	123 J	15.4	25.2
5	Tan silt (fill)	7752	875	0.09 U	2 U	23.1	73.3	4180	4760	0.58 U	0.79	40	0.12 R	86.1 J	205 J	21.8	21.8
7.5	Silty sandy gravel	4040	178	0.03 U	1.3 U	13.5	0.5 U	190	999	0.52 U	0.41 U	50	0.1 R	8.7 J	30.7 J	18.6	23.5
10	Sandy gravel	2170	276	0.03 U	1.3 U	7.4	4.17	231	585	0.51 U	0.4 U	80	0.1 R	3.1 J	21.8 J	12.8	17.2
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	NC	0.27	45.4	52.8	24.7	31.4

Notes:
- Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.
- Depths are in feet
- J - Estimated value
- NC - Not calculated.

Table 4.2.2-12
Concentrations of Parameters in Soil near the Ammonia Phosphate Plants
I. Ammonium Phosphate Plant Number 1

S030B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Road base/ sandy gravel	13,100.0	8.2 UJ	3.0 U	332.0	.7	36.5	17.4	84,500.0 J	180.0	3.2	13.1	6,400.0	8,910.0 J	7.8 J	7.2
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Tri Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Road base/ sandy gravel	4,040.0	347.0 J	.1 U	1.4 U	46.7	2,110.0	20,900.0	1.8	1.3 J	12.7 U	206.0	331.0	34.4	21.0
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S031B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Gray brown sandy gravel	8,780.0	18.3 UJ	8.4	130.0	.7	22.4	36.2	50,400.0 J	203.0	3.5	25.8	7,400.0	9,740.0 J	39.0 J	7.0
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Tri Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Gray brown sandy gravel	6,440.0	346.0 J	.1 U	4.2	73.1	2,870.0	17,500.0	2.4 J	.5	13.0 U	248.0	602.0	29.4	10.3 UJ
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S032B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Road base/ gravel (gypsum)	22,800.0	7.7 UJ	1.3 U	215.0	1.4	68.7	28.0	256,980.0 J	241.0	1.4	15.3	19,200.0	1,440.0 J	3.1 UJ	16.0
2.0	Red tan silt - moist	10,500.0	9.6 UJ	3.6 U	126.0	.1 UJ	16.2	1.2	41,000.0 J	21.5	4.3	8.4	520.0	10,500.0 J	5.8 J	6.7
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Tri Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Road base/ gravel (gypsum)	3,550.0	143.0 J	.1 U	1.7	12.5	97.6	7,620.0	7.2 J	6.0	12.0 U	222.0	293.0	242.0	91.0
2.0	Red tan silt - moist	15,500.0	386.0 J	.1 U	1.6 U	114.0	4,490.0	21,800.0	.4 J	.5 U	14.9 U	29.4	54.2	18.5	15.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S033B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan sandy gravel and road base	12,600.0	8.0 UJ	4.4 U	140.0	.6	32.5	15.5	109,000.0 J	147.0	3.0	13.0	6,900.0	7,480.0 J	54.0 J	8.9
2.0	Brown sandy gravel	8,290.0 J	8.3 UJ	1.7 U	161.0 J	.7	28.8	41.9	51,000.0 J	99.5 J	2.1	12.2 J	3,700.0	9,020.0 J	9.8	6.1
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Tri Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan sandy gravel and road base	5,220.0	210.0 J	.1 U	2.0	33.9	1,140.0	8,560.0	3.2 J	1.6	12.5 U	129.0	589.0	54.7	33.4
2.0	Brown sandy gravel	3,470.0 J	260.0 J	.3 U	4.7 U	42.3	3,130.0 J	26,700.0	1.1 U	.4 U	13.0 U	143.0 J	621.0 J	31.8	32.3
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

J - Estimated value

U - Not detected.

R - Rejected value.

NS - Not sampled.

NC - Not calculated.

Table 4.2.2-12 (continued)
Concentrations of Parameters in Soil near the Ammonia Phosphate Plants
I. Ammonium Phosphate Plant Number 1

S034B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan brown sandy silt with gravel	7,860.0	15.8 UJ	2.4	192.0	1.2 U	11.4	7.6	21,800.0	63.8	3.4	13.8	1,790.0	11,900.0	6.4 U	5.0 UJ
2.0	Brown silty sand with fine gravel	15,600.0	17.5 UJ	7.2	144.0	1.4 U	14.7	1.1 U	30,900.0	21.6	6.9	10.3	490.0	15,300.0	7.1 U	16.2 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan brown sandy silt with gravel	1,490.0	183.0 J	.2	2.7 U	18.7	842.0	10,200.0	1,590.0	1.8 U	.8 U	629.0	24.7 U	93.7	160.0	27.2	34.8
2.0	Brown silty sand with fine gravel	6,510.0	467.0 J	.1	3.0 U	12.5	230.0	1,150.0	2,810.0	1.7	.9 U	619.0	27.3 U	33.8	51.4	15.1	20.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

S035B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Brown-tan silt with gravel	9,090.0	16.7 J	3.2	577.0	1.5 U	20.4	35.2	39,000.0	141.0	3.8	24.2	5,170.0	10,800.0	72.8	5.4 UJ
2.0	Dark brown-tan silt/sand w/gravel	7,780.0	16.0 UJ	1.9	246.0	1.1 U	11.4	11.5	21,600.0	51.5	4.6	19.0	1,980.0	10,800.0	28.3 U	5.3 UJ
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Brown-tan silt with gravel	3,320.0	278.0 J	.4	5.8	40.0	1,470.0	23,800.0	1,990.0	1.3 U	.8 U	743.0	24.6 U	202.0	653.0	57.0	43.8
2.0	Dark brown-tan silt/sand w/gravel	2,120.0	187.0 J	.2	3.8	26.8	1,290.0	17,400.0	1,610.0	.8 U	.8 U	551.0	24.9 U	76.0	254.0	14.9	17.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

S036B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Brown silty sand with fine gravel	6,770.0	16.1 UJ	3.1	134.0	1.1 U	10.0	7.8	12,700.0	35.2	5.8	12.4	1,000.0	12,600.0	9.7 U	7.5 UJ
2.0	Tan silt with gravel	13,000.0	17.8 UJ	5.5	160.0	1.4 U	14.1	1.2 U	50,600.0	18.3	6.0	11.9	480.0	13,100.0	7.5 U	14.9 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Brown silty sand with fine gravel	2,530.0	186.0 J	.2	2.7 U	21.3	1,000.0	6,720.0	1,470.0	.4 U	.8 U	543.0	25.1 U	61.2	190.0	11.3	21.7
2.0	Tan silt with gravel	9,170.0	390.0 J	.1	3.0 U	14.3	200.0	3,420.0 J	3,000.0	.8 U	.9 U	562.0	27.8 U	26.8	55.7	44.5	41.1
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

J - Estimated value.

U - Not detected

R - Rejected value

NS - Not sampled.

NC - Not calculated.

Table 4.2.2-12 (continued)
Concentrations of Parameters in Soil near the Ammonia Phosphate Plants
I. Ammonium Phosphate Plant Number 1

S037B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Brown silty sand with fine gravel	15,700.0	16.1 UJ	1.5	188.0	1.6 U	31.2	12.6	82,100.0	119.0	4.7	15.7	4,630.0	10,600.0	12.5 U	11.5 UJ
2.0	Tan silt with gravel	12,200.0	16.7 UJ	3.9	148.0	1.3 U	18.8	1.1 U	58,000.0	16.2	5.7	9.1	930.0	12,000.0	6.7 U	14.2 J
Representative		13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Brown silty sand with fine gravel	6,500.0	278.0 J	.1	2.7 U	30.7	363.0	16,050.0	3,510.0	1.3 U	.8 U	1,270.0	25.1 U	131.0	269.0	64.5	37.4
2.0	Tan silt with gravel	13,300.0	368.0 J	.2	2.8 U	12.3	16.2	916.0	2,770.0	.3 U	.9 U	611.0	26.1 U	26.8	47.0	16.1	23.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

S106B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan silt	16,300.0	4.7 UJ	4.8	157.0	.8	21.2	.9 J	56,900.0	18.7 J	6.2	11.2	530.0	14,000.0	8.9	15.3 J
2.0	Tan silt	17,500.0	4.6 UJ	4.4	155.0	.9	15.2	1.2 J	9,530.0	21.6 J	7.2	14.8	640.0	16,700.0	11.4	16.3 J
5.0	Tan silt	12,500.0	4.6 UJ	6.3	158.0	.6	9.5	2.6 J	28,700.0	21.7 J	5.8	12.4	670.0	12,600.0	12.1	11.5 J
7.0	Tan silt	3,710.0	4.0 UJ	4.6	47.8	.2	3.4	.3 J	11,400.0	6.5 J	3.6	6.9	140.0	9,960.0	2.2	3.3 J
10.0	Sandy gravel	4,850.0	4.1 UJ	6.3	58.8	.3	2.0	.3 U	15,900.0	10.1 J	4.9	10.5	110.0	13,600.0	4.6	7.2 J
Representative		13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan silt	10,700.0	463.0	.4	1.6 U	13.9	276.0	1,800.0	3,760.0	.8	.4 U	790.0	.1 U	26.6	55.5 J	20.4	24.8
2.0	Tan silt	6,940.0	361.0	.4	1.5 U	16.6	133.0	1,950.0	4,680.0	.6	.4 U	1,200.0	.1	30.8	73.8 J	10.7	24.1
5.0	Tan silt	9,420.0	315.0	.3	1.5 U	17.0	79.4	2,110.0	2,980.0	.6 U	.4 U	980.0	.2	33.0	75.8 J	8.9	21.9
7.0	Tan silt	2,530.0	146.0	.3	1.3 U	10.0	128.0	727.0	805.0	.5 U	.3 U	6,030.0	.1 U	8.5	31.6 J	NA	NA
10.0	Sandy gravel	3,550.0	393.0	.3	1.4 U	12.6	37.0	1,150.0	831.0	.5 U	.3 U	2,790.0	.1 U	9.8	28.6 J	8.9	23.0
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	NC	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.
Depths are in feet.
J - Estimated value.
U - Not detected.
R - Rejected value.
NS - Not sampled.
NC - Not calculated.
NA - Not analyzed

Table 4.2.2-12 (continued)
Concentrations of Parameters in Soil near the Ammonia Phosphate Plants
II. Ammonium Phosphate Plant Number 2

S107B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Brown silty sandy gravel	8,790.0	4.2 UJ	4.8	114.0	.5	10.8	1.3 J	25,400.0	16.3 J	3.7	11.9	260.0	13,600.0	6.3	8.6 J
2.0	Gravelly silt	17,900.0	4.7 UJ	6.2	220.0	.8	27.4	4.0 J	43,300.0	31.5 J	7.1	14.0	1,010.0	14,800.0	11.3	15.6 J
7.0	Sandy gravel	11,900.0	4.1 UJ	8.2	67.4	.3	2.0	.3 U	9,110.0	18.3 J	10.8	18.3	140.0	24,200.0	3.8 J	14.6 J
10.0	Sandy gravel	4,680.0	4.0 UJ	4.5	63.2	.3	2.4	.3 U	8,650.0	9.7 J	4.8	10.1	130.0	13,300.0	3.2 J	4.1 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Brown silty sandy gravel	7,890.0	265.0	.3	2.1	25.4	2,700.0	22,000.0	1,780.0	.5 U	.3 U	870.0	.1 U	23.7	47.3 J	20.0	22.7
2.0	Gravelly silt	9,710.0	396.0	.4	1.6 U	16.9	416.0	4,450.0	4,240.0	1.0	.4 U	1,570.0	.2	41.9	92.0 J	10.2	19.6
7.0	Sandy gravel	6,550.0	289.0	.3	1.4 U	25.6	15.6	182.0	1,450.0	1.0	.3 U		.1 U	14.4	50.6 J	2.7 U	13.6
10.0	Sandy gravel	2,270.0	241.0	.3	1.3 U	12.4	5.4	188.0	971.0	.9	.3 U		.1 U	10.1	27.7 J	9.2	16.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	NC	0.27	45.4	62.8	24.7	31.4

S038B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Brown-tan silt	4,010.0	7.9 UJ	2.4 U	72.1	.8 U	7.4 U	3.4	22,900.0 J	55.2	4.3	5.8	1,400.0	6,660.0 J	3.2 UJ	3.1
2.0	Tan silty sand	12,100.0	10.2 UJ	6.2	245.0	.8 U	21.8	1.4	81,100.0 J	17.3	2.2	11.9	660.0	11,300.0	8.7 J	17.7
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Brown-tan silt	1,970.0	145.0 J	.1 U	1.3 U	17.2	1,130.0	6,140.0	.5 J	.4 U	12.2 U	37.0	93.8	12.6 UJ	13.6
2.0	Tan silty sand	12,800.0	284.0 J	.1 U	1.7 U	11.1	6,080.0	49,700.0	.8 J	.5 U	15.6 U	29.9	50.1	14.2 UJ	19.2
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	62.8	24.7	31.4

S040B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan sandy gravel	5,830.0	7.7 UJ	2.4 U	94.3	.6 U	7.4 U	2.2	24,500.0 J	48.9	3.6	7.3	1,200.0	9,450.0 J	5.3 J	4.6
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan sandy gravel	2,820.0	188.0 J	.1 U	1.3 U	10.9	775.0	6,770.0	.5 J	.4 U	12.1 U	31.5	47.5	11.6 UJ	19.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	62.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.
Depths are in feet
J - Estimated value.
U - Not detected.
R - Rejected value.
NS - Not sampled.
NC - Not calculated.

Table 4.2.2-12 (continued)
Concentrations of Parameters in Soil near the Ammonia Phosphate Plants
II. Ammonium Phosphate Plant Number 2

S041B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan sandy gravel	3,310.0	7.8 UJ	3.5 U	76.5	.6 U	5.4 U	.7	14,600.0 J	12.6	2.5	5.1	190.0	7,520.0 J	5.6 J	3.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan sandy gravel	2,320.0	119.0 J	.1 U	1.3 U	7.2	1,570.0	6,660.0	.6 J	.4 U	12.2 U	13.6	22.7	6.5 UJ	11.1 UJ
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S042B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan sandy gravel	3,610.0	7.6 UJ	.9 U	83.5	.6 U	4.6 U	.5 U	14,100.0 J	34.4	4.1	5.1	310.0	7,700.0 J	10.6 J	3.9
2.0	Tan sandy gravel	9,990.0	9.0 UJ	3.0 U	115.0	.7 U	19.3	.7	65,400.0 J	16.0	2.7	7.2	480.0	10,200.0 J	6.0 J	11.7
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan sandy gravel	2,590.0	139.0 J	.1 U	1.3 U	8.4	124.0	2,290.0	.8 J	.4 U	11.9 U	11.0	20.6	9.5 UJ	12.9
2.0	Tan sandy gravel	11,200.0	257.0 J	.1 U	1.5 U	11.2	3,510.0	18,900.0	.9 J	.5 U	14.0 U	45.6	37.0	13.1 UJ	23.5
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S043B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Brown tan sandy gravel	7,630.0	8.0 UJ	.5 U	117.0	.7 U	14.7	4.0	45,200.0 J	55.0	3.9	8.9	3,000.0	9,810.0 J	7.0 J	6.3
2.0	Sandy gravel	9,910.0	9.5 UJ	2.8 U	104.0	.6 U	11.5	.6 U	41,800.0 J	14.5	3.2	8.2	590.0	10,100.0 J	5.9 J	9.9
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Brown tan sandy gravel	2,940.0	266.0 J	.1 U	1.9 U	16.4	278.0	9,960.0	1.5 J	2.2	12.5 U	47.3	83.0	51.8	33.4
2.0	Sandy gravel	14,800.0	277.0 J	.1 U	1.6 U	11.0	1,720.0	14,100.0	1.0 J	.5 U	14.7 U	20.8	34.2	10.3 UJ	16.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.
Depths are in feet.
J - Estimated value
U - Not detected.
R - Rejected value.
NS - Not sampled.
NC - Not calculated.

Table 4.2.2-12 (continued)
Concentrations of Parameters in Soil near the Ammonia Phosphate Plants
II. Ammonium Phosphate Plant Number 2

S044B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan sandy gravel	5,480.0	7.8 UJ	3.0	145.0	.6 U	7.8 U	2.8	30,700.0 J	45.2	4.1	10.5	1,300.0	9,670.0 J	3.5 J	4.7
2.0	Tan sandy gravel	12,700.0	10.9 UJ	.7 U	376.0	.9 U	19.6	7.3	66,300.0 J	56.6	4.5	9.8	4,200.0	12,000.0 J	7.2 J	10.6
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan sandy gravel	2,190.0	153.0 J	.1 U	1.3 U	11.1	49.2	3,490.0	1.0 J	.4 U	12.2 U	35.0	56.1	17.7	15.3
2.0	Tan sandy gravel	4,460.0	344.0 J	.1 U	3.8 U	76.9	5,280.0	30,400.0	.8 J	.6 U	17.0 U	95.0	211.0	NA	NA
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S045B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan sandy gravel	6,480.0 J	7.9 UJ	2.9 U	94.5 J	.6 U	12.0	2.3 J	28,600.0 J	43.3	5.0	7.5	2,500.0	8,680.0 J	3.2 J	6.5
2.0	Tan sandy silt	7,540.0	9.4 UJ	5.6	124.0	.8 U	10.5 U	1.0	73,000.0 J	10.3	3.7	7.4	610.0	8,790.0 J	7.6 J	11.1
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan sandy gravel	3,140.0 J	156.0 J	.1 U	1.3 U	10.0	13.7	4,160.0	1.2	.4 UJ	12.2 U	28.5 J	58.1 J	13.2	18.8
2.0	Tan sandy silt	16,500.0	241.0 J	.1 U	1.6 U	10.8	830.0	12,100.0 J	.6 J	.5 U	14.7 U	16.8	32.6	3.0 UJ	17.0
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S108B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.5	Tan silt	10,600.0	4.8 UJ	7.1	169.0	.5	15.1	.5 J	109,000.0	12.9 J	4.6	10.4	470.0	10,600.0	17.9	13.2 J
2.0	Tan silt	11,600.0	4.8 UJ	6.6	149.0	.6	10.3	.4 U	74,500.0	13.9 J	4.9	8.7	520.0	11,100.0	17.4	12.4 J
5.0	Sandy gravel	4,550.0	4.2 UJ	6.9	32.2	.2	2.4	.3 U	5,090.0	9.0 J	3.9	7.8	110.0	12,900.0	5.0	6.0 J
7.0	Sandy gravel	4,590.0	4.0 UJ	3.6	38.1	.2	3.8	.3 U	9,840.0	8.4 J	2.7	7.5	150.0	8,670.0	3.7 J	4.0 J
10.0	Sandy gravel	4,230.0	4.0 UJ	5.6	41.3	.3	3.2	.3 U	3,150.0	54.2 J	3.7	10.9	100.0	20,000.0	2.7 J	3.5 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.5	Tan silt	16,100.0	259.0	.4	1.6 U	12.0	74.6	7,560.0	2,110.0	.6 U	.4	1,220.0	.2	15.4	42.2 J	15.1	26.9
2.0	Tan silt	20,000.0	336.0	.4	1.6 U	11.3	40.7	2,150.0	2,030.0	.6 U	.4 U	1240	.2	24.5	40.8 J	10.2	19.2
5.0	Sandy gravel	2,280.0	107.0	.3	1.4 U	9.8	25.9	244.0	701.0	.7	.3 U	7710	.1 U	8.2	25.9 J	5.3	10.6 UJ
7.0	Sandy gravel	1,670.0	52.6	.2	1.3 U	6.6	13.0	169.0	929.0	.9	.3 U	6200	.1 U	7.0	20.0 J	.5 U	11.4
10.0	Sandy gravel	1,810.0	128.0	.3	6.8	10.4	3.4	128.0	766.0	.5 U	.3 U	3530	.1 U	12.7	28.7 J	NA	NA
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	NC	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.
Depths are in feet.
J - Estimated value.
U - Not detected.
R - Rejected value.
NA - Not analyzed.
NC - Not calculated.

Table 4.2.2-13
Concentrations of Parameters in Soil in the Road Samples

S082B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Tan silt	9560 J	8.1 UJ	7.7	138 J	0.78	19.8	1.6 J	54400 J	18.8	4	11.7	3200	9420 J	8 J
2	Brown tan silt	9220 J	8.3 UJ	10.6	128 J	0.75 U	19.1	2.6 J	57500 J	15.4	4.1	26.4	2600	9440 J	10.3 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Tan silt	13.7	14300 J	292 J	0.1 U	1.4 U	11.5	78.1	2350	1.4	0.42 UJ	12.7 U	25.5 J	56.5 J	34.3	22.1
2	Brown tan silt	13.2	13700 J	289 J	0.09 U	1.9	10.9	73.6	918	0.84	0.43 UJ	12.9 U	23.5 J	52.7 J	23.4	21.2
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S083B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Tan brown silt	12500 J	8.2 UJ	4.1 U	152 J	0.86 U	20.5	0.66 J	52000 J	20.5	4.6	10.5	780	10700 J	6.3 J
2	Tan brown silt	11400 J	8.4 UJ	4.8 U	131 J	0.81 U	19.8	0.54 UJ	48200 J	16.3	4.9	9.5	530	11200 J	6.7 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Tan brown silt	11.2	14700 J	324 J	0.11 U	1.4 U	10.9	3.8	990	0.65	0.43 UJ	12.8 U	27.7 J	42.7 J	20.4	28.6
2	Tan brown silt	10.6	16000 J	348 J	0.06 U	1.4 U	11.6	6.7	1050	0.78	0.44 UJ	13.1 U	24.1 J	44.3 J	14.2	18.1
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S084B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Light tan fine silt	15900 J	8 UJ	3.1 U	148 J	0.99 U	26.1	2.3 J	46700 J	29.6	5.5	12.9	2700	12400 J	9.8 J
2	Light tan fine silt	10200 J	8 UJ	4.2 U	129 J	0.73 U	20.1	0.52 UJ	60100 J	12.6	4.3	7.8	490	9890 J	5.5 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Light tan fine silt	13	8460 J	374 J	0.07 U	1.3 U	13.2	1.4	1470	1	0.41 UJ	12.4 U	37.4 J	68 J	23.5	24.5
2	Light tan fine silt	12.9	16000 J	272 J	0.11 U	1.3 U	9	1.4	665	0.37	0.42 UJ	12.5 U	21.1 J	34 J	14.4	17.6
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S085B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Brown silty sand with Tan brown silt to silty	13800 J	8.5 UJ	6.7	241 J	1	26.1	10.7	49600 J	78.1	4.5	19.7	4700	10900 J	21.4
2	sandy gravel	8520 J	9.2 UJ	6.3	99.5 J	0.57	13.9 U	0.61	42900 J	15.5	4.3	9.8	410	10300 J	9.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Brown silty sand with Tan brown silt to silty	10.6	3770 J	217 J	0.27 U	1.9	19.4	150	25600	0.27 UJ	0.44 U	13.3 U	91.8	206	42.4	37.5
2	sandy gravel	10.2	12300 J	274 J	0.12 U	1.5 U	9.9	20.4	758	0.7 U	0.48 U	14.3 U	23.9	41.4	6.96 UJ	16.3
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:
Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.
Depths are in feet
J - Estimated value
R - Rejected value.
U - Not detected

Table 4.2.2-13 (continued)
Concentrations of Parameters in Soil in the Road Samples

S086B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Tan brown silt with trace gravel	11100 J	8.2 U	4.4	198 J	0.29 U	9.7 UJ	0.53 UJ	22200 J	32.3 J	8.9 J	47.5	1200	12500 J	20.4 J
2	Tan silt	12500 J	8.6 U	4.6	142 J	0.46 U	11.3 UJ	0.57 UJ	54000 J	13.7 J	5.4 J	10.5	450	12000 J	9.1 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Tan brown silt with trace gravel	9.3	5760 J	359 J	0.59	1.4 U	3400	20.5	4850	0.8	0.42 U	12.7 U	44.9 J	175 J	20.4	26.8
2	Tan silt	12.5	10900 J	324 J	0.07 U	1.5 U	20	1.6	717	0.87 U	0.48 U	13.7 U	21.9 J	45.6 J	11.7 UJ	19.3
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S088B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Red brown sandy silt with gravel	4920 J	8 UJ	1.8 U	99.7 J	0.3	10.8 U	1.2	12200 J	16.6	4.3	8.4	910	10200 J	7.1
2	Brown silt	8780 J	9.5 UJ	5.8	107 J	0.56	16.6 U	0.61 U	45600 J	13.7	3.6	7.7	610	9500 J	6.9
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Red brown sandy silt with gravel	6.4	3120 J	148 J	0.19 U	1.4 U	22.1	2050	23300	0.27 UJ	0.42 U	12.5 U	18.9	60.8	19.8	21.3
2	Brown silt	9.6	13800 J	297 J	0.06 U	1.6 U	16.2	1310	20600	0.32 UJ	0.49 U	14.8 U	24.5	33.7	6.31 UJ	16.8
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S089B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Red brown sandy silt with gravel	8300 J	8.1 UJ	5.5	151 J	0.54	18.2	5.5 U	23300 J	44.5	3.8	20	2600	9960 J	23.5
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Red brown sandy silt with gravel	7.1	3060 J	200 J	0.1 U	3.3	12	69	4220	0.77 U	0.42 U	12.6 U	51.5	164	14.9	23.4
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S090B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Red brown silt with trace gravel	14400 J	8.6 U	4.5	135 J	0.83 U	10.9 UJ	0.78 J	18500 J	18.6 J	6.3 J	13.6	760	14000 J	9.6 J
2	Brown silt	14700 J	9 U	4.7	122 J	1.2 U	14.7 UJ	0.59 UJ	27400 J	15.5 J	6.5 J	12.9	510	14800 J	9.2 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Red brown silt with trace gravel	13.8	8070 J	442 J	0.11 U	1.4 U	13.3	7.4	1070	0.49 U	0.45 U	13.4 U	22.9 J	58 J	25.6	27
2	Brown silt	13.3	8020 J	461 J	0.11 U	1.5 U	12.6	1.3	823	1.7 U	0.47 U	14.1 U	25.1 J	61.2 J	11.9	24.3
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet

J Estimated value

R Rejected value

U Not detected

Table 4.2.2-13 (continued)
Concentrations of Parameters in Soil in the Road Samples

S093B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Brown silt with trace gravel	10900 J	8.4 U	4.5	174 J	0.49 U	11.8 UJ	1.2 J	38600 J	21.9 J	4.9 J	39.3	690	11300 J	7.7 J
2	Tan silt	9040 J	8.3 U	4.7	126 J	0.64 U	7 UJ	0.75 J	38600 J	10.9 J	4.4 J	9.3	530	9980 J	5.9 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Brown silt with trace gravel	10.8	12300 J	329 J	0.1 U	1.4 U	70.8	2.1	924	0.59 U	0.43 U	13 U	23.5 J	129 J	12 UJ	17.8
2	Tan silt	9.5	9810 J	299 J	0.11 U	1.4 U	9.2	2.3	477	0.7 U	0.43 U	13 U	16.6 J	39.2 J	6.23 UJ	19.7
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S094B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Gray gypsum	22300 J	7.7 U	4.2 J	257	1.7	64.1	14	214000	219 J	3.7	35 J	16700	5630	3.8
2	Tan brown silt	13000 J	8.5 U	5.1 J	218	0.61	15	1.8	49600	16.9 J	5.5	9.4 J	650	12600	6.1
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Gray gypsum	14.5	5710 J	253	0.09 UJ	3.3	28 J	11.7	10300	3.9	3.7 J	12.1 U	204	192	139 J	54.2 J
2	Tan brown silt	11.7	14300 J	367	0.53 J	1.4 U	13.3 J	2.1	1260	0.29 U	0.44 UJ	13.2 U	30.2	63.3	25.3 J	22.3 J
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S095B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown sandy silt with fine gravel	8010 J	8.4 U	4.4	823 J	0.94 U	33.4 J	67.3 J	159000 J	165 J	0.44 UJ	32.2	16000	4220 J	49.3 J
2	Tan silt	8680 J	9 UJ	4.5	100 J	0.55	16.5 U	0.58 U	27500 J	9.8	4.6	10.9	460	10900 J	9.8
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark brown sandy silt with fine gravel	3.5	2480 J	131 J	0.05 U	3.4	20.8	222	26200	5.3	16.1	13.2 U	219 J	2440 J	115	64.7
2	Tan silt	12.1	9750 J	289 J	0.12 U	1.5 U	9.2	32.6	746	0.31 UJ	0.47 U	14 U	17.2	38.1	12.5	20.9
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S096B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Tan brown silt	13600 J	8.5 UJ	4.7 U	151 J	1	21.1	2.3 J	32100 J	44.1	5.5	19.4	1300	13200 J	8.8 J
2	Tan silt	10900 J	8.6 UJ	4.8 U	130 J	0.87	16.8	0.75 J	37800 J	11.9	5	13.4	630	11700 J	7.7 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Tan brown silt	12.5	6660 J	386 J	0.09 U	1.4 U	17.7	4.4	1650	0.92	0.44 UJ	13.3 U	33.9 J	72.6 J	18.4	24.1
2	Tan silt	11.3	10200 J	346 J	0.08 U	1.5 U	11.2	1	832	0.49	0.45 UJ	13.4 U	19.5 J	44 J	21.1	26.2
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

J - Estimated value.

R - Rejected value.

U - Not detected

Table 4.2.2-14
Concentrations of PCBs in Soils Associated with Roads (mg/kg)

Phase II Results

S085B

Sample Depth	Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260	
0	1	UJ	1	UJ	1	UJ	1	UJ	2	UJ	2	UJ	1	UJ
2	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ

S088B

Sample Depth	Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260	
0	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ
2	0.65	R	0.65	R	0.65	R	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ

S090B

Sample Depth	Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260	
0	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ

S094B

Sample Depth	Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260	
0	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
1	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
2	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ

Notes:
J - Estimated value.
R - Rejected value.
U - Not detected.
Depths are in feet.

Table 4.2.2-15
Concentrations of Parameters in Soil in the Bone Yard

S079B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Dark brown sandy silt with	13000 J	8.5 U	6.8	662 J	0.89 U	22.9 J	14.7 J	36900 J	111 J	7 J	25.5	4600	12400 J	31.4 J
2	Tan silt	12400 J	9.1 U	3.4	132 J	0.66 U	16.6 J	0.59 UJ	52200 J	12.5 J	5.7 J	10.4	500	12900 J	8.5 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Dark brown sandy silt with	10.8	4810 J	296 J	0.14 U	2.4	26.3	198	12200	2.5	0.44 U	13.2 U	132 J	234 J	29.5	30.8
2	Tan silt	14.8	10800 J	365 J	0.1 U	1.5 U	11.3	5.4	690	0.5	0.47 U	14.2 U	21 J	47.4 J	8.97 UJ	21.9
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S080B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Brown sandy silt	17900 J	6.7 U	3.2	151 J	1.1 U	21.5 J	11.2 J	11100 J	41.1 J	6 J	14.3	1900	15300 J	7.9 J
2	Brown tan silt	11400 J	8.8 U	6.9	133 J	0.56 U	11.4 UJ	0.57 UJ	41400 J	11.8 J	5.2 J	10.3	490	12300 J	6.7 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Brown sandy silt	11.1	5530 J	389 J	0.09 U	1.5 U	40.1	916	12000	0.62	0.45 U	13.6 U	64.5 J	269 J	21.2	31
2	Brown tan silt	12.1	11200 J	357 J	0.15 U	1.5 U	10.2	19.2	665	0.61	0.46 U	13.8 U	21.8 J	46.3 J	10.5 UJ	14.1
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S081B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Tan brown silt - trace fine gravel	14300 J	8.3 U	6.4	248 J	0.74 U	32.4 J	13.9 J	34200 J	74.9 J	6.3 J	57.8	2700	17700 J	31.2 J
2	Tan brown silt	13900 J	8.6 U	5.2	124 J	0.67 U	12.2 UJ	0.56 UJ	33600 J	14.6 J	5.9 J	10.5	530	13400 J	9.9 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Tan brown silt - trace fine gravel	12	7450 J	399 J	0.16 U	16.2	46.1	41	5500	2.1	0.43 U	12.9 U	71.5 J	221 J	25.5	29
2	Tan brown silt	12.8	11200 J	385 J	0.08 U	1.4 U	10.5	4.5	713	0.96	0.45 U	13.4 U	25.7 J	47 J	13	23.3
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

J - Estimated value.

U - Not detected.

Table 4.2.2-16
PCB Concentrations in the Bone Yard (mg/kg)

Phase II Results

S079B

Sample Depth	Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260	
0	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.65	U	0.2	R
2	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ

S080B

Sample Depth	Aroclor 1016		Aroclor 1221		Aroclor 1232		Aroclor 1242		Aroclor 1248		Aroclor 1254		Aroclor 1260	
0	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ	1	R	1	UJ
2	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ	0.65	UJ

Notes:

J - Estimated value.
R - Rejected value.
U - Not detected.
Depths are in feet.

Table 4.2.2-17
Concentrations of Parameters in Soil in the Ammonium Sulfate Plant

S046B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown sandy gravel	15400 J	8.2 UJ	3.1 U	278 J	1.5	116	18.1 J	119000 J	165	5.6	25.2	6800	7230 J	114 J
2	Tan sandy gravel	7200 J	8.2 UJ	4.4 U	80.4 J	0.6 U	16.2	1.4 J	23400 J	23.5	5.5	13.1	400	11100 J	4.7 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark brown sandy gravel	11.3	4690 J	252 J	0.09 U	5.6	31.7	152 J	25000	1.9	2 UJ	12.6 U	132 J	429 J	94.5	55.3
2	Tan sandy gravel	5.9 U	3650 J	194 J	0.08 U	1.4 U	11.9	39.4	2550	1.2	0.43 UJ	12.6 U	21.6 J	46.9 J	11	17.6
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S047B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown silty gravel	11900 J	8.2 UJ	6.8	1340 J	1.6	71.4	43.2	163000 J	267	25.9	93.9	12800	8480 J	100
2	Sandy gravel	4900 J	8.1 UJ	5.9	89.7 J	0.51 U	16.5	0.93 J	19100 J	31.6	4.9	11.6	440	13300 J	9.6 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark brown silty gravel	8.6	4780 J	199 J	0.08 U	10.6	51.1	127	6180	4.8	2.5	12.8 U	273	1010	80.7	40.9
2	Sandy gravel	6.1	2590 J	143 J	0.12 U	3.8	10.8	15.6	2430	6.2	0.42 UJ	12.6 U	12.9 J	56.2 J	12.6	18.6
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S048B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0.5	Dark brown clayey silt with grave	7760	15.9 UJ	11.6	1080	2.1 U	75	58.3	195000	285	2.6	74.2	14400	8590	213	6.7 UJ
2	Dark brown clayey silt with grave	22600	16.7 UJ	3.4	310	1.9 U	31.5	12	47600	91.6	7.5	45.4	2090	18400	43.8	15.2 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark brown clayey silt with grave	4330	130 J	0.15	27.4	49.2	419	62230	2370	11.1	3.2	2990	24.8 U	351	1200	133	55.1
2	Dark brown clayey silt with grave	6000	503 J	0.13 U	14.7	25.6	657	15100	5490	0.85 U	0.86 U	1390	25.9 U	116	403	16	28.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

S049B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium	Magnesium
0.5	Dark brown clayey silt with grave	16400	17.3 UJ	3.5	186	1.5 U	18.7	4.3	30100	37.7	6.9	15.1	2990	16200	10.6 U	13 UJ	4790
2	Dark brown clayey silt with grave	15700	16.5 UJ	5.5	221	1.6 U	25	5.5	34200	44.5	6.8	25.1	2140	22100	14.1 U	13.5 J	4870
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1	22,000

Sample Depth	Sample Description	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark brown clayey silt with grave	416 J	0.22	2.9 U	16.8	77	7110	3600	1.1 U	0.9 U	617	26.9 U	50.9	135	22.5	31.2
2	Dark brown clayey silt with grave	656 J	0.22	4.7	19.5	53.9	8380	4000	0.74 U	0.86 U	974	25.7 U	68.3	171	47.2	40.1
Representative		482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

Notes:
Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g
Depths are in feet.
J - Estimated value
U - Not detected.
NC - Not calculated

Table 4.2.2-17 (continued)
Concentrations of Parameters in Soil in the Ammonium Sulfate Plant

S109B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron	Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium	Magnesium
0	Silty gravel	8060	4.1	UJ	2.4		82.8	0.5	7.9	5.2		38200	35.8	4.4	12.2	4370	9070	11.4	7.9	4560
2	Tan silt	9170	4.6	UJ	3.7		110	0.61	9.5	0.84		79200	12.9	4.7	7	550	10000	7.2	12	15400
5	Gravelly sand	5340	4.1	UJ	3.3		51.3	0.44	2.8	0.31	U	19100	11.2	4.6	13	180	15200	4.5	6.7	3750
10	Sandy gravel	13800	4.3	UJ	3		56.9	1.1	5.7	0.33	U	11400	9.6	4.8	8.6	210	14400	41.7	7.3	2700
Representative		13,900	14.3		7.7		168	1	12.8	1.9		75,800	27.5	7.8	12.6	600	14,400	29.1	16.1	22,600

Sample Depth	Sample Description	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sulfate	Thallium		Vanadium	Zinc	Gross Alpha	Gross Beta
0	Silty gravel	252	J	0.07	U	1.4	U	18.3	0.57	10300	1460	1.8	U	0.31	U	10500	0.1	U	38.2	89.2	44.8	30.7
2	Tan silt	269	J	0.06	U	1.5	U	10.8	0.52	714	2220	0.8	U	0.35	U	1570	0.11	U	14.9	36.8	8.46	17.7
5	Gravelly sand	205	J	0.05	U	1.4	U	12.4	1.27	197	1180	0.52	U	0.31	U	1410	0.1	U	10.8	31.2	3.6	U 11.8
10	Sandy gravel	139	J	0.06	U	1.4	U	7.9	10.1	261	1690	0.72	U	0.33	U	6230	0.11	U	11.5	29.7	5.36	18.7
Representative		482		0.16		2.15		15.5	3.7	672	3,582.3	3.06		1.9		NC	0.27		45.4	52.8	24.7	31.4

Notes:
Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g
Depths are in feet.
J - Estimated value
U - Not detected
NC - Not calculated

Table 4.2.2-18
Concentrations of Parameters in Soil in the Sulfuric Acid Loading Dock Area

S058B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Grayish-brown silty gravel	8850 J	8.4 UJ	1.5 U	124 J	0.48	9	8.9	23500 J	78.6 J	2.4	340 J	1300	11600 J	29.7
2.5	Pale brown silt	10500 J	9 UJ	3.4 U	104 J	0.56 U	7	0.68	56000 J	14.2 J	5.2	8.1 J	490	12100 J	7.8
5	Pale brown silt	12000 J	9.2 UJ	5.6 U	127 J	0.7 U	9.3	0.95	46300 J	13.8 J	5.6	10.8 J	590	12900 J	7.2
7.5	Pale brown silt	7030 J	9.2 UJ	3.3 U	98.1 J	0.62 U	5.8	0.91	37100 J	8.9 J	4.2	8.1 J	450	9400 J	5.8
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Grayish-brown silty gravel	5.6	2210 J	104 J	1.8	4 U	18.1	13.7	4620	1.5 U	0.43 U	13 U	54.6 J	398 J	24.7	25.9
2.5	Pale brown silt	12.4	16200 J	373 J	0.18 U	1.5 U	14	3.8	636	1.3 U	0.47 U	14 U	20.5 J	46 J	6.45 UJ	24.5
5	Pale brown silt	15.1	14100 J	316 J	0.17 U	1.5 U	11.4	6.3	611	1.2 U	0.48 U	14.3 U	21.9 J	49.4 J	11.7 UJ	23.4
7.5	Pale brown silt	8.8	12200 J	307 J	0.15 U	1.5 U	10.1	4.5	658	1.2 U	0.48 U	14.3 U	15.5 J	38.3 J	15.3	23.9
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S059B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark yellowish-brown sandy gravel	10100	8.6 UJ	3.1	127 J	0.49	13	7.5	74100	72.7	4.1	21.6	2400	10800	35.2
2.5	Dark yellowish-brown silt	12100	9 UJ	3.1	148 J	0.5	9.2 U	0.58 U	70100	15.7	5.1	8.3	580	11500	8.1
5	Dark yellowish-brown silt	14100	9.2 UJ	4	141 J	0.82	10.9 U	0.6 U	46000	18.8	5.9	10.4	530	13200	6.5
7.5	Dark yellowish-brown silt	22100	9.2 UJ	4.6	179 J	1	18.7	0.6 U	35900	25.2	7.7	15.1	850	18000	9.2
10	Dark yellowish-brown silt	10700	9.1 UJ	3.3	112 J	0.59	8 U	0.59 U	34300	14.1	4.5	8.4	450	10500	6.5
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark yellowish-brown sandy gravel	8.5	7310	200	0.16 U	1.5 U	18.7	1	4160	1.8 U	0.56	13.4 U	59	164	44.1	29.9
2.5	Dark yellowish-brown silt	13.6	15500	328	0.14 U	1.5 U	12.7	5.6	914	1.2 U	0.47 U	14 U	22.3	39.8	7.51 UJ	19.8
5	Dark yellowish-brown silt	14.3	14700	395	0.13 U	1.6 U	14.3	6.9	634	1.2 U	1.7	14.3 U	25.6	47.5	15.5	20.7
7.5	Dark yellowish-brown silt	21.4	14900	451	0.14 U	1.8 U	18.5	12.1	604	1.3 U	0.48 U	14.4 U	33.7	68.3	10.9	21.2
10	Dark yellowish-brown silt	10.8	12700	330	0.13 U	1.5 U	10.8	9.5	603	0.84 U	0.47 U	14.2 U	20	38.4	14.3	17
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S060B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Light brownish-gray silty gravel (backfill)	840 J	7.8 UJ	0.63 U	164 J	0.1 U	4.1	1.6	54900 J	27.3 J	0.41 U	56.4 J	400	1660 J	44.7
2.5	Light yellowish-brown silt	11700 J	9.5 UJ	3.2 U	177 J	0.67	8.8	0.79	57500 J	11.8 J	5.4	9.8 J	570	12100 J	5.8
5	Light yellowish-brown silt	18700 J	8.8 UJ	9.2 U	400 J	0.9	14.1	1.6	42700 J	21 J	8.3	14.3 J	550	17700 J	13.3
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Light brownish-gray silty gravel (backfill)	0.2 U	135 J	21.8 J	0.62 U	7.5 U	3.3	239	1370	1.2 U	0.84	12.2 U	24.2 J	59.8 J	51	39
2.5	Light yellowish-brown silt	14.7	15600 J	510 J	0.22 U	2.7 U	14.9	24.3	766	1 U	0.49 U	14.6 U	20.2 J	46.6 J	11	21
5	Light yellowish-brown silt	19.9	13400 J	470 J	0.16 U	1.5 U	20.3	12.8	593	1 U	0.48 U	13.7 U	35.2 J	64.1 J	14.4	19.7
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

NS - Not sampled

U - Not detected.

J - Estimated value.

Table 4.2.2-18

Table 4.2.2-18 (continued)
Concentrations of Parameters in Soil in the Sulfuric Acid Loading Dock Area

S061B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark grayish-brown silty gravel (fill)	756	8.2 UJ	2.8	136 J	0.11 UJ	4.9 U	1.3	12100	31.6	0.48	20.5	530	1570	50.2
2.5	Light yellowish-brown silt	11000	9.6 UJ	4.9	159 J	0.5	8 U	0.62 U	65400	14	5.3	9.3	570	11500	6.8
5	Light yellowish-brown silt	17100	9.4 UJ	4.9	144 J	0.8	13.2	0.61 U	50700	19.9	7	13.1	590	15800	10.1
7.5	Yellowish-brown sandy gravel	5930	8.1 UJ	5.7	96.6 J	0.37	4.8 U	0.93	16700	22.6	6.4	14	230	12000	7.5
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	76,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Dark grayish-brown silty gravel (fill)	0.21 U	321	13.2	18.5	2.7	5.3	14.2	1230	1.3 U	0.43 U	12.8 U	12.9	55.2	100	51.1
2.5	Light yellowish-brown silt	12.7	14300	489	0.44 U	1.6 U	28.5	3	960	1.7 U	0.5 U	14.9 U	22.2	42.5	13.3 UJ	20.2
5	Light yellowish-brown silt	17.5	15100	756	0.22 U	1.6 U	24.3	3.8	621	1.8 U	0.49 U	14.7 U	32.9	58	22.7	13.2
7.5	Yellowish-brown sandy gravel	6.4	3360	249	0.22 U	1.5	12	5.3	538	0.87 U	0.42 U	12.7 U	20.4	60.2	NA	NA
Representative	Groundwater not encountered	17.8	16700.0	475.9	0.3	5.2	14.9	8.9	840.2	6.5	2.0	20.4	52.6	52.4	24.7	31.4

Notes:
Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.
Depths are in feet.
NS - Not sampled.
U - Not detected.
J - Estimated value.
NA - Not analyzed

Table 4.2.2-19
Concentrations of Parameters in Soil in the Water Reclaim Area

S072B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Dark brown silty gravel	7760	7.7 U	5.1 U	136	0.77	17.1 J	16.1	88600	101	3.6	38.7	11200	10100	9.2
3	Tan sandy gravel	12900	8.8 U	7.9	147	0.62	12.2 J	0.57 U	41900	15.3	5.3	10.1	700	12400	3.5 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Dark brown silty gravel	6.2	4610	166	0.16 U	3.1	27.8	28.6	14200	5 U	1.1	12.1 U	175	254 J	38	26.3
3	Tan sandy gravel	13.5	16800	354	0.1 U	1.5 U	12	2.2	557	2.1 U	0.46 UJ	13.7 U	27.9	44.5 J	7.69 UJ	23.4
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S073B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Dark brown sand with gravel	8860 J	8.4 U	5.1	581 J	0.9	26.2 J	37.3 J	120000 J	126 J	1.6 J	29.2	21000	7350 J	5.5 J
3.5	Tan sandy silt	9350 J	9.2 U	5.8	146 J	0.21 U	19.4 J	33.8 J	111000 J	13.8 J	2 J	9.1	440	7540 J	4.1 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Dark brown sand with gravel	5.3	3930 J	135 J	0.24 U	3.5	36.4	567	54800	3.6	2.5	13 U	207 J	388 J	57.9	40.7
3.5	Tan sandy silt	5.1	4520 J	396 J	0.06 U	1.6 U	47.3	281	75300	3.1	0.68	14.4 U	16.6 J	540 J	7.02 UJ	14.9
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S102B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Silty sandy gravel	6910	6.5 J	2.5	733 J	1.1	131 J	37.7	181000	193	0.43 U	40.4	45400	5810	14.8	3.3
2	Gravelly tan silt	14800	4.4 U	6.4	2690 J	0.98	21.3 J	16.4	38100	120	6.3	19	4730	14400	16.2	10.5
7	Tan silt	10900	4.7 U	4.1	99.9 J	0.6	9.5 J	0.59	41100	16.4	5.2	7.1	400	11500	8.1	11.8
10	Sandy gravel	4030	3.9 U	2.6	52.2 J	0.42	3 U	0.3 U	6290	7.7	8	13.2	130	15000	3.8	5
15	Sandy gravel	3490	3.9 U	1.9	51.8 J	0.27	2.7 U	0.37	11000	7.5	2.6	5.3	830	7660	3.9	3.7
20	Sandy gravel	6140	4.2 U	5.7	104 J	0.49	3 U	0.32 U	12800	9	5.2	9.5	160	12300	13	7.5
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Silty sandy gravel	790	42.6 J	0.49	7.1	18.1	363	41700	2430	5.6	1.6	12900	0.83	314	218	218	86.7
2	Gravelly tan silt	4610	440 J	0.09 U	2.4	46.8	1600	37000	5080	1.1	0.34 U	1560	0.48 U	225	246	9.11	11.2
7	Tan silt	15500	342 J	0.06 U	1.6 U	10.4	145	1090	2560	0.6 U	0.36 U	600	0.23 U	22.4	42.7	11.1	17.7
10	Sandy gravel	2340	432 J	0.05 U	1.3 U	13.7	32.6	283	1040	0.53 U	0.3 U	110	0.18 U	9.2	29.2	6.54	13.2
15	Sandy gravel	2500	149 J	0.04 U	1.3 U	6.6	31.2	612	913	0.51 U	0.3 U	1070	0.09 U	8	19.3	13	23
20	Sandy gravel	4230	296 J	0.05 U	1.4 U	10.7	8.9	175	1290	0.77	0.32 U	220	0.11 U	9	27.4	7.94	14.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	NC	0.27	45.4	52.8	24.7	31.4

Notes:
Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.
Depths are in feet
J - Estimated value
U - Not detected.
NC - Not calculated.

Table 4.2.2-20
Concentrations of Parameters in Soil in the Former Ore Pile

S074B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Tan silt with trace fine gravel	9260 J	8.3 U	5.5 J	278	1.1	37.3	31.4	149000	158 J	2.6	38.2 J	15800	7880	10.4
2	Tan brown silt	7260 J	8.7 U	5.8 J	85.7	0.44	9.9	0.58	59700	8.3 J	4.2	8.2 J	520	9420	5.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	800	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Tan silt with trace fine gravel	10.7	5990 J	216	1 J	5	46.1 J	603	28500	3.7	2.3 J	12.9 U	261	390	65 J	43.7 J
2	Tan brown silt	10.7	10200 J	254	0.97 J	1.5 U	9.2 J	50.9	777	0.3 U	0.45 UJ	13.6 U	15.4	36.6	12.9 J	20.3 J
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S075B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Tan silt with trace fine gravel	9060 J	8 U	4.4 J	207	0.6	20.4	7.5	84400	74.6 J	4	23.2 J	14800	14500	4.5
2	Tan brown silt	11600 J	8.4 U	4.7 J	108	0.54	12.3	0.93	76800	18.4 J	5.6	8.4 J	490	12700	3.9
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	800	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0.5	Tan silt with trace fine gravel	6.1	2430 J	269	0.41 J	2.1	20.1 J	31	14500	2.6	0.47 J	12.4 U	63.4	99.3	61.5 J	43.1 J
2	Tan brown silt	13	13800 J	269	1.6 J	1.4 U	11.3 J	9.4	844	0.44 U	0.44 UJ	13.1 U	30.2	39.7	20 J	22.7 J
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S076B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Brown silt with trace gravel	8360 J	8.3 U	4.6	176 J	1.9	48 J	53.7 J	209000 J	387 J	0.43 UJ	52.5	18000	5570 J	7.5 J
2	Tan brown silt	11200 J	8.8 U	6.2	118 J	0.52	9.4 UJ	0.94 J	56500 J	13.3 J	4.8 J	7.5	540	10700 J	5.7 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	800	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Brown silt with trace gravel	6.6	2840 J	223 J	0.31 U	13	83.1	151	49100	2	3.8	12.9 U	756 J	743 J	123	79.7
2	Tan brown silt	13.4	14600 J	336 J	0.07 U	1.5 U	11.3	4	573	5	0.46 U	13.7 U	24.4 J	35.6 J	9.65 UJ	19.1
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S077B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Dark red brown silt with gravel	7030	8 U	10.3	847	1.5	41.7 J	44.2	200000	275	0.42 U	41.8	14600	6720	28.2
2	Tan silt	7630	9.5	5.1 U	103	0.44	7 UJ	0.58 U	56800	8.2	4.2	6.9	910	9090	3.8
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	800	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Dark red brown silt with gravel	5.4	3170	112	0.38	11.2	72.2	27.6	56000	7.5	3.5	12.5 U	483	770 J	100	61.5
2	Tan silt	11	13200	268	0.11 U	1.5 U	9	4.4	648	2 U	0.45 UJ	13.4 U	15	32.9 J	18.1 UJ	16.1
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

J - Estimated value.

U - Not detected

Table 4.2.2-20

Table 4.2.2-20 (continued)
Concentrations of Parameters in Soil in the Former Ore Pile

S078B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Red brown fine silt	6160	7.9 U	14	123	1.8	74.6 J	61	12.2 U	370	0.41 U	53.6	19900	5520	3.2 U
2	Tan silt	11400 J	8.3 U	5	132 J	0.6	14.3 UJ	0.66 J	66600 J	12.9 J	5.1 J	8.6	520	11800 J	6.5 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	76,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Red brown fine silt	4.7	2040	60.8	0.32 U	13.1	79	47	34800	10.4	4.9	12.3 U	650	877 J	143	65.1
2	Tan silt	15.2	16100 J	327 J	0.07 U	1.4 U	11.6	20.2	572	1.7	0.43 U	12.9 U	24.2 J	41.4 J	12.9 UJ	14.4
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	82.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet

J - Estimated value.

U - Not detected

Table 4.2.2-21
Concentrations of Parameters in Soil in the Former Pillow Tank Area

S010B

Sample Depth	Sample Description	Aluminum		Antimony		Arsenic		Barium		Beryllium	Boron	Cadmium		Calcium		Chromium	Cobalt	Copper	Fluoride	Iron		Lead	
10.5	Pale brown silt (loess)	10500	J	7.9	UJ	5		131	J	0.65	18.3	0.51	U	49800	J	14.8	5.1	9.9	400	11400	J	10.3	
13	Pale brown silt (loess)	11500	J	8.3	UJ	6.9		150	J	0.66	21.8	0.54	U	49800	J	16.6	5	11.3	460	11800	J	11.8	
15.5	Pale brown silt (loess)	11100	J	8.2	UJ	6.2		124	J	0.63	19.7	0.53	U	44300	J	15.4	5	10	440	11400	J	9	
18	Pale brown silt (loess)	10200	J	8.2	UJ	4.4		121	J	0.6	17.7	0.53	U	35800	J	14.7	5.3	24.9	440	10700	J	9.4	
20.5	Pale brown silt (loess)	8870	J	7.9	UJ	4.9		124	J	0.58	14.8	0.52	U	44600	J	12.5	4.6	9.5	420	10300	J	10.2	
Representative	Groundwater not encountered	13,900		14.3		7.7		188		1	12.8	1.9		75,800		27.5	7.8	12.8	600	14,400		29.1	

Sample Depth	Sample Description	Lithium		Magnesium		Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Selenium		Silver		Thallium		Vanadium	Zinc	Gross Alpha		Gross Beta
10.5	Pale brown silt (loess)	10.5		16700	J	357	J	0.05	U	1.3	U	11.2	12.9	442	0.37	U	0.41	U	12.3	U	22.4	46.8	10.4	UJ	23.2
13	Pale brown silt (loess)	11.3		16900	J	368	J	0.06	U	1.4	U	11.7	2.6	559	0.27	UJ	0.43	U	12.9	U	24.8	47.7	6.35	UJ	20.3
15.5	Pale brown silt (loess)	10.8		14700	J	339	J	0.05	U	1.4	U	11.4	2.1	707	0.27	UJ	0.43	U	12.8	U	24.3	41.8	17.3		20.9
18	Pale brown silt (loess)	10.3		12300	J	300	J	0.07	U	1.4	U	13.2	5.4	694	0.38	U	0.42	U	12.7	U	22.4	46.7	18.6		23
20.5	Pale brown silt (loess)	9.5		15000	J	325	J	0.06	U	1.3	U	9.7	4.4	758	1.3	U	0.41	U	12.4	U	20.6	40.2	13.6		21
Representative	Groundwater not encountered	16.1		22,000		482		0.16		2.15		15.5	3.7	672	3.05		1.9		0.27		45.4	52.8	24.7		31.4

S011B

Sample Depth	Sample Description	Aluminum		Antimony		Arsenic		Barium		Beryllium		Boron	Cadmium		Calcium		Chromium	Cobalt	Copper	Fluoride	Iron		Lead	
9	Pale brown silt (loess)	8920	J	7.8	UJ	3.8	U	173	J	0.71	U	14.8	0.5	UJ	40300	J	12.2	4.1	8.6	460	9920	J	8.5	J
11.5	Pale brown silt (loess)	10100	J	8	UJ	5.2	U	106	J	0.77	U	14.2	0.52	UJ	48500	J	13	4.6	9.7	390	10800	J	9.1	J
14	Pale brown silt (loess)	9420	J	7.9	UJ	4.4	U	152	J	0.72	U	12.2	0.51	UJ	49200	J	14.4	4.7	9.2	520	10700	J	8.8	J
16.5	Pale brown silt (loess)	10400	J	8.2	UJ	6.3		111	J	0.77	U	11.6	0.53	UJ	41000	J	14.2	5.1	9.2	450	11300	J	6.6	J
19	Pale brown silt (loess)	10900	J	7.9	UJ	5.1	U	109	J	0.77	U	14.5	0.52	UJ	36800	J	14.7	5	9.1	390	11400	J	7.3	J
Representative	Groundwater not encountered	13,900		14.3		7.7		188		1		12.8	1.9		75,800		27.5	7.8	12.8	600	14,400		29.1	

Sample Depth	Sample Description	Lithium		Magnesium		Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Selenium		Silver		Thallium		Vanadium		Zinc		Gross Alpha		Gross Beta
9	Pale brown silt (loess)	9.4		13900	J	331	J	0.1	U	1.3	U	10.6	14.3	775	0.28		0.4	UJ	12.1	U	19.8	J	38.1	J	20.4		19.7
11.5	Pale brown silt (loess)	10.2		16300	J	338	J	0.15	U	1.3	U	10.7	2.5	769	0.59		0.41	UJ	12.4	U	21.8	J	43	J	15.9		21.7
14	Pale brown silt (loess)	9.5		16000	J	335	J	0.14	U	1.3	U	12.8	2.4	760	0.26	U	0.41	UJ	12.4	U	20.4	J	42	J	14		20.6
16.5	Pale brown silt (loess)	10.7		13200	J	333	J	0.06	U	1.4	U	11.3	2.1	768	0.27	U	0.42	UJ	12.7	U	21.8	J	41.5	J	12.7	UJ	22.1
19	Pale brown silt (loess)	10.7		13300	J	322	J	0.09	U	1.3	U	10.1	2.3	742	0.38		0.41	UJ	12.4	U	23	J	41.5	J	18.7		24.1
Representative	Groundwater not encountered	16.1		22,000		482		0.16		2.15		15.5	3.7	672	3.05		1.9		0.27		45.4		52.8		24.7		31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

J - Estimated value

U - Not detected.

Table 4.2.2-22
Concentrations of Parameters in Soil in the Former Water Treatment Settling Pond and Dewatering Pit

Former Water Treatment Settling Pond

S007B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Light yellowish-brown silty gravel and boulders	11400 J	7.5 UJ	4.4	157 J	0.6	10.2	5.1	27900 J	37.5	4.8	12.9	1600	12500 J	8.9
15	Brown silty sand and boulders	8720 J	8 UJ	1.3 U	83.5 J	0.37	4.8	2.7	19800 J	97	5.7	11.5	1500	12000 J	6.3
25	Gravel	4290 J	7.5 UJ	1 U	20.9 J	0.27	2.8	0.49 U	6850 J	12.5	6.7	8.8	150	14000 J	3.9
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Light yellowish-brown silty gravel and boulders	13.7	5880 J	278 J	0.07 U	1.3 U	15.9	33.8	3230	0.83 UJ	0.39 U	11.7 U	41.5	85.3	17.3	21
15	Brown silty sand and boulders	6.4 U	4070 J	121 J	0.06 U	2.7 U	17	85.9	1950	0.93 UJ	0.42 U	12.5 U	37.3	81.7	18	19.5
25	Gravel	2.7 U	5150 J	140 J	0.06 U	1.3 U	17.6	10.9	459	0.67 UJ	0.39 U	11.6 U	18.2	46.7	5.94 UJ	6.62 UJ
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	53.8	24.7	31.4

Dewatering Pit

S008B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Pond sediment (fill)	22700 J	8.4 UJ	15	646 J	5.2	38.2	131	149000 J	2710	3.8	116	30000	20200 J	81.6
2.5	Coarse grained sand with pea gravel	4550 J	8.1 UJ	3.3 U	64.3 J	0.23	2.3	0.54	17400 J	16.3	3	6.4	710	9100 J	4.6
10	Light yellowish-brown silty sandy gravel	5930 J	7.6 UJ	2.8 U	40.4 J	0.19	4.3	0.49 U	12500 J	30.9	5	8.6	550	13500 J	3.5
20	Light yellowish-brown silty sandy gravel	4970 J	7.8 UJ	2.3 U	46.1 J	0.13	4	0.5 U	21800 J	31.1	4.3	10.8	320	11100 J	6.4
26	Gravel	5680 J	7.6 UJ	0.55 U	36 J	0.12	2.5	0.49 U	6760 J	8.9	6.1	10.2	140	16400 J	3.1 U
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Pond sediment (fill)	7.1 U	16200 J	377 J	0.05 U	21.6	154	300	51300	9.6 J	3.1	13.1 U	1290	3510	408	138
2.5	Coarse grained sand with pea gravel	6 U	2910 J	126 J	0.05 U	1.3 U	9.6	22.6	544	0.57 UJ	0.4 U	11.9 U	12.7	36.8	14.5	20.9
10	Light yellowish-brown silty sandy gravel	4.1 U	3850 J	124 J	0.05 U	7.1 U	34.4	8.4	501	0.26 U	0.39 U	11.8 U	20	37.2	3.46 UJ	6.01 UJ
20	Light yellowish-brown silty sandy gravel	3.8 U	2870 J	149 J	0.05 U	5.5 U	37.6	5.7	301	0.68 UJ	2	12.1 U	15.3	24.8	11.1	13.7
26	Gravel	3.2 U	6370 J	238 J	0.05 U	1.3 U	19	5.4	407	0.68 UJ	0.4 U	11.9 U	13.4	25.3	5.1 UJ	13
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	53.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g
Depths are in feet.
J - Estimated value.
R - Rejected value
U - Not detected

Table 4.2.2-23
Concentrations of Parameters in Soil Near the Former East Overflow Pond

S099B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium	Magnesium
0	Gypsum fill	1,310.0	5.4 U	1.0 U	73.2 J	.2	26.4 J	7.1 J	247,000.0	50.1	.6 U	7.0	9,250.0	397.0	5.5	.6 U	117.0
10.0	Sandy gravel	4,460.0	4.0 U	1.6 U	396.0	.3	17.4 J	.8	5,500.0	22.0	1.7	9.1	7,030.0	7,860.0	5.2	1.6 U	485.0
30.0	Sandy gravel	9,960.0	4.0 U	1.6	83.9 J	.4	7.0 J	1.2	14,000.0	37.5	2.0	7.3	9,480.0	9,790.0	5.8	2.3 U	816.0
50.0	Gravel	6,010.0	4.0 U	1.8	59.9 J	.4	4.6 UJ	2.9	16,000.0	10.6	4.1	8.5	4,310.0	8,450.0	3.1	3.5	2,160.0
Representative	Groundwater encountered at 54 feet	13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1	22,000

Sample Depth	Sample Description	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	ph	Total Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Gypsum fill	5.1 J	1.2	1.8 U	5.3	477.0	4.0	3,960.0	355.0	5.6	1.9	15,300.0	.1 U	11.1	38.1	49.8	9.8
10.0	Sandy gravel	62.4 J	.1 U	1.3 U	4.0	42.2	5.6	1,380.0	1,410.0	.5 U	.4	640.0	.1 U	35.4	24.3	12.9	13.7
30.0	Sandy gravel	66.6	.1 U	1.3 U	4.1	167.0	5.0	4,230.0	3,460.0	.5 U	.3 U	610.0	.2 U	39.7	36.3	NA	NA
50.0	Gravel	204.0 J	.1 U	1.3 U	7.3 U	41.8	5.6	2,760.0	1,340.0	.7	.3	420.0	.1	32.5	84.8	13.0	11.8
Representative	Groundwater encountered at 54 feet	482	0.16	2.15	15.5	3.7		672	3,582.3	3.05	1.9	NC	0.27	46.4	82.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

J - Estimated value.

NA - Not analyzed

U - Not detected.

NS - Not sampled.

NC - Not calculated.

Table 4.2.2-24
Concentrations of Parameters in Soil in the Upper Gypsum Stack

S003B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
70	Brownish-yellow silt	11900 J	9.3 UJ	8.4	79.9 J	0.65	22.3	0.61 U	24700 J	15.2	8.7	8.8	540	15200 J	10.5
80	Brownish-yellow silt	7470 J	9.5 UJ	6.5	67 J	0.63	14 U	0.62 U	29700 J	8.9	4.3	8.7	500	9810 J	7.4
90	Yellowish-brown silt	11600 J	9.4 UJ	7.3	152 J	0.71	17.7 U	0.61 U	52600 J	12.9	5.8	8.4	510	11600 J	9.6
115	Silty sand	15800 J	9.1 UJ	3.4 U	494 J	2	18.1	0.59 U	1970 J	1.8	4.8	8.2	580	19700 J	85
135	Clayey sand	26200 J	9.5 UJ	4.1	34.5 J	4	20.5	0.61 U	3600 J	3.8	6.5	12.5	1100	26800 J	16.7
145	Clayey sand	25200 J	11.2 UJ	4.6 U	39.2 J	3.9	28.6	0.73 U	3300 J	5	7.3	16	1000	31700 J	21
Representative	Groundwater at 160.0 ft bgs	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	800	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
70	Brownish-yellow silt	10.6	4500 J	421 J	0.06 U	1.6 U	41.8	1190	34300 J	0.35 U	0.48 U	14.5 U	22.7	44.5	10.8	18.8
80	Brownish-yellow silt	11	9430 J	378 J	0.07 U	1.6 U	25.9	445	1720	0.31 UJ	0.5 U	14.9 U	16	34.1	15.3	20.1
90	Yellowish-brown silt	12.8	9880 J	730 J	0.08 U	1.6 U	65.5	445	1710	0.36 U	0.49 U	14.7 U	22.3	36.9	9.6 UJ	23.8
115	Silty sand	14.4	4400 J	1540 J	0.06 U	1.5 U	8.2	393	1390	0.31 U	0.47 U	14.1 U	9.2	52.8	NA	NA
135	Clayey sand	29.7	8710 J	496 J	0.06 U	1.6 U	3.1	431	2680	0.31 UJ	0.49 U	14.7 U	17.2	80.6	28.4	33.9
145	Clayey sand	31	8770 J	509 J	0.09 U	1.9 U	6.2	475	486	0.76 U	0.58 U	17.5 U	18	101	34	32.8
	Groundwater at 160.0 ft bgs	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

S004B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
53	Pale brown silt	29600	9.6 U	13.2 J	265	3.6	42 J	85.1	117000	300 J	1.1	454	103000	10800	3.9 UJ
60	Pale brown silt	11000	8.2 UJ	7.5 UJ	92.9	0.53	8.7 J	0.53 U	48500	14.6 J	4.2	7.1	550	10700	3.5
70	Pale brown silt	11500	8.1 UJ	5 UJ	108	0.55	10.7 J	0.52 U	47400	17.4 J	5.1	9.6	450	11600	5.6
80	Pale brown silt	13800	8.3 U	6.9 UJ	129	0.65	12.5 J	0.54 U	39800	18.5 J	5.4	10.4	520	13000	4.1
90	Pale brown silt	14300	8.6 U	6.8 UJ	138	0.63	12.2 J	0.6	31400	14.2 J	4.9	8.2	490	12100	6.4
100	Pale brown silt	13200	9.2 U	7.6 UJ	148	0.73	10.5 J	0.62 U	26400	17.3 J	5.6	11.4	550	13100	6.4
110	Pale brown silt	10200	8.9 U	7.7 UJ	136	0.57	7.8 J	0.58 U	76900	11.1 J	4.5	8.1	460	10900	5.9
120	Light gray tuff	5630	9.7 U	4 UJ	86.7	0.4	2.7 J	0.63 U	3440	5.1 J	3.5	5	290	8680	6.3
130	Very pale brown silty sand	30400	10.6 U	7 UJ	157	2.6	14.4 J	0.68 U	2240	10.5 J	6.2	53.8	610	21300	16.2
140	Very pale brown silty sand	15600	9 U	6 UJ	73.1	0.6	10.5 J	0.58 U	1730	9.4 J	6.7	12.1	1140	14200	6.7
150	Very pale brown silt	18000 J	9.5 U	2 UJ	85.3	1.9	4.7	0.62 U	2870	14.2 J	4	12.8 J	480	16800	11.8
160	Very pale brown silt	19700 J	9.6 U	5.9 J	229	2.3	7.5	0.62 U	2640	9 J	7.9	12.3 J	1350	17100	17.9
Representative	Groundwater at 160.0 ft bgs	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	800	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
53	Pale brown silt	2.6	2170	226 J	0.97	19.2	10.2	1830	29200	27.8 J	0.5 U	15 U	1380	551 J	11.3 UJ	27.7
60	Pale brown silt	11.6	14000	344 J	0.24 U	1.4 U	11.8	250	1190	2 UJ	0.43 U	12.8 U	23.2	37 J	11.5 UJ	12.9
70	Pale brown silt	12.2	15800	360 J	0.5 U	1.4 U	13.3	143	1280	1.4 UJ	0.42 U	12.6 U	25.5	39.6 J	52.5	60.1
80	Pale brown silt	15.1	13000	370 J	0.54 U	1.4 U	14.2	147	1210	1.6 UJ	0.43 U	13 U	28.3	43.9 J	34.2	48.9
90	Pale brown silt	15.6	7880	353 J	0.9	1.4 U	10.9	99.9	1050	2.2 UJ	0.44 U	13.3 U	25.4	39.1 J	10.2 UJ	14.4
100	Pale brown silt	14.8	11700	365 J	0.34 U	1.8	14.8	102	983	2.2 UJ	0.48 U	14.3 U	27	45.8 J	4.38 UJ	13
110	Pale brown silt	13.6	9170	319 J	0.27 U	1.5 U	9.7	78.5	976	2.9 UJ	0.46 U	13.9 U	19.5	36.8 J	15.2	47.4
120	Light gray tuff	4.7	1390	98.3 J	0.42 U	1.6 U	3.9	11.7	153	2.1 UJ	0.51 U	15.2 U	9.4	51.5 J	55.7	46.4
130	Very pale brown silty sand	32.4	4890	245 J	0.57 U	1.8 U	12.2	97.7	291	1.7 UJ	0.55 U	16.5 U	21.1	155 J	9.25 UJ	17.8
140	Very pale brown silty sand	21.7	5090	349 J	0.54 U	1.5 U	20.7	37.1	286	1.4 UJ	0.47 U	14 U	15.8	35.6 J	19.4	21.1
150	Very pale brown silt	17.7	6300 J	67.4	0.45 J	1.6 U	15.4 J	4.3	78.5	0.44 U	0.49 UJ	14.8 U	9.5	49.6	17.1 J	27.1 J
160	Very pale brown silt	22.2	5310 J	374	0.29 UJ	1.6 U	16.3 J	148	409	0.33 U	0.5 UJ	15 U	18.4	48.2	17.9 J	24 J
Representative	Groundwater at 160.0 ft bgs	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g

Depths are in feet.

bgs - below ground surface.

J - Estimated value.

U - Not detected

NS - Not sampled

NA - Not analyzed

Table 4.2.2-24 (continued)
Concentrations of Parameters in Soil in the Upper Gypsum Stack

S005B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
40	Pale yellowish-brown silt	7850	8.2 UJ	6.4	108	0.11 UJ	8.9 U	92.5	51600 J	12.1	4.3	9.9	1600	9890 J	6.5 J
50	Pale yellowish-brown silt	6800	8.3 UJ	6.3	119	0.11 UJ	6.1 U	0.54 U	42100 J	10	4.1	8.3	460	9530 J	6.5 J
60	Pale yellowish-brown silt	7970	8.3 UJ	6.7	120	0.16	5.7 U	0.54 U	38700 J	11.6	4.9	9.2	450	10600 J	6.4 J
70	Pale yellowish-brown silt	6440	8.2 UJ	6	155	0.11 UJ	5.6 U	0.53 U	43700 J	8.4	3.9	7.6	440	8660 J	6 J
80	Pale yellowish-brown silt	9590 J	8.3 UJ	5.5 U	127 J	0.53	8	0.94	52500 J	14.6 J	4.8	9.1 J	390	10800 J	7.4
90	Pale yellowish-brown silt	10700 J	8.2 UJ	5.2 U	75.7 J	0.56	8.8	0.88	31700 J	14.8 J	5	8.6 J	420	11400 J	9.9
100	Pale yellowish-brown silt	11700 J	8.6 UJ	6.6 U	118 J	0.62	8.2	1.2	47100 J	16.3 J	5.7	9.5 J	480	12500 J	9.7
110	Pale yellowish-brown silt	9330 J	8.5 UJ	2.7 U	138 J	0.59	5.5	0.84	9100 J	12.9 J	10.2	9.1 J	370	16200 J	9.7
120	Pale yellowish-brown silt	13900 J	8.5 UJ	3.6 U	161 J	0.66	11.8	0.93	38900 J	18.9 J	6.1	11.5 J	470	13800 J	6.7
130	Yellowish-brown sandy silt	20400 J	8.7 UJ	3.7 U	104 J	0.93	19.1	1	38300 J	22.8 J	7.9	14.2 J	450	18000 J	10
140	Yellowish-brown sandy silt	15800 J	8.6 UJ	2.4 U	112 J	0.73	14	0.81	49500 J	20.6 J	8.6	10.8 J	420	13800 J	12.4
150	Yellowish-brown sandy silt	17100 J	8.6 UJ	2.7 U	160 J	0.78	14.7	1.1	52400 J	22.8 J	6.8	12.5 J	440	15400 J	11
160	Yellowish-brown sandy silt	15000 J	8.6 UJ	1.3 U	203 J	0.76	8.4	0.94	40100 J	18.6 J	6.1	10.5 J	470	13500 J	11.2
170	Yellowish-brown sandy silt	16500	9 UJ	4.5	157 J	0.67	10.8 U	0.58 U	15000	17.8	6.9	13	520	15700	9.9
180	Yellowish-brown sandy gravelly silt	9160	8.6 UJ	4	106 J	0.46	6.2 U	0.56 U	31500	14	5.2	10.2	660	12700	4.1
190	Yellowish-brown sandy silt	9200	8.5 UJ	4.4	129 J	0.43	8 U	1.7	37100	13.2	4.9	11.5	340	11600	6.5
200	Yellowish-brown sandy silt	10800	8.6 UJ	3.3	108 J	0.62	8.7 U	0.57	29500	14.2	5	11.5	430	12900	5.2
220	Pale yellowish-brown silty sand	7450	9.6 UJ	2.3	53.2 J	0.42	4.3 U	0.62 U	5850	5	3	3.6 U	260	10000	3.9 U
Representative	Groundwater at 211.8 ft bgs	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
40	Pale yellowish-brown silt	6.7	12700	334 J	0.05 U	1.4 U	30.9	808	14100 J	1.2 J	0.43 U	12.8 U	18.7	481	9.64 UJ	17.8
50	Pale yellowish-brown silt	9.1	13500	314 J	0.05 U	1.4 U	9.9	179	8070	0.59 J	0.43 U	13 U	16	37.2	8.33 UJ	20.9
60	Pale yellowish-brown silt	11	12100	334 J	0.05 U	1.4 U	10.9	108	880	0.28 U	2.4	13 U	18.1	37.9	16 UJ	18.6
70	Pale yellowish-brown silt	9.5	12200	339 J	0.05 U	1.4 U	7.4	60.9	803	0.52 J	0.42 U	12.7 U	15.7	32.3	8.88 UJ	26.2
80	Pale yellowish-brown silt	11.7	15800 J	340 J	0.16 U	1.4 U	11.5	182	714	0.91 U	0.43 U	12.9 U	21.5 J	38.3 J	8.8	20
90	Pale yellowish-brown silt	13.5	10300 J	356 J	0.18 U	1.4 U	11.9	25.6	698	0.81 U	0.43 U	12.8 U	21.4 J	40.2 J	NA	NA
100	Pale yellowish-brown silt	14.3	14400 J	347 J	0.18 U	1.5 U	13.6	6	630	1.1 U	0.45 U	13.5 U	22.8 J	43.2 J	NA	NA
110	Pale yellowish-brown silt	10.9	5130 J	520 J	0.08 U	1.4 U	11.8	282	189	1.3 U	0.44 U	13.3 U	23.8 J	45.7 J	NA	NA
120	Pale yellowish-brown silt	16.4	13500 J	468 J	0.08 U	1.4 U	15.8	31.7	260	1.3 U	0.44 U	13.2 U	27.6 J	46.5 J	NA	NA
130	Yellowish-brown sandy silt	19.8	7270 J	556 J	0.05 U	1.5 U	15.6	13.5	259	1.6 U	0.45 U	13.6 U	35.1 J	63.2 J	11.2 UJ	21.4
140	Yellowish-brown sandy silt	15.8	12000 J	377 J	0.08 U	1.5 U	14.7	7	671	1.8 U	0.45 U	13.4 U	27.7 J	45.2 J	12.9	18.9
150	Yellowish-brown sandy silt	17	11900 J	408 J	0.05 U	1.9 U	16.4	8.3	670	1.4 U	0.45 U	13.4 U	31.2 J	57 J	12.1 UJ	29.8
160	Yellowish-brown sandy silt	13.4	13600 J	392 J	0.05 U	1.5 U	15.5	3	752	1.4 U	0.46 U	13.7 U	24.9 J	47.8 J	9.88 UJ	20.9
170	Yellowish-brown sandy silt	17.5	9160	436	0.18 U	1.5 U	15.2	2.4	728	2.3 U	1.4	14 U	27.2	50.5	12.8	34.7
180	Yellowish-brown sandy gravelly silt	9.9	8350	302	0.13 U	1.5 U	12.1	9.7	455	1.9 U	0.45 U	13.4 U	22.8	47.8	9.36 UJ	21.5
190	Yellowish-brown sandy silt	10.3	10400	308	0.11 U	1.4 U	13.3	45.6	1080	2.3 U	0.44 U	13.3 U	21.1	54	14.3	33.1
200	Yellowish-brown sandy silt	10.8	8400	300	0.12 U	1.4 U	11	46	749	1.7 U	0.45 U	13.4 U	22.6	54	6.47 UJ	19.9
220	Pale yellowish-brown silty sand	4.8	2520	130	0.19 U	1.6 U	4.2	63.1	713	2 U	0.5 U	15 U	11.7	29.5	13.3	32.7
	Groundwater at 211.8 ft bgs	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	82.8	34.7	31.6

Notes:
Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.
Depths are in feet.
bgs - below ground surface.
J - Estimated value
U - Not detected.
NS - Not sampled.
NA - Not analyzed

Table 4.2.2-24 (continued)
Concentrations of Parameters in Soil in the Upper Gypsum Stack

S006B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
44.6	Dark brown silty sandy gravel	8620	8.9 UJ	3.7 UJ	116	0.5	8.2	25.8	39200 J	11.9	8.1 J	6.5	310	10800 J	6.8
55	Dark brown silty sandy gravel	7970	8.3 UJ	3.7 UJ	104	0.47	11.2	17.8	38800 J	19.1	5 J	18.1	4000	10800 J	10
65	Dark brown silty sandy gravel	2920	7.9 UJ	2.6 UJ	51.6	0.3	4.9	0.51 U	9770 J	5.2	3.2 J	4.3	290	10100 J	8
70	Dark brown silty sandy gravel	7940	8.8 UJ	4.7 UJ	110	0.56	5.4	0.57 U	39700 J	11.6	4.5 J	6.6	480	10400 J	6.9
85	Yellowish-brown silty sandy gravel	4450	8 UJ	2.8 UJ	93.6	0.45	3.2	0.52 U	7030 J	7.7	6.1 J	5.4	220	17400 J	6.4
105	Yellowish-brown silt	8310	8.3 UJ	4.9 UJ	108	0.57	5.8	0.54 U	7870 J	14.8	4.4 J	7.6	350	11300 J	6.8
115	Yellowish-brown silt	9260	9.2 UJ	4.7 UJ	159	0.51	6.3	0.6 U	122000 J	10.9	4.1 J	7.9	450	8920 J	5.8
125	Yellowish-brown silty sandy gravel	3870	7.9 UJ	2.8 UJ	70.3	0.39	2.8	0.51 U	3280 J	6.3	4.7 J	4.2	170	13700 J	6.5
135	Yellowish-brown silty sandy gravel	8160	8.6 UJ	5.2 UJ	138	0.59	5.9	0.56 U	38000 J	11.8	5.9 J	7.1	340	14300 J	5.5
145	Yellowish-brown silty sandy gravel	7130	8.3 UJ	2.6 UJ	85.6	0.51	5.4	0.54 U	20700 J	11	3.9 J	7.7	380	11100 J	6.8
165	Dark red sand	12200 J	9.4 UJ	12.3	97.9 J	1.1	5.2	0.61 U	3300 J	12	7.6	6.8	390	17100 J	10.9
169	Dark red sand	11300 J	11.6 UJ	6.5	89.1 J	0.77	10	0.75 U	1270 J	9.3	5.9	6.6	330	11400 J	7.6
Representative	Groundwater at 169 ft bgs	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.8	7.6	12.8	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
44.6	Dark brown silty sandy gravel	7.8 J	6370	280 J	0.12	1.5 U	34.1	952	16300	2.4 U	0.46 U	13.8 U	17.2	52.5	23.9	23.9
55	Dark brown silty sandy gravel	6.9 J	5110	336 J	0.33	1.9 U	29.8	446	5540	1.3 U	0.43 U	13 U	27.8	150	69.4	44.4
65	Dark brown silty sandy gravel	4.1 J	3540	280 J	0.07	2.1 U	4.9	148	650	1.3 U	0.41 U	12.3 U	8.4	36.9	24.9	27.7
70	Dark brown silty sandy gravel	10.3 J	11600	380 J	0.05	1.5 U	11.8	115	1180	0.97 U	0.46 U	13.7 U	17.5	35.9	15.6	22.1
85	Yellowish-brown silty sandy gravel	6 J	3030	412 J	0.05 UJ	1.3 U	5.7	34.1	438	1.3 U	0.41 U	12.4 U	16.2	50.5	40.2	40.2
105	Yellowish-brown silt	9.2 J	6190	350 J	0.05 UJ	1.4 U	9.7	40.2	621	0.28 U	0.43 U	12.9 U	21.2	33.4	17.1	33.8
115	Yellowish-brown silt	11.5 J	8420	225 J	0.06 UJ	1.6 U	8.3	80.2	908	2 U	0.9	14.4 U	15.3	29.6	11.7	17.8
125	Yellowish-brown silty sandy gravel	4.5 J	1760	282 J	0.05 UJ	1.4	4	2.7	240	1.9 U	0.41 U	12.3 U	12.7	40.5	24.6	35.1
135	Yellowish-brown silty sandy gravel	9.4 J	4970	359 J	0.05 UJ	1.5 U	6.1	20.1	504	0.5 U	0.45 U	13.4 U	21.2	42.4	25.3	28
145	Yellowish-brown silty sandy gravel	8.2 J	5900	283 J	0.06 UJ	1.4 U	9.8	5.5	383	0.27 U	0.43 U	12.9 U	13.7	38.4	26	60.3
165	Dark red sand	13.3	4590 J	205 J	0.1 U	1.8 U	9	272	2300	0.54 UJ	0.49 U	14.6 U	27.6	40.6	13.1	29.9
169	Dark red sand	14.4	4200 J	139 J	0.2 U	2 U	9.4	297	639	1.7 UJ	0.6 U	18 U	15.3	34.3	25.4	39.4
	Groundwater at 169 ft bgs	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.9	34.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g
Depths are in feet
bgs - below ground surface.
J - Estimated value.
U - Not detected
NS - Not sampled.
NA - Not analyzed.

Table 4.2.2-25
Concentrations of Parameters in Soil Beneath the Lower Gypsum Stack

S001B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
65	Very dark grayish-brown silt	3070	11.2 UJ	2.3 U	249 J	0.46	26.6 J	14.8 J	209000	285	0.58 U	111	13180	605	9.7 U	1.3 U
75	Pale brown silt	8340	9 UJ	5.7	157 J	0.56	8.5 UJ	0.59 UJ	51200	9.4	13.6	7.9	560	10000	8.8 U	9.6
95	Light brownish-gray sandy gravel	2660	7.7 UJ	5.1	53.3 J	0.31	2.7 UJ	0.69 J	11300	5.7	7.1	10.7	100	16900	14.6 U	4 U
105	Light brownish-gray sandy gravel	3370	7.6 UJ	5.4	55.4 J	0.29	4.1 UJ	0.49 UJ	7560	8.9	5.2	9.9	110	17300	11.9 U	3.7 U
115	Pale brown silt	16700	9 UJ	3.6 U	113 J	0.9	16.5 J	0.58 UJ	19900	19.5	6.7	8.2	1500	14800	13.6 U	15.4
125	Pale brown silt	13200	9.1 UJ	2.6 U	184 J	0.73	9.1 UJ	0.59 UJ	37500	15.7	5.9	7.7	600	12300	13.5 U	12.2
135	Pale brown silt with sandy gravel	5630	8.4 U	4.9 UJ	45	0.45	7.7 J	0.55 U	6830	20.4 J	4.9	8.3	200	10600	3.6	4.6
145	Very dark grayish brown sand and gravel	8280	9.6 U	2 UJ	66.6	0.71	8.6 J	0.64 U	2410	13.5 J	4.6	6.5	230	13500	5	12.7
Representative		13,900	14.3	7.7	188	1	12.6	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
65	Very dark grayish-brown silt	344	6.5	26.6	5.2 U	11.3	1010	4000	1340	8.9 J	6.4	987	17.4 U	314	73	68.6	43.4
75	Pale brown silt	10200	591	0.28 U	1.5 U	50.6	701	7450	2690	2.3 UL	0.47 U	728	14.1 U	17.2	40.2	9.26 UJ	21.8
95	Light brownish-gray sandy gravel	2110	258	0.16 U	1.3 U	11.4	32.5	303	613	2.1 UL	0.4 U	281	18.1	10.4	34.4	10.2	20.7
105	Light brownish-gray sandy gravel	2810	258	0.17 U	1.3 U	11.7	16.9	216	889	2 UL	0.4 U	401	11.9 U	10.6	31	2.73 UJ	18.1
115	Pale brown silt	10400	305	0.16 U	1.5 U	11.9	22.7	716	4010	2.7 UL	0.47 U	985	14 U	32	58.4	7.81 UJ	17.5
125	Pale brown silt	13800	249	0.19 U	1.5 U	12	12.8	600	3060	2.3 UL	0.47 U	737	14.2 U	24.1	40.3	11.2	22.1
135	Pale brown silt with sandy gravel	1880	134 J	0.37 U	2.7	38.7	2.9	260	NA	1.5 UL	0.44 U	NA	13.1 U	10.6	26.4 J	24.7	18.5
145	Very dark grayish brown sand and gravel	2080	136 J	0.6 U	1.7 U	12.3	17	347	NA	1.4 UL	0.51 U	NA	15.3 U	9.2	62.7 J	14.6 UJ	20.9
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

S002B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
65	Pinkish gray silt (fill)	1710	21.8 UJ	0.77 UJ	680	0.93 U	33.3	6.6	223000	207	1.1 U	95.9	6920	790	5.6 U	1 UJ
75	Dark brown silt	624	22.5 UJ	0.77 UJ	161	1.1 U	4.4 U	6.4	265000	45	1.2 U	12.9	2470	274	9 U	0.58 UJ
85	Dark brown silt	5580	15.8 UJ	3	55.1	1.5 U	6.7	1.7	13600	16	4.4	11.9	220	11600	8.3 U	7.2 UJ
95	Pinkish-gray silty gravel	3410	16.9 UJ	2.9	75.8	1.4 U	3.3 U	1.1 U	16500	24.3	6.3	15.4	130	15600	6.6 U	6 UJ
105	Pinkish-gray sandy gravel	3510	15.1 J	5.8	78.6	1.3 U	3.4	1.5	19200	16.5	7.9	15	160	19100	9.1 U	7.2 UJ
115	Pinkish-gray sandy gravel	9400	9.5 UJ	4.3	108 J	0.63	5.6 UJ	4.1 J	48400	10.2	5.7	6.8	230	11500	12.1	10.6
125	Light yellowish-brown sand	2040	7.9 UJ	4.6	30.2 J	0.24	2.7 J	0.54 J	25800	13.5	3.1	7.3	190	8680	9.3 U	3.4 U
135	Yellowish-brown sandy gravel	11500	10 UJ	6.4	167 J	0.72	5.1 UJ	0.86 J	9650	22.3	6.4	12.1	500	16100	14.4	10.6 U
Representative		13,900	14.3	7.7	188	1	12.6	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
65	Pinkish gray silt (fill)	296	9.1 J	6.2	3.9	5.7 U	629	3410	767	21.1	6	1020	34 U	234	32.6	150	31.5
75	Dark brown silt	149	7.3 J	606	3.8 U	5.8 U	825	4150 J	304	1.9 U	3.2	866	35 U	59.6	13.5	20.1	11.5
85	Dark brown silt	2980	421 J	0.3 U	3.6	33.1	443	2650	1570	0.71 U	0.82 U	656	24.6 U	13.1	68.3	5.73	13.8
95	Pinkish-gray silty gravel	2690	268 J	0.23 U	5.1	19.3	244	1300	954	0.44 U	0.86 U	575	26.3 U	12.9	45.1	9.65	16.9
105	Pinkish-gray sandy gravel	2710	253 J	0.19 U	7	15.3	45.6	649	760	0.77 U	0.78 U	539	23.4 U	16.8	37.5	10.6	23.4
115	Pinkish-gray sandy gravel	11200	411	0.14 U	1.6 U	12.4	35.9	1060	2120	3.6 J	0.49 U	867	14.6 U	16.6	40.1	13.2	20.5
125	Light yellowish-brown sand	1870	179	0.18 U	2.5 U	8	5	253	415	1.9 UL	0.41 U	304	12.4 U	5.6	30.6	6.94 UJ	18.6
135	Yellowish-brown sandy gravel	4540	524	0.72 U	2.2 U	17.1	14.7	695	1860	2.2 UL	0.52 U	735	15.6 U	18.9	106	12.3	22.2
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

Notes:

Results in mg/kg, except for gross alpha and gross beta, which are in pCi/g.

Depths are in feet

bgs - below ground surface.

J - Estimated value

NA - Not analyzed.

U - Not detected

Table 4.2.2-26
Concentrations of Parameters in Soil in the Former Cooling Pond

S070B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Light yellowish-brown sandy gravel	12500	9.1 UJ	5.9 UJ	825	1.4	152 J	28.1	169000	291 J	0.47 U	59.5	8220	5880	7.7
2.5	Light yellowish-brown sandy gravel	6770	8 UJ	3.1 UJ	95.5	0.17	15.9 J	0.52 U	13400	14.2 J	3	5.7	320	6280	5.2
5	Weak red silty sand	29100	9.2 UJ	4.3 UJ	249	2.9	79.7 J	53.5	69800	96.1 J	4.2	81.9	42000	16000	6.8
7.5	Weak red silty sand	9360	8.4 UJ	2.9 UJ	316	0.49	81.5 J	1.4	34600	398 J	0.93	7.5	33000	16500	10.7
10	Yellowish-brown silt	10500	9.2 UJ	5.2 UJ	98.2	0.57	15.8 J	44.1	42000	17.8 J	3.6	8.4	860	19800	6.7
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	900	14,400	28.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Light yellowish-brown sandy gravel	5.1	2910	54.9 J	0.86	9.1	28.1	11200	49000	16.3 UJ	4.5	14.2 U	455	273 J	NA	NA
2.5	Light yellowish-brown sandy gravel	0.87	436	28.8 J	1.1	1.3 U	6	312	324	1.8 UJ	0.42 U	12.5 U	12.1	15.3 J	11.8 UJ	21.8
5	Weak red silty sand	4.8	5280	322 J	0.39 U	5.3	21.8	639	38500	2.1 UJ	0.46 U	14.4 U	453	2880 J	NA	NA
7.5	Weak red silty sand	0.28 U	324	20.1 J	0.53 U	11.3	2.2 U	736	11300	0.88 UJ	0.44 U	13.1 U	147	23 J	50.1	34.2
10	Yellowish-brown silt	6.1	10300	369 J	0.52 U	1.5 U	16.8	1180	20800	0.34 UJ	0.48 U	14.3 U	29.7	1420 J	32.1	35
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

S071B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Black silt (fill)	12700	9.8 UJ	4.4 UJ	290	0.47	151 J	8.7	65900	165 J	0.51 U	25.8	123000	4420	6.4
2.5	Black silt (fill)	18100 J	25.1	2.4 J	460	0.23 U	156	5.2	99800	43.9 J	0.93 U	14.2 J	177000	1220	12.5
5	Light yellowish-brown sandy gravel	16100 J	16 U	1.5 J	478	0.21 U	142	4.7	86500	48.1 J	0.83 U	18.9 J	173000	1420	10.8
7.5	Weak red silty sand	10700 J	9.6 U	2.2 UJ	365	0.13 U	155	1.4	42700	16.1 J	0.9	2.9 J	69800	2530	12.8
10	Weak red silty sand	10200 J	11 U	2.9 UJ	303	0.14 U	92.6	1.3	29200	27.1 J	2	4.2 J	47200	4630	6.6
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	900	14,400	28.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Black silt (fill)	1.5	635	14.9 J	0.27 U	5.3	13.7	5280	13200	11.1 UJ	2	15.3 U	165	110 J	NA	NA
2.5	Black silt (fill)	0.46 U	372 J	10.4	5.4 J	3 U	11.1 J	8580	36500	28.4	5.5 J	27.9 U	39.5	73.3	364	111
5	Light yellowish-brown sandy gravel	0.42 U	297 J	10.1	9.7 J	3.1	8.3 J	6050	5150	38.9	7.9 J	24.9 U	39.8	60.3	160 J	71.7 J
7.5	Weak red silty sand	0.25 U	210 J	13.9	0.47 J	1.6 U	2.5 UJ	955	1490	0.38 U	0.5 UJ	15 U	15.4	17	16.2 J	13.6 J
10	Weak red silty sand	0.29 U	288 J	23.5	0.62 J	1.9 U	3.2 J	1290	1720	1.5 U	0.57 UJ	17.2 U	23.8	19.2	NA	NA
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g

Above-representative values are in italics.

Depths are in feet.

J - Estimated value

U - Not detected.

NS - Not sampled

NC - Not calculated

NA - Not analyzed

Table 4.2.2-26 (continued)
Concentrations of Parameters in Soil in the Former Cooling Pond

S100B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Gravelly sandy silt	14300	4.2 UJ	3.4	143	0.43	30.5	2.5 J	24200	34.7 J	7.6	11.6	14400	14300	4.6	6.9 J
2	Tan silt		7.1 UJ	1.5	358	0.18 U	12.8	1.9 J	5090	25.4 J	0.73 U	9.9	4820	300	4.1 J	0.73 UJ
5	Fill (sandstone)	20000	6.3 UJ	1.9	465	0.16 U	436	2.7 J	108000	23.5 J	0.65 U	5.7	200000	631	15.5	0.65 UJ
7	Fill (sandstone)	7810	5.4 UJ	1.9	435	0.14 U	156	2 J	38000	9.6 J	0.55 U	2.6	49900	1640	18.8	0.55 UJ
10	Fill (sandstone)	40800	7.8 J	3.7	336 J	0.39	227 J	1.7	58000	306	1.7	6.6	134000	11600	10.9	1.4
12	Fill (sandstone)	16000	5.3 J	3.8	240 J	0.57	91.7 J	1.7	34300	198	2.5	6.9	69700	18000	13.1	1.2
15	Sandy gravel	21500	6.3 J	5.8	96.4 J	2.2	31.7 J	143	16200	23	2.7	56.4	21400	20100	7.7	5
25	Gravel	7990	4.1 U	4.9	87.3 J	0.21	28.6 J	0.55	9380	91.4	2	6.6	13100	14000	5.4	1.4
45	Gravel	4240	4 U	2.6	68.7 J	0.13	25 J	0.31 U	7500	38.3	0.95	2.3	17400	6500	3	0.61
55	Yellowish-brown silt	13000	4.7 U	3.4	86.5 J	0.88	7.6 UJ	0.36 U	45200	16.9	6.6	9.8	980	12900	10.2	13.7
65	Sandy gravel	1960	3.9 U	0.96 U	18.4 J	0.19	2.2 U	0.3 U	15600	11	2.1	7.7	160	6060	1.7	2.5
80	Clayey silt	18500	4.9 U	4.8	136 J	1.2	6.8 U	0.37 U	14400	22.7	9.9	13.6	540	21800	14.2	20.1
Representative	Groundwater encountered at 75 feet bgs	14638.6	30.9	8.5	203.2	1.2	18.1	1.2	86574.4	27.0	8.7	15.2	569.2	14930.2	26.1	17.8

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Tot Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Gravelly sandy silt	5500	323	0.25	1.4 U	22.6	41.7	344	3160	0.61	0.32 U	880	0.12	37.2	49.7	133	66.8
2	Tan silt	931	32.4	0.94	2.4 U	13.6	1450	1650	195	35.8	4.5	3910	0.17 U	14.4	38.2 J	178	57.3
5	Fill (sandstone)	705	27.5	0.41	2.1 U	8	2110	2590	483	15	3.7	3090	0.16 U	6.8	40.1 J	155	53.9
7	Fill (sandstone)	421	22.3	0.35	1.8 U	3.7	1900	2340	607	3.4	0.41 U	1550	0.13 U	4.6	27.5 J	60.5	37.9
10	Fill (sandstone)	587	24 J	0.04 U	5.6	4.8	3920	14300	12800	1.2	0.38 U	6120	0.91	119	24.1	90.1	43.1
12	Fill (sandstone)	887	24 J	0.08 U	6.5	3.1	1680	17200	8280	0.8	0.39 U	2110	1	54.5	25.1	16.6	18.7
15	Sandy gravel	1810	149 J	0.08 U	1.4 U	8	818	23100	5190	0.52 U	0.31 U	1960	0.17 U	114	1130	11.1	14.6
25	Gravel	406 J	76.2	0.08 U	4.6	4.9	315	5080	2510	0.53 U	0.32 U	20400	0.22 U	17.6	16.8	15.5	21.8
45	Gravel	302	87.2 J	0.06 U	3.2	3.2	71.6	1980	1380	0.49 U	0.31 U	160	0.21 U	6.1	9.3	8.54	18.6
55	Yellowish-brown silt	15900	805 J	0.07 U	1.6 U	61.7	1180	23700	3240	0.6 U	0.38 U	380	0.31 U	18.6	50	7.27	17.2
65	Sandy gravel	1980	93.5 J	0.06 U	1.3 U	4.2	49.9	395	518	0.49 U	0.3 U	20 U	0.1 U	4.7	12.7	9.47	16.6
80	Clayey silt	8760	406 J	0.09 U	1.6 U	22.1	7.5	718	3270	0.64 U	0.37 U	2930	0.28 U	23	67.8	15.9	20.8
Representative	Groundwater encountered at 75 feet bgs	22,000	482	0.16	2.15	15.5	3.7	672	3,982.3	3.05	1.9	NC	0.27	45.4	62.8	24.7	31.4

Notes:
- Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g
- Depths are in feet
- J - Estimated value
- U - Not detected.
- NS - Not sampled
- NC - Not calculated
- NA - Not analyzed

Table 4.2.2-27
Concentrations of Parameters in Soil in the Cooling Tower Area

S068B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Pale brown sandy silt	13500 J	8.9 U	8.1 J	211	0.89	92.9	23.4	121000	174 J	0.84	38.8 J	80000	5330	9.8
2.5	Dark brown silty gravel	9700 J	7.9 U	4.5 J	109	0.52	12.8	6.4	30400	53.2 J	6	41.1 J	20000	13600	10.8
5	Silty gravel	6120	8.2 U	4.8	161	0.33	9.6 J	8.3	30800	37.8	4.1	10.1	11800	7600	6.7
7.5	Pinkish gray silty sand	3750	7.9 U	3.9	47	0.18	2.1 UJ	0.51 U	22200	9	3	9	480	8870	6.3
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Pale brown sandy silt	4	1930 J	58.4	1 J	6.8	17.6 J	1854	14300	7.8	2.2 J	13.8 U	238	174	146 J	55.9 J
2.5	Dark brown silty gravel	3.6	1980 J	140	1.2 J	9.5	15.7 J	57.6	4730	0.54 U	0.41 UJ	12.4 U	56.1	119	NA	NA
5	Silty gravel	4.6	2470	168	0.22	1.4 U	13.8	613	9910	3 U	0.42 UJ	12.7 U	51.7	107 J	42.5 J	30.8 J
7.5	Pinkish gray silty sand	6.2	5400	181	0.09	1.3 U	30.6	849	8730	1.1	0.41 UJ	12.2 U	9.4	28.9 J	13 J	15.7 J
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S069B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Light gray gravel (backfill)	15200	8.7 U	7 U	263	1.3	122 J	28.2	158000	225	1	39.7	76000	4580	10.6
0.5	Light gray gravel (backfill)	22700	7.9 U	1.9 U	197	1.8	70.3 J	13.7	12.2 U	269	1.9	23.7	36100	3290	3.2 U
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Light gray gravel (backfill)	6.7	2570	120	0.1	6.4 U	23.8	4240	11500	8.8	2.8	13.6 U	257	230 J	160 J	67.7 J
0.5	Light gray gravel (backfill)	13.1	3350	266	0.05	3.2 U	19.8	50.9	4980	5.4	3.8	12.3 U	230	242 J	205 J	77 J
Representative	Groundwater not encountered	16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8	24.7	31.4

S101B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Sandy gravel	23300	4.1 UJ	2.5	248	1.7	128	11.5 J	192000	239 J	0.7	19.3	62000	4460	16.2	8.9 J
2	Gravelly silt	20000	4.7 UJ	3.1	330 J	1.6	121	18.5 J	168000 R	169 J	1.4	28.7	55600	8170	7.2	8.2
5	Silty sandy gravel	8390	4.2 UJ	4.3	122 J	0.48	7.6 U	1.3 J	35700	13.2 J	5.2	9.5	1330	11300	7.9	9.9
7	Silty sandy gravel	4570	4 UJ	2.1	59.1 J	0.36	6.1 U	0.34 J	11100	9.4 J	3.7	7.9	280	10700	2.4	6.3
10	Yellowish-brown silt	6960	4.3 UJ	5.2	90.8 J	0.5	6.3 U	2 J	18900	11.3 J	6.7	8.6	620	14700	6.6	7
12	Sandy gravel	4530	4.1 UJ	3.1	39.1 J	0.47	2.8 U	0.31 U	1860	12	6.2	24.9	490	19800	5.2	3.6
15	Silty sandy gravel	4580	4 UJ	2.8	34.1 J	0.46	2.8 U	0.31 U	7690	10.8 J	4.1	10.2	520	15300	3.3	4.3
17	Silty sandy gravel	4620	3.9 U	1.7	67.4 J	0.42	3.9 U	0.3 U	4980	9.5 J	3.4	6.5	300	9600	4.2	3.8
Representative	Groundwater not encountered	13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Ttl Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
0	Sandy gravel	2820	163	0.03 U	4.2	14.1	10.1	33700	6570	3.3	3.8	660	0.4	232	158 J	74.6	37
2	Gravelly silt	6020	181	0.03 U	3.5	17.5	42.2	21700	6350	2	1.7	730	0.43 J	239 J	227 J	72.2	43.2
5	Silty sandy gravel	9860	304	0.22	1.4 U	20.6	1110	3690	1730	0.73	0.32 U	60	0.17 J	17 J	117 J	NA	NA
7	Silty sandy gravel	3340	197	0.03 U	1.3 U	13.1	109	965	909	0.5 U	0.31 U	20 U	0.1 UJ	8 J	27.9 J	11	24.4
10	Yellowish-brown silt	5310	476	0.04 U	1.4 U	33.7	479	2560	1660	0.54 U	0.33 U	220	0.12 J	16.8 J	155 J	14.3	27.1
12	Sandy gravel	2060	238	0.03 U	1.4 U	16.8	218	868	1080	0.51 U	0.31 U	20 U	0.1 UJ	18.1 J	69.4 J	16.2	28.3
15	Silty sandy gravel	2450	153	0.19	1.3 U	14	195	925	967	0.51 U	0.31 U	20 U	0.1 J	10.7 J	55.5 J	14.3	21.6
17	Silty sandy gravel	1950	164	0.04	1.3 U	7.3	171	706	1120	0.5 U	0.3 U	20	0.1 UJ	9.4 J	56.9 J	NA	NA
Representative	Groundwater not encountered	22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	NC	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.
Depths are in feet.
J - Estimated value.
U - Not detected
R - Rejected value.
NC - Not calculated.
NA - Not analyzed

Table 4.2.2-28
Concentrations of Parameters in Soils Near the Former Unlined Ditch to Water Treatment Ponds

S097B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium	Magnesium
.0	Silty gravel	4,290.0	3.9 UJ	4.9	643.0	.4	4.1	1.9	20,100.0	16.6	3.4	7.9	320.0	11,400.0	4.9	4.9	2,560.0
2.0	Sandy gravel	1,060.0	3.9 UJ	.7	96.6	.2 U	4.5	.3 U	516.0	1.7	.4 U	1.2	100.0	929.0	3.9	.4 U	147.0 J
7.0	Sandy gravel	2,850.0	4.1 UJ	3.8	55.1	.3 U	4.5	.3 U	2,590.0	25.4	1.9	3.9	110.0	8,370.0	2.8	2.2	759.0
10.0	Silty sandy gravel	2,650.0	4.4 UJ	1.0	79.1	.2 U	5.0	.3 U	1,040.0	12.5	1.0	3.3	110.0	3,600.0	5.2	1.2	434.0
15.0	Silty gravel	13,000.0	4.0 UJ	4.6	58.2	.9	3.7	.3 U	6,100.0	24.8	9.2	18.7	240.0	19,100.0	5.2	10.7	5,140.0
20.0	Sandy gravel	6,100.0	4.1 UJ	5.2	45.1	.5 U	2.0	.3 U	11,500.0	10.6	6.4	11.4	160.0	13,200.0	4.9	7.2	3,340.0
25.0	Gravel	9,150.0	3.8 UJ	5.0	83.9	.6	4.1	.5	15,500.0	14.3	8.3	13.0	250.0	16,000.0	5.9	6.5	5,030.0
Representative		13,900	14.3	7.7	189	1	12.8	1.9	75,800	27.8	7.6	12.6	800	14,400	29.1	18.1	22,000

Sample Depth	Sample Description	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.0	Silty gravel	165.0 J	17.4	1.3 U	9.4	99.3	1,230.0	863.0	3.2	.3 U	130.0	.1 U	18.9	42.4	18.8	20.6
2.0	Sandy gravel	3.9	4.0	1.3	1.2	26.6	33.8	637.0	.5 U	1.0	20.0	.1	2.2	13.2	7.1	23.1
7.0	Sandy gravel	114.0 J	.2 U	3.6	4.9	8.0	65.7	850.0	.5 UL	.5	60.0	.1 U	5.5	11.1	NA	NA
10.0	Silty sandy gravel	14.3 J	.2 U	2.1	2.0	4.3	36.0	891.0	.6 U	.3 U	210.0	.1 U	3.4	5.6	4.6 U	12.6
15.0	Silty gravel	189.0 J	.2	1.6	21.7	.5	815.0	1,200.0	.5 UL	.3 U	4,600.0	.1 U	19.1	67.3	9.4	17.0
20.0	Sandy gravel	332.0 J	.1	1.4 U	13.4	8.9	209.0	1,050.0	.5 U	.6	30.0	.1	9.7	36.4	2.3 U	35.7
25.0	Gravel	398.0	.4	1.3 U	16.2	4.6	421.0	1,440.0	.5 U	.3 U	70.0	.2	14.2	45.4	11.1	19.7
Representative		482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	NC	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except for gross alpha and gross beta, which are in pCi/g.
Depths are in feet.
J = Estimated value.
U = Not detected
NR = No representative value
NC = Not calculated.
NA = Not analyzed.

TABLE 4.2.3-1
CONCENTRATIONS OF PARAMETERS IN FMC FEEDSTOCK, BYPRODUCT, AND WASTE SAMPLES

Parameter	Phosphate Ore		Calciner Pond Sediment		IWW Ditch Sediment										IWW Ditch Basin Sediment		Railroad Swale Sediment		Coke-Settling Pond Waste Sediment		Ferrophos Composite			
	FOSFPO01		FSDCPW01		FSDIWW01		FSDIWW02		FSDIWW03		FSDIWW04		FSDIWW05		FSDIWW06		FSDRRS01		FWSCSP01		FWSFSA01		FWSFSA02	
Aluminum	12400		11400		12800		18200		13800		10700		12900		9320		21800		718		1650		1430	
Antimony	16.8	UJ	59.2	J	82.8	UJ	53.3	UJ	39.6	UJ	29.3	UJ	37.6	UJ	25.3	UJ	43.7	UJ	13.9	U	61.4	J	42.3	J
Arsenic	14.6	J	6.7	UJ	38	J	17.5	J	25	J	9.2	J	20.8	J	13.3	J	21.1	J	0.49	UJ	0.52	UJ	1.8	UJ
Barium	105		94.6		886		591		650		645		1530		467		333		25.5		23.6		14.5	
Beryllium	1.9		1.3		1.6	U	1.4	U	1.4	U	0.71	U	1.3	U	0.65		2.7		0.18	U	4.1		1.7	
Boron	74.3		2640		50.1		44.5		50		27.9		52.1		36.2		108		11.7	J	4.8		7.6	
Cadmium	77.8	J	426	J	267	J	139	J	245	J	112	J	569	J	234	J	318	J	2.6		0.98	UJ	0.99	UJ
Calcium	232000		284000		121000		161000		76900		72800		114000		107000		391000		3930		17000		16900	
Chromium	822		531		582		377		418		218		677		275		737		8.2		6320		2550	
Cobalt	0.87	U	1.7	U	57		34.6		52.6		34.3		62.2		56.9		4.6		0.9		29.1		14.7	
Copper	104		58.9		1920		890		1430		687		2440		1050		168		7.3	J	851		453	
Fluoride	13200		191000		7460		8560		6320		5880		11400		9140		29500		228		1790		1890	
Iron	8910	J	5440	J	19300	J	14600	J	14300	J	10300	J	18200	J	10100	J	11400	J	2570		84500	J	38500	J
Lead	12.1	UJ	30.9	UJ	96.3	UJ	46.9	UJ	82	UJ	38.9	UJ	137	J	50.8	UJ	26.7	UJ	5.7	J	6.1	U	6.1	U
Lithium	11.8	UJ	23.1	UJ	13.1	UJ	15.7	UJ	11.8	UJ	9.6	UJ	11.9	UJ	8.2	UJ	17.4	UJ	9.1	U	1.2	UJ	1.1	UJ
Magnesium	2000		4730		10500		10900		9030		7770		6780		6230		6470		371		474		262	
Manganese	122		91.8		1220		1190		1260		4400		3950		1500		253		49.6		307		264	
Mercury	0.36	UJ	0.31	UJ	4	J	4.5	J	6	J	1.2	J	2.8	J	2.1	J	0.96	UJ	0.24		0.11	UJ	0.08	UJ
Molybdenum	15	U	32.5	U	14	U	9	U	8.5	U	4.9	U	13.8	U	10.3	U	18.5	U	3.6	U	151		93.2	
Nickel	126		79		99.6		88.3		72.6		62		121		68.1		126		9.1	U	1150		727	
Orthophosphate	3460		13200		1490		1040		915		391		1560		289		1760		15.9		37.5		13.7	
Total Phosphorus	65900		91000		42600		38200		28100		22700		45300		40400		123000		306		1510		902	
Potassium	3540		79800		3180		4310		3340		2510		3340		2190		6700		192		549		410	
Selenium	6.1	J	3.8	UJ	28.4	J	14.7	J	11	J	7.1	UJ	17.6	J	12.7	J	13.8	J	1.4	U	2.6	UJ	0.24	UJ
Silver	5.1		25.1		58.1		14.7		37.4		12.6		72.8		22.8		9.4		0.72	U	47		27	
Sodium	3400		20300		3990		3200		2070		1570		2910		1840		7140		565	J	553		583	
Sulfate	NA		NA		NA		NA		NA		NA		NA		NA		NA		764		NA		NA	
Thallium	26.2	R	50.35	R	129.1	R	83	R	61.7	R	45.6	R	58.6	R	39.4	R	68	R	0.1	UJ	23.6	R	23.8	R
Vanadium	996		607		423		366		317		185		460		276		1000		7.1		6330		2610	
Zinc	991	J	6000	J	6780	J	2930	J	4380	J	1980	J	8230	J	2730	J	2770	J	67.4		97.3	J	70.3	J

Notes: Concentrations in mg/kg
NA - Not Analyzed
U - Not Detected
J - Estimated Value
R - Rejected Value

TABLE 4.2.3-1

TABLE 4.2.3-1 *(continued)*
CONCENTRATIONS OF PARAMETERS IN FMC FEEDSTOCK, BYPRODUCT, AND WASTE SAMPLES

Parameter	Ferrophos Composite FWSFSA03		Pond 11S Waste Sediment FWSP1101		Pond 12S Waste Sediment FWSP1201		Pond 15S Waste Sediment FWSP5S01		Pond 8S Waste Sediment FWSP8S01		Pond 9E Waste Sediment FWSP9E01		Slag FWSSSA01		Slag FWSSSA02		Slag FWSSSA03		Slag FWSSSA04		Slag FWSSSA05		Slag FWSSSA06	
Aluminum	2330		4030		3940		2600		1350		4620		23600		25800		26900		24400		25700		24500	
Antimony	28.5	J	37.2	J	47	J	54.4	J	189	J	54.6	J	14.9	UJ	14.5	UJ	14.2	UJ	14.6	UJ	14.1	UJ	14	UJ
Arsenic	3.7	UJ	36.1	J	20.4	J	90.9	J	256	J	17.1	J	0.51	UJ	0.48	UJ	0.52	UJ	0.5	UJ	0.48	UJ	0.58	UJ
Barium	23.4		48.2		48.8		30.6		18.7		50.8		223		229		254		214		251		233	
Beryllium	1.8		0.29		0.35		0.2	U	0.19	U	0.37		1.9		2.1		2		1.8		1.9		1.9	
Boron	6.1		55.9	J	79.6	J	34.9	J	30.4	J	136	J	97.8		67.5		88.9		68.6		88		83.9	
Cadmium	2.8	UJ	2040		2030		1100		1360		2410		2.8	UJ	1.2	UJ	13	J	32.4	J	103	J	4.3	UJ
Calcium	24300		27000		26500		21900		13200		33200		274000		283000		291000		255000		286000		290000	
Chromium	2370		107		133		116		71.6		192		238		230		290		172		280		273	
Cobalt	12.6		3.1		1.8		0.79	U	0.74	U	6.6		1.2	U	1.6	U	1.6	U	1.6	U	1.4		1.6	
Copper	404		68	J	74.9	J	42.2	J	41.7	J	75.4	J	15.8		10.9		17.9		11.9		17.7		17	
Fluoride	3370		17100		15900		8850		8600		16100		14400		17800		17300		12400		16500		16200	
Iron	32800	J	1520		1630		1360		877		1980		1150	J	772	J	1160	J	1970	J	1530	J	1410	J
Lead	6	U	332	J	386	J	185	J	201	J	338	J	6	U	5.8	U	5.7	U	5.9	U	5.7	U	5.6	U
Lithium	2.2	UJ	9.5	U	8.7	U	9.9	U	9.3	U	9	U	16.5	UJ	17.2	UJ	19.5	UJ	17.9	UJ	18.9	UJ	18	UJ
Magnesium	710		1280		1100		704		549		951		3200		3200		3580		5510		3610		3690	
Manganese	190		80.8		49.4		53.2		37.9		52		114		127		169		205		168		126	
Mercury	0.24	UJ	0.24		0.46		0.23		0.74		0.82		0.17	UJ	0.05	UJ	0.12	UJ	0.05	UJ	0.05	UJ	0.39	UJ
Molybdenum	90.6		7.1		6.7		4.5		3.7	U	6.6		2.5	U	2.5	U	2.4	U	2.5	U	2.4	U	2.4	U
Nickel	535		16.2		16.4		17.6		16.2		26.5		8.8		3.8	U	8.8		6.5		11.9		7.9	
Orthophosphate	31.1		7910		10100		10100		9710		4030		46.1		44.6		91.1		57.2		30.3		104	
Total Phosphorus	1070		28000		25100		24200		21300		33500		1900		1610		4580		3800		3930		5680	J
Potassium	663		20100		19100		11400		7910		31300		6780		7130		8160		7700		8220		7360	
Selenium	1.1	UJ	49.6		16.5		13.3		10.8		45.3		4.5	J	4.6	J	2.8	UJ	4.3	J	6.9	J	4.9	J
Silver	26.7		199		198		106		116		218		2.6		2.3		4.8		4.9		3.7		4.3	
Sodium	593		2750	J	2670	J	2070	J	1630	J	4580	J	4200		4110		3970		3730		4210		4180	
Sulfate	NA		210		20	U	20	U	20	U	20		NA		NA		NA		NA		NA		NA	
Thallium	23.1	R	26		9.4	J	16.63	J	22.9		39.4		23.2	R	22.6	R	22.2	R	22.8	R	22	R	21.8	R
Vanadium	2630		68.5		93.4		84.1		42.9		169		215		183		243		150		249		250	
Zinc	169	J	26600		20200		11400		10400		21400		52.5	J	36.4	J	194	J	450	J	136	J	85.5	J

Notes: Concentrations in mg/kg
NA - Not Analyzed
U - Not Detected
J - Estimated Value
R - Rejected Value

Table 4.2.3-3
Constituents in Wastewater and Sediments

Sample Source	Sample ID	Sample type	Alkalinity, Bicarbonate (mg/l)	Alkalinity, Carbonate (mg/l)	Aluminum (*)	Ammonia (NH_3, as N) (mg/l)	Antimony (*)	Arsenic (*)	Barium (*)	Beryllium (*)	Boron (*)	Cadmium (*)	Calcium (*)	Chloride (*)	Chromium (*)	Cobalt (*)	Copper (*)	Fluoride (*)	Gross Alpha (**)	Gross Beta (**)
Calciner Pond Influent	FSWCPW01	PSL	541	1 U	9.24 J	268	1.92 J	3.977 J	0.26	0.001 UJ	2.89	0.818	154 J	3750	0.133 J	0.038 U	0.223	134	642	17700
IWW Ditch	FSWIWW01	PSL	324	1 U	7.66 J	288	1.28 UJ	1.759 J	0.27	0.001 UJ	4.53	0.0341 J	141 J	1620	0.02 UJ	0.027 U	0.163	61.6	155	6890
Discharge to Pond RE	FSWPSRRE	PSL	4420	1 U	715 J	39.6	7.12 J	0.04863 J	9.45	0.114	0.19	1.66	114 J	740	2.03 J	0.09	13.39	1510	668	6480
Discharge to Phase IV Ponds	FSWPWSIV	PSL	1640	1 U	2.36 J	29.7	0.94 UJ	0.1454 J	0.04	0.001 UJ	0.18	0.02364 J	30.4 J	307	0.413 J	0.034 U	0.032	436	21.8	2420
Phossy Water Discharge to Pond RS	FWWPRS01	PSL						0.6168 J												
Railroad Swale Composite	FWWRRS01	PSL	143	1 U	9.83 J	1.3	0.06 UJ	0.00832 U	0.22	0.001 UJ	0.41	0.15206	73.6 J	274	0.02863 J	0.044 U	0.139	4.2	48.3	30.1
Calciner Pond Sediment	FSDCPW01	PSW			11400		59.2 J	6.7 UJ	94.6	1.3	2640	426 J	284000		531	1.7 U	58.9	191000	225 J	111
IWW Ditch Sediments	FSDIWW01	PSW			12800		82.8 UJ	38 J	886	1.6 U	50.1	267 J	121000		582	57	1920	7460	116 J	73.4
IWW Ditch Sediments	FSDIWW02	PSW			18200		53.3 UJ	17.5 J	591	1.4 U	44.5	139 J	161000		377	34.6	890	8560	131 J	81.1
IWW Ditch Sediments	FSDIWW03	PSW			13800		39.6 UJ	25 J	650	1.4 U	50	245 J	76900		418	52.6	1430	6320	202 J	134
IWW Ditch Sediments	FSDIWW04	PSW			10700		29.3 UJ	9.2 J	645	0.71 U	27.9	112 J	72800		218	34.3	687	5880	149 J	99
IWW Ditch Sediments	FSDIWW05	PSW			12900		37.6 UJ	20.8 J	1530	1.3 U	52.1	569 J	114000		677	62.2	2440	11400	299 J	129
IWW Ditch Sediments	FSDIWW06	PSW			9320		25.3 UJ	13.3 J	467	0.65	36.2	234 J	107000		275	36.9	1050	9140	222 J	105
Railroad Swale Sediments	FSDRRS01	PSW			21800		43.7 UJ	21.1 J	333	2.7	108	318 J	391000		737	4.6	168	29500	155 J	72
Coke Settling Pond Sediments	FWSCSP01	PSW			718		13.9 U	0.49 UJ	25.5	0.18 U	11.7 J	2.6	3930	219	8.2	0.9	7.3 J	228	4.51 UJ	3.76 UJ

Sample Source	Sample ID	Sample Type	Iron (*)	Lead (*)	Lead-210 (pCi/g)	Lithium (*)	Magnesium (*)	Manganese (*)	Mercury (*)	Molybdenum (*)	Nickel (*)	Nitrate (NO_3 as N) (*)	Orthophosphate (PO_4 as P) (*)	pH	Phosphorus, Total (*)	Potassium (*)	Potassium-40 (pCi/g)	Radium-226 (pCi/l)	Radium-228 (pCi/l)	Selenium (*)
Calciner Pond Influent	FSWCPW01	PSL	7.06 J	0.3258 J		2.216	14.7 J	0.211	0.0001 UJ	0.31	0.339	27.9	3930	4.67	5340	19330 J		0.34 UJ	-0.4 U	2.785 J
IWW Ditch	FSWIWW01	PSL	4.99 J	0.001 UJ		1.599	22 J	0.187	0.0001 UJ	0.19	0.17	18.4	2210	7.12	2590	7470 J		0.72 UJ	-0.2 U	4.217 J
Discharge to Pond RE	FSWPSRRE	PSL	197.1 J	0.5472 J		1.664	19.6 J	11.63	0.00027	0.27	2.454	0.39	1360	10.47	7680	9890 J		103	-2.7 U	0.2069 J
Discharge to Phase IV Ponds	FSWPWSIV	PSL	2.136 J	0.001 UJ		0.537	13.3 J	0.204	0.0001 UJ	0.017 U	0.007 UJ	0.6	782	7.99	1370	2890 J		1.9 J	-2.4 U	0.2292 J
Phossy Water Discharge to Pond RS	FWWPRS01	PSL																		
Railroad Swale Composite	FWWRRS01	PSL	8.44 J	0.00599 UJ		0.057	14.8 J	0.16	0.0001 UJ	0.03 U	0.066	1.2	4.24	10.16	21.3	19.6 J		1.59	-0.3 U	0.0104 J
Calciner Pond Sediment	FSDCPW01	PSW	5440 J	30.9 UJ	1.72 U	23.1 UJ	4730	91.8	0.31 UJ	32.5 U	79		13200	5.02	91000	79800	70.4			3.8 UJ
IWW Ditch Sediments	FSDIWW01	PSW	19300 J	96.3 UJ		13.1 UJ	10500	1220	4 J	14 U	99.6		1490	7.68	42600	3180				28.4 J
IWW Ditch Sediments	FSDIWW02	PSW	14600 J	46.9 UJ		15.7 UJ	10900	1190	4.5 J	9 U	88.3		1040	8.15	38200	4310				14.7 J
IWW Ditch Sediments	FSDIWW03	PSW	14300 J	82 UJ		11.8 UJ	9030	1260	6 J	8.5 U	72.6		915	7.55	28100	3340				11 J
IWW Ditch Sediments	FSDIWW04	PSW	10300 J	38.9 UJ		9.6 UJ	7770	4400	1.2 J	4.9 U	62		391	8.13	22700	2510				7.1 UJ
IWW Ditch Sediments	FSDIWW05	PSW	18200 J	137 J		11.9 UJ	6780	3950	2.8 J	13.8 U	121		1560	7.87	45300	3340				17.6 J
IWW Ditch Sediments	FSDIWW06	PSW	10100 J	50.8 UJ		8.2 UJ	6230	1500	2.1 J	10.3 U	68.1		289	8.65	40400	2190				12.7 J
Railroad Swale Sediments	FSDRRS01	PSW	11400 J	26.7 UJ		17.4 UJ	6470	253	0.96 UJ	18.5 U	126		1760	8.94	123000	6700				13.8 J
Coke Settling Pond Sediments	FWSCSP01	PSW	2570	3.7 J	6.64 U	9.1 U	371	49.6	0.24	3.6 U	9.1 U	0.94	15.9	9.4	306	192	0.926 UJ			1.4 U

Sample Source	Sample ID	Sample Type	Silver (*)	Sodium (*)	Specific Conductance (mmhos/cm)	Sulfate (*)	Temperature (°C)	Thallium (*)	Total Dissolved Solids (mg/l)	Uranium-238 (pCi/g)	Vanadium (*)	Zinc (*)
Calciner Pond Influent	FSWCPW01	PSL	0.058	3990 J	3500	19800	37.77778	0.176 J	64000		1.14	10.13
IWW Ditch	FSWIWW01	PSL	0.035	1450 J	130	8400	25.33333	0.318 J	7460		0.83	5.25
Discharge to Pond RE	FSWPSRRE	PSL	2.45	1449 J	1206	33	19.83333	0.001 UJ	22100		15.62	5210
Discharge to Phase IV Ponds	FSWPWSIV	PSL	0.007 U	598 J	375	2 U	23.05556	0.001 UJ	10100		0.37	41.8
Phossy Water Discharge to Pond RS	FWWPRS01	PSL										
Railroad Swale Composite	FWWRRS01	PSL	0.01 U	179 J	1900	79	19.88889	0.001 UJ	1070		0.77	1.58
Calciner Pond Sediment	FSDCPW01	PSW	25.1	20300				50.35		17.5	607	6000 J
IWW Ditch Sediments	FSDIWW01	PSW	58.1	3990				129.1			423	6780 J
IWW Ditch Sediments	FSDIWW02	PSW	14.7	3200				83			366	2930 J
IWW Ditch Sediments	FSDIWW03	PSW	37.4	2070				61.7			317	4380 J
IWW Ditch Sediments	FSDIWW04	PSW	12.6	1570				45.6			185	1980 J
IWW Ditch Sediments	FSDIWW05	PSW	72.8	2910				58.6			460	8230 J
IWW Ditch Sediments	FSDIWW06	PSW	22.8	1840				39.4			276	2730 J
Railroad Swale Sediments	FSDRRS01	PSW	9.4	7140				68			1000	2770 J
Coke Settling Pond Sediments	FWSCSP01	PSW	0.72 U	565 J		764		0.1 UJ		3.11 U	7.1	67.4

Notes:
*Results with sample type PSL are in mg/l and with PSW are in mg/kg.
**Results with sample type PSL are in pCi/l and with PSW are in pCi/g
U = Not detected
J = Estimated value.

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table
4.2.3.2

Table 4.2.3-4

Concentrations of Parameters in Soil in Former Calciner Ponds 1C and 2C

F023B

Sample Depth	Sample Description	Aluminum		Antimony		Arsenic		Barium		Beryllium	Boron		Cadmium		Calcium		Chromium		Cobalt	Copper	Fluoride	Iron		Lead		Lithium	
0	Light brown sandy silt	13500	J	7.6	U	12.1	J	146	J	0.76	23.4	J	36.2	J	63400	J	141	J	4	20.2	28400	9520	J	14.8		11.5	J
10	Dark yellowish-brown clayey silt	9770	J	8.5	U	7.1	J	115	J	0.63	24.3	J	36.9	J	37100	J	16.8	J	10.2	8.2	2040	10600	J	10	U	9.5	J
20	Dark yellowish-brown clayey silt	8660	J	9.4		6.4	UJ	82.4	J	0.55	17.1	UJ	15.1	J	40400	J	12.8	J	4.4	9.7	1070	9680	J	9.3	U	10.2	J
30	Dark yellowish-brown clayey silt	8310	J	8.1	U	5.4	UJ	114	J	0.51	19.4	UJ	1.3	J	26900	J	11.4	J	5	7.9	690	10700	J	8.5	U	10	J
40	Dark yellowish-brown sandy gravel	4830	J	8.2	U	5.5	UJ	79.8	J	0.45	12.6	UJ	0.53	UJ	23100	J	8.5	J	5.1	7.1	400	11100	J	6.5	U	6.4	J
50	Dark yellowish-brown sandy gravel	5160	J	8	U	5.4	UJ	77.7	J	0.48	14.1	UJ	0.52	UJ	4680	J	9.7	J	5.7	9.8	370	14400	J	6.3	U	6.3	J
60	Dark yellowish-brown sandy gravel	5200	J	7.8	U	3.6	UJ	81.7	J	0.48	6.4	UJ	0.51	UJ	5610	J	8.7	J	6	6.6	210	15500	J	6.6	U	6.2	J
Representative		13,900		14.3		7.7		188		1	12.8		1.9		75,800		27.5		7.6	12.6	600	14,400		29.1		16.1	

Sample Depth	Sample Description	Magnesium		Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium		Selenium	Silver		Sodium		Thallium		Vanadium		Zinc	
0	Light brown sandy silt	10000	J	220	J	1.8		4.9		24.8	22.7	13800	5590	J	47.5	3.4		964	J	11.9	U	146	J	328	J
10	Dark yellowish-brown clayey silt	13800	J	209	J	0.17	U	1.4	U	27.1	220	2460	2910.	J	4.9	0.44	U	458	J	13.3	U	21.4	J	566	J
20	Dark yellowish-brown clayey silt	12200	J	323	J	0.09	U	1.4	U	36.6	163	1570	1920	J	2.8	0.44	U	447	J	13.2	U	19.5	J	32.5	J
30	Dark yellowish-brown clayey silt	8400	J	393	J	0.12	U	1.4	U	27	183	1410	1670	J	1.4	0.42	U	441	J	12.7	U	19.2	J	33.9	J
40	Dark yellowish-brown sandy gravel	5940	J	326	J	0.05	U	1.4	U	22.1	133	891	988	J	1.6	0.43	U	359	J	12.8	U	15.3	J	36.3	J
50	Dark yellowish-brown sandy gravel	2440	J	329	J	0.08	U	1.3	U	13.2	145	705	903	J	1.6	0.42	U	463	J	12.5	U	15.9	J	40.7	J
60	Dark yellowish-brown sandy gravel	2160	J	363	J	0.15	U	1.3	U	8.1	129	681	938	J	0.94	0.41	U	455	J	12.2	U	15.8	J	48.2	J
Representative		22,000		482		0.16		2.15		15.5	3.7	672	3,562.3		3.05	1.9		970.7		0.27		45.4		52.8	

Notes:

Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected.

Table 4.2.3-5
Concentrations of Parameters in Soil in the PCB Storage Shed

F043B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
17	Dark yellowish-brown silt	13900	16 UJ	4.6 J	223	0.24	17.9 U	1 U	43400	20.5	6.3	9.4 U	490	14300	21.3	12.7 UJ
19.5	Dark yellowish-brown silt	13700	16.2 UJ	4.8 J	148	0.22	13.5 U	1.1 U	43300	20.8	5.9	7.9 U	460	14800	11	11.8 UJ
22	Dark yellowish-brown silt	11700	16.5 UJ	4.1 J	146	0.21 UJ	12.5 U	1.1 U	39200	17.8	5.4	7.5 U	430	13300	6.8 U	9.8 UJ
24.5	Dark yellowish-brown silt	14900	17.2 UJ	5.3 J	137	0.23	28.4 U	1.1 U	40400	19.5	5.9	8 U	410	13600	7.2	11.7 UJ
27	Dark yellowish-brown silt	13200	16.5 UJ	5.1 J	119	0.21 UJ	25 U	1.1 U	34300	22.4	6.2	8 U	480	15200	6.8 U	10.3 UJ
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
17	Dark yellowish-brown silt	14300	409	0.05 U	2.7 U	12.8	3.3	663	3310	1.5 UJ	0.83 U	705	24.9 R	28.7	71
19.5	Dark yellowish-brown silt	13900	404	0.06 U	2.7 U	13.5	8.6	775	3050	1.6 UJ	0.84 U	782	25.2 R	33.7	55.6
22	Dark yellowish-brown silt	12800	381	0.79	2.8 U	11.9	4.2	726	2520	1.4 UJ	0.86 U	1000	25.7 R	28.7	43.6
24.5	Dark yellowish-brown silt	13000	415	0.2	2.9 U	12.4	5.6	775	3200	1.5 UJ	0.89 U	1550	26.8 R	29.5	47.5
27	Dark yellowish-brown silt	12900	386	0.06 U	2.8 U	12.8	5.4	745	2810	1.4 UJ	0.86 U	1450	25.7 R	35	47.9
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	970.7	0.27	45.4	52.8

F044B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
2	Very dark grayish brown silt	12900	22.1 UJ	69.7 J	123	2	65.1 U	229	231000	834	1.3	68.7	19200	9030	209	9.1 UJ
4.5	Very dark grayish brown silt	12100	28.7 UJ	61.2 J	131	2	74.8 U	184	229000	746	0.84 U	84.8	19800	8530	48.7	7.1 UJ
7	Very dark grayish brown silt	13800	21.5 UJ	23 J	130	1.4	53.3 U	135	179000	479	2.2	59.9	13500	9720	90.6	10 UJ
9.5	Yellowish-brown silt	13300	16.8 UJ	2.5 UJ	121	0.23	15.1 U	1.1 U	48300	17.8	5.9	9.2 U	480	13200	6.8 U	13.7 UJ
12	Yellowish-brown silt	12600	16.4 UJ	3.9 J	123	0.22	14.4 U	2.1 U	47400	21.9	5.2	9.5 U	630	12800	10.4	11.8 UJ
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
2	Very dark grayish brown silt	3750	242	0.06	12.9 U	162	72.4	65700	5040	12 J	6.4	2580	26.2 R	681	1610
4.5	Very dark grayish brown silt	3210	285	0.09	15.1 U	154	38.3	84000	4380	12.2 J	5.8	2610	25.3 R	864	1420
7	Very dark grayish brown silt	6660	291	0.06 U	10.8 U	99.6	46	14400	4570	7.2 J	5.4	2070	26 R	557	1170
9.5	Yellowish-brown silt	14400	379	0.06 U	2.8 U	12.4	2.2	703	3320	1.4 UJ	0.87 U	741	26.2 R	29.2	48.7
12	Yellowish-brown silt	13500	350	0.06 U	2.8 U	13.1	3.3	1400	3300	1.9 UJ	0.85 U	721	25.5 R	32.9	60.9
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	970.7	0.27	45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value.
R - Rejected value.
U - Not detected.

Table 4.2.3-5

Table 4.2.3-5 (continued)
Concentrations of Parameters in Soil in the PCB Storage Shed

F045B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium		Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium
3	Yellowish-brown silt (fill)	13200	17	UJ	5.3	UJ	140	J	0.63	46.5		1.5		46100	15.5	5.9	11.4	530	12400	18.4	J	14
5.5	Yellowish-brown silt (fill)	11700	17.1	UJ	5.1	UJ	97.4	J	0.57	13.5	U	2		49000	17	5.5	10.6	470	11700	12.7	J	13.1
8	Yellowish-brown silt (fill)	14500	17.1	UJ	2.8	UJ	154	J	0.77	55.7		3.8		46700	22.1	6.4	12.6	680	13600	12.6	J	15.4
10.5	Yellowish-brown silt (fill)	12600	17.1	UJ	4.1	UJ	137	J	0.61	28	U	1.7		39100	17.8	5.6	10.7	530	12000	12.3	J	13.5
13	Yellowish-brown silt (fill)	10900	15.8	UJ	4.6	UJ	134	J	0.58	23.5	U	1	U	41400	16.3	5.4	8.9	410	11500	8.4	J	11.1
Representative		13,900	14.3		7.7		188		1	12.8		1.9		75,800	27.5	7.6	12.6	600	14,400	29.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc	
3	Yellowish-brown silt (fill)	11900	351	J	0.06	U	2.9	U	13	244	1740	6000	1.3	UJ	0.68	U	673	26.4	U	25.6	50.6	J
5.5	Yellowish-brown silt (fill)	14100	330	J	0.06	U	2.9	U	13.4	27.1	821	4000	1	UJ	0.89	U	822	26.6	U	26.7	72.1	J
8	Yellowish-brown silt (fill)	14400	419	J	0.06	U	2.9	U	14.7	47.3	1410	5050	1.1	UJ	0.89	U	984	26.7	U	32.4	112	J
10.5	Yellowish-brown silt (fill)	13100	363	J	0.06	U	2.9	U	11.9	9.8	756	3800	1.3	UJ	0.89	U	794	26.6	U	27.3	68.5	J
13	Yellowish-brown silt (fill)	12400	381	J	0.05	U	2.7	U	12.6	2.9	697	2670	1	UJ	0.82	U	742	24.6	U	25.1	42.8	J
Representative		22,000	482		0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		45.4	52.8	

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
R - Rejected value
U - Not detected

Table 4.2.3-6
Gross Alpha and Gross Beta in Soil Samples

Old Ponds 1c and 2c

F023B

Sample Depth	0	10	20	30	40	50	60
Gross alpha	53.12 ± 11.86	14.07 ± 5.44	15.61 ± 6.2	15.03 ± 6.06	26.17 ± 7.78	40.76 ± 12.8	34.76 ± 8.94
Gross beta	38.77 ± 6.08	20.32 ± 4.54	27.27 ± 5.78	20.85 ± 4.62	31.86 ± 5.52	33.13 ± 5.62	42.49 ± 6.54

Pond 4E

F024B

Sample Depth	0	10	20	30	40	50	60	70	80
Gross alpha	95.3 ± 22.2	16.1 ± 9.44	18.5 ± 9.64	13.7 ± 8.44	13.1 ± 10.12	17.2 ± 10.4	28.9 ± 11.98	24.1 ± 12.62	11.7 ± 6.98
Gross beta	113 ± 13.32	25 ± 7.24	26.2 ± 7.02	21.1 ± 6.82	20.2 ± 7.2	23.9 ± 7.38	34.1 ± 7.66	31.5 ± 8.42	20.1 ± 6.54

Old Pond 5E

F025B

Sample Depth	5	10	20	30	60	70
Gross alpha	111.12 ± 6.99	302.95 ± 14.1	26.39 ± 4.05	10.15 ± 2.02	17.57 ± 3.13	15.24 ± 2.97
Gross beta	113.78 ± 4.54	265 ± 6.8	27.69 ± 2.52	16.95 ± 1.99	25.89 ± 2.27	28.73 ± 2.5

Old Pond 6E

F026B

Sample Depth	0	10	60
Gross alpha	22.29 ± 4.14	16.78 ± 2.99	19.41 ± 3.24
Gross beta	21.45 ± 2.27	23.3 ± 2.43	25.89 ± 2.49

Landfill

F027B

Sample Depth	0	10	20	30	40	50	60	70	80	90	100	110	120
Gross alpha	21.1 ± 10.7	15.61 ± 2.84	18.61 ± 3.08	12.64 ± 8.96	11.64 ± 8.68	26.87 ± 12.32	15 ± 8.2	14.34 ± 8.68	12.21 ± 8.84	18.81 ± 9.86	16.47 ± 9.56	21.21 ± 10.52	14.16 ± 9.02
Gross beta	20.02 ± 7.44	19.35 ± 2.15	26.42 ± 2.48	29.36 ± 9.14	24.02 ± 8.48	31.06 ± 8.04	19.61 ± 6.84	20.9 ± 7.12	21.74 ± 7.88	21.48 ± 7.02	20.9 ± 6.78	24.13 ± 8	20.29 ± 7.56

Notes: All results are in pCi/g.
Representative levels—gross alpha, 24.7 pCi/g; gross beta, 31.4 pCi/g.

Table 4.2.3-6 (continued)
Gross Alpha and Gross Beta in Soil Samples

Chemical Lab Drain Pit

F028B

Sample Depth	0	10	20	30	70
Gross alpha	78.21 ± 6.97	17.57 ± 3.21	17.02 ± 2.89	18.34 ± 3.03	18.83 ± 3.48
Gross beta	45.82 ± 3.15	25.08 ± 2.63	25.12 ± 2.55	21.84 ± 2.38	24.88 ± 2.58

F029B

Sample Depth	1	20	30	60	70
Gross alpha	33.09 ± 4.34	20.66 ± 3.82	16.48 ± 3.08	16.99 ± 2.89	9.07 ± 7.86
Gross beta	33.6 ± 3.01	24.67 ± 2.62	19.04 ± 2.16	21.23 ± 2.31	21.16 ± 7.52

IWW Basin Ditch

F030B

Sample Depth	0	10	20	30	40	50	65	75
Gross alpha	171.19 ± 24.6	13.91 ± 5.68	13.63 ± 5.44	96.96 ± 12.5	16.16 ± 5.82	15.55 ± 6.26	25.23 ± 7.44	20.44 ± 7.18
Gross beta	67.26 ± 7.8	21.22 ± 5.14	22.63 ± 4.9	18.36 ± 4.32	27.01 ± 5.26	26.26 ± 5.54	35.08 ± 5.6	23.93 ± 5.46

Pond 1E

F033B

Sample Depth	4.5	9.5	14.5	19.5
Gross alpha	23.9 ± 10.04	19.8 ± 8.88	114 ± 22.4	20 ± 9.86
Gross beta	34.6 ± 7.74	37.5 ± 8.54	152 ± 15.2	30.9 ± 7.52

Area 9S

F034B

Sample Depth	5	10	15	20
Gross alpha	32.1 ± 11.54	11.6 ± 11.54	31.8 ± 10.52	7.72 ± 5.52
Gross beta	47.3 ± 9.36	25 ± 9.36	42.9 ± 8.96	18 ± 6.52

Notes: All results are in pCi/g.
Representative levels—gross alpha, 24.7 pCi/g; gross beta, 31.4 pCi/g.

Table 4.2.3-6 (continued)
Gross Alpha and Gross Beta in Soil Samples

Transformer Salvage Area

	F035B					F036B				
Sample Depth	2	4.5	7	9.5	12	1	3.5	6	8.5	11
Gross alpha	311 ± 50	15.6 ± 10.86	19.3 ± 11.86	16.2 ± 8.72	11.5 ± 7.02	31.7 ± 10.9	13.2 ± 7.74	20.4 ± 9.92	13 ± 7.74	5.37 ± 4.88
Gross beta	187 ± 17.2	28.8 ± 9.08	25.2 ± 6.9	30.5 ± 7.84	18 ± 5.8	39.3 ± 8.34	23.3 ± 7	26.2 ± 6.84	22.8 ± 6.76	14 ± 5.96

Waste Storage Area

F037B

Sample Depth	20
Gross alpha	32.6 ± 14.86
Gross beta	62.7 ± 10.12

Railroad Swale

	F039B					F040B	F041B			F042B		
Sample Depth	0	2.5	5	7.5	10	14	7.5	10	12.5	7.5	10	12.5
Gross alpha	216 ± 45.2	280 ± 57	16.6 ± 7.84	21.6 ± 9.82	17.7 ± 9.32	18.5 ± 9.18	96.91 ± 22	7.23 ± 5.76	10.94 ± 6.94	7.3 ± 6.34	12.59 ± 8.74	12 ± 7.32
Gross beta	76.1 ± 12.44	82.2 ± 12.92	22.2 ± 6.56	28.5 ± 7.36	24.8 ± 7.04	22.5 ± 6.66	62.62 ± 11.7	17.62 ± 6.32	20.87 ± 7	20.88 ± 7.28	29.3 ± 8.1	19.24 ± 6.88

F131B

Sample Depth	40	60	70
Gross alpha	5.71 ± 2.76	16 ± 5.02	17.9 ± 8.61
Gross beta	13.2 ± 3.51	23.7 ± 4.28	21.6 ± 4.41

PCB Storage Shed

	F043B					F044B				
Sample Depth	17	19.5	22	24.5	27	2	4.5	7	9.5	12
Gross alpha	11.6 ± 7.12	19.4 ± 10.2	19.5 ± 9.68	16.9 ± 10.08	25.3 ± 10.76	236 ± 47.4	287 ± 49.6	103 ± 27.2	81.6 ± 23.4	19.9 ± 10.72
Gross beta	25.2 ± 6.94	25.3 ± 7.6	27.8 ± 7.5	19.7 ± 7.12	25.7 ± 6.9	79.5 ± 12.36	130 ± 16.7	53 ± 10.08	45 ± 10.1	26.1 ± 8.34

F045B

Sample Depth	3	5.5	8	10.5	13
Gross alpha	24.1 ± 13.34	22.5 ± 10.22	17.9 ± 11.98	20.4 ± 10.7	14.6 ± 9.72
Gross beta	26.7 ± 8.16	32.6 ± 8.52	25.3 ± 7.82	25.6 ± 8.28	19.7 ± 7.76

Notes: All results are in pCi/g.
Representative levels—gross alpha, 24.7 pCi/g; gross beta, 31.4 pCi/g.

Table 4.2.3-6 (continued)
Gross Alpha and Gross Beta in Soil Samples

Septic Drainfield Area

	F046B			F047B					F048B				
Sample Depth	0	7.5	10	0	2.5	5	7.5	10	0	2.5	5	7.5	10
Gross alpha	18.5 ± 9.54	17.8 ± 9.58	13.9 ± 7.94	22.1 ± 9.52	18.4 ± 9.38	14.5 ± 7.74	12.8 ± 8.28	10.3 ± 7.1	85.8 ± 25.6	18.6 ± 9.76	19.8 ± 10.36	18.7 ± 9.3	17.2 ± 9.48
Gross beta	30.5 ± 7.98	23.1 ± 6.36	23.8 ± 6.82	26.4 ± 7.1	28.1 ± 6.9	25.6 ± 7.42	28.3 ± 7.48	30.4 ± 7.46	36.5 ± 8.26	24 ± 6.92	23.5 ± 7.1	29.9 ± 8.28	28.2 ± 7.62

F049B

Sample Depth	1.5	4	6.5	9	11.5
Gross alpha	54.8 ± 19.38	11.1 ± 7.24	21.3 ± 10.64	14.9 ± 9.02	15.5 ± 10.46
Gross beta	37 ± 8.3	21.8 ± 7.22	25.6 ± 7.82	25.8 ± 7.48	26.2 ± 7.82

Calciner Fines

	F050B					F051B				
Sample Depth	0	2	4	6	10	5	7	9	11	14
Gross alpha	137 ± 45	232 ± 61	352 ± 79.8	241 ± 61.4	186 ± 52	185 ± 58.4	115 ± 37.6	22.3 ± 14.62	39.5 ± 19.3	62.6 ± 27
Gross beta	133 ± 21	170 ± 23.6	199 ± 25.4	157 ± 28	131 ± 25.8	94.9 ± 23.2	56.1 ± 14.64	29.3 ± 11.54	42.4 ± 12.84	41.1 ± 12.92

	B127B				
Sample Depth	0	5	15	25	35
Gross alpha	84.2 ± 13.1	5 ± 2.37	17.4 ± 5.95	11.9 ± 5.15	20.7 ± 6.14
Gross beta	81.5 ± 6.36	5 ± 2.49	20.7 ± 3.93	20.6 ± 3.92	21.1 ± 3.95

F128B

Sample Depth	0	10	20	30	40	50	60	70	80
Gross alpha	63.9 ± 11.4	13.7 ± 5.29	17.3 ± 6	20.4 ± 6.68	15.9 ± 5.98	16 ± 5.69	23.3 ± 6.92	26.1 ± 6.77	11.4 ± 5.54
Gross beta	61.7 ± 6.12	33.2 ± 4.66	27 ± 4.33	25.8 ± 4.26	20.6 ± 3.9	24.1 ± 4.15	36.2 ± 4.88	26.9 ± 4.32	17.9 ± 3.76

Secondary Condenser

	F052B					F053B				
Sample Depth	10	12.5	15	17.5	20	10	12.5	15	17.5	20
Gross alpha	32 ± 13.14	48.1 ± 16.08	18.6 ± 9.9	9.08 ± 6.68	12.3 ± 9.06	43.4 ± 15.68	28.2 ± 11.18	15.9 ± 9.66	25.8 ± 11.78	20.4 ± 10.64
Gross beta	27.4 ± 7.5	35.4 ± 8.96	31.4 ± 8.4	20.8 ± 6.58	21.1 ± 6.9	43.5 ± 9.74	26.5 ± 7.52	24.9 ± 7.7	26.2 ± 7.78	23.7 ± 7.62

Notes: All results are in pCi/g.
Representative levels—gross alpha, 24.7 pCi/g; gross beta, 31.4 pCi/g.

Table 4.2.3-6 (continued)
Gross Alpha and Gross Beta in Soil Samples

Under Silica Pile

	F054B					F130B						
Sample Depth	40	42.5	45	47.5	50	0	10	20	40	50	70	90
Gross alpha	15.9 ± 8.56	14.5 ± 7.98	12.6 ± 7.52	29.3 ± 15.32	15.9 ± 8.82	126 ± 19.6	22.3 ± 6.01	7.35 ± 3.27	5 ± 2.64	5 ± 2.66	12.9 ± 3.92	11.6 ± 4
Gross beta	26 ± 7.32	26.4 ± 7.16	21 ± 6.7	41 ± 11.6	22.2 ± 6.58	59.5 ± 8.36	23.1 ± 4.21	13.6 ± 3.62	10 ± 3.25	16.2 ± 3.74	21.3 ± 4.1	22.1 ± 4.2

Old Pond 7S – Tree-Line Area

	F055B		F056B		F057B	
Sample Depth	3	5	5	7	5	7
Gross alpha	16.6 ± 12.7	46 ± 19	25.4 ± 16.08	1530 ± 199.8	31.4 ± 17.28	47.4 ± 31
Gross beta	22.6 ± 10.4	42 ± 11.56	32.5 ± 11.66	1070 ± 77	28.1 ± 10.94	34.9 ± 17.04

Old Pond 6S Area

	F058B		F059B
Sample Depth	7	9	10
Gross alpha	161 ± 57.2	143 ± 49.2	1660 ± 149
Gross beta	546 ± 50.6	81.7 ± 21.6	1220 ± 59.6

Area West of Mobile Shop

	F060B		F061B	
Sample Depth	1	3	5	7
Gross alpha	130 ± 30.2	135 ± 35	159 ± 32.6	192 ± 41.2
Gross beta	59.7 ± 11.54	79.1 ± 13.48	116 ± 16.08	145 ± 19.5

Long-Term Phosphorus Storage Area

	F062B		F063B	
Sample Depth	1	3	5	7
Gross alpha	17.7 ± 13.94	17.3 ± 15.66	22.2 ± 14.98	40.4 ± 19.9
Gross beta	27.6 ± 11.44	29.2 ± 13.36	22.2 ± 10.42	29.3 ± 8.98

Notes: All results are in pCi/g.
Representative levels—gross alpha, 24.7 pCi/g; gross beta, 31.4 pCi/g.

Table 4.2.3-6 (continued)
Gross Alpha and Gross Beta in Soil Samples

Phos Dock Area

F064B		
Sample Depth	2.5	4.5
Gross alpha	13.9 ± 10.5	38.8 ± 15.04
Gross beta	30.4 ± 10.36	31.4 ± 7.94

Paved Area North of Furnace Building

	F066B		F067B		F068B		F069B	
Sample Depth	3	5	5	9	3	5	3	5
Gross alpha	16.9 ± 13.16	23.2 ± 15.14	32 ± 11.12	17.1 ± 8.3	14.2 ± 12.16	24.6 ± 15.66	16.4 ± 12.94	24.1 ± 13.94
Gross beta	23.1 ± 10.78	27.8 ± 11.26	36.6 ± 7.64	25.7 ± 6.54	19.3 ± 9.8	27.6 ± 11.18	24.9 ± 10.44	32.1 ± 10.62

Phossy Waste/Precipitator Slurry Pipeline Cleanout Areas

	F070B		F071B		F072B		F073B		F074B		F075B	
Sample Depth	3	5	5	7	8	10	14	16	10	12	5	7
Gross alpha	27.3 ± 19.04	31.9 ± 18.28	19.5 ± 9.18	17.5 ± 8.36	33.3 ± 11.52	17.9 ± 7.64	16.7 ± 8.52	11.3 ± 7.24	14 ± 8.2	71.8 ± 16.04	14.7 ± 10.3	31.1 ± 17.56
Gross beta	28 ± 13.04	36.5 ± 12.44	27.9 ± 6.94	25.6 ± 6.66	33.7 ± 7.36	26.2 ± 6.6	28.1 ± 6.96	25.6 ± 6.52	31.2 ± 7.18	77.8 ± 10.2	23.6 ± 8.28	30.1 ± 11.54

	F076B		F077B		F078B		F079B	
Sample Depth	15	17	5	14	25	27	5	7
Gross alpha	16.5 ± 13.64	9.26 ± 11.1	94.1 ± 32.2	18.5 ± 13.9	14.3 ± 12.48	14 ± 12.24	42.6 ± 20	57.3 ± 22.8
Gross beta	29 ± 11.52	27.9 ± 11.12	53 ± 14.42	28.5 ± 11.24	21.2 ± 10.26	20.7 ± 10.14	40 ± 12.78	69 ± 15.96

Bannock Paving Area

	F080B		F081B		F082B	
Sample Depth	5	7	4	7	5	9
Gross alpha	14.6 ± 10.18	9.31 ± 9.66	21.5 ± 15.24	21.8 ± 14.56	12.1 ± 9.46	12.4 ± 12.42
Gross beta	23 ± 8.2	19.8 ± 8.76	25.2 ± 11	19.9 ± 10.1	21.4 ± 8.08	18.5 ± 9.76

Notes: All results are in pCi/g.
Representative levels—gross alpha, 24.7 pCi/g; gross beta, 31.4 pCi/g.

Table 4.2.3-6 (continued)
Gross Alpha and Gross Beta in Soil Samples

Rail Car Loading and Unloading Area at Bannock Paving Company

	F083B		F084B	
Sample Depth	5	9	5	7
Gross alpha	12.6 ± 10.48	18.6 ± 13.9	14.8 ± 12.22	20.9 ± 14.46
Gross beta	30.5 ± 9.92	20.4 ± 10.4	23.3 ± 10.6	21.9 ± 10.5

Shale Ore Handling Area

	F090B		F091B		F092B		F093B		F094B	
Sample Depth	3	5	0	2	0	2	3	5	6	8
Gross alpha	207 ± 40.8	262 ± 58.4	86 ± 40.6	23.3 ± 10.4	35.9 ± 12.26	22.1 ± 10.44	222 ± 61	95.7 ± 32.8	20.3 ± 13.54	42.2 ± 19.4
Gross beta	84 ± 12.32	75.3 ± 11.7	65.1 ± 11.18	30.8 ± 8.02	28.7 ± 7.12	31 ± 7.92	92.4 ± 19.16	46 ± 13.18	25.3 ± 10.82	38.4 ± 12.42

	F132B				
Sample Depth	0	2	5	7	10
Gross alpha	113 ± 14.2	91.8 ± 12.6	24 ± 4.98	12.8 ± 3.62	7.43 ± 2.89
Gross beta	69.6 ± 6.15	56.8 ± 5.52	23.9 ± 3.46	13.9 ± 2.8	16.2 ± 2.97

Road Samples

	F101B		F101R		F102B		F103B		F104R		F105B	
Sample Depth	5	7	0.5	1.5	3	5	3	5	0.5	1.5	1	3
Gross alpha	94.1 ± 27	22.8 ± 14.3	88.8 ± 33.2	182 ± 65	17.4 ± 10.68	13.3 ± 10.86	19.6 ± 11.66	17.1 ± 10.42	177 ± 63	102 ± 55.4	281 ± 52.2	206 ± 37.2
Gross beta	47.5 ± 11.86	26 ± 10.74	77.1 ± 18.74	81 ± 19.52	23.3 ± 8.2	21.2 ± 8.76	24.9 ± 8.64	26.5 ± 8.56	82.4 ± 24.8	79.9 ± 29.4	108 ± 13.88	99.3 ± 13.32

	F106B		F107R		F108B		F109B		F110B		F111R	
Sample Depth	1	3	0.5	1.5	0.5	2.5	0.5	2.5	0.5	2.5	0.5	2
Gross alpha	15.5 ± 11.18	10.3 ± 8.26	234 ± 71.6	99.9 ± 37.8	41 ± 16.1	57.2 ± 18.2	30.2 ± 11.44	19.3 ± 10.12	28.5 ± 14.36	90.3 ± 22.8	334 ± 94.2	162 ± 31.2
Gross beta	23 ± 8.86	23.3 ± 7.92	88.4 ± 25.6	53.1 ± 16.5	27.8 ± 7.78	38.5 ± 9.14	32.4 ± 8.08	20.8 ± 6.62	28.4 ± 10.54	53.3 ± 10.62	125 ± 26.2	79.9 ± 10.98

Notes: All results are in pCi/g.
Representative levels—gross alpha, 24.7 pCi/g; gross beta, 31.4 pCi/g.

Table 4.2.3-6 (continued)
Gross Alpha and Gross Beta in Soil Samples

Road Samples (continued)

	F112R		F113R		F114R		F115R		F119R		F121R	
Sample Depth	0.5	2	0.5	2	0.5	2	0.5	2	0.5	2	0.5	2
Gross alpha	149 ± 28.8	188 ± 33.4	145 ± 27.8	28.6 ± 19.26	177 ± 31.4	17.4 ± 8.88	151 ± 27	27.6 ± 16.14	226 ± 77.8	153 ± 89	129 ± 26.6	126 ± 22.8
Gross beta	76.8 ± 10.2	107 ± 12.92	79.8 ± 10.52	33.5 ± 13.8	78.8 ± 10.24	37.8 ± 7.72	81.4 ± 10.72	25.2 ± 10.88	96 ± 26.6	85.1 ± 38.4	65.6 ± 9.78	69.6 ± 9.82

	F122R		F123B		F124B		F125B		F126B	
Sample Depth	0	2	2	4	10	12	1	3	0	2
Gross alpha	38.2 ± 17.34	9.38 ± 8.14	25.8 ± 15.78	22.9 ± 14.9	61.8 ± 28	26.2 ± 17.04	29.9 ± 19.34	16 ± 14.76	19.2 ± 14.58	22.9 ± 15.06
Gross beta	34.1 ± 10.28	25.1 ± 8.32	27.1 ± 11.26	25.7 ± 10.9	37.8 ± 14.56	32.4 ± 11.9	23.9 ± 12.5	18.7 ± 11.68	33.2 ± 11.42	29.8 ± 11

Slag Pit Haul Road

F129B						
Sample Depth	0	5	10	15	20	25
Gross alpha	62.4 ± 11.6	10.9 ± 4.09	18.7 ± 5.56	11.4 ± 4.18	15.9 ± 4.63	14 ± 4.92
Gross beta	35.3 ± 5.29	23.4 ± 4.32	20.2 ± 4.17	19.4 ± 4.07	25.8 ± 4.49	23 ± 4.34

Upgradient of Pond 8S

F158B	
Sample Depth	93
Gross alpha	11.6 ± 5.88
Gross beta	20.7 ± 5.24

Downgradient of Pond 8S

F159B	
Sample Depth	96
Gross alpha	13.3 ± 4.57
Gross beta	19.8 ± 4.17

Notes: All results are in pCi/g.
Representative levels—gross alpha, 24.7 pCi/g; gross beta, 31.4 pCi/g.

Table 4.2.3-7

Concentrations of Parameters in Soil in the Phossy Waste/Precipitator Slurry Pipeline Cleanout Areas

F070B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
3	Brown silt	14900	15.9 UJ	1.9 U	145	0.81	17	8.3 UJ	45800	24.8	6.6 J	13.7	1090 J	14800	6.4	15.1 U
5	Brown tan silt	12400	16.7 UJ	4.2 U	136	0.22	15.9	1.9 UJ	43800	17.1	5.9 J	9.6	720 J	12900	8.6	11.6 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
3	Brown silt	13400	410	0.18 U	2.9 U	13.8 J	309	2020	NA	2.7 U	1.1	NA	24.8 U	37.3 J	209
5	Brown tan silt	13200	373	0.13 U	2.8 U	11.3 J	20.7	1030	NA	3.2 U	0.87 U	NA	26 U	29.8 J	86.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

F071B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Brown silt with trace slag	12800	17.5 U	5.2	129	0.48	20.8 J	2.3	42800	18.5	5.9	10.7	750	12300	12	15.6
7	Gray gravel/silt	11700	16.7 U	6.4	119	0.48	14.8 UJ	1.1	33700	16.6	6	9.8	460	12100	8	12 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
5	Brown silt with trace slag	11400	341	0.4	3 UJ	10.7	72.1	1700	NA	1.9 UJ	0.91 U	NA	27.2 U	29.4	85
7	Gray gravel/silt	10900	334	0.16	2.8 UJ	10	111	1140	NA	2.2 UJ	0.87 U	NA	26 U	26.1	58.2
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

F072B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
8	Brown silt with trace slag	13900	16.7 U	4.3	131	0.4	21.2 J	4.1	66800	43.5	4.6	13.8	2450	10700	6.7 U	12.3 U
10	Brown silt	13500	17.2 U	5.2	141	0.45	13.1 UJ	1.5	36800	21.2	6.7	12.5	840	13300	6.4	14.1 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
8	Brown silt with trace slag	8650	293	0.3	2.8 UJ	11.4	2.9	1020	NA	1.9 UJ	0.87 U	NA	26 U	48.4	199
10	Brown silt	11200	427	0.14	2.9 UJ	11.4	1.4	1150	NA	2.5 UJ	0.9 U	NA	26.9 U	28.5	71.3
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value
NA - Not analyzed
U - Not detected.

Table 4.2.3-7

Table 4.2.3-7 (continued)

Concentrations of Parameters in Soil in the Phossy Waste/Precipitator Slurry Pipeline Cleanout Areas

F073B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
14	Slag to brown silt	8320	17.4 U	5.2	146	0.52	11.2	11.8 UJ	33700	20.2	5.1	11.6	740	10700	6.5	10.5 U
16	Brown silt	8100	19.6	6.3	115	0.48	10.3	1.1 UJ	43600	11.7	5.5	9.4	520	10300	7.2	10 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
14	Slag to brown silt	10400	357	0.21 U	2.9 UJ	13.5	558	2620	NA	2.6 UJ	1.8	NA	27.1 U	24.3	316
16	Brown silt	12600	327	0.44	2.8 UJ	9	416	2160	NA	2.1 UJ	0.87 U	NA	26.2 U	18.3	39.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	62.8

F074B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
10	Gravel/slag fill	13300	16.6 U	5.5	130	0.44	20.5 J	32.3	49600	41.4	5.9	14.9	2690	11900	84.5	12.8 U
12	Brown silt	13700	16.9 U	6.3	115	0.5	20.5 J	1.1 U	31800	17.1	6.1	11.2	490	13000	9.1	13.7 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
10	Gravel/slag fill	11500	339	0.33	3.7 U	14.5	418	12000	NA	2.6 UJ	20 U	NA	25.9 U	52.9	3790
12	Brown silt	12200	396	0.24 U	2.8 UJ	10.7 U	575	2320	NA	1.4 UJ	0.88 U	NA	26.3 U	27	59.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	62.8

F075B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Brown silt with trace gravel	13300	18.7 UJ	3.8 U	129	0.48	13.1 UJ	1.1 U	43500	16	4.9	9.8	550	12800	11.8	14.9
7	Brown silt	11800	17 UJ	3.5 U	110	0.4	16.4 UJ	1.1 U	24800	13.1	3.8	9	440	10900	6.8 U	11.6
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
5	Brown silt with trace gravel	13500	346	0.17 U	2.8 U	12.3	4.8	717	NA	1.3 U	0.87 U	NA	26 U	27.8	65
7	Brown silt	8860	285	0.38 U	2.9 U	8.7	5.7	528	NA	1.6 U	0.88 U	NA	26.5 U	22.7	51.1
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	62.8

Notes:
Results are in mg/kg.
Depths are in feet
J - Estimated value.
NA - Not analyzed
U - Not detected

Table 4.2.3-7

Table 4.2.3-7 (continued)

Concentrations of Parameters in Soil in the Phossy Waste/Precipitator Slurry Pipeline Cleanout Areas

F076B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
15	Brown silt	11700	8.1 UJ	5.6 U	118	0.59	23.1	0.53 U	39400	17.2	5.6	8.4	470	12400 J	12.4 J	14.7 J
17	Brown silt	12900	8.2 UJ	5.4 U	137	0.68	26.1	3.3	42200	16.9	5.6	7.7	620	12400 J	15.7 J	16 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	900	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
15	Brown silt	12700	362 J	0.13 U	1.4 U	11.3	353	1470	7400	0.93 U	0.42 U	629	12.7 U	28.6 J	41.5
17	Brown silt	12400	385 J	0.34 U	1.4 U	11.2	515	4760	8400	1 U	0.43 U	616	12.9 U	27 J	139
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	970.7	0.27	45.4	52.8

F077B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Brown sandy silt with gravel	22500	7.8 UJ	1.9 U	202	1.7	47.4	14.2	198000	124	2.9	13.9	12600	4710 J	12.3 J	18.2 J
14	Brown silt to gravel	15500	9.2 J	3.7 U	141	1.1	26.9	98.2	83100	208	5	37.9	2660	10200 J	108 J	13.7 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	900	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
5	Brown sandy silt with gravel	7200	289 J	0.33 U	2.8 U	10	16.7	5840	7620	4.1	3.8	2580	12.2 U	114 J	302
14	Brown silt to gravel	8750	384 J	0.25 U	7.6 U	48.2	138	9960	7270	2.4 U	32.4	1180	13 U	211 J	5080
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	970.7	0.27	45.4	52.8

F078B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
25	Tan silt	11100	8.2 UJ	3.9 U	148	0.63	11 U	0.53	40300	13.9	5.3	7.1	600	11000 J	11.9 J	13.1 J
27	Brown silt	11100	8.5 UJ	3.5 U	150	0.62	10.7 U	0.55 U	31400	13.2	5.6	8.1	550	11600 J	12.2 J	11.8 J
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	900	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
25	Tan silt	12700	351 J	0.63	1.4 U	10	20.2	1140	2440	1.1 U	0.42 U	567	12.7 U	21.6 J	48.8
27	Brown silt	11800	377 J	0.19 U	1.6 U	11.2	3.5	760	2560	1.3 U	0.44 U	537	13.2 U	21.9 J	45.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	970.7	0.27	45.4	52.8

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
NA - Not analyzed.
U - Not detected

Table 4.2.3-7

Table 4.2.3-7 (continued)

Concentrations of Parameters in Soil in the Phossy Waste/Precipitator Slurry Pipeline Cleanout Areas

F079B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron		Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Red brown clayey silt	15100	18.8	UJ	4.7	147	0.85	18.8	U	121	45200	24.6	6.4	14.5	1730	12900	28.8	14.3
7	Red brown silt	17500	17	UJ	7.9	148	1.1	35.4	U	231	60900	50.5	5.3	20.9	3650	11800	84.1	14.6
Representative		13,900	14.3		7.7	188	1	12.8		1.9	75,800	27.5	7.6	12.6	800	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium		Vanadium	Zinc
5	Red brown clayey silt	13200	453	0.33	J	2.8	U	16.2	1400	13000	NA	17	5.8	NA	26.2	U	36	1960
7	Red brown silt	11400	370	3	J	2.9	U	20.4	1430	25100	NA	4.3	25.3	NA	26.5	U	55.4	6980
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27		45.4	52.8

Notes:

Results are in mg/kg

Depths are in feet.

J - Estimated value

NA - Not analyzed.

U - Not detected.

Table 4.2.3-8
Concentrations of Parameters in Soil in the Septic Drainfields

F046B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium	
0	Dark brown topsoil (fill)	15100	18.7	UJ	5.1	UJ	151	0.82	16	UJ	1.2	U	58300	19.2	5.7	12.8	640	13100	7.5	U	15	U
7.5	Slag gravel	11000	17.9	UJ	6.2	UJ	128	0.68	7.6	UJ	1.5		36800	15.2	5.7	10	1180	11800	8.1		11.8	U
10	Dark yellowish-brown silt	11200	18.7	UJ	5.2	UJ	126	0.67	8.5	UJ	1.2	U	33300	14.8	6	10.3	490	12200	7.5	U	11.1	U
Representative		13,900	14.3		7.7		188	1	12.8		1.9		75,800	27.5	7.6	12.6	600	14,400	29.1		16.1	

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
0	Dark brown topsoil (fill)	11600	363	0.06	U	3.2	U	17	2.4	844	4290	3	UJ	0.97	U	939	29.1	U	29.6	59.2
7.5	Slag gravel	12100	204	0.06	U	3	U	12	8.2	867	2460	2.5	UJ	0.93	U	743	27.9	U	22.4	52.8
10	Dark yellowish-brown silt	11000	286	0.06	U	3.2	U	12.4	9.4	784	2470	2.1	UJ	0.97	U	844	29.1	U	23.9	51.6
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		45.4	52.8

F047B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium	
0	Dark brown topsoil	18700	17.8	UJ	4.4	UJ	189	1	22	UJ	2.7		13300	26.8	8.3	20.1	700	16800	12		19.2	
2.5	Dark yellowish brown silt	10600	17.9	UJ	4.3	UJ	165	0.62	9.4	UJ	1.2	U	38100	11.4	5.4	9.8	610	11200	7.2	U	12.9	U
5	Dark yellowish brown silt	9430	17.9	UJ	6.1	UJ	132	0.62	7.8	UJ	1.2	U	39700	11.3	4.5	9.8	470	10500	7.2	U	11.4	U
7.5	Dark brown silt	10600	18	UJ	4.8	UJ	137	0.69	14	UJ	4.4		34500	19	5.4	13	800	11400	7.3	U	12.4	U
10	Dark brown silt	11200	19.8	UJ	5.7	UJ	191	0.73	7.9	UJ	1.3	U	35500	15.2	6	11.6	550	12900	9.5		11.5	U
Representative		13,900	14.3		7.7		188	1	12.8		1.9		75,800	27.5	7.6	12.6	600	14,400	29.1		16.1	

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
0	Dark brown topsoil	5660	557	0.06	U	3	U	17	17.8	1200	5270	2	UJ	0.93	U	875	27.8	U	32.2	90.4
2.5	Dark yellowish brown silt	11400	244	0.06	U	3	U	10.8	3.7	784	2820	1.6	UJ	0.93	U	705	27.9	U	20.1	45.3
5'	Dark yellowish brown silt	11200	208	0.06	U	3	U	10.8	7.2	706	2620	1.7	UJ	0.93	U	696	27.9	U	18.8	42.8
7.5	Dark brown silt	9890	378	0.06	U	3	U	14.3	13.3	1320	3030	2.2	UJ	0.94	U	753	28.1	U	25.6	69.8
10	Dark brown silt	12300	717	0.07	U	3.3	U	13.5	9.8	873	2540	2	UJ	1	U	704	30.9	U	22.9	50.6
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		45.4	52.8

Notes:

Results are in mg/kg.

Depths are in feet

J - Estimated value

U - Not detected

Table 4.2.3-8 (continued)
Concentrations of Parameters in Soil in the Septic Drainfields

F048B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium
0	Dark brown topsoil (fill)	11400	16.8	UJ	2.2		116	0.77	16.7	J	1.1	U	36900	22.8	5.5	8.6	1690	14000	10.1	J	12.1
2.5	Yellowish-brown silt	16000	17.6	UJ	3.7		156	0.85	17.4	J	1.1	U	50100	21.4	6.5	11.8	550	15300	17	J	16.1
5	Yellowish-brown silt	16000	18.1	UJ	2.8		168	0.88	27.2	J	1.2	U	45800	20.1	6.7	11.4	600	15100	13.6	J	17.3
7.5	Yellowish-brown silt	11800	15.5	UJ	2.1		153	0.74	14.9	J	1	U	33000	15.2	5	8.4	470	11900	10.2	J	13.2
10	Yellowish-brown silt	12700	17.4	UJ	4		124	0.88	9	J	1.1	U	37100	18.8	6.2	10.5	530	14500	14.4	J	13.6
Representative		13,900	14.3		7.7		188	1	12.8		1.9		75,800	27.5	7.8	12.6	600	14,400	29.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
0	Dark brown topsoil (fill)	8270	383		0.08	U	2.8	U	12.4	4	1350	2810	2.1	J	0.87	U	825	26.2	U	33	65.3
2.5	Yellowish-brown silt	11700	395		0.09	U	3	U	14.1	2	725	3930	1.2	UJ	0.91	U	842	27.4	U	31.2	51.9
5	Yellowish-brown silt	12300	412		0.08	U	3.1	U	14.8	0.8	732	4160	1.1	UJ	0.94	U	935	28.2	U	30.2	52.3
7.5	Yellowish-brown silt	10200	327		0.07	U	2.6	U	11.3	0.9	565	2810	0.59	UJ	0.81	U	773	24.2	U	22.8	40.3
10	Yellowish-brown silt	11700	419		0.09	U	2.9	U	14.4	1.5	739	2930	1.2	UJ	0.9	U	795	27.1	U	26	51.3
Representative		22,000	482		0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		46.4	62.8

F049B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium		Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium
1.5	Yellowish-brown silt	13700	17.2	UJ	3.5	J	154	0.43	U	18.4	UJ	1.1	U	31300	20.7	6	11	650	13600	11		13.5
4	Yellowish-brown silt	15400	17.8	UJ	3.4	J	156	1.3	U	13.3	UJ	1.2	U	47900	18.4	6.1	12	600	13400	7.2	U	14.8
6.5	Light yellowish-brown silt	11900	16.3	UJ	4.3	J	131	1.2	U	16.1	UJ	1.1	U	38600	17.9	5.4	9.4	510	11800	6.5	U	13.2
9	Light yellowish-brown silt	13700	17.4	UJ	2.5	J	136	1.3	U	22.8	UJ	1.1	U	37300	20	5.5	11.1	1240	13200	7	U	14.2
11.5	Light yellowish-brown silt	11100	16.1	UJ	3.5	J	167	1.2	U	10.4	UJ	1	U	31200	20	5.6	9.9	930	12800	6.5	U	11.6
Representative		13,900	14.3		7.7		188	1		12.8		1.9		75,800	27.5	7.8	12.6	600	14,400	29.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
1.5	Yellowish brown silt	9740	446	J	2	J	2.9	U	10.5	6.8	881	3610	1.1	U	0.89	U	931	26.8	U	34.3	48.7
4	Yellowish-brown silt	9470	347	J	0.48	J	3	U	14.2	4.3	598	4080	1.3	U	0.92	U	788	27.7	U	27.6	45.1
6.5	Light yellowish-brown silt	10300	333	J	0.3	J	2.7	U	15.1	2.9	641	3000	1.3	U	0.84	U	676	25.3	U	24.1	39.2
9	Light yellowish-brown silt	11000	381	J	0.41	J	2.9	U	13.7	4.4	732	3580	1.1	U	0.9	U	881	27.1	U	28.9	49.5
11.5	Light yellowish-brown silt	10800	387	J	0.28	J	2.7	U	15.8	6	734	2710	1	U	0.84	U	630	25.1	U	24.7	45.6
Representative		22,000	482		0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		46.4	62.8

Notes:

Results are in mg/kg
Depths are in feet.
J - Estimated value
U - Not detected.

Table 4.2.3-9
Concentrations of Parameters in Soil in Former Pond 7S - Tree-Line Area

F055B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron		Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
3	Brown silt	17800	15.4	UJ	4.5	178	1.2	28.6	U	154	83400	139	6.2	27.9	4720	12000	30.8
5	Brown silt	15100	17.1	UJ	3.6	143	0.82	18.9	U	32.2	40800	21.1	6.8	12.9	490	13800	14.8
Representative		13,900	14.3		7.7	188	1	12.8		1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Selenium		Silver	Thallium		Vanadium	Zinc
3	Brown silt	15.9	11100	374	0.06	UJ	5.1		31.4	72.5	8240	3	U	17.2	24.1	U	153	2940
5	Brown silt	16.3	13200	438	0.06	UJ	2.9	U	17	1440	8940	1.7	U	1.1	26.7	U	29.8	801
Representative		16.1	22,000	482	0.16		2.15		15.5	3.7	672	3.05		1.9	0.27		45.4	52.8

F056B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
5	Tan brown silt	15600	16	UJ	6.6	157	1.1	41.4	33.7	80700	114	5.2	21.3	2830	11700	9.4
7	Tan silt to black	16000	161	J	27.7	150	1.9	124	5610	93100	242	19.3	221	44800	3690	1300
Representative		13,900	14.3		7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium		Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Selenium		Silver	Thallium		Vanadium	Zinc	
5	Tan brown silt	14.1		14400	410	1.1	J	2.7	U	31.6	4.4	9530	2.3	U	1.7	24.9	U	148	437	
7	Tan silt to black	9.2	U	3260	1240	2.3	J	26.9		38.1	11900	51400	24.4		786	87.7	U	149	499000	J
Representative		16.1		22,000	482	0.16		2.15		15.5	3.7	672	3.05		1.9	0.27		45.4	52.8	

F057B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron		Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
5	Tan fine silt	13500	15.8	UJ	3.6	141	0.74	21.5	U	27.1	53700	33.7	5.7	12.5	890	12500	13.8
7	Tan sand/silt with gray clay	14900	16.4	UJ	5.6	141	0.91	20.3	U	235	63900	109	6	28.3	3330	11900	56.9
Representative		13,900	14.3		7.7	188	1	12.8		1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Selenium		Silver	Thallium		Vanadium	Zinc
5	Tan fine silt	13.7	16700	359	1.9	J	2.7	U	15.2	104	2230	4.3	U	2.1	24.6	U	43	485
7	Tan sand/silt with gray clay	13.6	14600	344	0.32	J	4.7		29.4	386	12700	9.1		30	25.5	U	117	3860
Representative		16.1	22,000	482	0.16		2.15		15.5	3.7	672	3.05		1.9	0.27		45.4	52.8

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected.

Table 4.2.3-10
Concentrations of Parameters in Soil in the Long-Term Phosphorous Storage Area

F062B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
1	Tan brown silt	15200	16.9 UJ	3 U	137	0.22 U	24.7 J	1.1 U	47600	18.7 J	6.4	11 J	1500	14000	6.8 U
3	Tan brown silt	14200	17.1 UJ	4.3 U	181	0.22 U	18.4 UJ	1.1 U	49000	14.7 J	6	10.7 J	1010	14500	6.9 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
1	Tan brown silt	14.2 U	11400	420	0.14 U	2.9 U	12.3 J	472	8880	2.9 U	0.88 U	26.3 U	30.3 J	58.9
3	Tan brown silt	15.7 U	14300	427	0.2 U	2.9 U	13.2 J	18.5	3070	3.5 U	0.89 U	26.6 U	25.8 J	55.9
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F063B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
5	Brown silt	16900	18.2 UJ	4.3 U	132	0.42	22 UJ	1.2 U	39700	47.2 J	7.4	15.1 J	600	16900	7.3 U
7	Brown silt	13800	18.5 UJ	8.4	179	0.88	27 J	1.2 U	41200	126 J	7.7	23.3 J	540	17000	12.3 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
5	Brown silt	19 U	12600	476	0.17 U	3.3 U	18.8 J	6.5	655	2.9 U	0.95 U	28.4 U	59.2 J	59
7	Brown silt	16 U	12800	483	0.17 U	3.1 U	36.1 J	4.1	801	2.3	1.3	28.8 U	131 J	57.3
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

Notes:

Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected.

Table 4.2.3-11
Concentrations of Parameters in Soil in the Railcar-Loading and -Unloading Area at Bannock Paving Company

F083B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Brown tan silt	15900	16.5 UJ	4.7 U	177	0.96	20.7 UJ	1.1 U	42400	17.3	6.5	11.4	500	15000	8.9	15.4
9	Brown silt	13700	16.3 U	3.3	174	0.68	14.9 U	1.3	51500	17.8	6.1	10.6	500	12200	11.8 UJ	13.3 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
5	Brown tan silt	13900	437	0.22 U	2.8 U	14.8	1	662	NA	4.5	0.86 U	NA	25.7 U	30.3	54.4
9	Brown silt	12700	345	0.57 J	2.8 U	12.1	2.9	776	3160	2.3 U	0.85 U	622	25.4 U	28.3	44.5
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27	45.4	52.9

F084B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Tan brown silt with gravel (slag)	16600	16.7 U	3.7	145	0.7	16.8 U	3.1	24700	18.8	5.4	13.2	1680	14500	11.1 J	15.1
7	Brown silt	15400	16.9 U	1.3 U	145	0.71	15.9 U	1.1	31300	17.3	5	14.4	1200	13500	7.3 J	14.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
5	Tan brown silt with gravel (slag)	9660	312	0.38 J	2.8 U	12.5	104	1900	5080	2.5 U	0.87 U	722	26 U	32.7	207
7	Brown silt	8900	391	0.42 J	2.9 U	10.6	86.4	1500	4580	2 U	0.88 U	710	26.4 U	28.7	60.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27	45.4	52.9

Notes:

Results are in mg/kg.

Depths are in feet.

J - Estimated value.

NA - Not analyzed.

U - Not detected

Table 4.2.3-12
Concentrations of Parameters in Soil in the Secondary Condenser Area

F052B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
10	Yellowish-brown silt	12300	17 UJ	2.3 J	122	1.3 U	12.8 UJ	1.7	37200	21.2	4.2	9	1390	12000	7.5	12.6
12.5	Yellowish-brown silt	11000	16.5 UJ	3.8 J	123	1.2 U	8.9 UJ	1.6	34700	16.4	4	8	1140	11900	7.6	11.6
15	Yellowish-brown silt - trace gravel	10400	16.7 UJ	2.8 J	113	1.3 U	9.7 UJ	1.1 U	28400	15.4	3.9	10.8	510	12100	7.5	11.2
17.5	Yellowish-brown silt	9890	16.6 UJ	3.8 J	111	1.3 U	8.2 UJ	1.7	29100	18.3	3.4	8.9	800	11000	9.4	10.6
20	Yellowish-brown silt	8610	17.2 UJ	3.7 J	97.1	1.3 U	5.3 UJ	1.1 U	29100	13.6	4.6	27.4	500	11200	6.9 U	10.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	800	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
10	Yellowish-brown silt	10500	321 J	0.86 J	2.9 U	11.3	3.7	896	2960	1.6 U	0.88 U	765	26.5 U	30.9	47.9
12.5	Yellowish-brown silt	11400	339 J	0.87 J	2.8 U	10.5 U	3.7	914	2650	1.7 U	0.86 U	825	25.7 U	26.9	53
15	Yellowish-brown silt - trace gravel	9820	427 J	0.29 J	3.8 U	11.9	5.1	718	2600	1.8 U	0.87 U	934	26 U	23.6	56.7
17.5	Yellowish-brown silt	9180	332 J	0.16 J	2.8 U	12.4	5.7	710	2250	1.7 U	0.86 U	698	25.8 U	24.5	45.8
20	Yellowish-brown silt	10400	449 J	0.33 J	2.9 U	16.2	9.9	883	1960	1.6 U	0.89 U	669	26.8 U	19.5	43.3
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27	45.4	52.8

F053B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
10	Dark brown silt	8580	15.9 UJ	3.2 J	113	1.2 U	6.4 UJ	1 U	35200	16.7	4.3	8.4	520	10800	8.4	10.3
12.5	Dark brown silt	17400	15.9 UJ	1.9 J	173	1.2 U	35.9 J	4.6	120000	91.9	2.7	9.7	6530	7170	6.4 U	13.7
15	Dark brown silt	11500	16.6 UJ	3.2 J	148	1.3 U	9.8 UJ	1.1 U	29300	18.1	4.9	14.3	570	12600	12.3	11.7
17.5	Dark brown silt	12700	16.3 UJ	4.3 J	133	1.2 U	15.6 UJ	1.1 U	31600 U	21.9	4.7	13.2	1390	12500	6.6 U	12.1
20	Dark brown silt	13900	17.2 UJ	3.7 J	114	1.3 U	14.6 UJ	1.1 U	23400	19	5.4	12.3	510	14000	6.9 U	12
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	800	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
10	Dark brown silt	10100	430 J	0.95 J	2.7 U	14.3	4.6	695	1860	1.4 U	0.83 U	650	24.8 U	18.9	39.8
12.5	Dark brown silt	7110	268 J	0.25 J	2.7 U	9.9	3.7	1760	4190	2.2 U	0.96	1710	24.8 U	84.6	79.1
15	Dark brown silt	10000	496 J	0.25 J	2.8 U	13.4	5.1	771	2610	1.2 U	0.87 U	745	26.2 U	26.5	52.1
17.5	Dark brown silt	9770	445 J	0.18 J	2.8 U	12.5	5	708	2890	1.2 U	0.85 U	752	25.4 U	31	46.2
20	Dark brown silt	9330	398 J	0.35 J	2.9 U	11.1	12.3	923	3140	1.2 U	0.89 U	738	26.7 U	28.5	53.6
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27	45.4	52.8

Notes:

Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected.

Table 4.2.3-13
Concentrations of Parameters in Soil in the Former Transformer Salvage Area

F035B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium		Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium
2	Slag (fill)	14300	17	UJ	5.7	UJ	130	J	0.85	50.1		135		24300	23.1	2.3	10.6	1330	12600	10.1	J	8.1
4.5	Reddish-yellow silt	14500	17.2	UJ	5.6	UJ	139	J	0.94	23.1	U	81.7		68800	94.6	6	26.3	3620	11300	98.7	J	11.8
7	Reddish-yellow silt	11700	15.6	UJ	3.8	UJ	118	J	0.67	20.2	U	1	U	38000	15.2	5.6	9.9	380	12100	8.4	J	12.4
9.5	Reddish-yellow silt	11600	16.9	UJ	4.1	UJ	130	J	0.68	11.7	U	1.1	U	41800	15.4	5.9	12.4	430	12400	13.6	J	12.8
12	Reddish-yellow silt	11800	16.3	UJ	4.3	UJ	150	J	0.66	28.2	U	1.1	U	39300	14.7	5.3	11	440	12300	9.1	J	13
Representative		13,900	14.3		7.7		188		1	12.8		1.9		75,800	27.5	7.8	12.6	600	14,400	28.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate		Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc	
2	Slag (fill)	3550	239	J	0.06	U	4.5		10	1530	J	33400	13600	1.3	UJ	0.88	U	856	26.4	U	30.7	19300	J
4.5	Reddish-yellow silt	9970	651	J	0.06	U	3.3		45.4	2280		49900	8870	3	UJ	26.8		1040	26.8	U	90.8	4250	J
7	Reddish-yellow silt	12200	356	J	0.05	U	2.6	U	12.6	750	J	2500	4510	1.4	UJ	0.81	U	712	24.4	U	23.4	46.7	J
9.5	Reddish-yellow silt	13100	402	J	0.06	U	2.9	U	13	295		1820	4710	1.5	UJ	0.88	U	685	26.4	U	22.4	54.7	J
12	Reddish-yellow silt	15000	399	J	0.06	U	2.7	U	13.3	452		2320	5050	1.5	UJ	0.84	U	653	25.3	U	23.1	50.7	J
Representative		22,000	482		0.16		2.15		15.5	3.7		672	3,582.3	3.05		1.9		970.7	0.27		46.4	62.8	

F036B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium		Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium
1	Light brown silt	13200	16.5	UJ	3.7	UJ	126	J	0.71	16.1	U	8.4		29800	18.8	5.6	17	1580	12700	13.5	J	13.2
3.5	Light brown silt	12500	15.6	UJ	4.1	UJ	137	J	0.69	12.7	U	1.8		46400	18.5	6.4	11.3	460	13500	9.4	J	13.2
6	Light brown silt	13100	16.1	UJ	5.5	UJ	131	J	0.8	17.1	U	118		54400	47.3	5.6	25.2	2700	11300	69.7	J	12.1
8.5	Light brown silt	13900	16.2	UJ	4.3	UJ	150	J	0.75	27.1	U	3.6		33700	17.1	6.1	12.9	550	13400	14.7	J	14.9
11	Light brown silt	12000	16.6	UJ	3.7	UJ	123	J	0.63	11.7	U	1.1	U	46900	15.1	5.6	12.1	490	12300	12.5	J	13
Representative		13,900	14.3		7.7		188		1	12.8		1.9		75,800	27.5	7.8	12.6	600	14,400	28.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate		Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc	
1	Light brown silt	8280	487	J	0.05	U	2.8	U	25.8	950		6850	5840	1.8	UJ	0.86	U	659	25.7	U	32	1400	J
3.5	Light brown silt	13800	401	J	0.05	U	2.6	U	13.9	46.5		816	4550	1.2	UJ	0.81	U	626	24.3	U	27.2	93.9	J
6	Light brown silt	11000	347	J	0.05	U	2.7	U	19.5	147		7160	5710	2.6	UJ	21		625	25	U	59.3	2740	J
8.5	Light brown silt	12200	410	J	0.06	U	2.7	U	14.7	54.8		1150	5640	1.4	UJ	0.84	U	721	25.2	U	27.7	116	J
11	Light brown silt	13500	365	J	0.06	U	2.8	U	12.1	48.5		651	4980	1.4	UJ	0.88	U	621	25.9	U	24.4	48.4	J
Representative		22,000	482		0.16		2.15		15.5	3.7		672	3,582.3	3.05		1.9		970.7	0.27		46.4	62.8	

Notes:

Results are in mg/kg

Depths are in feet.

J - Estimated value.

U - Not detected

Table 4.2.3-14
Concentrations of Parameters in Soil in the Bannock Paving Area

F080B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Tan brown silt	19100	17	UJ	6.3	U	183	1.1	19.1	UJ	1.1	U	58200	20.3	7.3	13.9	560	16100	8.8	18
7	Tan brown silt	18000	17.6	UJ	5.6	U	181	1	20	UJ	1.1	U	55000	33.9	6.5	14	760	15500	13.5	16.7
Representative		13,900	14.3		7.7		188	1	12.8		1.9		75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
5	Tan brown silt	11600	421	0.19	U	2.9	U	14.3	1.1	657	N/A	1.6	U	0.86	U	N/A	26.5	U	32	60.2
7	Tan brown silt	12900	418	0.35	U	3	U	15	0.9	934	N/A	1.7	U	0.91	U	N/A	27.4	U	46.6	61.6
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		48.4	52.8

F081B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium
4	Tan brown silt	14200	16.2	U	4.3		139	0.67	19	U	1.1		43700	23	6.3	12.8	670	13200	9.5	J	13.3
7	Tan brown silt	11100	16	U	3.2		91.3	0.67	11.1	U	1.1		46000	17.5	5.1	8.9	530	11300	6.4	UJ	10.2
Representative		13,900	14.3		7.7		188	1	12.8		1.9		75,800	27.5	7.6	12.6	600	14,400	29.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
4	Tan brown silt	10100	372	0.26	J	2.7	U	13.4	9.7	684	4520	2.6	U	0.84	U	799	25.2	U	30.1	51.2
7	Tan brown silt	12300	327	0.17	J	2.7	U	12.1	7.5	745	2340	2.1	U	0.83	U	632	24.9	U	25.8	41.5
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		48.4	52.8

F082B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Tan brown sandy silt	15100	16.4	UJ	6	U	189	0.9	15.4	UJ	1.1	U	49800	18.9	5.9	11.5	580	14300	8.2	15
9	Brown silt with sand	14900	16.5	UJ	6	U	133	0.89	18.8	UJ	1.1	U	42900	21.4	5.6	11.1	460	13700	10.1	13.8
Representative		13,900	14.3		7.7		188	1	12.8		1.9		75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
5	Tan brown sandy silt	14400	398	0.27	U	2.8	U	11.8	1.1	722	N/A	1.2	U	0.85	U	N/A	25.5	U	31.3	50.4
9	Brown silt with sand	13400	372	0.16	U	2.8	U	15.5	2.2	624	N/A	1.2	U	0.86	U	N/A	25.8	U	33.8	48.7
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		48.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value
NA - Not analyzed
U - Not detected

Table 4.2.3-15
Concentrations of Parameters in the Chemical Laboratory Drain Pit

F028B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium		Calcium	Chromium		Cobalt	Copper		Fluoride	Iron	Lead		Lithium
0	Reddish-brown silt	17000	7.8	U	5.4	UJ	152	1.3	44.6	J	1.3		149000	95.7	J	3.8	17	J	10300	5460	3.1	U	14.7
10	Reddish-brown silt	9630	8.4	U	6.1	UJ	125	0.84	7.8	UJ	0.55	U	34200	12.9	J	5.3	9.1	J	430	11700	10.1		11.7
20	Reddish-brown silt	8560	8.2	U	5.4	UJ	82.9	0.52	5.4	UJ	0.53	U	19000	12.9	J	4.7	7.3	J	350	11000	9		8.8
30	Reddish-brown silt with medium grain sand	9480	8.9	U	5.5	UJ	118	0.54	6	UJ	0.58	U	41100	12.8	J	5.1	9.1	J	390	11200	7		10.2
70	Brown clayey silt	14600	10.6	U	4.1	UJ	125	0.84	8.6	UJ	0.69	U	47700	18.4	J	6.9	11.7	J	490	15200	8.4		17.7
Representative		13,900	14.3		7.7		188	1	12.8		1.9		75,800	27.5		7.8	12.6		600	14,400	29.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
0	Reddish-brown silt	5350	192	J	0.05	U	2.1	U	12.9	1.1	3810	5650	1.4		2.3		2300	0.4	U	99.5	51.9
10	Reddish-brown silt	10500	360	J	0.1		1.4	U	12.3	4.4	724	2290	0.26	UJ	0.44	U	448	0.44	U	20.9	40.8
20	Reddish-brown silt	6110	342	J	0.1		1.4	U	10.6	4.8	952	1830	0.27	UJ	0.43	U	409	0.43	U	20.9	39.6
30	Reddish-brown silt with medium grain sand	13700	350	J	0.11		1.5	U	12.3	2.4	825	1870	0.29	UJ	1.8		439	0.46	U	21.4	42.9
70	Brown clayey silt	14300	347	J	0.14		1.8	U	15.6	0.7	542	3230	0.34	UJ	0.55	U	564	0.55	U	28.6	51.8
Representative		22,000	482		0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		45.4	52.8

F029B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium		Calcium	Chromium		Cobalt	Copper		Fluoride	Iron	Lead		Lithium
1	Yellowish-brown gravelly silt	10100	8.9	U	5.2	UJ	129	0.63	7.1	UJ	7.3		38200	30.7	J	4.7	14.6	J	1560	10900	56.4		11.2
20	Brown silt	9810	9.6	U	6.2	UJ	110	0.74	5.3	UJ	0.63	U	19800	12.2	J	6.3	12.1	J	520	13500	11.4		11.1
30	Brown silt	5950	9.1	U	5	UJ	95.1	0.41	3.5	UJ	0.59	U	36800	8.6	J	4.1	7.4	J	450	8840	6.3		7.9
60	Brown coarse grained sand	3690	8	U	13.3	J	78.5	0.33	1.6	UJ	0.52	U	7080	6.2	J	4	8.2	J	130	11000	4.8		8.7
70	Brown silt	12400	16.6	UJ	4.7	U	120	J 1.6	9.5	U	1.2	U	41900	16.8		5.7	9.1		430	13100	9.2	U	13
Representative		13,900	14.3		7.7		188	1	12.8		1.9		75,800	27.5		7.8	12.6		600	14,400	29.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
1	Yellowish-brown gravelly silt	9380	325	J	0.15		1.5	U	14.9	212	5460	3710	0.29	UJ	9.8		492	0.46	U	35.2	1390
20	Brown silt	8450	470	J	0.21		1.9	U	15.3	12.3	1100	2220	0.33	UJ	0.5	U	464	0.5	U	20.3	57.3
30	Brown silt	11500	299	J	0.19		1.5	U	9.1	2.1	730	1340	0.3	UJ	0.47	U	345	0.47	U	14.9	34.6
60	Brown coarse grained sand	2180	140	J	0.14		1.4	U	11.2	1.9	141	765	0.28	UJ	0.42	U	274	0.42	U	7.6	22.1
70	Brown silt	13400	285		0.09		3.1	U	12.1	U 2.4	630	2550	0.84	UJ	0.97	U	790	29	UJ	23.7	44.1
Representative		22,000	482		0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		970.7	0.27		45.4	52.8

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected

Table 4.2.3-16
Concentrations of Parameters in Soil Beneath the Paved Area North of Furnace Building

F066B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
3	Tan brown silt/sand	11100	15.4 UJ	0.53 UJ	180	0.59	19.9 U	1 U	27900	18.9	8.6	8.7	270	15500	9.9	11.3
5	Tan brown silt/sand with slag	7570	16.1 UJ	2.2 U	147	0.51	9.2 U	1 U	44000	16.7	5.7	7.7	520	12600	10.7	9.1
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
3	Tan brown silt/sand	9700	514	0.75 J	2.6 U	11.1	3.8	598	NA	1.1 U	0.8 U	NA	24.1 U	31.1	46.1
5	Tan brown silt/sand with slag	5700	309	1.1 J	2.7 U	7.3	1.6	860	NA	1.2 U	0.84 U	NA	25.1 U	23.7	56.1
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

F067B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Tan brown silt with gravel (slag)	15400	16.2 U	5.1	155	0.95	32.4 J	8.5	85400	48.9	4.8	11.6	4300	9790	10.9	13.3
9	Tan brown silt with gravel (slag)	12400	16.3 U	5.3	123	0.43	16 UJ	1.1 U	33400	17.1	5.9	9.1	530	12200	7.1	11.4
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
5	Tan brown silt with gravel (slag)	9030	259	1.1	2.7 UJ	11.6	7	1440	NA	2.1 UJ	1.1	NA	25.3 U	54.6	199
9	Tan brown silt with gravel (slag)	11400	366	0.16	2.8 UJ	11.1	3.8	569	NA	2.6 UJ	0.85 U	NA	25.4 U	26.2	46.8
Representative		22,000	482	0.16	2.15	15.5	3.7	672		3.05	1.9	970.7	0.27	45.4	52.8

F068B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
3	Red brown silt	16100	17.6 UJ	2.7	148	0.95	13.2 U	1.1 U	54400	18.9	5.8	12.2	450	13700	7.8	14
5	Tan brown silt	15600	17.3 UJ	1.3 U	175	0.91	11.7 U	1.1 U	43000	18.8	6.7	11.9	480	14800	10.8	17.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
3	Red brown silt	11300	348	0.39 J	3 U	13.2	0.7	649	NA	1.9 U	0.91 U	NA	27.4 U	28.8	43.5
5	Tan brown silt	13100	430	0.37 J	2.9 U	12.5	1.3	643	NA	1.7 U	0.9 U	NA	27 U	29.5	51.7
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

F069B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
3	Brown silt	14300	16 UJ	3.1	152	0.72	19.3 U	1 U	49100	18.2	6	9.8	510	12700	9.6	14
5	Tan brown fine silt	14400	16.8 UJ	3.5	120	0.87	13.9 U	1.1 U	38400	17.2	5.8	12.2	510	13600	8.2	15.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
3	Brown silt	11400	329	0.23 J	2.7 U	11.5	1	737	NA	2.2 U	0.83 U	NA	25 U	28.2	43.7
5	Tan brown fine silt	12800	382	0.19 J	2.8 U	14.7	1.6	711	NA	1.8 U	0.87 U	NA	26.2 U	29.3	46.6
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value.
NA - Not analyzed.
U - Not detected

Table 4.2.3-17
Concentrations of Parameters in Soil in the Area West of the Mobile Shop

F060B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
1	Dark brown silt with gravel	15900	16.1	UJ	3	U	151	1.3	49	J	21.4	151000	180	2.6	204	10690	7580	74.4	15
2	Dark brown/black sandy silt with gravel	19900	16.2	UJ	2.6	U	187	1.5	53.9	J	82.1	167000	281	3.8	39.6	12210	8630	122	15.3
Representative		13,900	14.3		7.7		188	1	12.8		1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver	Sodium	Thallium		Vanadium	Zinc
1	Dark brown silt with gravel	4870	451	0.8	64.7	34.5	20.7	7130	N/A	2.5	U	4.9	N/A	25	U	170	410
2	Dark brown/black sandy silt with gravel	6230	384	0.39	U 8.9	47.9	41.6	9770	N/A	3.4	U	28.8	N/A	25.2	U	242	4690
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05		1.9	970.7	0.27		45.4	52.8

F061B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium	Beryllium	Boron		Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
1	Dark brown sandy silt with gravel	18800	21.9	J	2.8	U	191	1.4	61.2	J	125	159000	241	2.8	33	8920	7080	153	15.8
2	Gray/black silty sand with gravel	15400	23.3	J	5.5	U	147	0.84	52.1	J	446	82200	129	4.9	51.4	9260	11100	420	13.2
Representative		13,900	14.3		7.7		188	1	12.8		1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver	Sodium	Thallium		Vanadium	Zinc
1	Dark brown sandy silt with gravel	6350	395	0.25	U 4.5	35.5	151	17100	N/A	3	U	45.9	N/A	25.8	U	232	7970
2	Gray/black silty sand with gravel	7720	330	0.51	U 6	28.7	874	34300	N/A	4.9	U	124	N/A	28.3	U	131	20400
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05		1.9	970.7	0.27		45.4	52.8

Notes:

Results are in mg/kg.

Depths are in feet.

J - Estimated value.

NA - Not analyzed.

U - Not detected

Table 4.2.3-18
Concentrations of Parameters in Soil in the Phos Dock Area

F064B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
2.5	Brown sandy silt with trace gravel (slag)	14000	17.4 UJ	4.5 J	137	0.46 U	35.8 UJ	1.1 U	51900	29.8	3.1	9.6	2520	12200	9.3	12.6
4.5	Brown silt with trace gravel	12900	17.8 UJ	2.1 J	127	0.41 U	18.4 UJ	1.8	53400	31.5	3.7	11.3	3860	13000	15.4	12.2
Representative		**13,900**	**14.3**	**7.7**	**188**	**1**	**12.8**	**1.9**	**75,800**	**27.5**	**7.6**	**12.6**	**600**	**14,400**	**29.1**	**16.1**

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
2.5	Brown sandy silt with trace gravel (slag)	7290	375 J	0.72 J	2.9 U	11.8	95.9	17100	4350	1.8	0.9 U	1660	27.1 U	36	150
4.5	Brown silt with trace gravel	7130	373 J	1.4 J	3 U	12.1	254	15600	4750	1.8	0.93 U	1400	27.8 U	38	157
Representative		**22,000**	**482**	**0.16**	**2.15**	**15.5**	**3.7**	**672**	**3,562.3**	**3.05**	**1.9**	**970.7**	**0.27**	**45.4**	**52.8**

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected.

Table 4.2.3-19
Concentrations of Parameters in Soil in the Shale Ore Handling Area

F090B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
3	Dark brown silt with trace gravel	11300	16.1 UJ	8.9	113	2.9	54.2 J	94.6	228000	761	0.84 U	106	18000	9340	12.3 J	11.4
5	Dark brown silt	13000	16.1 UJ	9.1	125	3.1	60.1 J	108	212000	871	1.1	119	17300	10100	13 J	13.9
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
3	Dark brown silt with trace gravel	2790	153	0.54	23.9	151	8.2	83700	3450	10.2 J	6	2990	25.1 U	993	1140
5	Dark brown silt	2780	170	0.36 U	17.4	143	23.9	71500	3680	7.6 J	6.8	2820	25.1 U	1070	1010
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,982.3	3.05	1.9	970.7	0.27	45.4	52.8

F091B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Tan/red brown silt with gravel	7290	15.2 UJ	4.4	93.2	0.81	5.8 J	7.1	34800	66.1	4.1	16.3	1060	12300	10 J	8 U
2	Brown silt with gravel	13900	16.2 UJ	2.9	137	1	14.4 J	3	48100	36.9	5.8	11.2	1030	13700	14.3 J	13.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0	Tan/red brown silt with gravel	4540	216	0.08 U	2.9	24.5	30.8	5080	1880	2.4 J	0.79 U	807	23.7 U	66.3	123
2	Brown silt with gravel	10300	346	0.09 U	2.7 U	14.4	2.2	2770	3370	1.2 UJ	0.84 U	924	25.3 U	52.6	73.9
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,982.3	3.05	1.9	970.7	0.27	45.4	52.8

F092B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Red brown to light tan silty sand	9830	16 UJ	15.2	121	2.7	68.1 J	63.3	212000	689	1.6	109	18600	10800	32.2 J	38.9
2	Brown silt with gravel	14100	17.5 UJ	4.1	151	1	12.6 J	1.1 U	44700	20.4	6.4	10.9	530	14600	15.3 J	19
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0	Red brown to light tan silty sand	5170	244	0.38 U	22.5	156	6.3	68700	3110	6.9 J	5.7	2820	24.9 U	848	1220
2	Brown silt with gravel	12600	419	0.08 U	2.9 U	13.8 U	1.5	804	3570	1.3 UJ	0.91 U	784	27.2 U	28.4	55
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,982.3	3.05	1.9	970.7	0.27	45.4	52.8

Notes:

Results are in mg/kg

Depths are in feet.

J - Estimated value.

NA - Not analyzed

U - Not detected

NC - Not calculated.

Table 4.2.3-19 (continued)
Concentrations of Parameters in Soil in the Shale Ore Handling Area

F093B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
3	Brown/red brown silt (shale)	17200	16.3 UJ	5.3	147	0.86	15.4 U	2.4	42700	29.5	6.9	13.6	2070	14600	6.7	15.9
5	Red brown silt	17100	15.9 UJ	2.8	166	0.75	20.2 U	1 U	52000	24.8	7.1	11.5	510	14800	7.7	16.6
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
3	Brown/red brown silt (shale)	10200	398	2.5 J	2.8 U	14.8	7.4	5160	NA	2.2 U	0.85 U	NA	25.4 U	45.2	76.7
5	Red brown silt	14300	379	0.89 J	2.7 U	16.2	1.5	685	NA	1.3 U	0.82 U	NA	24.7 U	38.7	56.9
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	970.7	0.27	48.4	52.8

F094B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
6	Dark brown to tan silt/sand	13300	16 UJ	2.7	145	0.79	14.1 U	1 U	31200	17.2	5.8	10.6	460	13200	6.4 U	16
8	Dark brown silt	13300	16.7 UJ	0.55 UJ	127	0.78	16.8 U	1.1 U	37200	18.2	6.7	11.1	420	14300	9.6	15
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
6	Dark brown to tan silt/sand	11100	396	0.06 UJ	2.7 U	11.5	317	1570	NA	1.6 U	0.83 U	NA	24.9 U	28	51.8
8	Dark brown silt	11500	391	1.1 J	2.8 U	11.1	21.4	636	NA	1.3 U	0.87 U	NA	26 U	30	56.1
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	970.7	0.27	48.4	52.8

F132B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Grayish-brown gravelly silt	10900	6 J	11.1	99.6 J	2	64	124	NA	670	0.33	102	19700	7890	16.4 J	7.9 J
2.5	Grayish-brown gravelly silt	10100	4.8 UJ	25.7	90.5 J	2	51.4	104	NA	709	0.32	111	17300	8140	14.7	8.2
5	Grayish-brown gravelly silt	11500	4.7 UJ	3.5	121 J	0.63	10.1 U	1.2	NA	17.5	5.3	8.8	560	12000	7.3	10.7
7.5	Pale yellowish-brown silt	10800	4.8 UJ	3.4	121 J	0.62	6.5 U	0.32 U	NA	14.3	5.3	8.4	470	12300	7.4	10.3
10	Pale yellowish-brown silt	11500	4.7 UJ	4	113 J	0.61	9.8 U	0.5 U	NA	15.4	5.4	8.5	430	12600	7.3	10.2
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc
0	Grayish-brown gravelly silt	NA	159	0.39	17	146	62.8	69000	2970	7.3	8	300	3.2	1000	1290
2.5	Grayish-brown gravelly silt	NA	109	0.45	28.4	160	43.4	59300	3520	9.1	9.7	20	2.9	1010	1310
5	Grayish-brown gravelly silt	NA	357 U	0.06	1.4 U	12.3	3.11	899	3180	1.4	0.42 U	20	0.1 U	25.6	53.2
7.5	Pale yellowish-brown silt	NA	359 U	0.09	1.4 U	11.7	1.95	612	2570	0.52 U	0.42 U	190	0.22	20.5	44
10	Pale yellowish-brown silt	NA	375 U	0.07 J	1.4 U	12.3	1.6	723	2470	0.53 U	0.42 U	140	0.18	21.8	47.7
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.06	1.9	NC	0.27	48.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value.
NA - Not analyzed
U - Not detected
NC - Not calculated

Table 4.2.3-20
Concentrations of Parameters in Soil Beneath the Roads

F101B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
5	Brown silt with slag gravel	14500	17 UJ	5.1	137	0.75	32.2 U	1.1 U	43200	21.8	6	10.2	600	13400	7.5
7	Brown silt	15000	15.8 UJ	3.5	104	0.79	13.4 U	1 U	34200	20.4	8.7	11.2	490	14100	8.6
Representative		13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
5	Brown silt with slag gravel	15.3	13700	367	0.9 J	2.9 U	11.8	35.1	632	2.1 U	0.86 U	26.5 U	34.2	49.5
7	Brown silt	14.9	13000	426	1.3 J	2.7 U	13.4	3.9	675	1.6 U	0.82 U	24.5 U	31	53.5
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F101R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown silty sand with trace gravel	19300	17 UJ	3.2 U	166	1.2	42.5 J	340	76800	108 J	5.9	22 J	12380	12000	69.9
1.5	Gray sandy silt with trace gravel	20700	16.4 UJ	3.3 U	181	1.4	69.5 J	204	117000	141 J	4.4	19.7 J	12890	9850	41 U
Representative		13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Dark brown silty sand with trace gravel	22.6 U	9800	269	0.3	4.3 U	22.6 J	86.4	11800	6.4	35.2	26.6 U	105 J	8020
1.5	Gray sandy silt with trace gravel	21.9 U	8770	280	0.05 U	3.8 U	17.5 J	52.1	6850	4.4	22.4	25.5 U	134 J	5180
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F102B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
3	Tan brown silt	16500	16.9 UJ	6.1 U	145	1	20.3 UJ	2.2	54300	38.6	6	12.8	970	13700	8.4
5	Tan brown silt	14700	17.6 UJ	5.4 U	153	0.95	13 UJ	1.1 U	52400	18.7	6.1	10.8	520	14700	7.1 U
Representative		13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
3	Tan brown silt	15.3	10300	404	0.32 U	2.9 U	16	1.3	405	1.9 U	0.88 U	26.3 U	48.3	79.5
5	Tan brown silt	15.2	13400	425	0.35 U	3 U	14.8	0.9	719	0.9 U	0.92 U	27.5 U	27.7	53.4
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet
J - Estimated value.
U - Not detected
NC - Not calculated

Table 4.2.3-20 (continued)
Concentrations of Parameters in Soil Beneath the Roads

F103B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
3	Tan brown silt	14300	17.5 UJ	4.1 U	153	0.65	12.9 UJ	1.1 U	50100	16.9	6	11.7	600	14300	8.2
5	Tan brown silt	11200	16.7 UJ	4.8 U	194	0.75	9.4 UJ	1.1 U	37900	14.8	5.2	9.9	520	12500	9.7
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
3	Tan brown silt	15.1	14000	417	1.1	3 U	12.1	9.7	855	1.4 U	0.91 U	27.3 U	26.5	55.9
5	Tan brown silt	11.4	12400	388	0.16 U	2.8 U	10.3	7.1	775	1.4 U	0.87 U	26 U	24.7	47.8
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F104R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Gray slag	25400	15 UJ	1.7 U	215	2.6	76.7 J	12.6	253000	820 J	5	84.3 J	17260	9980	6 U
1.5	Gray slag	18600	15.4 UJ	3.1 U	153	3.3	74.2 J	5.5	192000	2830 J	16.8	348 J	14540	39100	6.2 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Gray slag	16.3 U	3750	333	0.05 U	17.4 U	139 J	5.1	3490	2.8 U	6	23.3 U	757 J	200
1.5	Gray slag	12.7 U	3850	483	0.05 U	75.6	641 J	6	4100	1.5 U	17.8	23.9 U	2820 J	452
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F105B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
1	Dark grayish brown silt (fill)	10000	16.7 UJ	54.2 J	113 J	1.9	44.8	159	223000	622	1.5	86	19700	6990	44 J	7.7 U
3	Dark grayish brown silt (fill)	19400	15.3 UJ	13.7 J	182 J	1.7	57.2	108	192000	269	3	37.9	14100	7410	51 J	14.8
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
1	Dark grayish brown silt (fill)	2880	212 J	0.06 U	13.8	134	312	103000	4840	9.1 J	6.4	2550	26.1 U	724	1400 J
3	Dark grayish brown silt (fill)	5560	479 J	0.05 U	4.6	50.3	54	35800	8430	5.3 J	11.7	2730	23.9 U	311	1280 J
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected.
NC - Not calculated

Table 4.2.3-20 (continued)
Concentrations of Parameters in Soil Beneath the Roads

F106B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
1	Tan brown silt	15300	16.5 UJ	4.9 U	156	0.96	21.4 UJ	5.4	64100	36.2	5.4	11.3	2050	12600	13.3
3	Tan silt	10400	19.5 J	4.4 U	104	0.7	14.2 UJ	1.1 U	44900	13.7	4.9	10	440	11900	9.6
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
1	Tan brown silt	18.4	14200	350	0.26 U	2.8 U	16.8	2.8	772	2.2 U	0.86 U	25.8 U	48.3	93.6
3	Tan silt	11	15100	355	0.19 U	2.8 U	12.6	1.5	657	1.1 U	0.86 U	25.7 U	23.8	44.4
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F107R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Slag gravel	28600	15.1 UJ	2.9 U	232	2.5	94.1 J	7.2	269000	428 J	3.1	31.9 J	16750	3670	6.1 U
1.5	Slag/gravel/brown silt	21900	15.1 UJ	3.7 U	184	1.3	40.1 J	13.6	109000	239 J	5.9	26.6 J	7230	12700	43.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Slag gravel	18 U	4230	288	0.06	4.7 U	45.8 J	3.4	2430	2.7	5	23.5 U	370 J	127
1.5	Slag/gravel/brown silt	16.6 U	6910	455	0.05 U	7.1 U	52.1 J	8.3	6910	2.3 U	4.9	23.6 U	279 J	503
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F108B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0.5	Tan silt with gravel	17400	16.5 UJ	4.5	162	1.5	25.1 J	6.6	91800	108	5.5	19.5	3890	12200	13.7 J	19.1
2.5	Dark tan silt	15000	15.5 UJ	4.3	147	1.2	25.3 J	12.6	85300	72	4.7	12.3	6370	11200	13.5 J	16.6
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0.5	Tan silt with gravel	11700	369	0.1 U	3.5	22.3	1.7	3230	4530	1.6 UJ	0.92	1300	25.7 U	112	135
2.5	Dark tan silt	13100	295	0.1 U	2.6 U	17.3	1.6	4220	3810	3 UJ	0.81 U	985	24.2 U	83.7	91.3
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected
NC - Not calculated

Table 4.2.3-20 (continued)
Concentrations of Parameters in Soil Beneath the Roads

F109B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0.5	Road surface - gypsum/slag/gravel	18000	16.6 UJ	3.5	152	1.1	15.3 J	3	27800	27.1	7.1	14.8	1240	16800	12.1 J	15.2
2.5	Tan silt	20700	16.2 UJ	4.6	168	1.3	64.9 J	24.4	39100	62.1	6.8	15.5	6520	16000	16 J	17.6
Representative		13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0.5	Road surface - gypsum/slag/gravel	8240	444	0.06 U	2.8 U	16.5	2.9	1270	4430	2.1 UJ	0.86 U	864	25.9 U	37.8	81.1
2.5	Tan silt	8380	432	0.31 U	2.7 U	19.8	4.6	4850	6400	15.3 J	0.84 U	1290	25.3 U	74.6	284
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.06	1.9	970.7	0.27	45.4	52.8

F110B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0.5	Dark brown/black silt with gravel	20600	16.5 UJ	6 J	201	1.5 U	55.7 J	32.8	132000	182	5.5	48.8	4420	9390	6.6 U	30
2.5	Brown/black silt with trace gravel	16300	18.4 UJ	3.1 J	155	0.46 U	16.5 UJ	3.3	42500	26.8	6.1	13.1	1460	14400	10.1	16.1
Representative		13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0.5	Dark brown/black silt with gravel	10600	490 J	1.1 J	5.7 U	28.5	9.8	3370	6020	1.2	3.3	1910	25.7 U	183	400
2.5	Brown/black silt with trace gravel	11300	398 J	0.41 J	3.1 U	15.8	8.1	2030	4060	1.7	0.96 U	922	26.7 U	38.7	67.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.06	1.9	970.7	0.27	45.4	52.8

F111R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Gray silt with slag (gravel)	22700	14.9 UJ	2.7 U	203	2	96.3 J	55.4	250000	292 J	2.3	22.9 J	19020	3230	6 U
2	Gray silt with slag (gravel)	26500	18.5 U	4.6	230	2.1	113 J	64	297000	336	3	29.3	18900	3180	7.5 U
Representative		13,900	14.3	7.7	168	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Gray silt with slag (gravel)	37.6	7410	195	0.05 U	3.6 U	23.9 J	0.6	5080	5.3	7.7	23.2 U	266 J	706
2	Gray silt with slag (gravel)	39.3	10200	242	0.06 U	5 U	27.8	0.5 U	3070	6.6 J	11.5	28.9 U	317	866
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.06	1.9	0.27	45.4	52.8

Notes:

Results are in mg/kg.
Depths are in feet.
J - Estimated value
U - Not detected
NC - Not calculated

Table 4.2.3-20 (continued)
Concentrations of Parameters in Soil Beneath the Roads

F112R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Gray silt with slag	23400	15.1 U	3.4	221	1.7	82 J	17.7	239000	168	2.2	15.8	12100	2320	6.1 U
2	Gray silt with trace slag	19800	15 U	3.9	187	1.7	71.1 J	43.8	221000	179	2.3	24.8	17500	2980	60.5
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Gray silt with slag	15.5 U	4460	246	0.05 U	2.5 UJ	9.2	2	6210	4.7 UJ	4.5	23.5 U	175	272
2	Gray silt with trace slag	14.5 U	5330	167	0.05 U	5.8 U	25.2	11.4	13500	3.5 UJ	20.4	23.4 U	192	3730
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F113R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown/gray sand/silt - trace gravel	19700	15.8 U	5.4	179	1.8	84.1 J	35.9	198000	243	2.1	25	13100	3740	6.4 U
2	Tan brown sandy silt	10900	16.3 UJ	2.8 U	112	0.21 U	27.5 J	2.6	44500	39.7 J	5.4	9.6 J	2620	13800	6.6 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Dark brown/gray sand/silt - trace gravel	14 U	5010	186	0.22 U	4.4 U	25.3	3	14500 J	5.2 UJ	4.3	24.6 U	253	476
2	Tan brown sandy silt	9.9 U	7340	334	0.05 U	2.7 U	11.4 J	6.8	3250	1.4 U	0.85 U	25.4 U	50.2 J	67.8
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F114R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown/gray silt/sand - trace gravel	16600	15.9 U	10.8	159	1.7	91.5 J	84	199000	298	2.2	38.4	14600	4540	8.7
2	Brown sandy silt	10100	16.3 U	13	101	0.37	20.5 J	87.1	34700	99.6	5.1	19.3	8020	11500	15.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Dark brown/gray silt/sand - trace gravel	12.3 U	3830	225	0.06 U	6.6 U	45.7	7.6	13800	8.3 J	3.8	24.6 U	338	405
2	Brown sandy silt	8.2 U	5620	260	0.56	2.7 UJ	20.5	17.9	6180	10.5 J	0.85 U	25.4 U	131	396
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value.
U - Not detected.
NC - Not calculated

Table 4.2.3-20 (continued)
Concentrations of Parameters in Soil Beneath the Roads

F115R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Dark brown sandy silt	12300	15.6 U	25.6	107	2	64.6 J	194	180000	588	2.5	74	12000	8410	7.5
2	Tan brown silt	13000	16.5 UJ	4.6 U	127	0.21 U	20.2 UJ	2.7	42900	26.2 J	6.4	10.8 J	620	14200	6.6 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Dark brown sandy silt	8.5 U	3190	184	0.53	21	118	22.2	34800	8.3 J	5.2	24.4 U	720	907
2	Tan brown silt	12.6 U	9270	361	0.68	2.8 U	11.1 J	6	1650	2.3 U	0.86 U	25.7 U	38.2 J	71.8
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F119R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Red brown fine silt (shale ore)	11300	15.8 UJ	10.5	109	2.7	62.7 J	98.9	228000	728 J	1.4	101 J	15680	9230	6.2 U
2	Dark red brown silt (shale ore)	11100	16.2 U	35	110	2.7	88.4 J	94.2	219000	744	2.2	106	20000	8720	9.4
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Red brown fine silt (shale ore)	10.7 U	2180	121	0.52	19.9 U	128 J	14.6	52500	10.1	6.7	24.7 U	917 J	1040
2	Dark red brown silt (shale ore)	10 U	2230	148	0.46	25.8	153	22.3	35800	15.2 J	6.8	25.2 U	1000	1190
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F121R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0.5	Gray silt/slag	22800	15.4 U	5.4	212	2.3	84.6 J	50.8	247000	315	2.5	29.2	14000	2890	6.2 U
2	Gray silt (slag) with gravel	16600	15.4 U	4.8	152	1.5	47.3 J	29	156000	209	3.2	23.2	9850	3590	6.2 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0.5	Gray silt/slag	16 U	3870	168	0.05 U	5.2 U	29.3	4	5140	6.4 J	5.5	24.1 U	325	396
2	Gray silt (slag) with gravel	11.8 U	2950	142	0.13 U	24.9	25.8	2.4	8400	4.1 UJ	3.1	24 U	207	267
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

Notes:
- Results are in mg/kg
- Depths are in feet.
- J - Estimated value
- U - Not detected
- NC - Not calculated

Table 4.2.3-20 (continued)
Concentrations of Parameters in Soil Beneath the Roads

F122R

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Clean fill - brown silt	15500	16.4 UJ	5.7 U	139	0.82	20 UJ	6	48300	42.6	4.9	14	1250	13100	13
2	Clean fill - brown silt	13900	15.9 UJ	4.3 U	140	0.88	13.7 UJ	1.3	11000	22.9	5.6	13	620	14900	9.8
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0	Clean fill - brown silt	16	6360	393	0.22 U	2.8 U	14.6	5.1	4320	1.4 U	0.85 U	25.6 U	54.3	169
2	Clean fill - brown silt	14.8	6950	537	0.29 U	2.7 U	14.3	10.2	876	1.4 U	0.83 U	24.9 U	34.7	81.6
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F123B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
2	Brown sandy silt with trace gravel	13400	16.8 U	3.6	112	0.7	19 U	1.1 U	38200	18.1	5.6	10	590	12000	7.4 J	15.2
4	Brown silt	11400	16.5 U	4	95.5	0.69	25.4 U	1.1 U	31100	15.5	5.5	6.6	900	12000	6.8 J	11.9 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
2	Brown sandy silt with trace gravel	10400	353	0.6 J	2.8 U	9.2	143	698	3990	2.9 U	0.87 U	792	26.2 U	28.1	46.4
4	Brown silt	12300	384	0.22 J	2.8 U	12.7	4.7	671	3100	7	0.86 U	673	25.7 U	25	42.3
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

F124B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
10	Slag/gravel	19400	17.7 UJ	3.2 U	174	1.3	50.4 J	51.9	122000	131 J	4.7	18 J	7060	9620	26.9
12	Tan brown silt/sandstone	15900	23.5 J	9.9	121	1.1	39.4 J	1300	38800	43.6 J	6.5	11.6 J	2700	12700	11.4
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
10	Slag/gravel	14 U	6910	476	0.06 U	5.7 U	19.2 J	434	8010	4.6	9.1	27.6 U	124 J	1160
12	Tan brown silt/sandstone	4 U	7210	435	0.17 U	7 U	8.4 J	2880	52400	2.9 U	0.88 U	26.4 U	54.9 J	25100
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

Notes:

Results are in mg/kg.

Depths are in feet.

J - Estimated value.

U - Not detected.

NC - Not calculated

Table 4.2.3-20 (continued)
Concentrations of Parameters in Soil Beneath the Roads

F125B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
1	Tan fine silt	14200	17.2 UJ	4.3 U	143	0.76	14.6 UJ	2.6	34700	22.6 J	6.8	11.9 J	2180	14800	6.5
3	Brown silt	16600	16.7 UJ	3.4 U	150	0.85	23.2 J	3.2	34100	30.6 J	6.6	12.6 J	2580	14900	6.7 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
1	Tan fine silt	14.5 U	11000	465	0.17 U	2.9 U	11.9 J	92.1	1340	2.6 U	0.89 U	26.8 U	33.8 J	113
3	Brown silt	16.8 U	10100	482	0.25 U	2.8 U	12.5 J	18.3	1150	3.3 U	0.87 U	26 U	42.6 J	97.2
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

F126B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead
0	Tan silt with gravel	12800 J	7.9 UJ	7 UJ	134 J	0.93	36	13.8	46700 J	174 J	6.2	44.1	1300	15000 J	8.7
2	Tan silt with gravel	15400 J	8.6 UJ	4.4 UJ	151 J	0.78	22.7	18.5	39200 J	9 J	4.8	12.7	2190	13600 J	12.5
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1

Sample Depth	Sample Description	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Selenium	Silver	Thallium	Vanadium	Zinc
0	Tan silt with gravel	14.1	14100 J	395 J	0.05 U	2.4	71	189	4090	1.7 U	1.8	12.4 U	276 J	223 J
2	Tan silt with gravel	15.4	11900 J	329 J	0.06 U	1.4 U	15.8	647	3570	2.2 U	0.45 U	13.4 U	47.3 J	884 J
Representative		16.1	22,000	482	0.16	2.15	15.5	3.7	672	3.05	1.9	0.27	45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value.
U - Not detected
NC - Not calculated

Table 4.2.3-20 (continued)
Concentrations of Parameters in Soil Beneath the Roads

F129B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Gravelly sand (fill)	22300	3.8	UJ	0.91	208	1.8	55.6	10.6	213000	236	2	18.2	13500	3250	4.9	15
5	Moderate yellowish-brown silty sand	13500	4	UJ	3.5	143	0.69	11.7	0.64	291000	16.6	5.6	8.8	440	12400	7.9	12.8
10	Moderate yellowish-brown silty sand	11500	4	UJ	6.2	132	0.66	9.6	0.36	26600	14.5	5.1	8.9	410	12000	8.3	10.9
15	Moderate yellowish-brown silty sand	12300	4	UJ	2.8	96.9	0.67	10.5	0.73	34800	17.1	5.9	9.4	409	12800	8.6	11
20	Moderate yellowish-brown silty sand	10700	4	UJ	3.7	121	0.61	8.6	0.42	21100	14.7	5.3	7.9	373	11600	9.6	9.4
25	Moderately yellowish-brown silty sand	11800	4.2	UJ	4.9	140	0.65	7.6	0.93	37000	16.5	6.1	10	441	13200	8.6	9.9
Representative		13,900	14.3		7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sulfate		Thallium		Vanadium	Zinc
0	Gravelly sand (fill)	3990	235	0.45		2.1	U	19.2	3.1	4390	6520	3.1		4.8		700		0.34	J	190	137
5	Moderate yellowish-brown silty sand	11000	372	0.59		1.3	U	10.8	4.1	727	3470	0.53	U	0.31	U	30		0.2	J	24.3	42.42.5
10	Moderate yellowish-brown silty sand	11300	373	0.08	U	1.3	U	10.2	6.7	879	2500	0.52	U	0.31	U	20	U	0.1	UJ	21.3	46.9
15	Moderate yellowish-brown silty sand	12400	395	0.23	U	1.3	U	11.3	3.4	808	2400	0.54	U	0.31	U	450		0.14	J	23.7	45.9
20	Moderate yellowish-brown silty sand	8350	371	0.08	U	1.3	U	9	2.6	771	2190	0.51	U	0.31	U	980		0.1	UJ	21.3	39.4
25	Moderately yellowish-brown silty sand	12100	407	0.12	U	1.4	U	13.1	3.8	763	2150	0.55	U	0.32	U	750		0.16	J	24	54.6
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,562.3	3.05		1.9		NC		0.27		45.4	52.8

Notes:

Results are in mg/kg

Depths are in feet.

J - Estimated value.

U - Not detected.

NC - Not calculated

Table 4.2.3-21
Concentrations of Parameters in Soil in the Waste Oil Storage Area

F037B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium		Beryllium	Boron		Cadmium		Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium
20	White silt (possible fill)	13100	16.1	UJ	4.5	UJ	151	J	0.67	33.9	U	1	U	30800	18.1	3.9	7.2	1550	12700	11.3	J	19.2
Representative		13,900	14.3		7.7		188		1	12.8		1.9		75,800	27.5	7.6	12.8	600	14,400	29.1		18.1

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver	Sodium	Thallium		Vanadium	Zinc	
20	White silt (possible fill)	11600	179	J	0.06	U	2.7	U	10.8	96.1	8020	9490	1.4	UJ	0.84	968	25.1	U	23.1	449	J
Representative		22,000	482		0.16		2.15		15.5	3.7	672	3,562.3	3.06		1.9	970.7	0.27		45.4	52.8	

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected.

Table 4.2.3-22
Concentrations of Parameters in Soil in the 9S Storage Area

F034B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Pale brown silt	10700	16.4 UJ	5.2 UJ	166	0.55	28.7 UJ	25.1	43800	15.9	3.6	6.6	1980	10900	10.7	18
10	Pale brown silt	12300	16.5 UJ	4 UJ	98.6	0.72	32.6 UJ	1.1 U	41000	16.4	3.6	7.1	2120	10500	7.2	17.1 U
15	Reddish-yellow sandy gravel	4150	15.4 UJ	4.8 UJ	62.3	0.27	26.6 UJ	13	11200	10.8	2.9	7.8	460	10800	9.6	4.6 U
20	Reddish-yellow sandy gravel	2920	14.7 UJ	10 J	33.9	0.24	7.5 UJ	1.3	4940	13.1	5.9	7.4	180	8770	5.9 U	2.8 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
5	Pale brown silt	14500	307	0.05 U	2.8 U	11.1	430	2730	7870	1.5 J	1.2	924	25.5 U	21.9	366
10	Pale brown silt	14100	352	0.06 U	2.6 U	10.2	279	1870	8080	1.5 UJ	0.86 U	855	25.7 U	26.4	146
15	Reddish-yellow sandy gravel	2210	192	0.05 U	2.6 U	6.5	61.5	767	2640	1.1 UJ	0.83	635	24 U	9.3	210
20	Reddish-yellow sandy gravel	1360	115	0.05 U	2.5 U	10.9	53.1	477	2090	1.3 UJ	0.76 U	512	22.9 U	5.9	32.9
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

B-2

Sample Depth	Sample Description	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Fluoride	Iron	Lead	Magnesium
0.5		<42	107 B	4150	77500	216	141	57 J+	2840	574	2650 B
6.5		<8.4	127	<0.6	43800 J	15.6 J	7	189	11400 J	8.2	14100
11.5		<8.4	152	<0.6	42500 J	15.3 J	7.2	129	11300 J	11.3	13200
Representative		7.7	188	1.9	75,800	27.5	12.8	600	14400	29.1	22,000

Sample Depth	Sample Description	Manganese	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
0.5		214	10400 J	74100 J	50800	73.4 J	69.9	7990	183	52600
6.5		349 J-	233	1970	7110	<10.8	0.95 B	<764	24.9	180
11.5		341 J-	129	1810	7000	<10.8	0.81 B	<464	25.7	67.2
Representative		482	3.7	672	3,562.3	3.1	1.9	970.7	45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
B - The reported value is less than the contract required detection limit (CRDL) but is greater than or equal to the IDL.
J - Estimated value.
J+ - A (+) symbol with the "J" qualifier indicates that the value listed is most likely greater than (+) the true value.
J- - A (-) symbol with the "J" qualifier indicates that the value listed is most likely less than (-) the true value.
U - Not detected.

Table 4.2.3-23
Concentrations of Parameters in Soil in the Active Landfill

F027B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic		Barium		Beryllium	Boron		Cadmium		Calcium	Chromium		Cobalt	Copper		Fluoride	Iron	Lead		Lithium	
0	Light brown silt	14000	15	UJ	4	U	132	J	0.7	13.7	U	0.97	U	46200	17.9		5.6	6.4		410	13100	9.6	U	12.2	UJ
10	Brownish-yellow silt	12900	9.4	U	6.5	UJ	175		0.63	9	UJ	0.54	U	55400	17.4	J	5.8	9.9	J	450	12600	10		14.8	
20	Brownish-yellow silt	9140	8.6	U	5	UJ	95.1		0.6	5.8	UJ	0.56	U	36700	14.4	J	8.8	8.1	J	400	15200	7.8		11.4	
30	Brownish-yellow silt	16300	16.9	UJ	4.8	U	146	J	0.79	21.5	U	1.1	U	41900	20.4		6.1	8.8	U	450	14600	6.6	U	15.1	UJ
40	Brownish-yellow silt	14900	17	UJ	4.4	U	158	J	0.66	18	U	1.1	U	63800	18.9		6.1	9		500	13600	10.9	U	14.9	UJ
50	Brownish-yellow silt	14200	16.7	UJ	3.6	U	120	J	0.58	13.7	U	1.1	U	49700	17.5		6.4	8.7		450	14100	10.2	U	12.8	UJ
60	Yellowish-brown gravelly silt	10600	16	UJ	2.3	U	86	J	0.59	16.5	U	1	U	47900	13.8		4.8	6.4	U	310	12900	7.3	U	10.7	UJ
70	Yellowish-brown silt	15400	17	UJ	4.5	U	123	J	0.79	17.6	U	1.1	U	57100	20.5		6	8.4	U	490	13700	11.3	U	15	UJ
80	Yellowish-brown silt	11800	16.7	UJ	3.5	U	109	J	1.4	9.6	U	1.1	U	47000	14.8		5.8	7.3		430	11300	12.1	U	12.9	UJ
90	Yellowish-brown silt	14100	16.9	UJ	4	U	126	J	1.5	10.8	U	1.1	U	41400	17.1		6.1	9.9		500	13600	8	U	13.9	UJ
100	Yellowish-brown silt	14800	16.4	UJ	3.1	U	106	J	1.6	10.8	U	1.1	U	46200	19		5.7	9.7		480	13200	11.9	U	13	UJ
110	Yellowish-brown silt	15500	16.3	UJ	4.2	U	107	J	0.79	15.4	U	1.1	U	46500	18.1		6.3	9.8		470	13900	6.6	U	15.1	UJ
120	Yellowish-brown silt	17600	17.6	UJ	5	U	120	J	0.79	12.6	U	1.1	U	33200	18.2		7	11.2		490	15100	10.8	U	15.1	UJ
Representative		13,900	14.3		7.7		188		1	12.8		1.9		78,800	27.5		7.6	12.6		600	14,400	29.1		16.1	

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel		Orthophosphate	Total Phosphorus	Potassium	Selenium		Silver		Sodium	Thallium		Vanadium	Zinc
0	Light brown silt	13400	378		0.06		2.5	U	11.9	U	2	769	3160	0.92	UJ	0.78	U	826	23.3	UJ	29.5	53.4
10	Brownish-yellow silt	14700	383	J	0.06	U	1.4	U	13.5		39.6	779	2610	0.28	UJ	0.44	U	927	0.44	U	27.3	43.2
20	Brownish-yellow silt	10200	378	J	0.06		1.6	U	10.9		2.6	838	1690	0.28	UJ	0.45	U	779	0.45	U	26.3	45.7
30	Brownish-yellow silt	14100	424		0.06	UJ	2.9	U	11.6	U	1.7	649	3760	0.64	UJ	0.88	U	1010	26.4	UJ	32.7	50.7
40	Brownish-yellow silt	16300	390		0.06	UJ	2.9	U	12.5	U	0.5	U 575	3130	0.95	UJ	0.88	U	855	26.5	UJ	29.6	48.1
50	Brownish-yellow silt	10300	422		0.06	UJ	2.8	U	12.7	U	0.6	584	2690	0.92	U	0.87	U	807	26	UJ	29.8	47.5
60	Yellowish-brown gravelly silt	7220	259		0.05	UJ	2.7	U	9.9	U	0.5	U 384	2140	0.63	UJ	0.83	U	696	25	UJ	23.2	43.1
70	Yellowish-brown silt	13100	366		0.06	UJ	2.9	U	18.7	U	0.5	U 889	3020	0.95	UJ	0.88	U	724	26.5	UJ	29.8	44.8
80	Yellowish-brown silt	10700	306		0.06	UJ	2.8	U	14.1	U	0.5	U 602	2470	1	UJ	0.87	U	942	26	UJ	20.9	41
90	Yellowish-brown silt	14200	427		0.05	UJ	2.9	U	16.6	U	0.8	721	2720	1.3	UJ	0.88	U	640	26.3	UJ	25.8	49.3
100	Yellowish-brown silt	13300	391		0.17		2.8	U	15	U	0.6	766	3140	0.94	UJ	0.86	U	665	25.6	UJ	25.2	48.6
110	Yellowish-brown silt	13500	427		0.17		2.8	U	15.9	U	0.6	769	3160	0.82	UJ	0.85	U	705	25.5	UJ	28.5	55.2
120	Yellowish-brown silt	10600	423		0.18		3	U	15.5	U	0.5	U 759	3410	0.3	UJ	68.8		637	27.5	UJ	28.2	51.5
Representative		22,000	482		0.16		2.15		15.5		3.7	672	3,582.3	3.06		1.9		970.7	0.27		48.4	62.9

Notes:

Results are in mg/kg.

Depths are in feet.

J - Estimated value

U - Not detected.

Table 4.2.3-24
Concentrations of Parameters in Soil at the Pond 8S Recovery Process Area

F058B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead		Lithium
7	Black/gray gravel/slag/sludge	9120	140	J	68.9	69.2	0.7	277	3280	43700	151	7	109	30200	2130	569	J	13
9	Black/gray sludge to dark brown silt	10800	17.1	U	66.9	108	0.85	55.3	202	201000	730	3.2	82.3	16800	7870	56.8	J	13.5
Representative		13,900	14.3		7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1		16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium		Vanadium	Zinc
7	Black/gray gravel/slag/sludge	2380	325	0.17	J	10.5	40.8	133000	59700	38000	16.4	307	4700	36.8		115	48700
9	Black/gray sludge to dark brown silt	6420	418	0.31	J	15	229	9440	53100	4130	11	7.2	3200	26.7	U	642	1790
Representative		22,000	482	0.16		2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27		45.4	52.8

F059B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt		Copper	Fluoride	Iron	Lead		Lithium	
10	Black/gray slag	11500	88.3	J	27.9	65.4	0.91	207	486	51600	116	1.6	U	130	52200	1920	763	J	2.9	U
Representative		13,900	14.3		7.7	188	1	12.8	1.9	75,800	27.5	7.6		12.6	600	14,400	29.1		16.1	

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel		Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium		Vanadium	Zinc
10	Black/gray slag	1080	55.1	0.35	J	5.2	U	8	U	11800	40900	21700	29.3	1000	3340	47.8	U	105	9600
Representative		22,000	482	0.16		2.15		15.5		3.7	672	3,562.3	3.05	1.9	970.7	0.27		45.4	52.8

Notes:
Results are in mg/kg.
Depths are in feet.
J - Estimated value.
U - Not detected.

Table 4.2.3-25
Concentrations of Parameters in Soil in Pond 8S

B-12

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.0				2.3 K				2.1 K					215.0			
10.0		14,300.0	17.3 U	4.4 J	138.0	1.1	39.3 J	535.0	83,900.0	154.0	7.2	40.8	7,030.0	11,400.0	137.0 J	12.4
20.0		13,900.0 J	17.1 U	3.3 U	109.0 J	.6	17.6 UJ	.9 U	36,200.0 J	16.5 J	4.2	11.5	784.0	13,500.0 J	9.4 J	13.2
30.0		12,000.0 J	17.1 U	5.4 U	115.0 J	.6	11.9 UJ	.9 U	45,300.0 J	16.5 J	6.0	10.6	312.0	13,400.0 J	10.6 J	11.2
40.0		11,600.0 J	16.8 U	3.8 U	117.0 J	.6	12.9 UJ	2.2 U	43,200.0 J	16.6 J	5.5	15.6	349.0	12,900.0 J	10.5 J	11.3
50.0		11,100.0 J	17.7 U	4.0	125.0 J	.5	12.6 UJ	.9 U	50,700.0 J	14.0 J	5.3	12.8	350.0	11,900.0 J	14.0 J	11.5 U
60.0		6,500.0 J	15.9 U	3.4	67.6 J	.3	6.3 UJ	4.0 U	34,100.0 J	12.7 J	4.0	70.4	235.0	10,400.0 J	8.0 J	10.3 U
70.0		8,510.0 J	25.4 U	4.6	93.1 J	.7	10.0 UJ	1.3 U	34,600.0 J	11.3 J	5.6	25.6	490.0	11,000.0 J	18.5 J	11.4
80.0		10,000.0 J	19.4 U	6.9	136.0 J	.7	10.6 UJ	1.3 U	48,500.0 J	13.3 J	7.0	26.3	393.0	14,600.0 J	15.1 J	12.9
90.0		9,720.0	18.9 U	4.4 J	212.0	.7	6.7 U	2.3 U	38,100.0	11.7	7.6	7.7	441.0	15,900.0	.3 U	12.6
Representative		13,900	14.3	7.7	188	1	12.8	1.9	78,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.0							8.5	774.0		1.2 K							
10.0		8,790.0	408.0	.1 U	4.5 U	35.7	126.0	9,960.0	9,790.0	6.7	56.0	1,830.0	8.0 J	138.0	10,800.0	143.0	117.0
20.0		13,800.0 J	407.0 J	.1 U	4.4 U	13.4	349.0	1,610.0	6,410.0	1.1 U	.9 U	869.0	.4	24.7	96.0	6.3	20.0
30.0		14,600.0 J	393.0 J	.1 U	4.4 U	15.7	17.9	803.0	2,500.0	1.0 UJ	.9 U	1,040.0	.4 U	24.6	64.5	13.4	20.0
40.0		14,300.0 J	399.0 J	.1 U	4.4 U	14.8	9.2	771.0	2,530.0	1.0 UJ	.9 U	907.0	.4 U	25.1	98.9	9.8	15.0
50.0		15,600.0 J	366.0 J	.1 U	4.6 U	15.8	2.3	773.0	2,190.0	.9 UJ	.9 U	864.0	.4 UJ	21.4	89.5	8.7	16.0
60.0		7,110.0 J	293.0 J	.1 U	4.1 U	10.3 U	22.0	638.0	2,290.0	.8 UJ	.8 U	724.0	.4 UJ	16.2	242.0	16.1	16.0
70.0		10,500.0 J	244.0 J	.1 U	4.4 U	11.0 U	98.3	1,260.0	4,330.0	1.0 UJ	.9 U	869.0	.4 U	17.2	110.0	10.8	22.9
80.0		9,430.0 J	457.0 J	.1 U	5.0 U	12.6 U	10.7	877.0	4,600.0	1.1 UJ	1.0 U	782.0	.5 UJ	22.1	117.0	22.6	25.6
90.0		8,120.0	506.0	.1 U	4.6 U	11.5 U	9.5	1,290.0	2,190.0	1.8 U	.9 U	1,120.0	.1 UJ	23.9	82.4	21.9	17.9
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,862.3	3.05	1.9	3,862.3	0.27	45.4	52.8	24.7	31.4

B-13

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
.0				4.2 K				1.4 K					178.0			
10.0		8,990.0 J	17.9 U	4.6	134.0 J	.6	11.4 UJ	15.2	37,800.0 J	11.9 J	5.6	13.9	430.0	11,100.0 J	6.6 J	11.6 U
20.0		8,450.0 J	16.5 U	6.9	122.0 J	.6	9.8 UJ	.9 U	39,800.0 J	12.7 J	5.3	13.6	386.0	11,200.0 J	6.4 J	10.7 U
30.0		9,240.0 J	16.7 U	4.8	118.0 J	.6	9.6 UJ	1.5 U	26,000.0 J	14.1 J	5.5	32.2	395.0	12,400.0 J	6.6 J	11.4
40.0		10,400.0 J	17.1 U	4.2	356.0 J	.6	9.7 UJ	.9 U	44,800.0 J	14.0 J	5.9	12.2	372.0	12,300.0 J	5.5 J	11.1 U
50.0		9,130.0	8.6	4.5 J	121.0	.6	6.8 U	.4 U	39,900.0	11.9	4.7	17.4	402.0	10,600.0	6.8 J	9.7
60.0		7,730.0 J	17.1 U	3.3	138.0 J	.6	6.9 U	.9 U	46,700.0 J	13.7 J	6.6	10.6	337.0	13,300.0 J	5.4 J	11.0 U
70.0		9,100.0	17.8 U	4.6 J	152.0	.6	7.8 U	.9 U	33,400.0	11.6	6.6	14.2	266.0	12,000.0	.3 U	11.6 U
80.0		13,000.0	17.4 U	4.2 J	148.0	.9	12.7 U	.9 U	60,900.0	16.5	7.3	16.2	411.0	14,500.0	18.7 J	12.9
90.0		9,390.0	17.5 U	4.2 J	102.0	.7	7.4 U	.9 U	58,100.0	20.9	5.9	11.9	475.0	14,300.0	7.4 J	11.3 U
100.0		13,200.0	17.8 U	4.3 J	149.0	.9	12.3 U	.9 U	61,500.0	18.1	6.6	9.3	460.0	14,600.0	17.0 J	13.0
Representative		13,900	14.3	7.7	188	1	12.8	1.9	78,800	27.5	7.5	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
.0							2.0	669.0		1.0 K							
10.0		11,100.0 J	382.0 J	.1 U	4.7 U	11.6 U	123.0	3,250.0	3,070.0	1.1 UJ	.9 U	751.0	.4 UJ	16.7	637.0	6.9	14.9
20.0		11,900.0 J	348.0 J	.1 U	4.3 U	10.7 U	70.3	992.0	3,230.0	.9 UJ	.9 U	679.0	.4 UJ	19.6	52.7	11.3	20.2
30.0		10,600.0 J	400.0 J	.1 U	4.3 U	11.2	9.6	797.0	1,820.0	.8 UJ	.9 U	1,180.0	.5 UJ	19.4	111.0	6.8	16.5
40.0		13,800.0 J	366.0 J	.1 U	4.4 U	11.1 U	5.2	775.0	2,060.0	.8 UJ	.9 U	1,080.0	.4 UJ	21.6	90.9	14.5	18.4
50.0		13,000.0	338.0	.1 U	1.3 U	11.0	4.6	817.0	1,730.0	1.0 U	.1 U	940.0	.2	18.9	63.9	13.4	17.6
60.0		10,900.0 J	435.0 J	.1 U	4.4 U	11.0 U	4.3	626.0	1,510.0	.8 UJ	.9 U	1,110.0	.5 UJ	23.4	52.1	7.6	20.0
70.0		7,770.0	332.0	.1 U	4.6 U	11.6 U	1.2	416.0	1,750.0	1.3	.9 U	1,080.0	.1 UJ	16.9	137.0	10.1	13.7
80.0		14,600.0	426.0	.1 U	4.5 U	15.3	.5 U	670.0	2,840.0	1.9	.9 U	1,240.0	.1 UJ	25.2	187.0	13.5	17.7
90.0		17,000.0	398.0	.1 U	4.5 U	12.6	.5 U	834.0	2,070.0	1.0 U	.9 U	1,040.0	.1 UJ	29.8	98.7	10.2	18.6
100.0		13,900.0	407.0	.1 U	4.6 U	11.6	4.6	778.0	2,980.0	1.6 U	.9 U	1,110.0	.1 U	27.2	57.4	11.8	18.3
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

B - The reported value is less than the contract required detection limit (CRDL) but is greater than or equal to the IDL.

J - Estimated value

J+ - A (+) symbol with the "J" qualifier indicates that the value listed is most likely greater than (+) the true value

J- - A (-) symbol with the "J" qualifier indicates that the value listed is most likely less than (-) the true value.

U - Not detected

Table 4.2.3-25 (continued)
Concentrations of Parameters in Soil in Pond 8S

F150

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
1.0				3.2 K				.5 UK					285.0			
2.0				2.5 K				.5 UK					116.0			
10.0		23,300.0	15.7 U	2.1 J	215.0	2.0	63.6 J	13.5	211,000.0	178.0	3.8	13.9	11,400.0	5,110.0	6.3 J	15.9
20.0		13,800.0 J	17.4 U	5.7	139.0 J	.7	15.8 UJ	.9 U	39,100.0 J	18.5 J	5.4	17.8	422.0	13,200.0 J	6.3 J	15.2
30.0		12,300.0 J	16.6 U	4.4 U	122.0 J	.6	17.0 UJ	.9 U	34,500.0 J	15.7 J	5.3	18.3	349.0	13,600.0 J	10.0	12.3
40.0		10,600.0 J	16.6 U	4.3 U	131.0 J	.5	13.2 UJ	.9 U	40,100.0 J	22.0 J	5.6	57.8	394.0	13,900.0 J	6.0 J	10.8 U
50.0		11,000.0 J	16.7 U	4.3 U	113.0 J	.5	10.7 UJ	.9 U	37,300.0 J	14.4 J	4.4	30.7	368.0	11,100.0 J	8.1	10.8 U
60.0		9,980.0 J	16.8 U	4.2 U	98.3 J	.5	9.0 UJ	.9 U	42,500.0 J	14.1 J	4.2	20.9	370.0	10,700.0 J	7.7 J	10.9 U
70.0		9,990.0 J	16.5 U	3.9 U	116.0 J	.5	9.8 UJ	.9 U	42,800.0 J	17.0 J	4.6	16.9	319.0	11,800.0 J	9.4 J	10.7 U
80.0		12,900.0 J	16.8 U	4.0 U	117.0 J	.7	9.5 UJ	.9 U	41,500.0 J	15.9 J	4.9	37.6	389.0	12,300.0 J	2.3 U	11.9
90.0		13,800.0 J	17.1 U	45.0 U	142.0 J	.8	12.9 UJ	.9 U	49,300.0 J	16.5 J	5.7	59.3	376.0	13,100.0 J	12.3 J	14.4
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Gross Alpha	Gross Beta
1.0							1.0	954.0		.8 K							
2.0							21.9	612.0		.5 UK							
10.0		5,920.0	272.0	.1 U	4.1 U	10.2 U	9.9	4,080.0	6,880.0	2.3 U	.8 U	2,810.0	.1 UJ	157.0	239.0	172.0	84.0
20.0		12,600.0 J	357.0 J	.1 U	4.5 U	12.3	118.0	1,630.0	4,550.0	1.2 UJ	.9 U	824.0	.4 UJ	26.0	84.3	8.7	18.7
30.0		12,500.0 J	395.0 J	.1 U	4.3 U	12.6	7.5	821.0	2,420.0	1.3 UJ	.9 U	853.0	.5	24.0	83.0	13.7	23.9
40.0		13,800.0 J	355.0 J	.1 U	4.3 U	13.1	3.0	857.0	2,040.0	1.0 UJ	.9 U	940.0	.4 U	31.6	125.0	10.1	17.6
50.0		13,100.0 J	333.0 J	.1 U	4.3 U	11.3	2.2	856.0	2,290.0	.9 UJ	.9 U	902.0	.4	22.6	84.9	8.5	17.0
60.0		13,800.0 J	323.0 J	.1 U	4.4 U	10.9 U	1.5	810.0	2,030.0	.8 UJ	.9 U	800.0	.4	20.7	87.6	9.8	17.9
70.0		13,500.0 J	367.0 J	.1 U	4.3 U	10.7 U	1.6	800.0	2,040.0	1.0 UJ	.8 U	842.0	.0 U	24.0	159.0	9.1	18.7
80.0		12,600.0 J	336.0 J	.1 U	4.4 U	13.4	.8	830.0	2,980.0	.9 UJ	.9 U	1,080.0	.5 U	22.6	77.1	7.3	18.7
90.0		14,000.0 J	352.0 5.0	.1 U	4.4 U	15.6	.5 U	691.0	3,170.0	1.4 UJ	.9 U	1,140.0	.6	23.9	83.8	9.1	17.2
Representative		22,000	482	0.16	2.15	15.6	3.7	872	3,582.3	3.06	1.9	970.7	0.27	45.4	82.8	24.7	31.4

Notes:

Results are in mg/kg, except gross alpha and gross beta, which are in pCi/g.

Depths are in feet.

B - The reported value is less than the contract required detection limit (CRDL) but is greater than or equal to the IDL.

J - Estimated value.

J+ - A (+) symbol with the "J" qualifier indicates that the value listed is most likely greater than (+) the true value.

J- - A (-) symbol with the "J" qualifier indicates that the value listed is most likely less than (-) the true value.

U - Not detected.

Table 4.2.3-26
Concentrations of Parameters in Soil in Former Pond 1E

F033B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
4.5	Brownish-yellow silt	15300	16 UJ	5 UJ	138 J	0.82	50.6	485 U	39000	51.5	5.8	22.9	4130	12000	79.6 J	17.7
9.5	Brownish-yellow silt	12600	16.1 UJ	5.5 UJ	109 J	0.77	25.6 U	3.9 U	31500	16.5	4.6	8.8	1460	12300	7.8 J	15
14.5	Brownish-yellow silt	15100	17.8 UJ	5.3 J	139	0.82	23.6 UJ	3.9	10200	19.9	5.6	9.6	1580	14300	9.2	14.1 U
19.5	Brownish-yellow silt	10700	15.7 UJ	3.4 UJ	103	0.54	12.2 UJ	1 U	44400	16.6	4.1	7.3	1210	10900	8.9	10.7 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
4.5	Brownish-yellow silt	10600	315 J	0.05 U	2.7 U	16	1010	6410	15900	1.9 UJ	46.1 U	1550	24.9 U	55	7320 J
9.5	Brownish-yellow silt	12000	444 J	0.06 U	2.7 U	12.2	714	2380	7740	1.3 UJ	0.84 U	1050	26.1 U	23.9	295 J
14.5	Brownish-yellow silt	6290	459	0.06 U	3 U	17.6	367	1900	6600	3.1 UJ	0.82 U	966	27.7 U	29.3	174
19.5	Brownish-yellow silt	15400	342	0.05 U	2.7 U	11.9	236	1830	4740	1.6 UJ	0.82 U	716	24.5 U	25.6	78.7
Representative		22,000	482	0.16	2.15	18.5	3.7	672	3,562.3	3.06	1.9	970.7	0.27	48.4	82.8

B-1

Sample Depth	Sample Description	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Fluoride	Iron	Lead	Magnesium
0.5		<42	99.2 B	5110	62700	278	155	106 J+	3490	683	2450 B
6.5		<8.4	150	0.78 B	48900 J	16.6 J	10.4	156	10800 J	11.5	11400
11.5		<8.4	168	0.74 B	42000 J	17.5 J	10.2	189	11600 J	7.2	12500
31		<8.4	177	<.6	457000 J	13.1 J	8	220	11000 J	10.3	13400
Representative		7.7	168	1.9	75,800	27.5	12.6	600	14400	29.1	22,000

Sample Depth	Sample Description	Manganese	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
0.5		159	7720 J	86000 J	66300	77.6 J	79.6	13000	234	69800
6.5		207 J-	269	5770	9295	<10.8	1.1 B	<484	17.2	1590
11.5		266 J-	287	2820	7190	<10.8	0.8 B	<484	22.5	1070
31		392 J-	371	2320	7340	<10.8	1.1 B	<484	22.1	182
Representative		482	3.7	672	3,562.3	3.1	1.9	970.7	48.4	82.8

Notes:
Results are in mg/kg
Depths are in feet
B - The reported value is less than the contract required detection limit (CRDL) but is greater than or equal to the IDL.
J - Estimated value
J+ - A (+) symbol with the "J" qualifier indicates that the value listed is most likely greater than (+) the true value.
J- - A (-) symbol with the "J" qualifier indicates that the value listed is most likely less than (-) the true value.
U - Not detected

Table 4.2.3-27
Concentrations of Parameters in Soil in Former Pond 4E

F024B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Slag fill	17500	18.4 UJ	9.4 J	154	0.3	54.6 U	918	37200	55.9	7.1	41.4	6030	13400	157	17.5 UJ
10	Brown silt (fill)	15300	17 UJ	4.4 J	165	0.22 UJ	20.2 U	1.1 U	46800	18.9	5.5	8.9 U	1510	13400	6.9	15.1 UJ
20	Brown silt	13400	15.8 UJ	5.2 J	140	0.21	14.4 U	1 U	48700	17	5.1	6.3 U	810	12900	6.9	11.4 UJ
30	Brown silt	15800	20.4 UJ	3.8 UJ	177	0.26	28.3 U	1 U	48700	19.5	5.3	8.9 U	930	14200	10.1	13.2 UJ
40	Brown silt	19200	18.5 UJ	3.4 UJ	165	0.3	21.2 U	1.2 U	66200	21.4	6	11 U	1330	17100	9.4	16.6 UJ
50	Brown silt	19900	20.5 UJ	6.7 J	220	0.41	28.1 U	1.3 U	57600	24.2	7.2	16 U	700	16600	7.9 U	17.1 UJ
60	Silty gravel	11900	16.2 UJ	4.8 J	146	0.21 UJ	11.4 U	1.1 U	24600	21.9	13.1	7.4 U	390	27300	6.7	8.9 UJ
70	Brown sandy gravel	12500	15.9 UJ	6.4 J	179	0.21 UJ	14 U	1 U	40600	18.4	9.4	7.8 U	410	20200	6.9	10.9 UJ
75	Light yellowish-brown silt	15200	18.4 UJ	5.7 J	114	0.33	13.7 U	1.2 U	94100	19.2	5.8	9.3 U	460	13000	19.5	13.7 UJ
Representative		13,900	14.3	7.7	189	1	12.8	1.9	75,800	27.5	7.5	12.8	600	14,400	28.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0	Slag fill	9570	242	0.06 U	6.5 U	18	370	25700	15700	11.3 J	87.1	1940	28.7 R	55	15200
10	Brown silt (fill)	12400	393	0.05 U	2.9 U	13.7	192	1640	8000	2.1 UJ	0.86 U	966	26.4 R	36.8	65.3
20	Brown silt	15200	371	0.07	2.7 U	12.4	248	1160	5900	2.2 UJ	0.82 U	825	24.6 R	27.4	46
30	Brown silt	14700	377	0.06 U	2.7 U	12.4	389	1580	6900	1.4 UJ	0.82 U	933	24.6 R	30.4	52.3
40	Brown silt	16400	521	0.43	3.1 U	15.4	41.1	4280	8460	1.7 UJ	0.96 U	989	28.8 R	32.5	60.4
50	Brown silt	17600	393	0.06 U	3.3 U	15.4	166	1160	8250	1.7 UJ	1 U	1040	30.7 R	36.8	64.1
60	Silty gravel	8280	427	0.06	2.7 U	17.2	95	896	3700	1.2 UJ	0.84 U	1200	25.2 R	41.9	71.2
70	Brown sandy gravel	8080	485	0.06 U	2.7 U	15	18.5	900	2800	1.4 UJ	0.83 U	1150	24.8 R	33.7	57.3
75	Light yellowish-brown silt	10600	296	0.06 U	3.1 U	13.9	23.1	1060	2970	1.4 UJ	0.96 U	1470	28.7 R	26.1	43.1
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,982.3	3.06	1.9	970.7	0.27	45.4	63.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value
R - Rejected value
U - Not detected

Table 4.2.3-28
Concentrations of Parameters in Soil in Former Pond 5E

F025B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
5	Dark olive gray silt	16300	15.4	7.8 J	143	1	28.4 J	532	34100	48.2 J	6.3	25 J	7670	12200	108	15.7
10	Dark olive gray silt	19400	32	9.3 J	181	2.2	67.9 J	2080	69700	108 J	10.2	57.3 J	35000	9950	360	14.7
20	Yellowish-brown silt	12600	9.1 U	6.6 UJ	165	0.68	12.5 UJ	0.59 U	44900	15.9 J	5.9	8.5 J	1120	12700	6.2	15.2
30	Light brown sandy gravel	3970	7.6 U	6 UJ	62.2	0.29	4.9 UJ	0.55	9590	8 J	4.4	7.2 J	380	11900	4.2	5.2 U
60	Brown gravelly silt	12100	8.9 U	6.7 UJ	100	0.67	10.9 UJ	0.58 U	39800	16.3 J	6.2	8.1 J	920	12700	6.3	13.8
70	Brown gravelly silt	12100	9.6 U	6.3 UJ	90	0.72	13 UJ	0.63 U	46600	13 J	5.3	8.9 J	700	12300	7.6	15.1
Representative		13,900	14.3	7.7	186	1	12.8	1.9	75,800	27.5	7.8	12.6	800	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
5	Dark olive gray silt	9420	277 J	0.2	1.6 U	15.5	620	12300	11900	5.9	61	1050	0.48 U	48	11600
10	Dark olive gray silt	10700	442 J	0.25	8.5 U	24.9	2390	33600	23700	18.6	152	2710	18.7	78	200000 J
20	Yellowish-brown silt	15000	374 J	0.07	1.5 U	14	516	1630	5790	0.3 UJ	0.47 U	598	0.47 U	25.8	47
30	Light brown sandy gravel	3580	315 J	0.05 U	1.3 U	11.5	194	356	1960	0.27 UJ	0.4 U	267	0.4 U	9.2	37.5
60	Brown gravelly silt	9980	476 J	0.06 U	1.5 U	13.5	312	2510	6870	0.28 UJ	0.46 U	546	0.46 U	25.5	42.3
70	Brown gravelly silt	7260	476 J	0.06 U	1.6 U	10.3	333	1380	6250	0.31 UJ	0.51 U	715	0.51 U	22.3	38
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.8

B114

Sample Depth	Sample Description	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Fluoride	Iron	Lead	Magnesium
5.5		<8.4	114	21.7	27600	14.3	13.4	350	10000	7.3	9010
21		<8.4	94	<0.6	49100	6.6	6.7	320	7700	<6	12100
51		<8.4	65.9	<0.6	48700	9.1	7.7	470	10000	<6	14200
71		<8.4	111	<0.6	15200	6.7	10	87	8210	<6	4720
96		<8.4	98.6	<0.6	57100	7	30.1	2	7360	<6	6360
141		<8.4	77.8	<0.6	36800	6.6	10.7	<2	6980	<6	6800
Representative		7.7	186	1.9	75,800	27.5	12.6	800	14400	29.1	22,000

Sample Depth	Sample Description	Manganese	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
5.5		217	200	3400	6170	<10.8	2.5	<464	16.7	1720 J
21		244	270	1300	4090	<10.8	<0.8	<464	13	43.2 J
51		264	220	1600	5050	<10.8	<0.8	<464	18.4	46.1 J
71		209	250	1000	4740	<10.8	<0.8	<464	12.2	35.9 J
96		492	18	730	1780	<10.8	<0.8	<464	12.7	42.4 J
141		306	9	720	1320	<10.8	<0.8	<464	11.8	31.8 J
Representative		482	3.7	672	3,562.3	3.1	1.9	970.7	45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value
U - Not detected

Table 4.2.3-29
Concentrations of Parameters in Soil in Former Pond 6E

F026B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Light yellowish-brown silt	11400	8.1 U	5.9 UJ	121	0.7	8.8 UJ	0.71	43600	16.3 J	5	6.6 J	1610	12300	6.8	13.2
10	Light yellowish-brown silt	9340	10.7	5.7 UJ	107	0.54	6.9 UJ	0.62 U	36200	12.7 J	4.8	8 J	1570	10600	7.7	10.7
60	Light yellowish-brown gravelly silt	12500	9.5 U	6.5 UJ	102	0.88	18.1 J	0.62 U	41300	15.1 J	5.7	9.8 J	2640	12700	5.8	15.4
Representative		13,900	14.3	7.7	166	1	12.8	1.9	75,600	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0	Light yellowish-brown silt	13400	340 J	0.14	1.4 U	11.7	203	1400	3820	0.25 UJ	1.4	354	0.42 U	24.3	53.8
10	Light yellowish-brown silt	12200	325 J	0.12	1.6 U	13.2	435	1640	4430	0.31 UJ	0.5 U	523	0.5 U	20.5	37.7
60	Light yellowish-brown gravelly silt	8060	395 J	0.12	1.6 U	11.8	50.1	13900	7530	0.31 UJ	0.49 U	808	0.49 U	21.9	42.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,562.3	3.05	1.9	970.7	0.27	45.4	52.6

B130

Sample Depth	Sample Description	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Fluoride	Iron	Lead	Magnesium
16		<8.4	115	<0.6	5690	13.3	12.6	330	12000	<6	4680
41		<8.4	114	<0.6	44900	10	8.1	210	10100	<6	13200
71		8.5	122	0.87 B	65900	7	13.9	240	7460	6.4	7960
Representative		7.7	166	1.9	75,900	27.5	12.6	600	14400	29.1	22,000

Sample Depth	Sample Description	Manganese	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Vanadium	Zinc
16		449	210	1700	6250	<10.8	<0.6	470 B	20	66.5 J
41		329	150	1600	4430	<10.8	<0.6	<464	18.7	45.7 J
71		449	260	1300	5260	<10.8	<0.6	<464	12	35 J
Representative		482	3.7	672	3,562.3	3.1	1.9	970.7	45.4	52.6

Notes:

Results are in mg/kg

Depths are in feet.

J - Estimated value.

U - Not detected

Table 4.2.3-30
Concentrations of Parameters in Soil in the Railroad Swale

F039B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Dark yellowish-brown silty gravel (fill)	10300	16.1 UJ	12.2	85.8	2.9	95 J	104	243000	720	1.1	95.8	17500	8780	17.4 J	9
2.5	Dark yellowish-brown silty gravel (fill)	10400	16.5 UJ	20.2	87.3	2.9	78.3 J	103	221000	647	1.6	93.3	15400	7930	7.3 J	10.5 U
5	Dark yellowish-brown silty gravel (fill)	5170	16 UJ	3.9	58.2	0.4	4.4 J	1 U	14800	71.8	4.9	13.2	360	20300	6.5 UJ	6 U
7.5	Grayish-brown silt	12000 J	17.4 UJ	3.6	136	0.75	13.5 J	3.4	48600	37.5	5.3	14.4	1900	11500	8 J	14.1 U
10	Grayish-brown silt	14800	16.7 UJ	2.4 J	157	0.44 U	19.9 UJ	2.6	45200	38.2	5.4	14.8	890	12300	9.6	13.7
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0	Dark yellowish-brown silty gravel (fill)	2650	221	0.42 U	27.8	163	35.2	81400	3230	8.7 J	5.9	3020	25 U	980	1270
2.5	Dark yellowish-brown silty gravel (fill)	3310	173	0.4 U	27.7	155	46.9	76000	3180	9.9 J	4.7	2790	25.7 U	875	1260
5	Dark yellowish-brown silty gravel (fill)	2940	180	0.07 U	10.4	13.4	19	1860	1370	2.1 UJ	0.83 U	629	25 U	20.9	46.5
7.5	Grayish-brown silt	10900	340	0.12 U	2.9 U	19.6	4.4	3930	3400 J	3.9 J	0.9 U	866 J	27.1 U	53.4	105
10	Grayish-brown silt	11000	333 J	1 J	2.8 U	19.6	14.2	2730	3670	1.1 U	0.87 U	1200	26 U	50	102
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,682.3	3.06	1.9	970.7	0.27	45.4	82.8

F040B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
14	Yellowish-brown silt	9340	17.8 UJ	7.5 UJ	87.1	0.58	9.5 UJ	1.2 U	41900	12.1	4.7	9.3	480	10800	10	10 U
16.5	Yellowish-brown silt	11100	17.9 UJ	4.1 UJ	120	0.68	17.1 UJ	13.4	50300	36.2	7.7	12	1280	10400	10.8	10.1 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
14	Yellowish-brown silt	14000	341	0.06 U	3 U	11.8	12.8	1450	2670	2.7 UJ	0.93 U	862	27.8 U	20.2	44
16.5	Yellowish-brown silt	11100	301	0.06 U	3 U	15.5	24.1	2450	3070	1.6 UJ	1.2	991	27.8 U	43.3	232
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,682.3	3.06	1.9	970.7	0.27	45.4	82.8

Notes:

Results are in mg/kg

Depths are in feet

J - Estimated value

U - Not detected.

NC - Not calculated

Table 4.2.3-30 (continued)
Concentrations of Parameters in Soil in the Railroad Swale

F041B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
7.5	Slag (fill)	16500	36.8 J	21.1	196 J	3.5	121 U	282	156000	988	6.7	125	13300	12600	42.1 U	13.2 UJ
10	Black silt (fill)	10200	18.4 UJ	3.5 U	122 J	1.5 U	6.7 U	1.2 U	42200	17.7	5	10	600	12300	13.6 U	10.3 UJ
12.5	Black silt (fill)	11000	20.5 UJ	5.8 U	172 J	2.1 U	12.6 U	1.3 U	50500	16	8.1	10.8	510	13500	23.5 U	14.4 UJ
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
7.5	Slag (fill)	4320	272	0.93	28.6 U	188	111	53600	4840	17.5 J	17.7	2870	41.3 UJ	1290	4210
10	Black silt (fill)	11000	245	0.07	3.1 U	12	3	1080	3040	2.5 UJ	0.98 U	899	28.7 UJ	24	58.6
12.5	Black silt (fill)	15700	280	0.08	5.4 U	17.3	3.5	682	3540	1.1 UJ	1.1 U	1120	32 UJ	26	53.1
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27	45.4	52.8

F042B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
7.5	Brown silt	13000	17.3 UJ	4.5 U	136 J	1.6	10.9 U	1.1 U	33300	46.8	5.9	12.9	690	14100	7.8 U	12 UJ
10	Brown silt	9490	18.7 UJ	6.1	155 J	1.5	8.1 U	1.2 U	49800	12.9	5.4	11.5	620	12000	15.8 U	10 UJ
12.5	Brown silt	9600	19.5 UJ	5 U	152 J	1.5	18.3 U	1.3 U	40400	15.1	5.1	7.5 U	460	11700	19.5 U	9.7 UJ
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
7.5	Brown silt	10400	421	0.07	2.9 U	18.4 U	3.1	1450	4280	0.98 UJ	0.9 U	671	28.9 UJ	53.1	52.9
10	Brown silt	11400	371	0.1	3.2 U	15.8 U	2.7	1200	3080	0.81 UJ	0.97 U	698	29.2 UJ	19.8	50.9
12.5	Brown silt	13600	358	0.08	3.3 U	13.2 U	2.7	623	2930	1 UJ	1 U	723	30.5 UJ	21.3	42.6
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	970.7	0.27	45.4	52.8

F131B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
40	Sand	3210	6.1 J	4.3	60.3	0.3	2.3 U	0.29 U	8910	7.6	4.7	8.7	128	12600	4.5	5
60	Moderate yellowish-brown clayey silt	12700	4.7 UJ	3.2	108	0.72	7.7	0.8	33200	16.7	6	8.9	461	13500	9.3	13.3
70	Pale olive gray clay	14800	5.9 UJ	1.3	110	0.66	13	1.9	107000	17.7	6.5	7.7	648	15100	7.6	16.4
80	Medium dark gray silty sandy gravel	2950	4.6 UJ	7.8	26.1	0.22	2.6 UJ	0.75	29600	14.7	3	28.9	290	10600	3.1	4.3
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.8	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc
40	Sand	2580	260	0.72	1.3 U	8.5	14.4	1780	623	0.5 U	0.29 U	20 U	0.09 UJ	8.5	21.7
60	Moderate yellowish-brown clayey silt	11600	341	0.09 U	1.6 U	11.5	11.5	880	2740	0.59 U	0.38 U	20	0.23 J	22.2	44.9
70	Pale olive gray clay	16700	447	4.8	2 U	13.6	11.7	611	2770	0.8 U	0.46 U	20	0.2 J	20.8	48.3
80	Medium dark gray silty sandy gravel	4700	189	0.05 U	1.5 U	12.4	6.2	578	588	0.6 U	0.36 U	20 U	0.1 U	10.1	30.2
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,582.3	3.05	1.9	NC	0.27	45.4	52.8

Notes:
Results are in mg/kg.
Depths are in feet
J - Estimated value

Table 4.2.3-31
Concentrations of Parameters in IWW Basin and Ditch

F030B

Sample Depth	Sample Description	Aluminum		Antimony		Arsenic		Barium		Beryllium	Boron		Cadmium		Calcium		Chromium		Cobalt	Copper	Fluoride	Iron		Lead		Lithium	
0	Sandy gravel	18400	J	7.8		9	J	175	J	1.7	73.6	J	87.7	J	165000	J	295	J	4	48.1	11700	6350	J	14	U	13.1	J
10	Brown clayey silt	14200	J	8.5	U	6.2	UJ	168	J	0.74	17.8	UJ	0.66	J	35100	J	15.6	J	5.9	11.1	440	13100	J	7.9	U	15	J
20	Brown sandy silt	12200	J	8.9	U	6.4	UJ	126	J	0.66	11.2	UJ	0.7	J	44300	J	18	J	5.7	9.6	420	12600	J	9.2	U	12	J
30	Yellowish-brown gravel and sandy silt	5690	J	8	U	7.5	J	71.5	J	0.37	4.1	UJ	0.52	UJ	7960	J	12.9	J	4.3	8.7	200	13200	J	8.2	U	5.6	J
40	Yellowish-brown gravel and sandy silt	2910	J	8	U	9.5	J	41	J	0.27	3.6	UJ	0.52	UJ	5780	J	34.4	J	4.2	13	170	15300	J	7.4	U	3.2	UJ
50	Brown silty sand	11800	J	8.9	U	6.5	UJ	188	J	0.69	10.1	UJ	0.58	UJ	31200	J	12.8	J	6.1	12.1	430	12900	J	7.3	U	15.1	J
65	Dark brown silty sand	7920	J	8.9	U	4.4	UJ	123	J	0.44	6.6	UJ	0.58	UJ	6330	J	11.5	J	6	10.1	300	11700	J	4.6	U	8.6	J
75	Dark brown sandy silty gravel'	4220	J	12.8		4.7	UJ	106	J	0.42	10.7	UJ	0.56	UJ	76000	J	6.4	J	3.1	5.9	200	6870	J	3.5	U	6.3	J
Representative		13,900		14.3		7.7		188		1	12.8		1.9		75,800		27.5		7.9	12.6	600	14,400		28.1		16.1	

Sample Depth	Sample Description	Magnesium		Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium		Selenium		Silver		Sodium		Thallium		Vanadium		Zinc	
0	Sandy gravel	5400	J	319	J	0.08	U	7.3		54.2	41.6	20200	5680	J	6.2		6.5		2070	J	12	U	299	J	944	J
10	Brown clayey silt	11400	J	370	J	0.71	U	1.4	U	11.7	6.6	747	3840	J	0.29	UJ	0.44	U	705	J	13.2	U	26	J	45.6	J
20	Brown sandy silt	14000	J	359	J	1.7		1.5	U	11.8	3.1	744	2510	J	0.29	UJ	0.46	UJ	519	J	13.9	U	28	J	44.1	J
30	Yellowish-brown gravel and sandy silt	2950	J	238	J	1		1.3	U	10.3	1.8	146	1220	J	0.27	U	0.42	U	266	J	12.5	U	11.8	J	22.8	J
40	Yellowish-brown gravel and sandy silt	1350	J	280	J	0.11	U	4.8		8.6	2	268	870	J	0.25	UJ	0.83		275	J	12.4	U	9.3	J	27	J
50	Brown silty sand	9110	J	369	J	1.1		1.5	U	12.6	2.8	685	2770	J	0.3	UJ	0.46	U	716	J	13.9	U	23.3	J	41.9	J
65	Dark brown silty sand	4990	J	340	J	0.71	U	1.5	U	12.5	1.9	404	1700	J	0.29	UJ	0.46	U	1280	J	13.8	U	17.8	J	32.4	J
75	Dark brown sandy silty gravel	3650	J	247	J	0.12	U	1.4	U	4.5	45.2	840	902	J	0.28	UJ	0.45	U	586	J	13.4	U	10.3	J	28.8	J
Representative		22,000		482		0.16		2.15		15.5	3.7	672	3,582.3		3.86		1.9		970.7		0.27		45.4		92.8	

Notes:
Results are in mg/kg.
Depths are in feet
J - Estimated value
U - Not detected

Table 4.2.3-32
Concentrations of Parameters in the Calciner Pond Sediment Storage Area A

F050B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Red-brown clay with silt	20400	19.1 U	15.6	234	0.49	1550	184	169000	783	1.4	72.6	155000	10200	50.2 J	5.1 U
2	Red-brown clay with silt	20700	22.1 U	16.6	202	0.53	2450	334	168000	1010	1.6	111	254000	8790	106 J	5.1 U
5	Red-brown clay with silt	21700	21.2 U	15.2	215	0.88	2380	327	238000	1130	1.1 U	109	269000	7400	133 J	5 U
7	Red-brown clay with silt	16600	26 J	14	201	0.35	549	320	178000	614	1.6	73.2	157000	6150	52.6 J	4.3 U
10	Red-brown clay with silt	16300	21.2 J	18.1	207	0.46	298	343	159000	665	1.9	83.7	129000	8530	71.7 J	4.3 U
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
0	Red-brown clay with silt	2380	46.1	15.6 J	36.3	41.1	1650	19700	38400	680	49.7	4730	29.7 U	632	1070
2	Red-brown clay with silt	1750	30.1	24 J	35.5	53.1	2320	35400	69600	748	110	5300	34.4 U	794	1640
5	Red-brown clay with silt	4080	35.2	22.3 J	39	36.4	1880	32800	13300	744	107	5150	33.1 U	654	1780
7	Red-brown clay with silt	2130	56	10.4 J	25.1	47.5	2070	38600	19800	616	37.1	3600	29.3 U	586	2080
10	Red-brown clay with silt	2030	75.8	9.9 J	23.5	58.2	2590	37900	27700	751	50.4	3200	29.4 U	586	2820
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,662.3	3.05	1.9	970.7	0.27	45.4	82.8

F128B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Grayish-brown gravelly silt	18200	8.4 J	7.2	336	0.68	131	68.1	71300	334	3.9	35.2	62600	17500	19.6	3.4
10	Moderate yellowish-brown silt	21600	5.9 J	6.3	185	0.76	43.2	83.5	15400	71.4	4.9	15.2	25000	18400	9.6	8.4
20	Moderate yellowish-brown silt	13900	8.7 J	3.5	85	0.76	15.5	53.7	44600	18.1	6.1	9.8	2880	12900	9.1	11.4
30	Moderate yellowish-brown silt	10400	8.5 J	1.8	187	1.3	9.3	82.4	44200	12.2	6.8	8.3	2090	12700	6.2	10.5
40	Moderate yellowish-brown sandy gravelly silt	15100	4.4 UJ	3.1	156	0.73	14.9	0.71 U	71300	22	6	9.5	3030	13200	9	16.1
50	Moderate yellowish-brown sandy gravelly silt	6810	4.1 UJ	1.4	148	0.72	4.8 U	0.44 U	16000	9.7	6.4	8.5	340	16300	6.1	7.5
60	Sandy gravel with silt	8200	6.7 J	3.1	135	0.57	6.4 U	0.38 U	20700	15.3	8.7	9.5	190	19000	5.2	8.4
70	Dark gray sandy gravel	6070	4.6 J	2	91.8	0.54	6.3 U	0.46 U	4260	7.9	5.6	6.9	180	16500	4.9	6.4
80	Dark gray sandy gravel	4160	4.1 UJ	1.3	74.4	0.51	3.8 U	0.89 U	12800	7.1	3.7	9.3	600	12500	5.3	5
100	Moderate yellowish-brown silt	13400	5.1 J	1.9	153	0.71	10.7	0.53 U	78500	18.4	6.5	12	890	12700	8.3	14
Representative		13,900	14.3	7.7	188	1	12.8	1.9	75,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc
0	Grayish-brown gravelly silt	1560	73.9	0.1	32.2	21.3	326 J	15100 J	18400	73.9	6.5 U	20 U	15.7	248	389
10	Moderate yellowish-brown silt	4020	110	0.27 U	1.5	15.3	138 J	5760 J	12200	7.6	0.54 U	20 U	14.8	139	1060
20	Moderate yellowish-brown silt	15100	274	0.12 U	1.5 U	24.8	112 J	2840	4660	1.2	0.34 U	80	2.9	28.9	1220
30	Moderate yellowish-brown silt	5970	441	0.15 U	1.5 U	34	117 J	2510	3430	4.2	0.32 U	80	0.11 U	17.5	851
40	Moderate yellowish-brown sandy gravelly silt	15700	1030	0.08 U	1.5 U	66.8	103 J	8470	4280	17.1	0.34 U	100	0.12 UJ	28.1	44.8
50	Moderate yellowish-brown sandy gravelly silt	3600	562	0.08 U	1.7 U	20.4	598 J	4500	1940	3.2	0.31 U	80	0.1 U	18.2	51.2
60	Sandy gravel with silt	4830	393	0.08 U	1.4 U	10.7	56.4 J	428	1880	1.1	0.32 U	20 U	0.1 U	25.3	54.6
70	Dark gray sandy gravel	2780	265	0.07 U	1.5 U	6.1	28.6 J	340	1750	1.6	0.3 U	20 U	0.1 U	15.3	52.4
80	Dark gray sandy gravel	1970	250	0.07 U	2.4 U	5	47.4 J	735	1130	1.1	0.31 U	20 U	0.1 U	10.5	43.3
100	Moderate yellowish-brown silt	13100	437	0.08 U	1.6 U	15.9	243 J	31800	3870	13.5	0.37 U	200	0.12 U	21	45.4
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,662.3	3.05	1.9	NC	0.27	45.4	82.8

Notes:
Results are in mg/kg
Depths are in feet
J - Estimated value.
U - Not detected.

Table 4.2.3-33
Concentrations of Parameters in Soil in the Calciner Pond Sediment Storage Area B

F051B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron		Cadmium	Calcium	Chromium	Cobalt		Copper	Fluoride	Iron	Lead		Lithium	
5	Red-brown to tan silty sand	5460	17.1	U	13.3	84.5	0.48	568		261	280000	326	0.89	U	76.1	54400	3870	13.8	UJ	4	U
7	Red-brown to tan silty sand	11800	16.7	U	8.6	114	0.7	20.5	U	3.3	33500	29.1	7		11.1	830	12100	6.7	UJ	10.3	U
9	Red-brown to tan silty sand	10600	15.9	U	9.2	171	0.66	48.2		31.3	32400	133	3.4		18.8	28900	13100	10.9	UJ	3.2	U
11	Red-brown to tan silty sand	14900	17.1	U	8.4	218	0.71	52		36.6	51700	173	3.1		27.8	40900	13400	8.1	UJ	3.5	U
14	Red-brown to tan silty sand	15400	18.2	U	8	158	0.33	43.5		52.9	51600	153	3.7		25.3	30300	13800	6.7	UJ	5.2	U
Representative		13,900	14.3		7.7	188	1	12.8		1.9	75,800	27.5	7.8		12.6	600	14,400	29.1		16.1	

Sample Depth	Sample Description	Magnesium	Manganese		Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver		Sodium	Thallium		Vanadium	Zinc
5	Red-brown to tan silty sand	1190	50.4		1	J	16.1	U	120	1190	85800	8810	805	9.5		4870	26.7	U	390	1250
7	Red-brown to tan silty sand	9680	383		0.25	J	2.8	U	15.1	72.3	2000	5320	4.5	U	0.87	U 992	26	U	44.1	73.2
9	Red-brown to tan silty sand	2060	120		3	J	9	U	14.7	131	6750	5040	187		1.2	1300	24.8	U	110	437
11	Red-brown to tan silty sand	2710	91.1		5.4	J	13.2	U	20.9	140	10500	7010	61.2		2.4	1980	26.7	U	163	480
14	Red-brown to tan silty sand	3570	135		1.6	J	8.8	U	23.1	147	J 16100	6800	40.8		0.84	U 1700	25.2	U	169	538
Representative		22,000	482		0.16		2.15		15.5	3.7	672	3,582.3	3.06		1.9	970.7	0.27		45.4	52.8

F127B

Sample Depth	Sample Description	Aluminum	Antimony		Arsenic	Barium	Beryllium	Boron		Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Grayish-brown sludge	14300	32.8	J	27.1	107	1.8	4380		616	264000	674	7	72.1	221000	6410	54.3	13.5
5	Moderate yellowish-brown silt	6250	10.2	J	2.9	119	0.56	15.2		0.73	U 48000	13	5.2	9.5	500	11100	9.1	10.4
15	Moderate yellowish-brown silt	9030	4.3	UJ	8.3	199	0.55	11.3		0.42	U 52400	14.7	5.4	9.4	470	11700	9.2	10.7
25	Moderate yellowish-brown silt	10300	4.2	UJ	3.8	118	0.57	10.6		0.51	U 54000	15.4	4.9	8.8	530	11600	8	13.2
35	Moderate yellowish-brown silt (wet)	12900	8.1	J	3.7	129	0.68	12.3		0.97	U 36500	17.2	5.8	10.6	420	13200	8.3	16.1
Representative		13,900	14.3		7.7	188	1	12.8		1.9	75,800	27.5	7.8	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury		Molybdenum		Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver		Sulfate	Thallium		Vanadium	Zinc
0	Grayish-brown sludge	5760	107	7.7		39		107	12800	J 64800	42200	376	57.6		8080	26.6		673	8010
5	Moderate yellowish-brown silt	16100	383	0.07	U	1.4	U	11.1	348	J 1850	4790	0.71	0.33	U	180	1.8		16.8	63.5
15	Moderate yellowish-brown silt	17400	370	0.06	U	1.4	U	12.1	61.2	J 695	4840	0.28	U 0.33	U	1920	0.11	U	17.9	46.4
25	Moderate yellowish-brown silt	16400	361	0.06	U	1.4	U	13	2.2	J 611	2280	0.28	U 0.33	U	2300	0.11	U	20.1	40.9
35	Moderate yellowish-brown silt (wet)	11400	389	0.06	U	1.6	U	13	3.5	J 608	2730	0.31	U 0.37	U	1140	0.13	U	23.8	54
Representative		22,000	482	0.16		2.15		15.5	3.7	672	3,582.3	3.06	1.9		NC	0.27		45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet
J - Estimated value
U - Not detected
NC - Not calculated

Table 4.2.3-34
Concentrations of Parameters in Soil in the Former Kiln Scrubber Overflow Pond

F054B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
40	Reddish-yellow silt	18600	18.7 UJ	13.7 J	144	1.7	19.2 UJ	266	42200	22.2	9.5	11.7	2700	14700	7.5 U	15 U
42.5	Reddish-yellow silt	11700	16.5 UJ	7.7 UJ	127	1.4	13.3 UJ	365	43200	16.8	6.7	8.1	1720	10900	6.6 U	9.6 U
45	Reddish-yellow silt	9780	15.9 UJ	5.9 UJ	79.5	0.64	9.4 UJ	123	39600	14.1	7.5	7.8	1280	10500	6.4 U	9.2 U
47.5	Reddish-yellow silt	7540	16.3 UJ	12.5 J	92.1	0.62	10 UJ	89	26600	11.1	6.4	7.4	840	11000	6.6 U	7.4 U
50	Reddish-yellow silt	12900	16.4 UJ	5.3	115	0.91	15.7 J	111	43500	19.2	7.1	8.3	920	12600	11.6 J	12.3
Representative		13,900	14.3	7.7	168	1	12.8	1.9	76,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
40	Reddish-yellow silt	13400	407	0.06 U	3.2 U	26	36.7	2560	4020	4.9 UJ	0.97 U	635	29.2 U	174	889
42.5	Reddish-yellow silt	12400	357	0.06 U	2.8 U	17.5	29.5	2080	2520	21.8 J	0.86 U	680	25.7 U	107	1100
45	Reddish-yellow silt	13300	312	0.06 U	2.7 U	17.4	23.6	1570	1960	5.4 J	0.82 U	683	24.7 U	79.3	512
47.5	Reddish-yellow silt	9510	387	0.09 U	2.8 U	13.6	28.3	1360	1710	16.7 J	0.85 U	703	25.5 U	39.9	399
50	Reddish-yellow silt	14300	385	0.09 U	2.8 U	17.8	31.9	1330	2910	4.7 J	0.85 U	673	25.5 U	62.6	565
Representative		22,000	482	0.16	2.16	15.5	3.7	672	3,982.3	3.05	1.9	970.7	0.37	45.4	52.8

F130B

Sample Depth	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Calcium	Chromium	Cobalt	Copper	Fluoride	Iron	Lead	Lithium
0	Dark yellow silt	5760	3.9 UJ	1.9	97.7	1.3	217	77.7	264000	304	0.4 U	77.7	37400	3830	12.3	5.4
10	Moderate yellowish-brown silt	16900	4.5 UJ	11.3	159	1.5	12.1	281	36800	22.8	9	10.8	3380	13700	9.9	12.1
20	Moderate yellowish-brown silt	9560	4.6 UJ	11.5	139	1.1	5.3 UJ	176	49100	13.1	8.1	11.1	1390	10800	9.7	9.6
30	Sandy gravel	3080	4 UJ	2.4	59.1	0.3	3.2 U	76	6530	22.7	2.4	5.7	349	9260	3.7	2.4
40	Sandy gravel	1720	3.8 UJ	4.5	38.3	0.17	2.4 U	18.3	4900	5.7	3.4	6.1	108	9470	2.5	2
50	Sandy gravel	1810	3.8 UJ	12.4	30.8	0.31	2.1 U	16	1960	6.9	4.9	14.2	244	18600	4.9	1.4
60	Dark gray silty sandy gravel	2290	8.2 J	3	72.5	0.38	1.8 U	1	6380	5.7	3.9	14.2	232	13800	4.4	4.3
70	Moderate yellowish-brown sandy silt	15200	4.8 UJ	7.4	139	1	7.2 U	0.41	4820	20.5	8	10.3	540	17200	10.2	15.6
80	Dark yellowish-brown sandy gravel with silt	8640	4.5 UJ	3.7	185	0.7	9.7	1.1	19000	18.9	7.7	38.3	325	19400	7.3	9
100	Dark yellowish-brown sandy gravel with silt	8820	4.7 UJ	3.1	116	0.86	5.1 U	0.36 U	26400	12.8	6.1	6.9	378	12800	9.8	8.9
Representative		13,900	14.3	7.7	168	1	12.8	1.9	76,800	27.5	7.6	12.6	600	14,400	29.1	16.1

Sample Depth	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Orthophosphate	Total Phosphorus	Potassium	Selenium	Silver	Sulfate	Thallium	Vanadium	Zinc
0	Dark yellow silt	1130	394	1	7.5 U	75.4	22.1	69300	2470	4.9	7	150	5.1 J	281	605
10	Moderate yellowish-brown silt	12100	329	0.45 U	1.5 U	22	61.1	3150	3370	11.6	0.34 U	280	12.8 J	155	823
20	Moderate yellowish-brown silt	14600	448	0.06 U	1.5 U	20.4	67.3	1730	1930	8.6	0.36 U	200	0.3	84.2	869
30	Sandy gravel	1590	323	0.19	4.1 U	14.4	35.2	920	819	5.4	0.31 U	20	0.1 UJ	12.1	1070
40	Sandy gravel	926	460	0.57	1.3 U	10.9	3	45.6	363	1.6	0.3 U	20	0.09 UJ	6.6	135
50	Sandy gravel	607	247	0.35	1.3 U	14.6	11.5	325	585	2.1	0.3 U	40	0.1 UJ	11.2	149
60	Dark gray silty sandy gravel	1150	383	0.51	4.1 U	10.3	2.1	472	664	2.2	0.3 U	20 U	0.1 UJ	8.9	48.3
70	Moderate yellowish-brown sandy silt	6960	551	0.2	1.6 U	18.3	2.6	817	3080	2.9	0.37 U	80	0.15 J	28.3	53.9
80	Dark yellowish-brown sandy gravel with silt	4250	421	0.57	2.6 U	13.5	42	853	1700	1.8	0.35 U	200	0.11 UJ	23.7	57.3
100	Dark yellowish-brown sandy gravel with silt	5320	358	1.2	1.6 U	7.6	78.5	788	1790	2.2	0.36 U	320	0.13 J	18.7	37.2
Representative		22,000	482	0.16	2.15	15.5	3.7	672	3,982.3	3.05	1.9	NC	0.37	45.4	52.8

Notes:
Results are in mg/kg
Depths are in feet.
J - Estimated value.
U - Not detected.
NC - Not calculated

Table 4.2.4-1
Facility Soil Summary

SIMPLOT AREAS	Soil Boring Identification Numbers	Depth of Fill (feet bgs)[a]	Maximum Depth Sampled (feet bgs)[a]	Maximum Depth of EMF-Related Representative Level Exceedance in Native Soil (feet bgs)[a,b,c]	Predominant EMF-Related Constituents Above Representative Levels at Maximum Depth[c]
Without Head:					
Triple Superphosphate Area	S050B-S053B, S098B	0-3.5	10	10	P, SO4
Former Phosphoric Acid Loading/Railcar Cleaning Area	S056B, S103B	7	7	No native soils sampled	
Sulfuric Acid Plants #1 and #2	S062B-S065B, S104B	0-7	20	Not applicable (d)	
Phosphoric Acid Tank Containment Area	S054B, S055B,	4	5	5	P
Phosphoric Acid Loading Area	S066B, S067B, S105B	7-8	10	10	P
Ammonium Phosphate Plant #1	S030B-S037B, S106B-S107B	9	10	10	P, SO4
Ammonium Phosphate Plant #2	S038B-S045B, S107B	2	12	12	SO4
Roads	S082B-S086B, S088B-S090B, S093B-S096B	0-2	2	2	Various (b)
Bone Yard	S079B-S081B	None	2	2	Various (b)
Ammonium Sulfate Plant	S046B-S049B, S109B	2	10	10	SO4
Sulfuric Acid Loading Dock	S058B-S061B	0.5	10	Not applicable (d)	
Water Reclaim Area	S072B, S073B, S102B	0-3	20	7	F, P, SO4
Former Ore Pile Area	S074B-S078B	None	2	less than 2	Various (b)
Former Pillow Tank Area	S010B, S011B	None	20	Not applicable (d)	
With Head:					
Former Water Treatment Settling Pond	S007B	12	25	15	Various (b)
Dewatering Pit	S008B	2.5	26	2.5	F
East Overflow Pond	S099B	None	50	50	F, P, SO4, Cd, Zn
Upper Gypsum Stack	S003B-S006B	38-66	220	169	P
Lower Gypsum Stack	S001B, S002B	65	145	145	P
Former Cooling Pond Area	S070B, S100B	10-15	80	55	F, P
Cooling Tower Area	S068B, S069B, S101B	7.5	17	17	P, Zn
Former Unlined Ditch	UDP01-UDP04, S097B, SSODP01-SSODP06, SBSODP01-SBSODP04	None	33	2	Various (b)

FMC AREAS	Soil Boring Identification Numbers	Depth of Fill (feet bgs)[a]	Maximum Depth Sampled (feet bgs)[a]	Maximum Depth of EMF-Related Representative Level Exceedance in Native Soil (feet bgs)[a,b,c]	Predominant EMF-Related Constituents Above Representative Levels at Maximum Depth[c]
Without Head:					
PCB Storage Shed	F043B-F045B	7.5-17	17	Not applicable (d)	
Phossy Waste/Precipitator Slurry Pipeline Cleanout Areas	F070B-F079B	3-25	27	27	P
Septic Drainfields	F046B-F049B	less than 2.5	11	10	P
Tree-Line Area Adjacent to Former Pond 7S	F055B-F057B	7	7	Not applicable (d)	
Long-Term Phosphorus Storage Area	F062B, F063B	None	7	7	Various (b)
Railcar Loading and Unloading at Bannock Paving Company	F083B, F084B	7-9	9	No native soils sampled	
Secondary Condenser Area	F052B, F053B	10+	20	17	Zn, F, P, gross alpha
Former Transformer Salvage Area	F035B, F036B	6-10	12	11	P, K
Bannock Paving Area	F080B-F082B	4-5	9	7	Various (b)
Chemical Lab Seepage Pit	F028B, F029B	Not known	70	30	P, Zn
Pave Area North of Furnace Building	F066B-F069B	3-5	9	Not applicable (d)	
Area West of Mobile Shop	F060B, F061B	2	2	No native soils sampled	
Phos Dock Area	F064B	4.5	4.5	No native soils sampled	
Shale Ore Handling	F090B-F094B	0-5	8	6	P
Roads	F101B, 101R, F102B, F103B, 104R, F105B, F106B, 107R, F108B-F110B, F111R-F115R, F119R, F121R, F122R, F123B-F126B, F129B	0-2	2	2	P, F, K, Zn
Waste Oil Storage Area	F037B	20	20	Not applicable (d)	
9S Storage Area	F034B	5	20	15	F, P, K, Zn
Active Landfill	F027B	None	138	Not applicable	
8S Recovery Process	F058, F059B	9	10	10	Various (b)
With Head:					
Former Pond 8S	B150, B12, B13	10-14	90	90	P, Zn
Former Pond 1E	B-1, F033B	4.5	31	31	F, P, K, Zn
Former Pond 4E	F024B	11	75	75	F, P, K, Zn
Former Pond 5E	114, F025B	5	141	141	F, P, K
Former Pond 6E	130, F026B	None	180	180	P, K
Former Pond 7E	F162B	None	70	26	P, Ni
Railroad Swale	F039B-F042B, F131B	7.5-18	80	70	P
IWW Basin and Ditch	F130B	None	75	Surface	Various (b)
Calciner Ponds and Calciner Pond Sediments	F023B, F050B, F051B, F128, F127B	0-14	100	100	P, F, K, Ca, Se, Ni
Former Kiln Scrubber Overflow Pond	F054B, F130	40	90	50	Zn, Cd

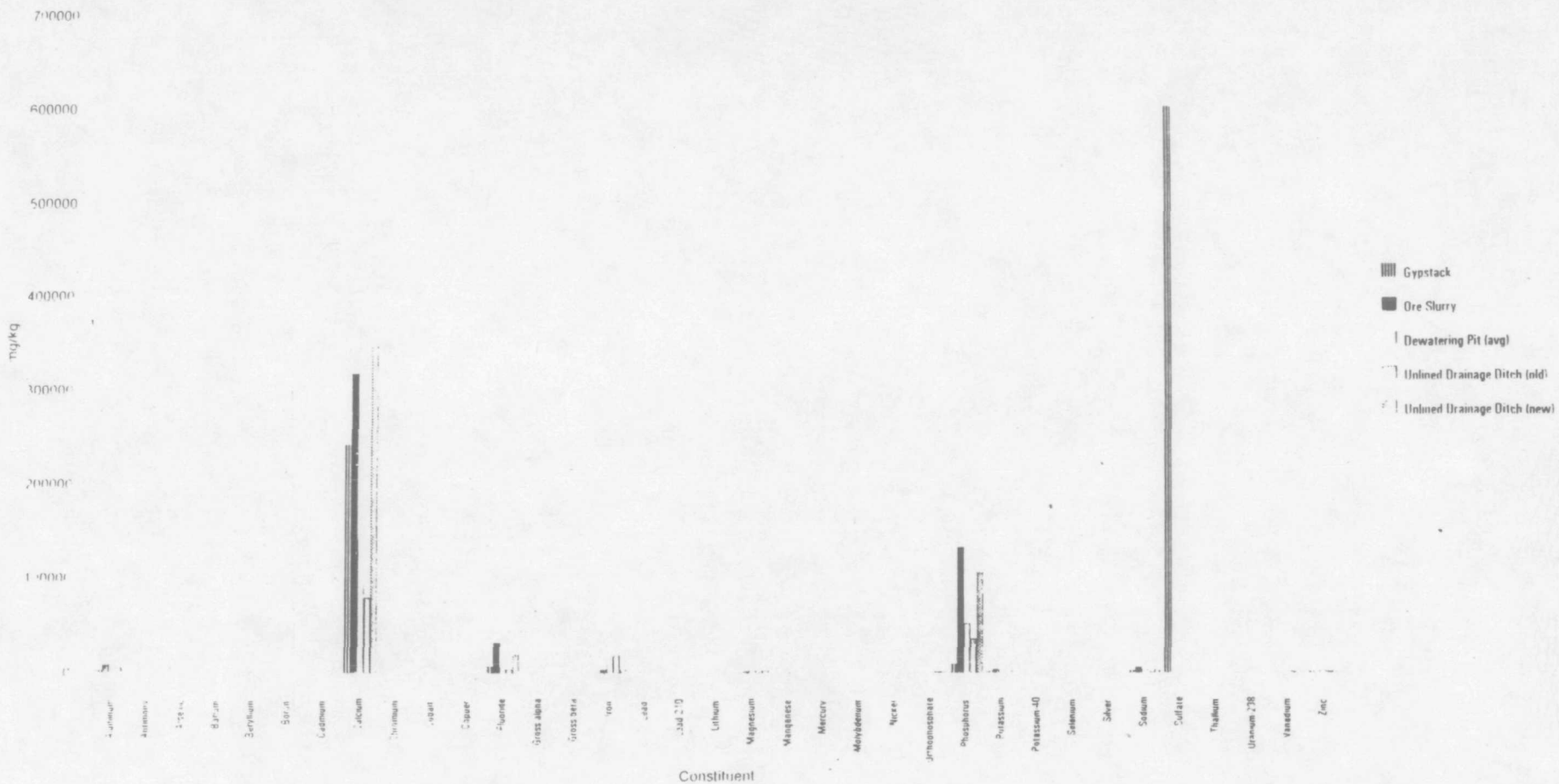
Notes:

(a) Depths are approximate.

(b) "Various" - See text and tables in Section 4.2.2 or 4.2.3 for specific list of constituents.

(c) Depths and constituents do not necessarily reflect all representative level exceedances. Table was developed from area text summaries provided in Sections 4.2.2 and 4.2.3 for which the assessment of EMF-related effects was based on the nature, magnitude and number of representative level exceedances.

(d) "Not applicable" - EMF-related constituents did not exceed representative levels in native soils.



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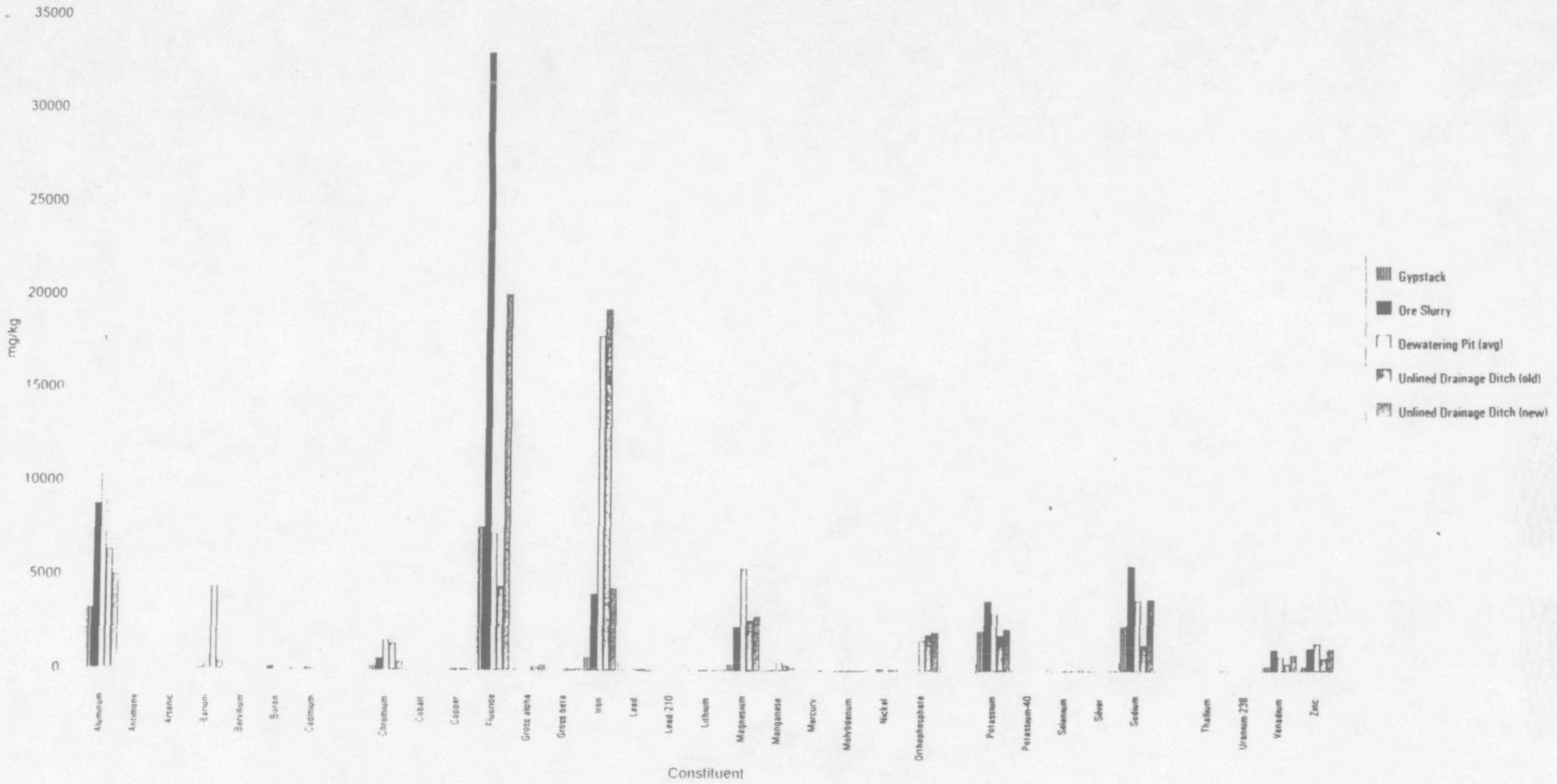
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Characteristic Constituents of Simplot Potential Source Solids

CTR No	DRAWING No	REV
21372	FIGURE 4.2.2-1	



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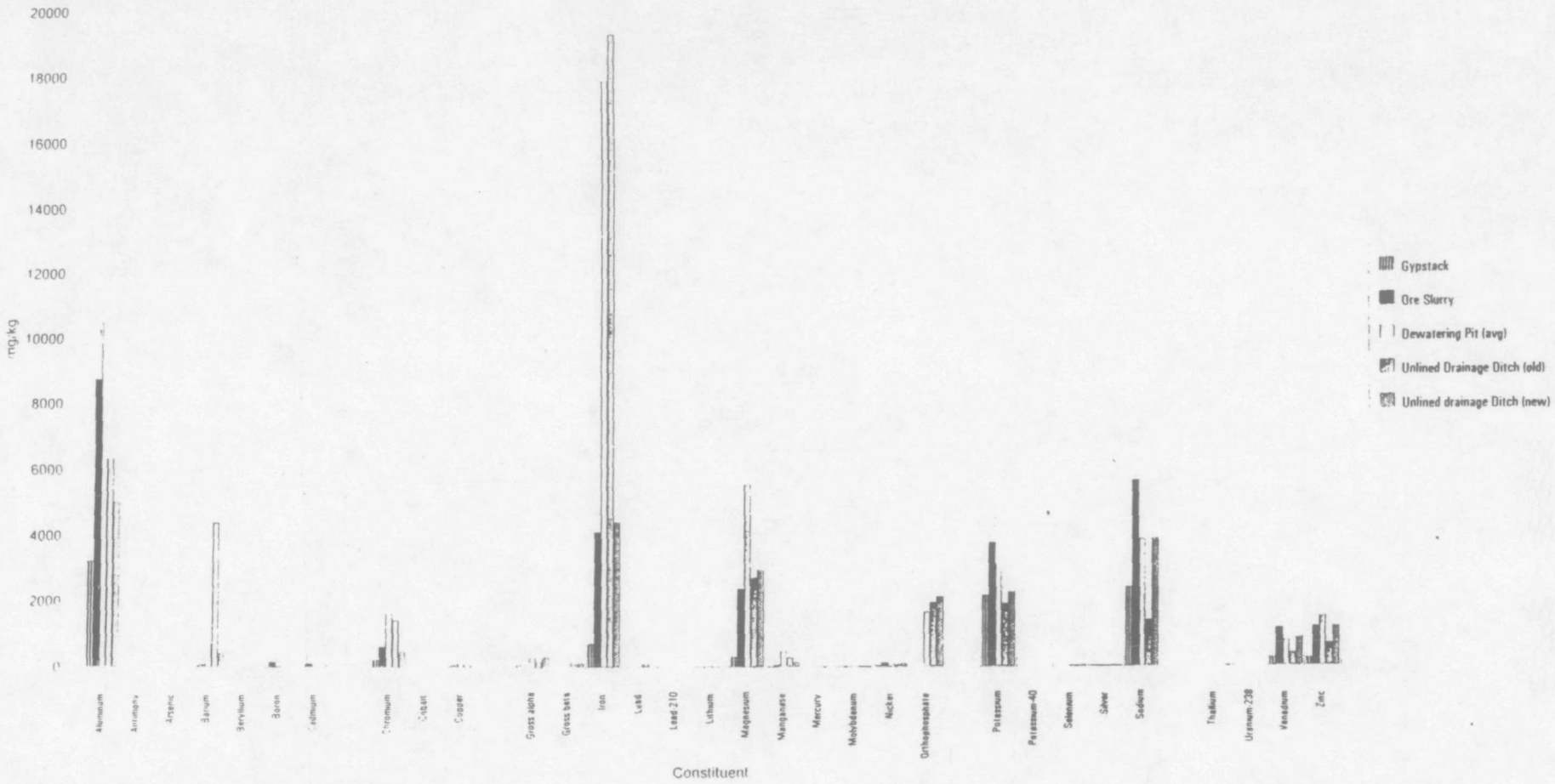
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Characteristic Constituents of Simplot Potential Source Solids without Sulfate, Total Phosphorus, or Calcium

JOB No	DRAWING No	REV
21372	FIGURE 4.2.2-2	



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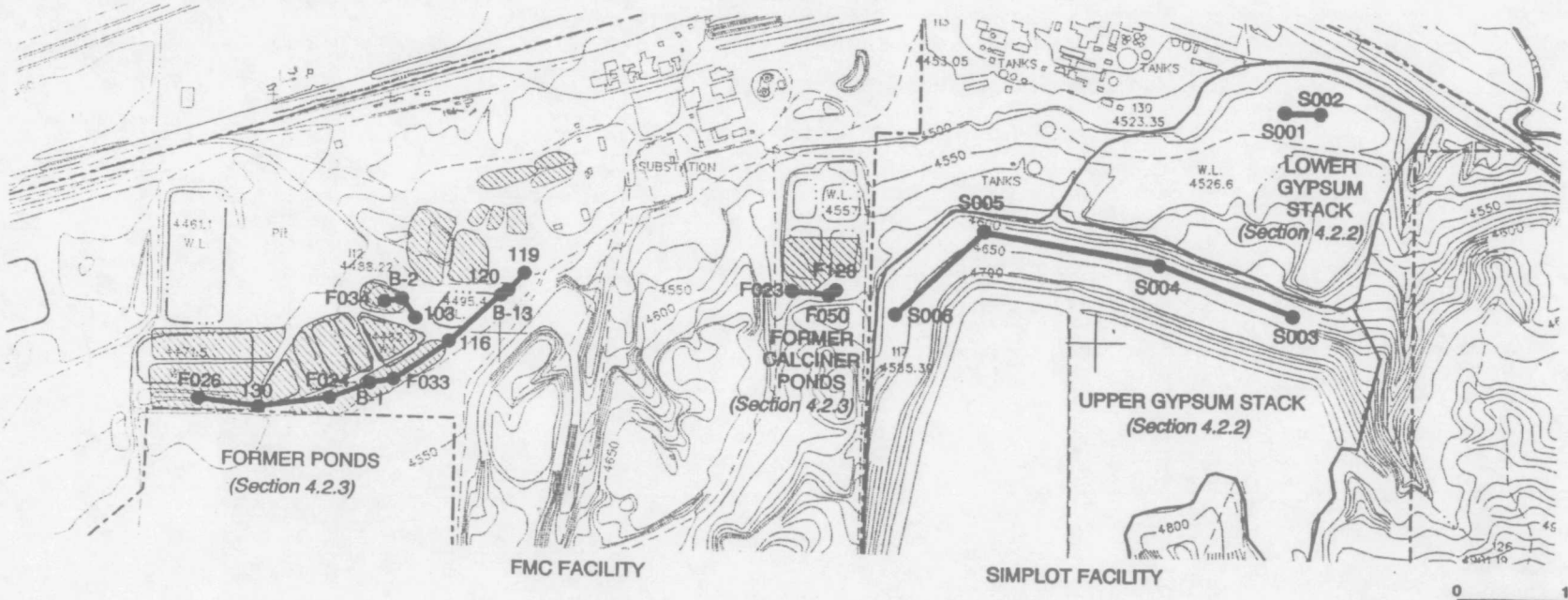
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Characteristic Constituents of Simplot Potential Source Solids without Sulfate, Fluoride, Total Phosphorus, or Calcium

JOB No	DRAWING No	REV
21372	FIGURE 4.2.2-3	



Legend:

- Cross-Section
- F034 Soil Boring
- Former Pond

0 1000 2000 FEET

0 200 400 600 METERS

N

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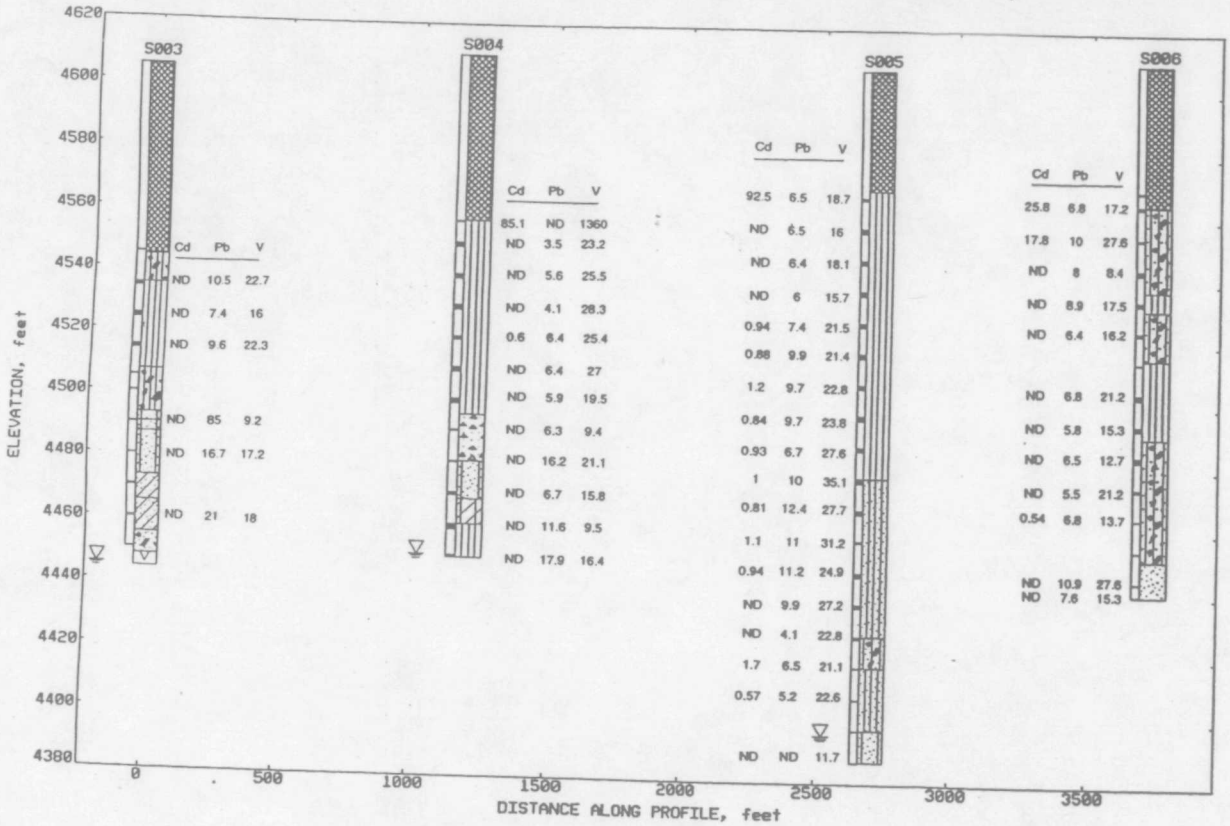
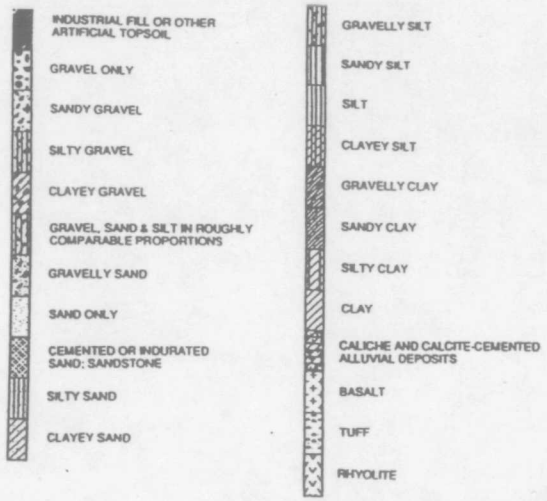
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Cross-Section Lines - Facility Soils

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.2-4	



EXPLANATION OF SOIL AND ROCK SYMBOLS



Cd = Cadmium

Pb = Lead

V = Vanadium

Cd	Pb	V
25	86.8	17.2

(Concentrations in mg/kg)

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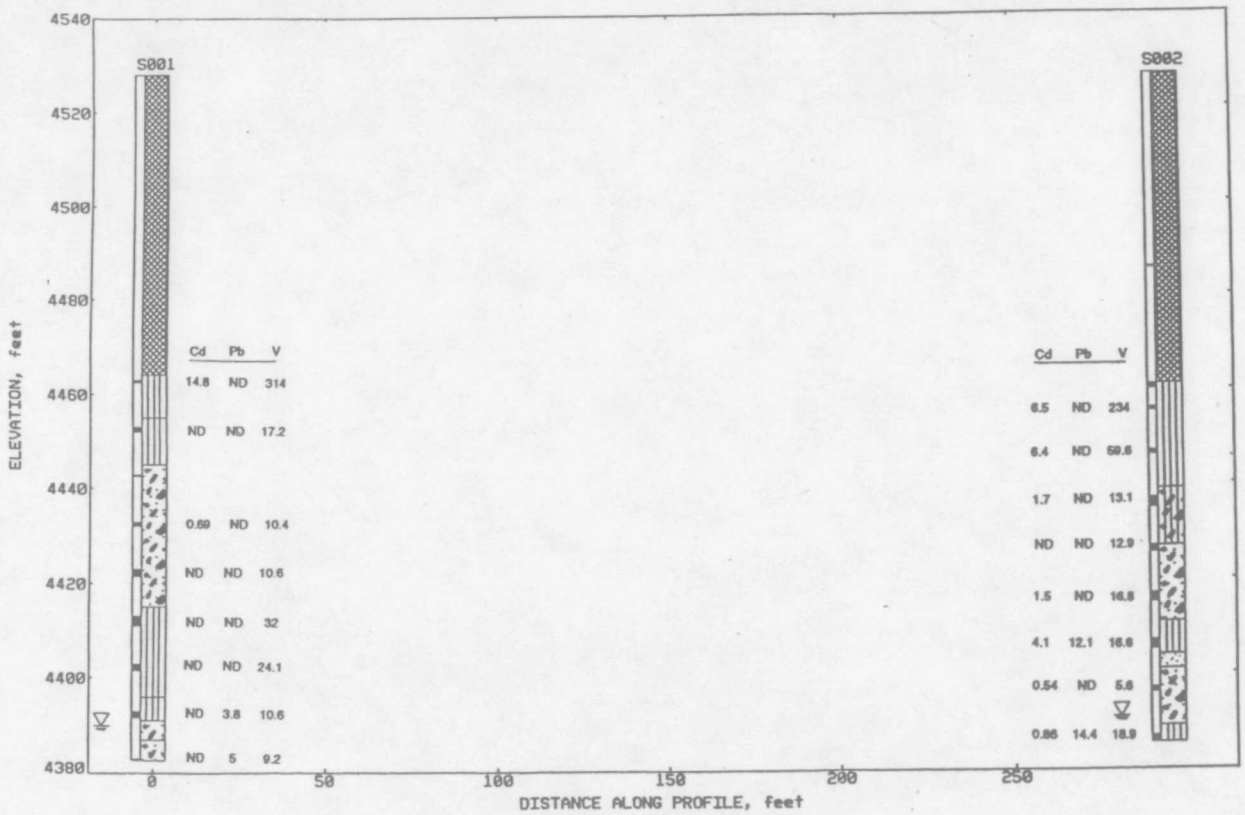
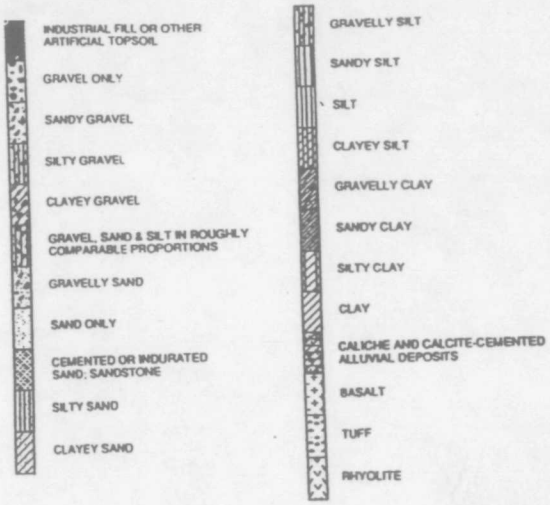
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Cross Section of Upper Gypsum Stack, Cadmium, Lead, and Vanadium Profile

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.2-5	0



EXPLANATION OF SOIL AND ROCK SYMBOLS



Cd = Cadmium

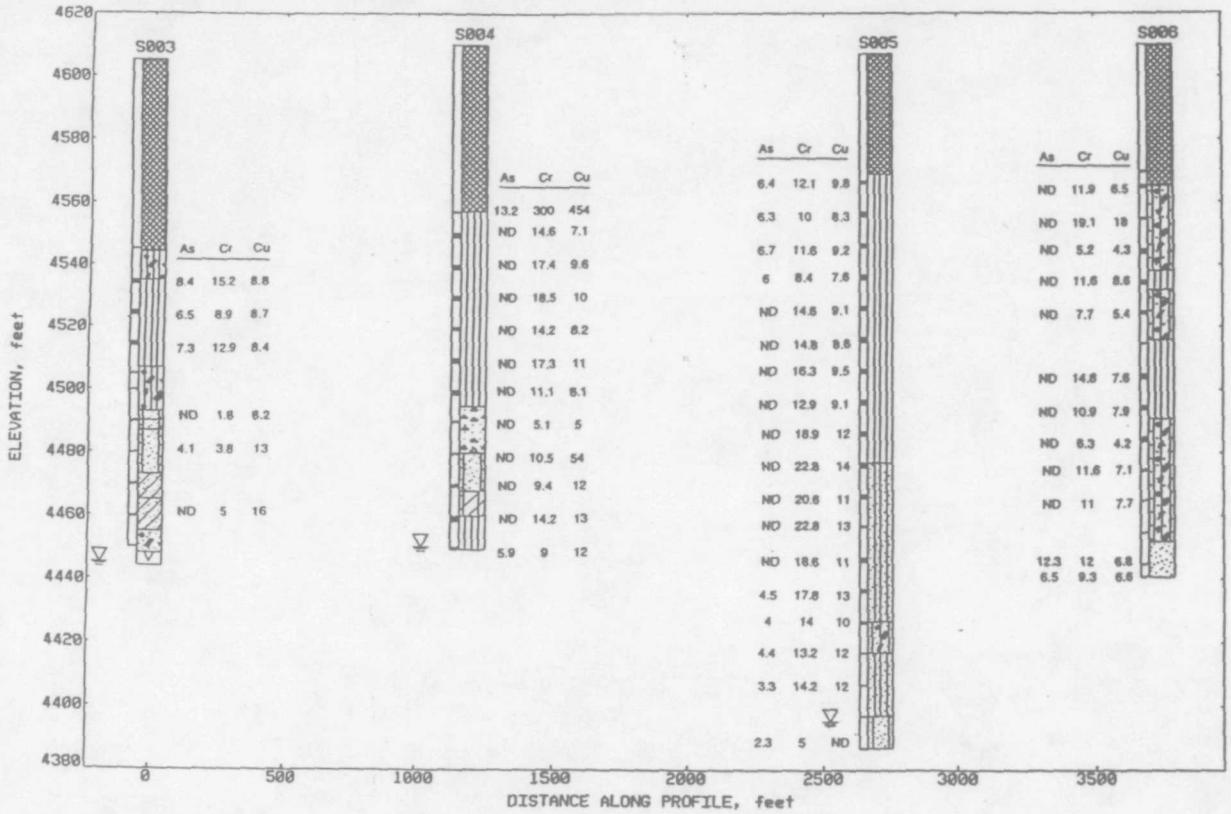
Pb = Lead

V = Vanadium

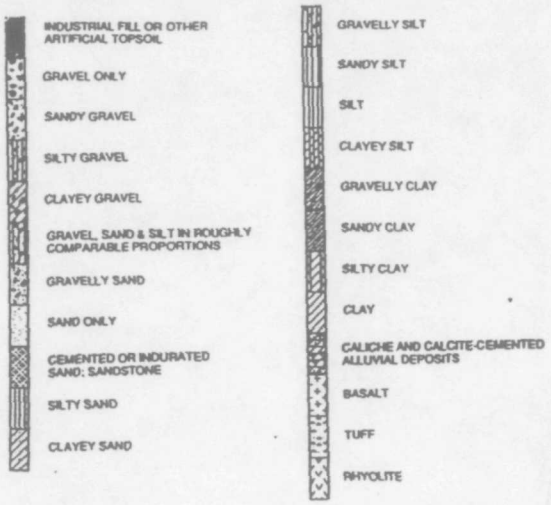
Cd	Pb	V
4.1	12.1	16.6

(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO			
EASTERN MICHAUD FLATS POCATELLO, IDAHO			
Cross Section of Lower Gypsum Stack, Cadmium, Lead, and Vanadium Profile			
BECHTEL	JOB No. 21372	DRAWING NO. FIGURE 4.2.2-6	REV.



EXPLANATION OF SOIL AND ROCK SYMBOLS



As = Arsenic

Cr = Chromium

Cu = Copper

As	Cr	Cu	
6.4	12.1	9.8	(Concentrations in mg/kg)

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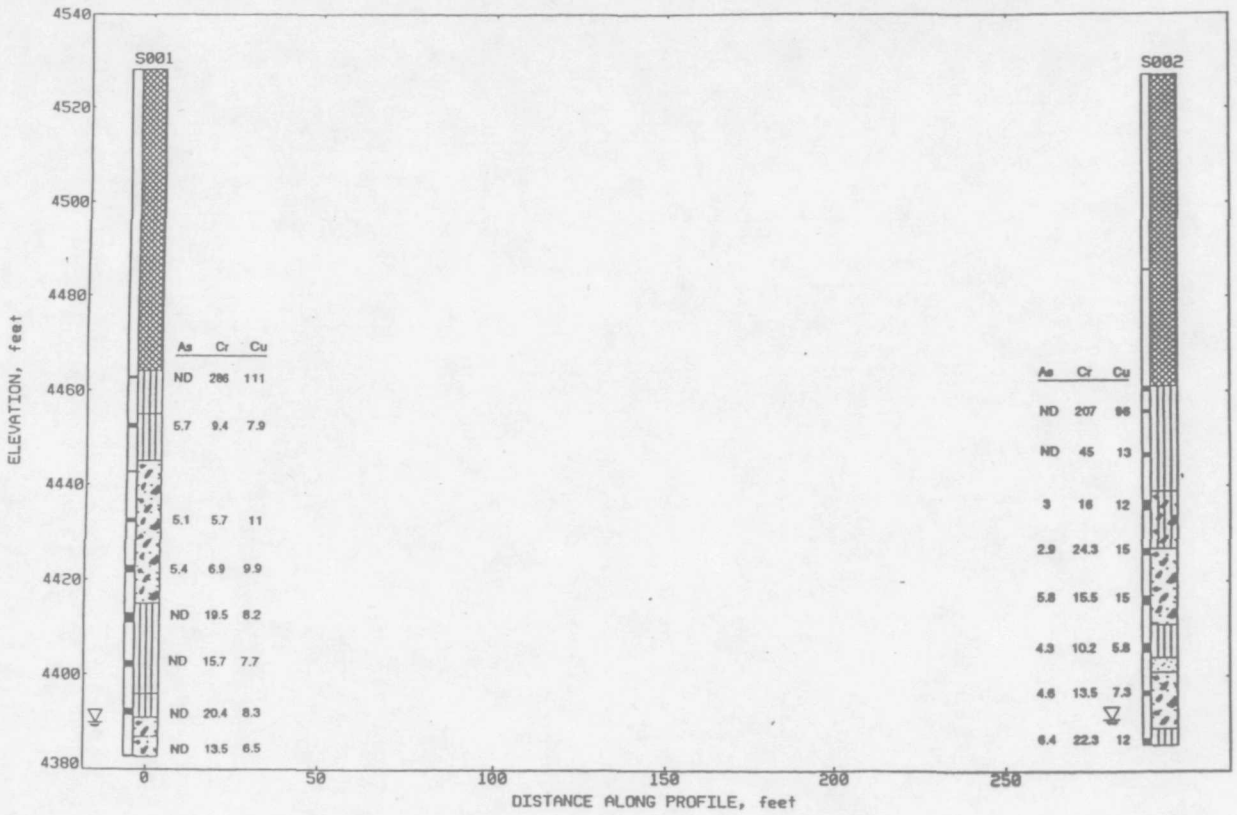
SAN FRANCISCO

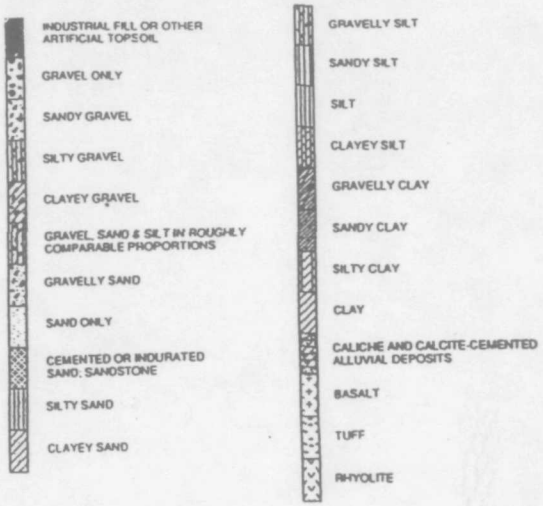
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Cross Section of Upper Gypsum Stack, Arsenic, Chromium, and Copper Profile

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.2-7	0



EXPLANATION OF SOIL AND ROCK SYMBOLS



As = Arsenic

Cr = Chromium

Cu = Copper

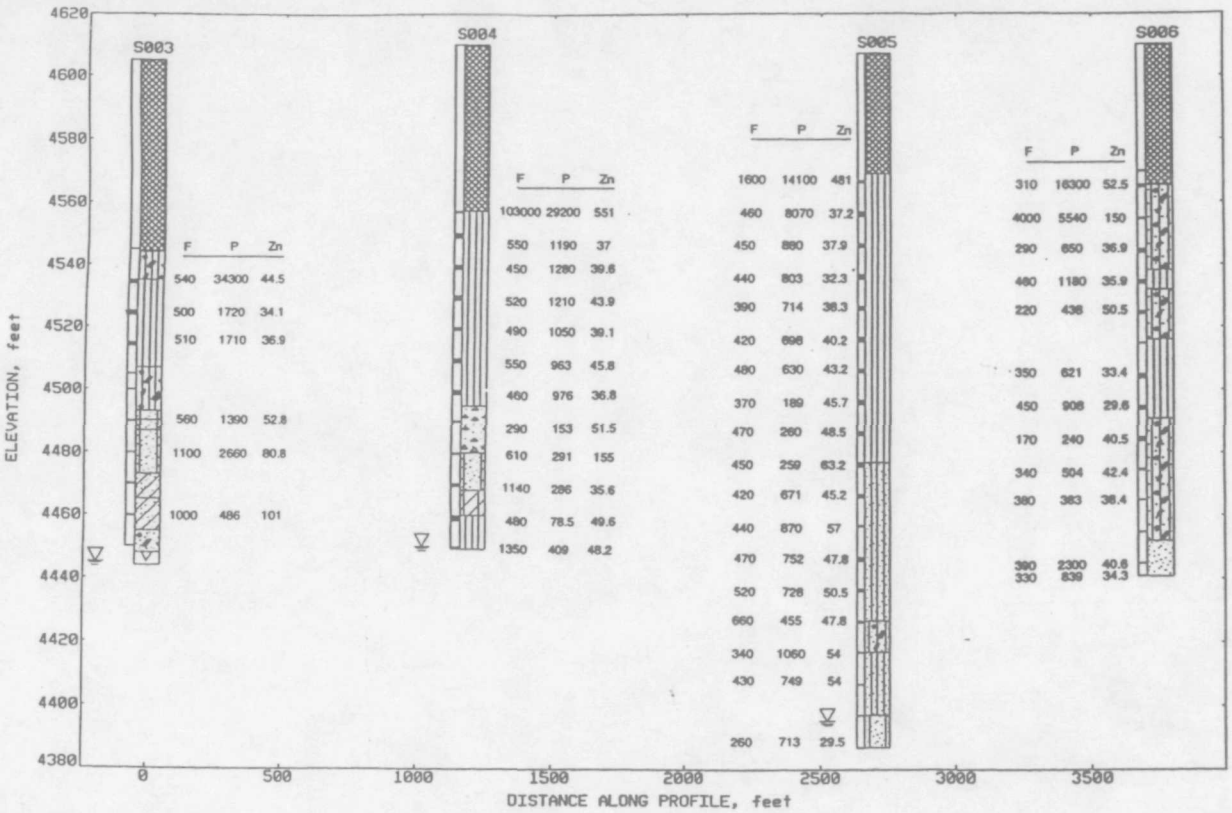
As	Cr	Cu	
3	16	12	(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

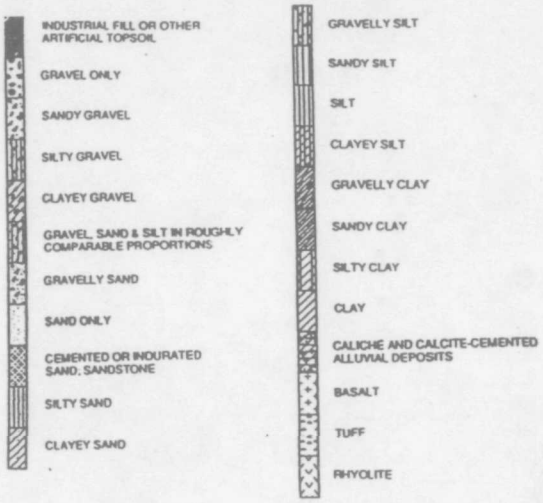
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Cross Section of Lower Gypsum Stack, Arsenic, Chromium, and Copper Profile

JOB No.	DRAWING NO.	REV.
21372	FIGURE 4.2.2-8	



EXPLANATION OF SOIL AND ROCK SYMBOLS



F = Fluoride

P = Phosphoruos

Zn = Zinc

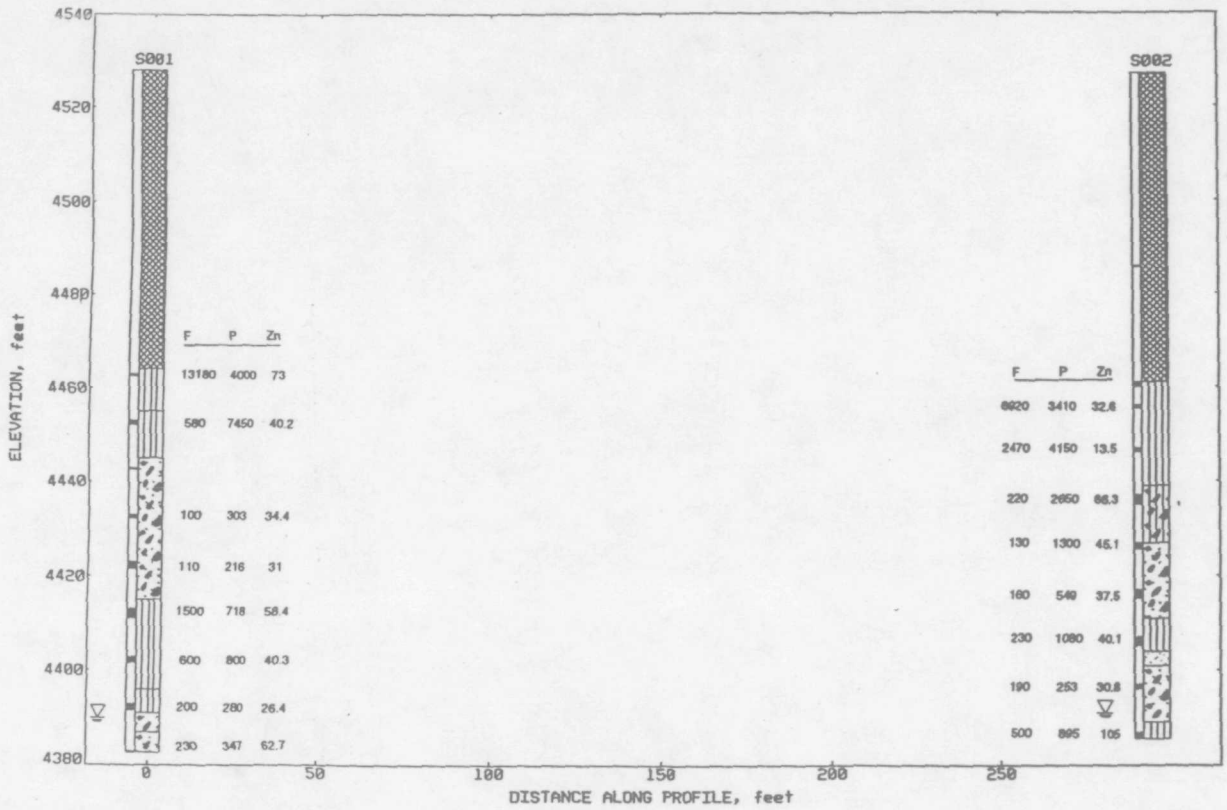
F	P	Zn	
480	78.5	49.6	(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

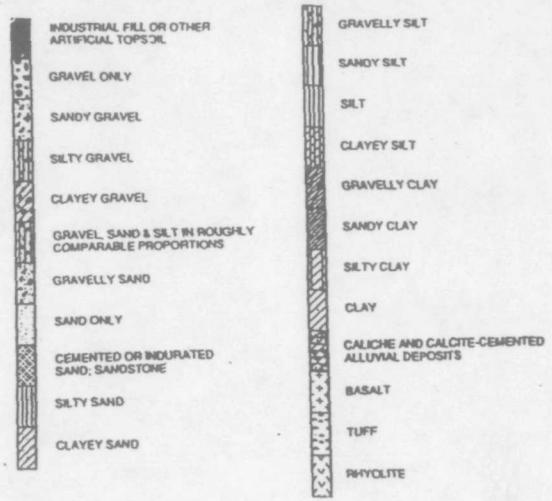
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Cross Section of Upper Gypsum Stack, Fluoride, Total Phosphorus, and Zinc Profile

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.2-9	0



EXPLANATION OF SOIL AND ROCK SYMBOLS



F = Fluoride

P = Phosphorous

Zn = Zinc

F	P	Zn	
160	549	37.5	(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Cross Section of Lower Gypsum Stack, Fluoride, Total Phosphorus, and Zinc Profile

JOB No.	DRAWING NO.	REV.
21372	FIGURE 4.2.2-10	

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Characteristic Constituents of FMC Potential Source Solids

JOB No	DRAWING NO.	REV
21372	FIGURE 4.2.3-1	

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Characteristic Constituents of FMC Potential Source Solids Without Calcium

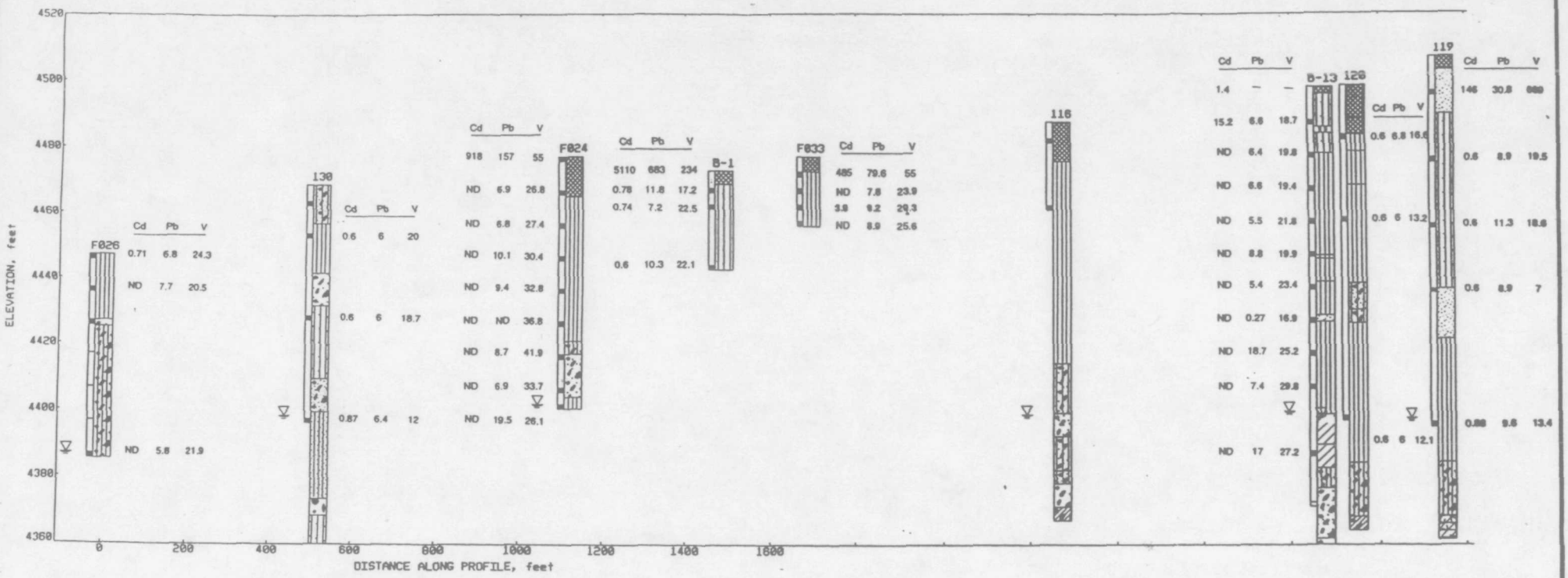
JOB No.	DRAWING NO.	REV
21372	FIGURE 4.2.3-2	

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Characteristic Constituents of FMC Potential Source Solids Without Calcium, Fluoride, and Total Phosphorous

JOB No	DRAWING NO.
21372	FIGURE 4.2.3-3



EXPLANATION OF SOIL AND ROCK SYMBOLS

- INDUSTRIAL FILL OR OTHER ARTIFICIAL TOPSOIL
- GRAVEL ONLY
- SANDY GRAVEL
- SILTY GRAVEL
- CLAYEY GRAVEL
- GRAVELLY SILT
- SANDY SILT
- SILT
- CLAYEY SILT
- GRAVELLY CLAY
- SANDY CLAY
- SILTY CLAY
- CLAY
- CALICHE AND CALCITE-CEMENTED ALLUVIAL DEPOSITS
- BASALT
- TUFF
- RHYOLITE
- GRAVEL, SAND & SILT IN ROUGHLY COMPARABLE PROPORTIONS
- GRAVELLY SAND
- SAND ONLY
- CEMENTED OR INDURATED SAND; SANDSTONE
- SILTY SAND
- CLAYEY SAND

Cd = Cadmium

Pb = Lead

V = Vanadium

Cd	Pb	V
0.88	9.6	13.4

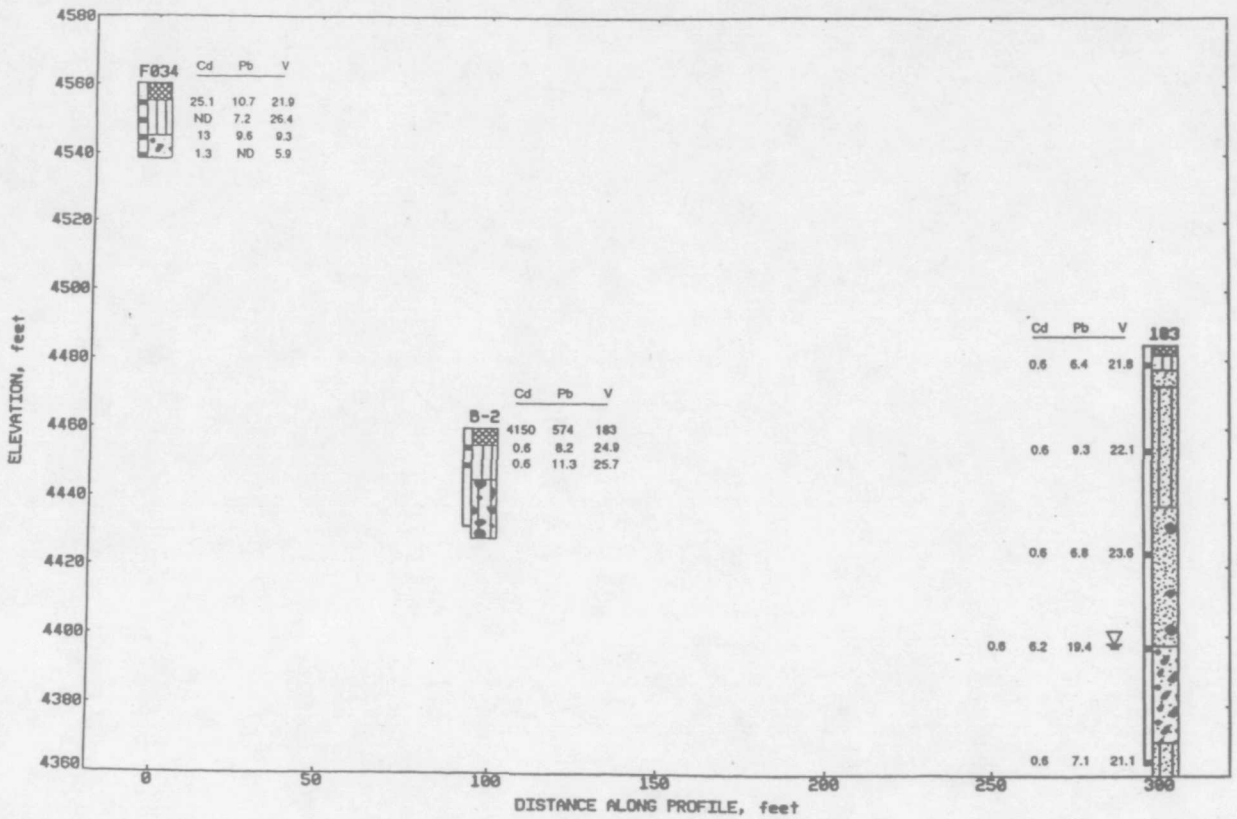
(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

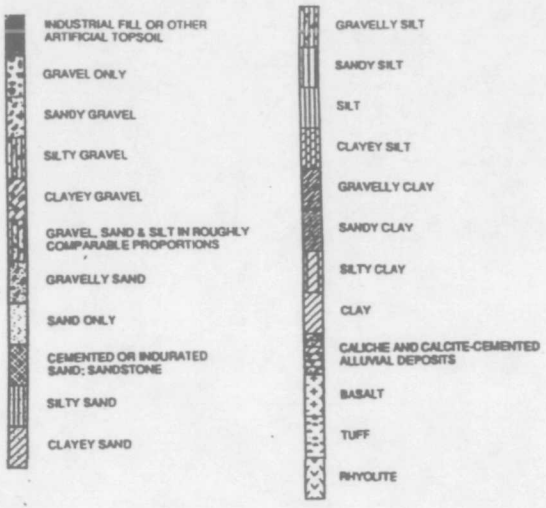
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Southwest Pond Area Section
Cadmium, Lead and Vanadium Profile
(Sheet 1 of 2)

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.3-4	0



EXPLANATION OF SOIL AND ROCK SYMBOLS



Cd = Cadmium

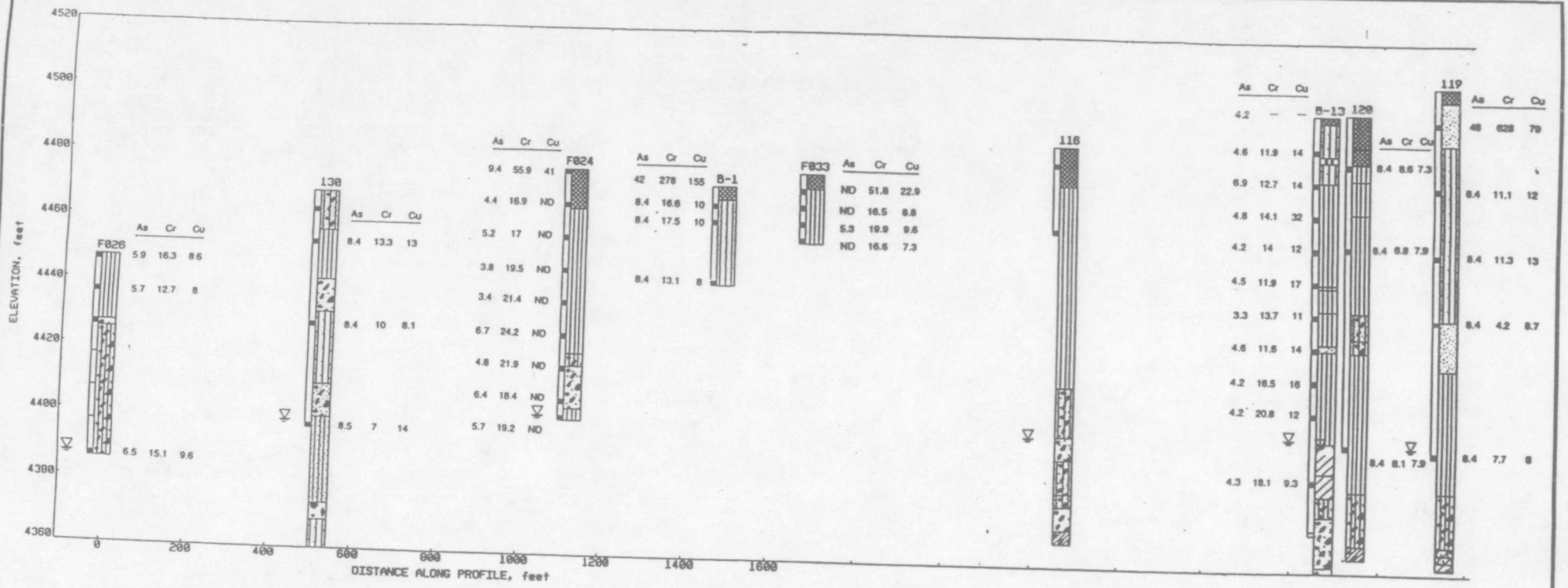
Pb = Chromium

V = Vanadium

Cd	Pb	V
0.6	7.1	21.1

(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO			
EASTERN MICHAUD FLATS POCATELLO, IDAHO			
Southwest Pond Area Section Cadmium, Lead, and Vanadium Profile (Sheet 2 of 2)			
BECHTEL	Job Number	Drawing No.	Rev.
	21372	FIGURE 4.2.3-4	0



EXPLANATION OF SOIL AND ROCK SYMBOLS

- INDUSTRIAL FILL OR OTHER ARTIFICIAL TOPSOIL
- GRAVEL ONLY
- SANDY GRAVEL
- SILTY GRAVEL
- CLAYEY GRAVEL
- GRAVELLY SILT
- SANDY SILT
- SILT
- CLAYEY SILT
- GRAVELLY CLAY
- SANDY CLAY
- SILTY CLAY
- CLAY
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- BASALT
- TUFF
- RHYOLITE
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- GRAVELLY SAND
- SAND ONLY
- CEMENTED OR INDURATED SAND; SANDSTONE
- SILTY SAND
- CLAYEY SAND

As = Arsenic

Cr = Chromium

Cu = Copper

As	Cr	Cu
4.3	18.1	9.3

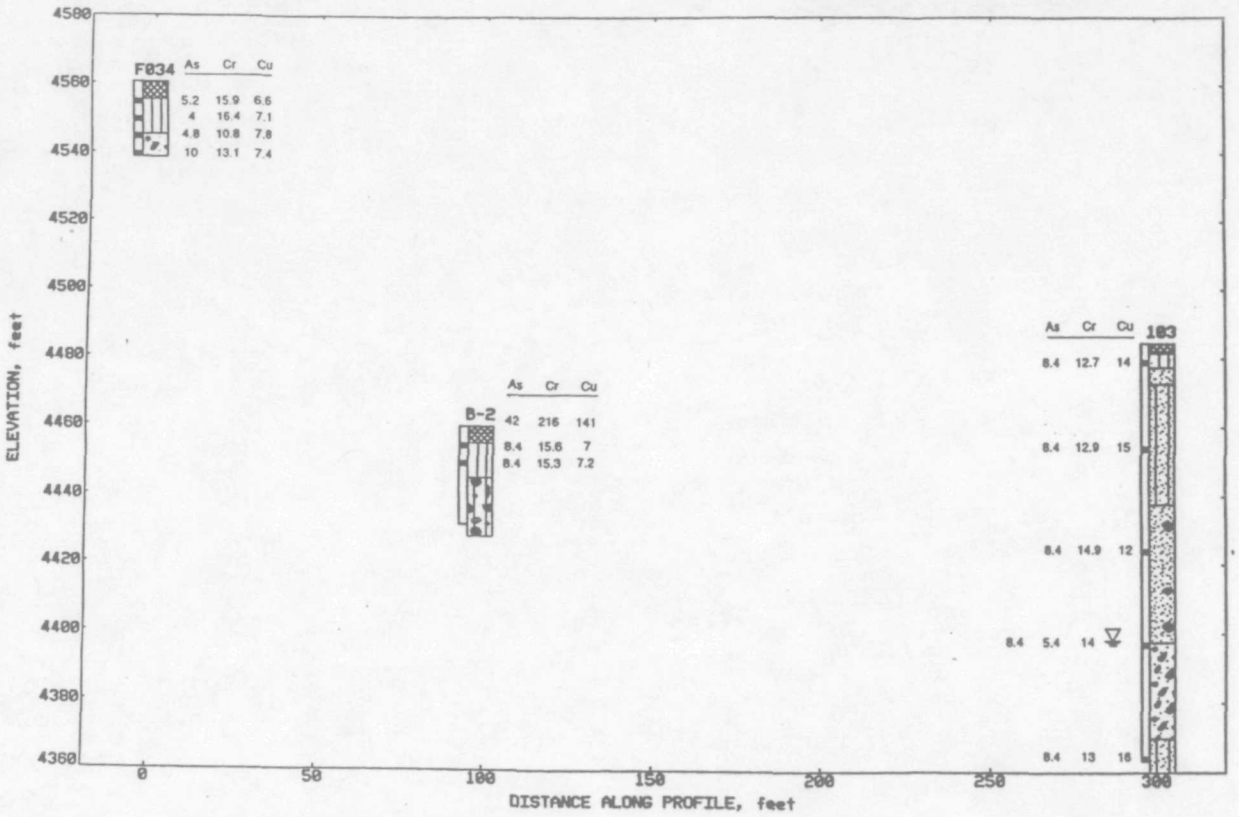
(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Southwest Pond Area Section
Arsenic, Chromium, and Copper Profile
(Sheet 1 of 2)

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.3-5	0



EXPLANATION OF SOIL AND ROCK SYMBOLS

- INDUSTRIAL FILL OR OTHER ARTIFICIAL TOPSOIL
- GRAVEL ONLY
- SANDY GRAVEL
- SILTY GRAVEL
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- GRAVEL, SAND & SILT IN ROUGHLY COMPARABLE PROPORTIONS
- GRAVELLY SAND
- SAND ONLY
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- GRAVELLY SILT
- SANDY SILT
- SILT
- CLAYEY SILT
- GRAVELLY CLAY
- SANDY CLAY
- SILTY CLAY
- CLAY
- CALICHE AND CALCITE-CEMENTED ALLUVIAL DEPOSITS
- BASALT
- TUFF
- RHYOLITE

As = Arsenic

Cr = Chromium

Cu = Copper

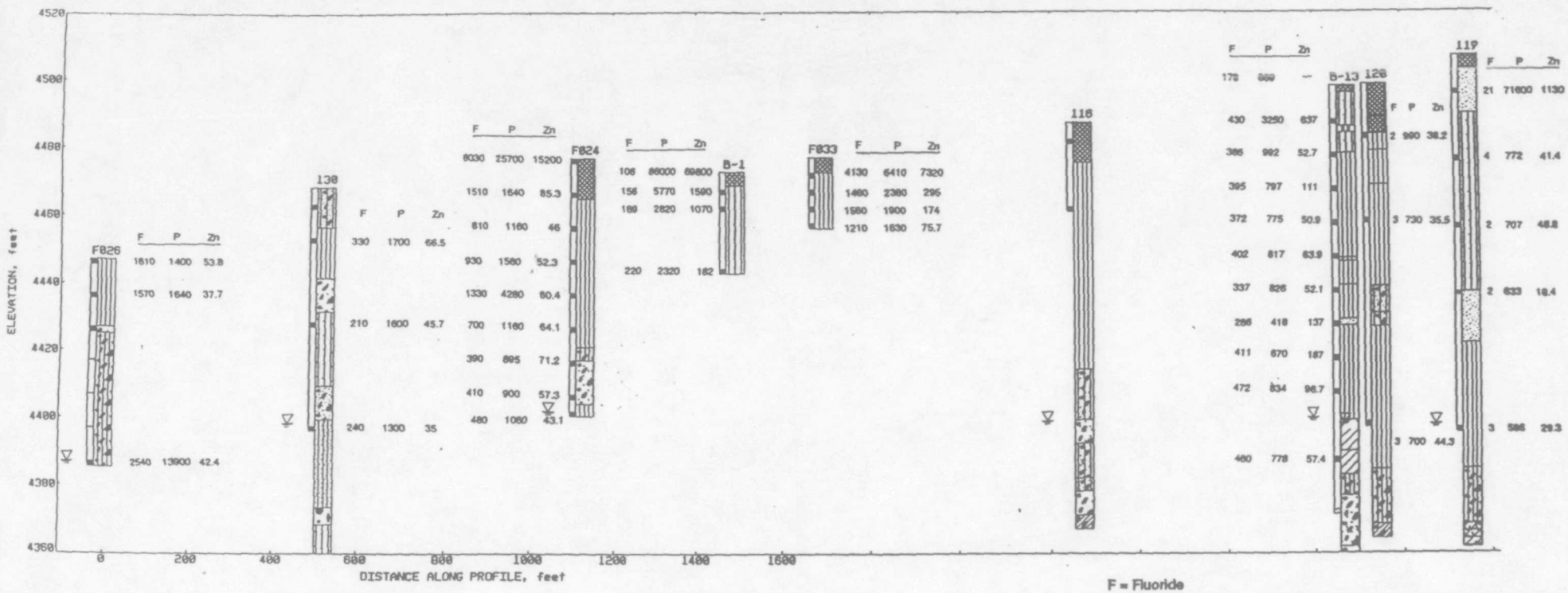
As	Cr	Cu	
8.4	14.9	12	(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Southwest Pond Area Section
Arsenic, Chromium, and Copper Profile
(Sheet 2 of 2)

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.3-5	0



F = Fluoride

P = Phosphorous

Zn = Zinc

F	P	Zn	
3	586	29.3	(Concentrations in mg/kg)

EXPLANATION OF SOIL AND ROCK SYMBOLS

- INDUSTRIAL FILL OR OTHER ARTIFICIAL TOPSOIL
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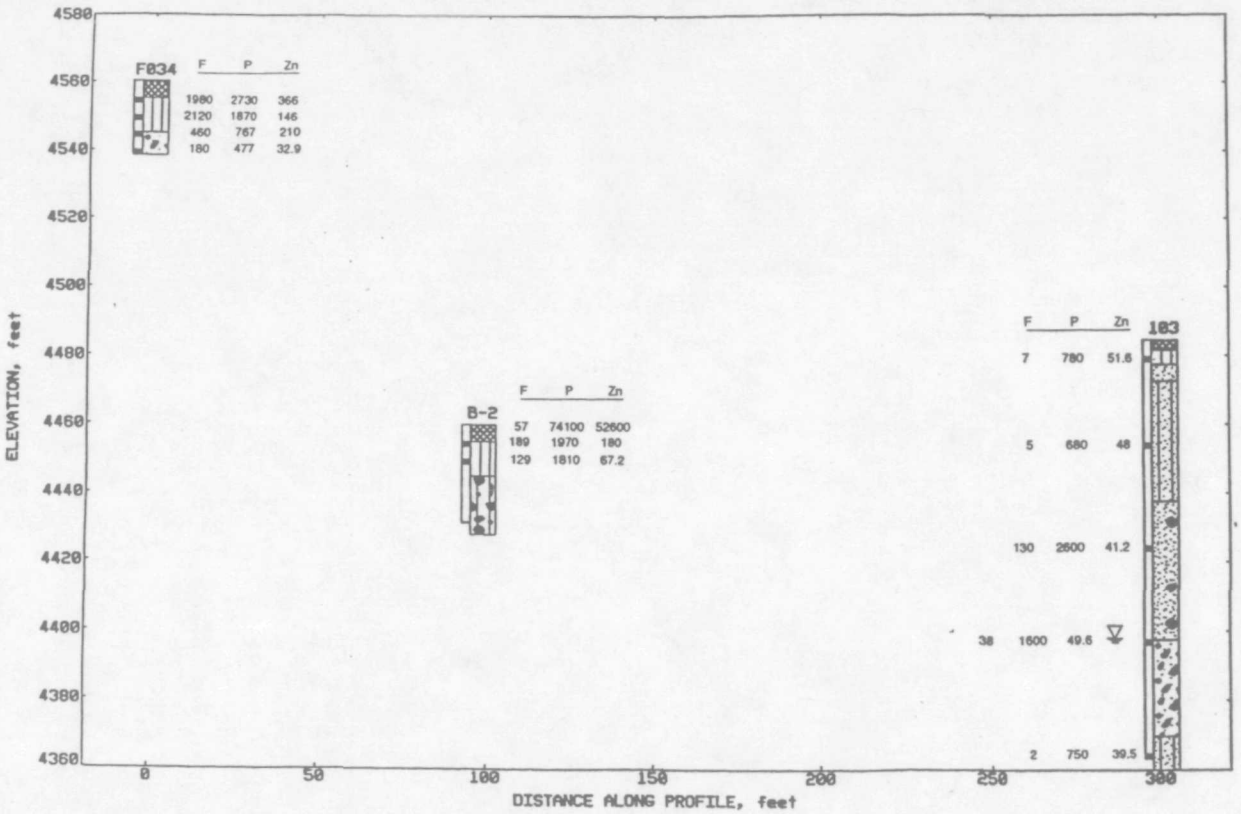
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

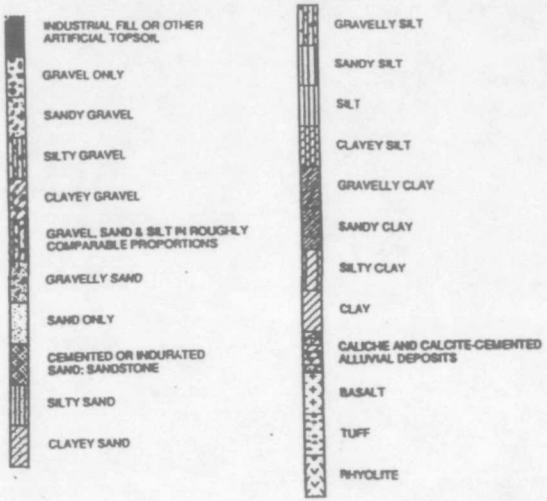
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Southwest Pond Area Section
Fluoride, Phosphorus, and Zinc Profile
(Sheet 1 of 2)

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.3-6	0



EXPLANATION OF SOIL AND ROCK SYMBOLS



F = Fluoride

P = Phosphorous

Zn = Zinc

F	P	Zn
38	1600	49.6

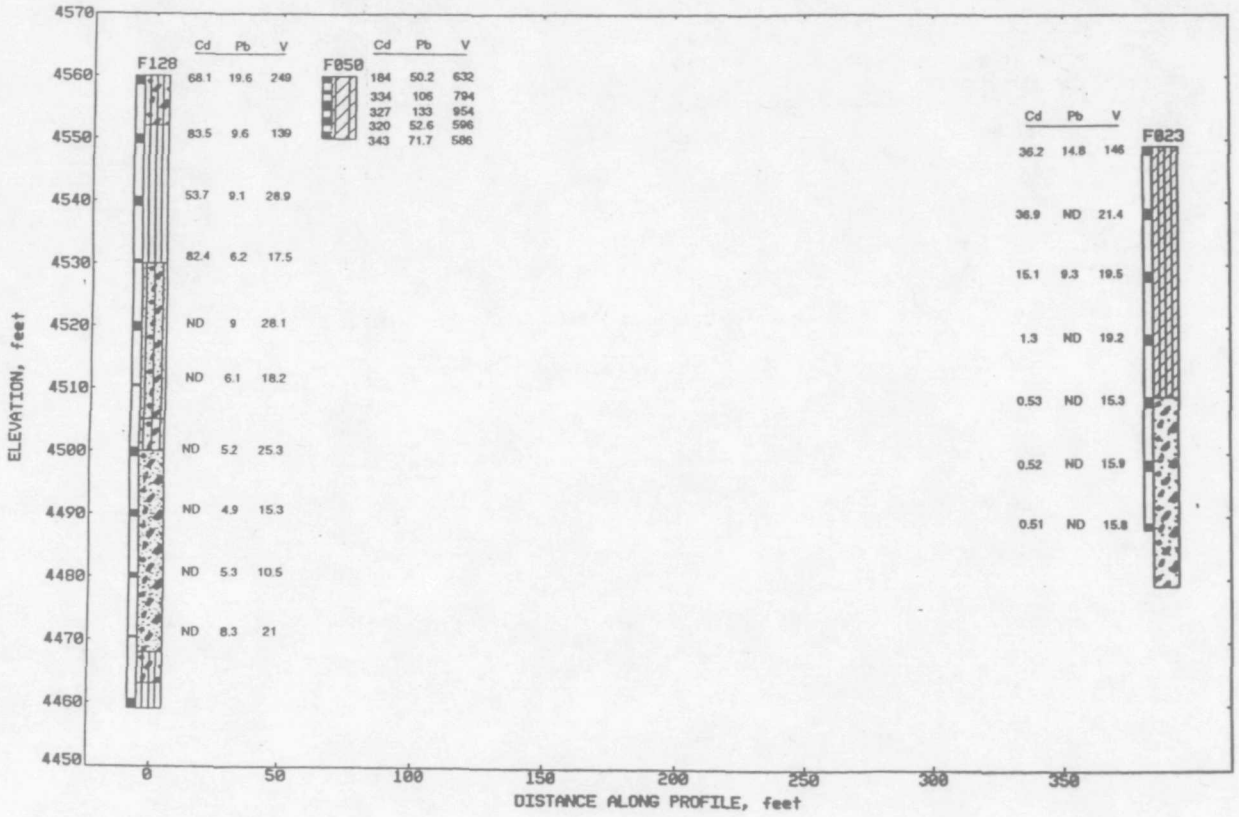
(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

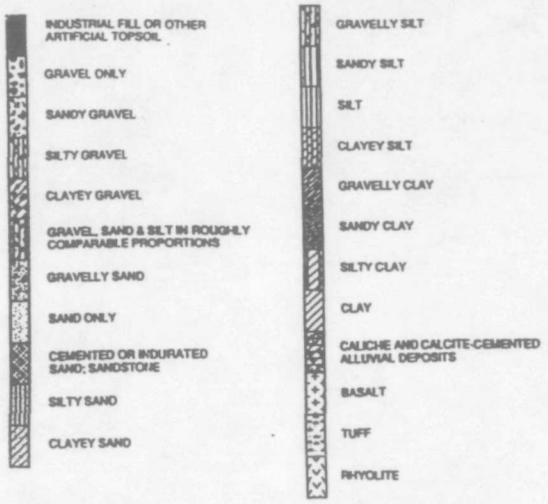
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Southwest Pond Area Section
Fluoride, Phosphorus, and Zinc Profile
(Sheet 2 of 2)

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.3-6	0



EXPLANATION OF SOIL AND ROCK SYMBOLS



Cd = Cadmium

Pb = Lead

V = Vanadium

Cd	Pb	V
15.1	9.3	19.5

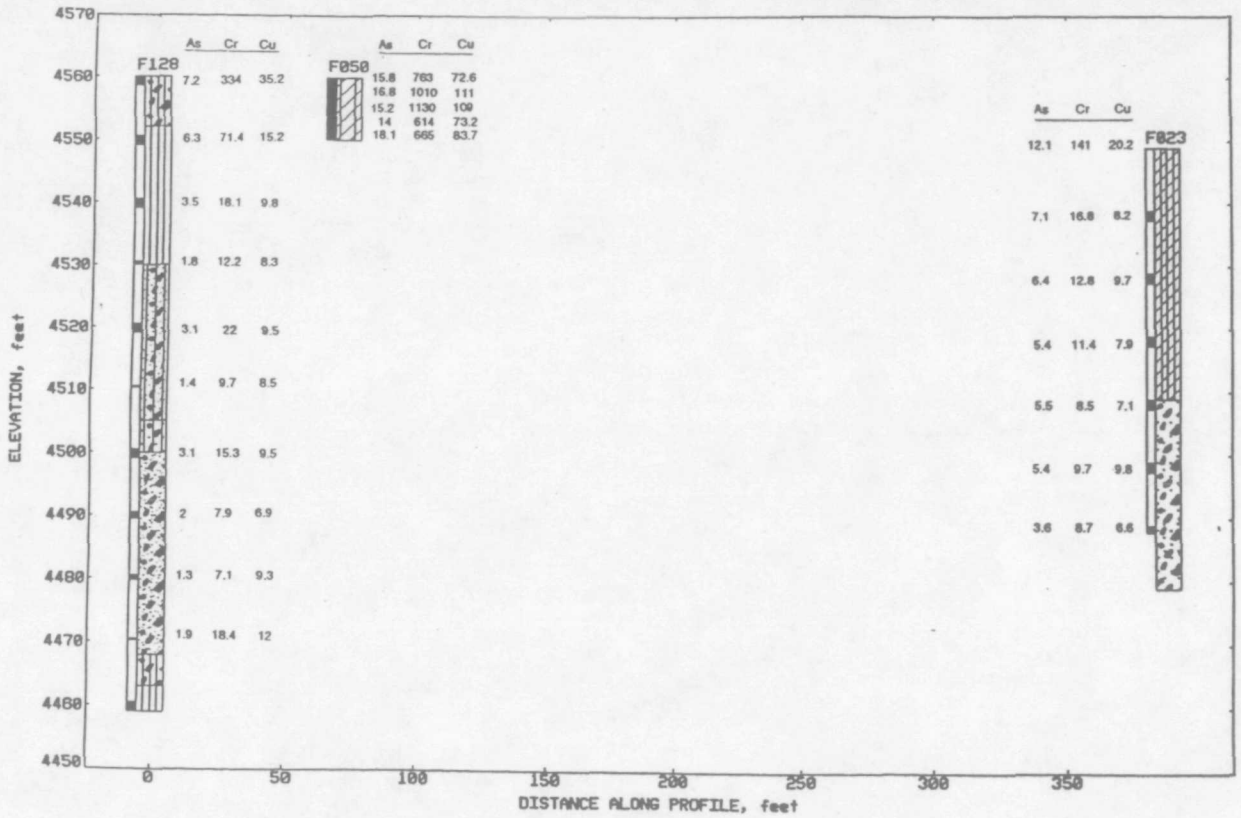
(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

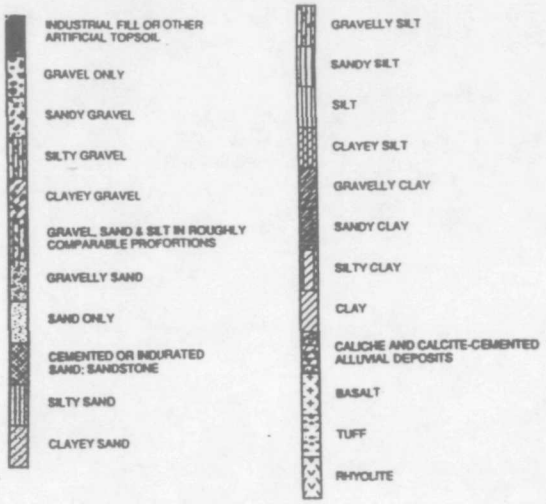
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Calciner Pond Area Section
Cadmium, Lead, and Vanadium Profile

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.3-7	0



EXPLANATION OF SOIL AND ROCK SYMBOLS



As = Arsenic

Cr = Chromium

Cu = Copper

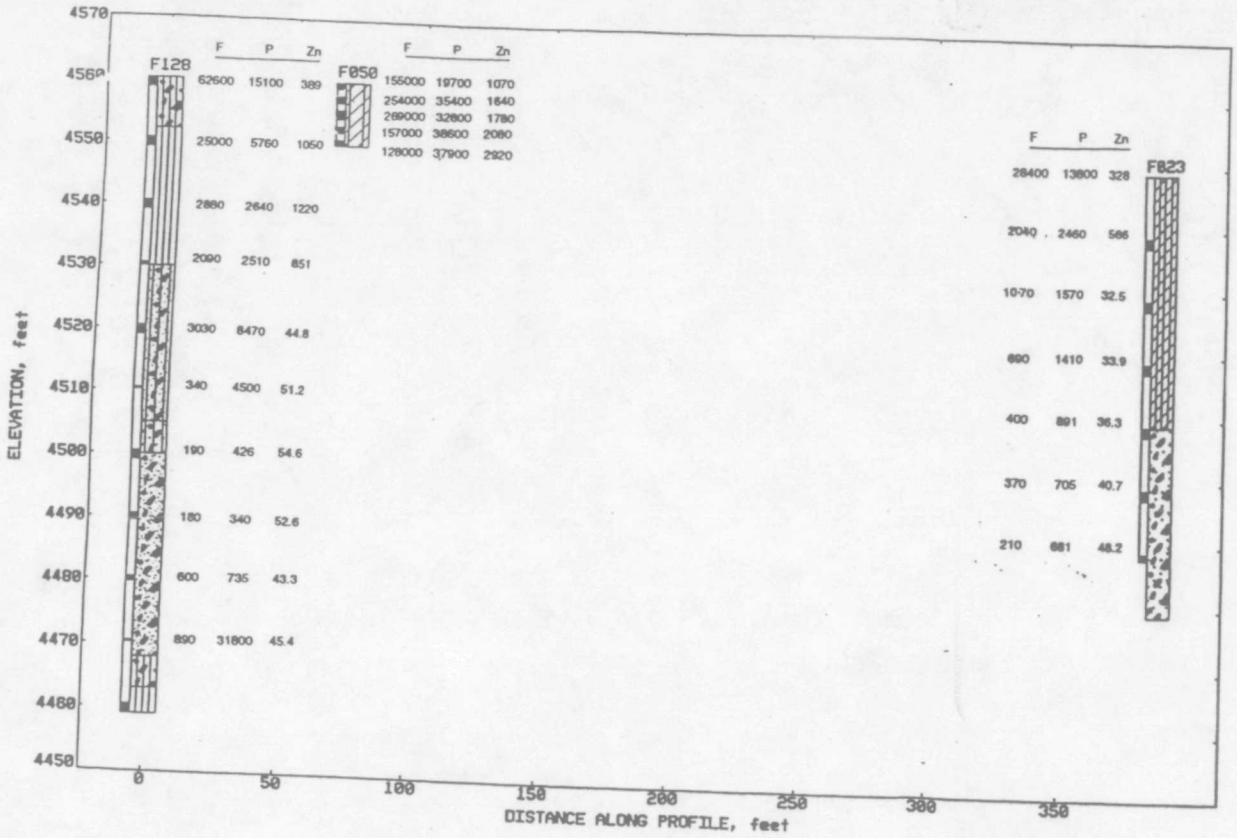
As	Cr	Cu	
3.6	8.7	6.6	(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Calciner Pond Area Section
Arsenic, Chromium, and Copper Profile

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.3-8	0



EXPLANATION OF SOIL AND ROCK SYMBOLS

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- SILT
- CLAYEY SILT
- GRAVELLY CLAY
- SANDY CLAY
- SILTY CLAY
- CLAY
- CALICHE AND CALCITE-CEMENTED ALLUVIAL DEPOSITS
- BASALT
- TUFF
- RHYOLITE

F = Fluoride

P = Phosphorous

Zn = Zinc

F	P	Zn
210	681	48.2

(Concentrations in mg/kg)

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Calciner Pond Area Section
Fluoride, Phosphorus, and Zinc Profile

Job Number	Drawing No.	Rev.
21372	FIGURE 4.2.3-9	0