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# Remedial Investigation Report for the Eastern Michaud Flats Site

## Part II
## Surface and Subsurface Characterizations

Volume III
Sections 4.3 – 4.4

Prepared for
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## 4.3 SURFACE SOILS

Section 4.3 presents the results of the surface soil investigation. Phase I sampling was conducted in 1992; Phase II sampling was conducted in 1993. A total of 144 locations were sampled: 108 in Phase I and 36 in Phase II.

### Surface Soil Investigation Objectives

The objective of the surface soils investigation was to assess the presence of EMF site-related constituents that may have been deposited on soils as a result of potential airborne releases from the EMF facilities. The surface soils may also reflect the impacts of any past runoff from the facilities, although overland flow does not currently escape the facility boundaries (Section 3.2).

Phase I sampling locations were selected using a radial grid that originated near the northern end of the fenceline separating the industrial operation areas of the FMC and Simplot facilities. The 360 degrees of this circular grid were divided into 16 equal radials at approximately 23 degree intervals (Figure 2.2-1). Sampling locations along these radials were chosen based on regularly increased spacing relative to distance from the center point. Four locations were identified at regular intervals within the first mile, and sample identification suffixes A, B, C, and D were used to indicate the relative distance of each location from the facilities. Three locations were sampled within the second mile, and sample suffixes A, B, and C were used to designate relative distance. Two locations were sampled within the third mile, and suffixes A and B were used to designate relative distance. Four samples of surface soils (top 2 inches) were taken at each location, then identified and composited for analysis. A subsurface soil sample was also obtained at each location at a depth of 2 feet. Sampling locations were locally adjusted, as necessary, to avoid sampling in plowed or irrigated fields and areas of known runoff.

In Phase II, additional samples were collected in an area immediately north of the facilities' industrial operation areas, in order to assess constituent variance within this area. Samples were also collected approximately one-half mile beyond the most-distant Phase I samples along southwestern radials and near distant outliers along other radials to further characterize

geographic trends in constituent concentrations observed in the Phase I samples. Samples were also collected within Pocatello to assist in determining the representative composition of surface soils. However, the data associated with these samples were not ultimately used to derive the representative levels used in this report. (Reference Section 4.2.1 for discussion of soil representative levels.)

All samples collected in Phase I and II were tested for inorganics and selected radionuclides, as described in Section 2.2. Samples collected in Phase II were also tested for sulfate, potassium, and calcium to assist in comparing the soils with the characteristic constituents of potential sources described in Section 4.2. The analytical results were compared with representative levels and the suite of constituents characteristic of EMF potential sources to identify areas of surface soils affected by facility releases. As part of this review, the activities of lead-210, polonium-210, and uranium-238 detected in each surface soil sample were compared to determine if these radionuclides were in secular equilibrium. This process aided in identifying the potential source of the radionuclides.

**Overview of Surface Soil Investigation Findings**

The findings of Section 4.3 include the following:

- Concentrations of EMF-related constituents in soils significantly above background levels outside the operational areas are primarily on properties owned by FMC or Simplot. With the exception of the Batiste Spring property, these properties were owned by the Companies prior to the initiation of the remedial investigation. The Batiste Springs property was purchased by FMC in the summer of 1995.

- The highest concentrations of EMF-related constituents in surface soils are found to the north and east of the industrial operation areas of the facilities. The principal area of accumulation lies between the operations area and Interstate 86. Constituent concentrations decrease rapidly with increasing distance from the facilities. The suite of constituents present in these soils is characteristic of phosphate ore, and it appears that windblown dusts from ore handling activities have affected these soils.

- The distribution and concentration of fluoride, total phosphorus, zinc, and cadmium along the 338-degree (north/northwest) radial suggest a nonfugitive dust EMF source (i.e., a point source such as a stack emission).

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- Subsurface soils have not been impacted by airborne releases, with the possible exception of several samples taken near I-86 just north of the facilities, where mechanical turning of surface soils during highway construction may have introduced constituents into the subsurface.
- There also appears to be an imprint of polonium-210 on the surface soils within the first mile north and east of the operating area above activities that would be expected from phosphate ore dusts alone. However, slightly elevated activities of lead-210 and polonium-210 in surface soils beyond the first mile segment of the sampling grid may be attributable to the decay of naturally occurring radon-222 rather than to EMF-related emissions.

**Section Content and Organization**

Section 4.3.1 presents a review of the methods used to evaluate the results of the radiological analyses of surface soils. Section 4.3.2 summarizes the surface soil investigation results. It is organized in subsections specific to four geographic quadrants—the northeastern, southeastern, southwestern, and northwestern. Summaries of quadrant-specific findings are presented at the end of each subsection. Overall investigation findings are presented in Section 4.3.3. The organization and major findings of Section 4.3 are illustrated in Figure 4.3-1. The analytical results for all surface soil samples are presented in Appendix W.

### 4.3.1 RADIOLOGICAL DATA INTERPRETATION

Uranium-238 and its radioactive daughters represent a naturally occurring radioactive decay series characterized by a very long-lived parent nuclide (uranium-238) and a single gaseous member (radon-222). In the uranium series, the activities of the uranium-238 daughters build up over time and, after approximately seven uranium-238 daughters' half lives, reach what is known as natural "secular equilibrium" with the activity of the parent nuclide (i.e., the activities of the daughters are essentially equal to the activity of the parent, uranium-238).

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| RADIOLOGICAL DATA INTERPRETATION (Section 4.3.1) | It appears that uranium-238, lead-210, and polonium-210 are in secular equilibrium in surface soil samples from 58 of the 89 sampling locations at which they were measured. The remaining 31samples appear to be enriched in either lead-210 or polonium-210. |
| QUADRANT ANALYSIS (Section 4.3.2) | Samples were collected in a radial grid that originated from the northernmost point along the fenceline between the FMC and Simplot facility industrial operations area and extended 3 miles from that point in all directions. Characteristic EMF constituents (cadmium, total chromium, fluoride, total phosphorus, vanadium, and zinc) were utilized to assess whether EMF facility air emissions were deposited on the soils. Sampling results are presented in Tables 4.3-1 through 4.3-6. |
| CONCLUSIONS (Section 4.3.3) | • Concentrations of EMF-related constituents in soils significantly above background levels outside the operational areas are primarily on properties owned by FMC or Simplot.<br>• The highest concentrations of EMF-related constituents in surface soils are found to the north and east of the industrial operation areas of the facilities. The principal area of accumulation lies between the operations area and I-86. Constituent concentrations decrease rapidly with increasing distance from the facilities. The suite of constituents present in these soils is characteristic of phosphate ore, and it appears that windblown dusts from ore handling activities have affected these soils.<br>• The distribution and concentration of fluoride, total phosphorus, zinc, and cadmium along the 338-degree (north/northwest) radial suggest a nonfugitive dust EMF source.<br>• Subsurface soils have not been affected by airborne releases, with the possible exception of several samples taken near I-86 just north of the operations area, where mechanical turning of surface soils during highway construction may have introduced constituents into the subsurface.<br>• There also appears to be an imprint of polonium-210 on the surface soils within the first mile north and east of the operations area above activities that would be expected from phosphate ore dusts alone. However, the slightly elevated activities of lead-210 and polonium-210 in surface soils beyond the first mile segment of the sampling grid may be attributable to the decay of naturally occurring radon-222 rather than to EMF-related emissions. |

**FIGURE 4.3-1**
**OVERVIEW OF SECTION 4.3 SURFACE SOILS**

As noted in EPA's radiological characterization studies of the Simplot and FMC processes (EPA, 1978a, 1978b), the activities of uranium-238, lead-210, and polonium-210 in ore are in secular equilibrium at typical activities of 22 to 27 ρCi/g. Secular equilibrium is disrupted if a radionuclide is chemically or physically separated from the uranium-238 parent (e.g., volatilization of polonium-210 during the calcining process or through escape of radon-222 gas).

Eighty-nine surface soil samples were analyzed for uranium-238, lead-210, and polonium-210. The laboratory reported an "actual value" and an accuracy (or uncertainty) of two standard deviations about this value (also referred to as 2- sigma). This standard practice for radiological analyses indicates that there is a 95 percent probability that the radionuclide activity in the sample is between the interval of plus 2- sigma and minus 2- sigma about the actual value. Examination of analytical data using this confidence interval is commonly used to determine whether the radionuclides within a decay series are in secular equilibrium.

Uranium-238, lead-210, and polonium-210 will be in secular equilibrium in soils that have been impacted by emissions from source materials, unless one or more members of the decay series were enriched or depleted in the emission process. Using these principles, the radionuclide data for surface soils were reviewed to identify the following:

- Samples with uranium-238, lead-210, and polonium-210 activities in secular equilibrium that also exceed representative soil levels (approximately 3 ρCi/g).
- Samples in which these radionuclides are not in secular equilibrium and which also exceed representative levels.

These samples were identified by first tabulating the analytical data for uranium-238, lead-210, and polonium-210 (activity, uncertainty, etc.) in surface soil samples, as presented in Table 4.3-1. Sample results and associated information are sorted by the sample location (transect and distance from the sampling grid origin) and by radionuclides (in the order, lead-210, polonium-210, and uranium-238) for each sample.

Where the actual reported activity was at or below the minimum detection activity (MDA) of the detection system, the MDA was adopted as the actual activity. In these cases, the minus-uncertainty was established as the MDA, but not less than zero, and the plus-uncertainty level was assigned as zero.

The reported activity for lead-210, polonium-210, and uranium-238 and the associated (+/-) two-sigma uncertainty values presented in Table 4.3-1 were plotted for each radial transact, as shown in Figures 4.3-2 through 4.3-17. These figures provide a convenient method to identify samples in which uranium-238, lead-210, and polonium-210 are in secular equilibrium. Where the reported radionuclides activities at a sample location overlap within the limit of their two sigma uncertainties, it can be assumed that the radionuclides were present in secular equilibrium.

A detailed discussion of Figures 4.3-2 through 4.3-17 is provided in Section 4.3.2. In general, it appears that uranium-238, lead-210, and polonium-210 are in secular equilibrium in surface soil samples collected at 58 of the 89 sampling locations. Thirty-one exhibited evidence of an enrichment of either lead-210 or polonium-210. These locations—with the enriched radionuclide shown parenthetically—were: 000-1A (Po-210); 023-1B (Po-210), 023-1D (Po-210); 045-1A01 (Pb-210 and Po-210), 045-1A02 (Pb-210 and Po-210), 045-1A04 (Pb-210 and Po-210); 090-1B (Po-210), 090-1B02 (Po-210), 090-1B04 (Po-210); 120-2C (Po-210); 135-3B (Po-210); 158-3B (Pb-210 and Po-210); 180-3A (Po-210); 203-4A (Po-210); 205-3B (Pb-210); 225-2A (Po-210), -3B (Po-210); 230-3B (Pb-210 and Po-210); 240-3A (Pb-210), -3B (Pb-210); 270-1D (Po-210; 293-1A01 (Pb-210),-1A02 (Po-210), -1B01 (Pb-210); -1B05 (Pb-210); 315-1A (Po-210), -1C (Po-210) -3B04 (Pb-210); and 338-1B (Po-210), -1D (Po-210).

These observations were then compared with representative soil activities (3.9 ρCi/g for uranium-238, 3.03 ρCi/g for lead-210, and 3.7 ρCi/g for polonium-210). A radionuclide was considered to be present above the soil representative level if its "actual value" was greater than the representative level. This review indicated that sample activities at 47 of the 89 sampling

locations exhibiting secular equilibrium exceeded reference levels. Of the 31 sampling locations that did not exhibit secular equilibrium, 30 had activities that exceeded reference levels. These locations are summarized in Table 4.3-2. Inspection of Figures 4.3-2 through 4.3-17 will show, however, that the analytical confidence interval for many of these cases extends below representative levels. In such cases, there is a probability that the activity is less than the representative level.

### 4.3.2 QUADRANT ANALYSIS

This discussion of the surface soil sampling results is organized into four subsections: the northeastern quadrant (encompassing sampling radials 0 through 90 degrees), the southeastern quadrant (radials 113 through 180 degrees), the southwestern quadrant (radials 203 through 270), and the northwestern quadrant (radials 293 through 338).

For each quadrant, the results are presented in order of increasing distance along the radial from the center of the sampling grid. A wind rose for the period October 1993 through September 1994 is presented in Figure 4.3-17a. The radial grid and associated Phase I and Phase II sampling locations are shown in Figures 4.3-18a and 4.3-18b.

The initial focus of data interpretation was determining whether the constituents characteristic of EMF particulate source materials (i.e., cadmium, total chromium, fluoride, total phosphorus, vanadium, and zinc) were present in the soils above representative levels. If patterns clearly indicative of particulate sources were not evident, the data were evaluated for characteristic secondary constituents to determine if either particulate or nonparticulate sources could be identified. The principles of secular equilibrium described in Section 4.3.1 were a part of this review. Section 4.2.2 (Simplot) and 4.2.3 (FMC) describe the source characteristics used.

The composite 5-year windrose developed from data collected at Simplot's meteorological site 1 (Figure 3.5-3) was used in evaluating the potential origin of EMF-related constituents. Further evaluation of potential sources was made as an element of the EMF atmospheric dispersion modeling study; this evaluation is presented in Part III of this report.

Isopleth maps for the principle constituents discussed in this section are presented in Figures 4.3-18c through 4.3-27.

### 4.3.2.1 Northeastern Quadrant

The northeastern quadrant is downgradient of potential source areas along the direction of the prevailing southwesterly wind. The quadrant has been defined to include sampling radials along 0, 23, 45, 68, and 90 degrees. The analytical data associated with these sampling locations are presented in Table 4.3-3.

***Within the First Mile.*** Constituents found in surface soils within the 1-mile radius of the grid center (samples with suffix 1A through 1D) were frequently present in concentrations greater than the levels found in representative surface soils. Constituents above representative levels included the six constituents characteristic of EMF particulate source materials: cadmium (up to 163 mg/kg), total chromium (up to 471 mg/kg), fluoride (up to 27,200 mg/kg), total phosphorus (up to 84,900 mg/kg), vanadium (up to 729 mg/kg), and zinc (up to 1,220 mg/kg). Arsenic, barium, beryllium, boron, copper, lead, mercury, nickel, selenium, silver, and thallium were also frequently present above representative levels in the first mile. Aluminum, antimony, iron, lithium, manganese and molybdenum were sporadically detected in a few samples at concentrations above representative levels.

The range of activities for the radionuclides within the 1-mile radius was as follows: polonium-210 (one nondetect at 0.879 ± 1.09 ρCi/g to 50.9 ± 17.4 ρCi/g); lead-210 (eleven nondetect to 36.3 ± 24 ρCi/g) and uranium-238 (ten nondetect to 26.9 ± 5.22 ρCi/g). Of the 21 samples collected within the first mile in the northeast quadrant analyzed for radionuclides, 12 contained uranium-238, lead-210, and polonium-210 in secular equilibrium, and activities of one or more radionuclides exceeded representative levels in 9 of these cases. Nine other samples did not contain radionuclides in secular equilibrium. Of these, polonium-210 was elevated in all nine, while uranium-238 and lead-210 were also elevated in five of these samples.

Representative levels for radionuclides were exceeded in 18 of the 21 samples collected within the first mile, as shown in Figures 4.3-2 through 4.3-6, and as summarized in Table 4.3-2.

Radionuclide activities followed much the same pattern as concentrations of inorganics that appeared to be related to the EMF facilities (Table 4.3-1). The greatest values were found within the samples from the "A" locations (nearest to the facilities); these tended to be greater than those obtained at the "B" locations, which in turn were greater than the "C" locations and "D" locations (farthest from the facility). This represents a direct correlation of activity with distance from the EMF facilities.

With the inclusion of calcium and potassium in the analysis of samples collected during Phase II to assist in the comparison of results with potential source characteristic constituents, it appears that some of the elevated constituents in soils are attributable to the presence of phosphate ore mixed with native soils within the first mile of the northeast quadrant. Samples collected along the 45-degree and the 90-degree radials contained the greatest concentrations of phosphate-ore-related constituents. Samples along the 45-degree radial had, on the whole, less fluoride (highest concentration 16,900 mg/kg) and total phosphorus (highest concentration 52,600 mg/kg) than the 90-degree radial samples (which contained a maximum of 27,200 mg/kg of fluoride and 84,900 mg/kg total phosphorus).

The presence of polonium-210 in nine samples at activities above levels indicative of secular equilibrium with uranium-238 suggests a stack-based emission source other than ore handling emissions. These elevated levels of polonium-210 were most pronounced in samples with a "1B" suffix, and declined toward levels indicative of secular equilibrium with uranium-238 in samples collected beyond this distance. The samples in which uranium-238, lead-210, and polonium-210 were both in secular equilibrium and above representative levels suggest the possible contribution of a source associated with ore handling.

***Beyond First Mile Along the 0-Degree Radial.*** The distribution of constituents present in excess of representative concentrations within the second and third miles was different than that found within the first mile. Constituents which exceeded representative levels were generally limited to the six EMF characteristic constituents plus copper. Characteristic constituent concentrations dropped dramatically in miles 2 and 3. Cadmium, total chromium, fluoride and vanadium fell below representative levels in mile 2. Total phosphorus, zinc, and copper concentrations approached or fell below representative levels in mile 3.

The only radionuclide activity detected in the three samples analyzed from this radial beyond the first mile was found in the sample from 2A (polonium-210 at 5.35 ± 1.92 pCi/g. All other samples were nondetect. As shown in Figure 4.3-2, polonium-210 is in secular equilibrium with lead-210 and uranium-238 in the sample from 2A. While the reported activity of polonium-210 may appear to exceed its reference level, this activity is within the uncertainty of the lead-210 activity, which is itself at representative levels. Lead-210 activities exceeded representative levels in the samples collected at locations 000-2C and 000-3B.

***Beyond First Mile Along the 23-Degree Radial.*** Similar to radial 000, constituents in excess of representative levels beyond the first mile in radial 023 were generally limited to five of the six EMF characteristic constituents (all but total chromium) plus copper. Fluoride dropped below representative levels in mile 2; cadmium and zinc dropped below representative levels in mile 3. Phosphorus approached its representative level at mile 3. Copper (33.6 mg/kg), iron (20,000 mg/kg), and lead (39.9 mg/kg) concentrations were above representative levels in the sample taken at 2A. However, the sample was taken in the vicinity of an active gravel pit, and these results are not likely indicative of EMF influence.

Two soil samples collected within the 1- to 2- and the 2- to 3-mile segments along the 23-degree radial were tested for radioactivity. The sample taken at 2B contained polonium-210 above its representative levels at 5.02 ± 2.02 pCi/g; lead-210 was not detected. However, polonium-210

and lead-210 appear to be in secular equilibrium with uranium-238 in this sample, as shown in Figure 4.3-3.

***Beyond First Mile Along the 45-Degree Radial.*** The EMF characteristic constituents were present in all three of the 45-degree radial samples taken between 1 and 2 miles (2A, 2B, and 2C). However, the concentrations were greatly reduced from those found within the first mile (Table 4.3-3). The range of concentrations for the characteristic parameters was as follows: cadmium (up to 12.7 mg/kg), fluoride (up to 1,300 mg/kg), total phosphorus (up to 2,960 mg/kg), vanadium (up to 54.3 mg/kg), and zinc (up to 137 mg/kg). Arsenic, barium, beryllium, boron, copper, thallium, selenium and silver, which were all above representative levels in the first mile of this radial, were within their representative ranges in miles 2 and 3.

The only other parameter that substantially exceeded the representative level was lead (59.5(J) mg/kg at 3A and 64.4 mg/kg at 3B). It is unlikely that the lead in these samples is attributable to emissions from the EMF facilities, because constituents that are more characteristic of EMF potential sources than lead (e.g., total phosphorus) were not equally above their representative levels in these two samples.

Polonium-210 was detected in one of the three samples collected in the 1- to 3-mile segment of the 045 radial, but was within representative levels (2.76 ± 0.552 pCi/g) in this sample. The three radionuclides were in secular equilibrium in the three samples collected beyond the first mile along this radial. The actual values of lead-210 reported by the laboratory exceeded representative levels in all three samples.

***Beyond First Mile Along the 68-Degree Radial.*** Similar to samples along the 45-degree radial, the EMF characteristic parameters were present at above-representative levels in all samples taken along the 1- to 3-mile segment of the 68-degree radial. This may be indicative of higher windspeeds in this direction than in the directions of the 000- and 23-degree radials, along which representative level exceedances did not extend as far. In addition to the six EMF

characteristic parameters, copper, lead, nickel and thallium were detected above their representative levels in this segment of the radial.

Polonium-210 was detected in the 3B sample at 4.43 ± 1.88 ρCi/g and lead-210 was detected in the 2B soil sample at 8.09 ± 7.76 ρCi/g. However, as shown in Figure 4.3-5, all three radionuclides appear to be within secular equilibrium. The actual values of lead-210 in the samples from location 2B and 3B exceeded representative levels.

***Beyond First Mile Along the 90-Degree Radial.*** The EMF characteristic parameters were generally above representative levels in the samples taken in the 1- to 2-mile range of the 90-degree radial, indicating an EMF-related effect. The levels, however, were not significantly elevated: cadmium (up to 9.8 mg/kg), fluoride (up to 1,460 mg/kg), total phosphorus (up to 3,190 mg/kg), vanadium (up to 37.4 mg/kg), and zinc (up to 124 mg/kg). Other above-representative constituents included barium (235 mg/kg at 2A and 224 mg/kg at 2B) and lead (63.3(J) mg/kg at 2A). Barium is not associated with EMF-related materials. While lead is present in some potential sources, it is not accompanied by other trace metals such as arsenic or silver as one would expect if it were EMF-related.

In the samples collected in the 2- to 3-mile segment of the 90-degree radial, the EMF characteristic constituents approached or fell below their representative levels. Polonium-210 was detected (3.29(J) ±1.53 ρCi/g) in the one of the two soil samples, but below its representative levels. As shown in Figure 4.3-6b, the three radionuclides are in secular equilibrium in the samples collected from locations 2B and 3A.

***Northeastern Quadrant Summary.*** Above-representative levels of trace metals, fluoride, total phosphorus, polonium-210, lead-210, and uranium-238 were found in surficial soils within the first mile of the EMF study area in the northeastern quadrant. Within this 1-mile radius, concentrations generally declined with distance from the industrial operations areas of the plants. With minor exceptions concerning zinc, no single EMF characteristic constituent exceeded its

representative level unless most or all of the others also exceeded their representative levels. The EMF-related constituents appear to have been deposited together as part of a single particulate matrix, rather than as individual species.

The EMF characteristic parameters (which are not necessarily related to ore only) were detected at some locations above representative levels in the area between 1 and 2 miles. Several metals, lead, copper, and nickel were frequently detected in soil samples at above-representative concentrations throughout the quadrant. These did not appear to be EMF-related unless linked with the characteristic parameters. The EMF characteristic parameters generally fell below, or at least approached, representative levels in the 2 to 3 mile segment of this quadrant.

With the exception of several samples within the 1-mile radius that appear to have been impacted by mechanical mixing, there appears to have been little to no EMF-related effect on subsurface soils in this quadrant (i.e., subsurface soil concentrations were generally below representative levels [Table 4.3-3]).

There is a distinct constituent distribution pattern in the northeastern quadrant. As would be expected with a wind-distributed depositional environment, the concentrations of site-related particulate are asymptotic in nature. That is to say, the highest concentrations were found near the fencelines of the industrial operations areas of the facilities. These values declined dramatically with distance from these fencelines.

The asymptotic pattern, with minor variation, holds true for the EMF characteristic parameters, as illustrated by Figures 4.3-28 through 4.3-33 for cadmium, total chromium, fluoride, total phosphorus, vanadium, and zinc. For each, there is a relatively smooth decrease from elevated levels near the industrial operations areas to lower levels with increasing distance. Radionuclides tend to follow a similar pattern, as was shown in Figures 4.3-2 through 4.3-6. An enrichment in polonium-210 beyond levels associated with secular equilibrium with uranium-238 was observed in samples collected approximately within the first one-half mile along several radials. This

appears to indicate a secondary source (the FMC calciner scrubber stacks), in addition to ore particulates, contributed polonium-210.

Figures 4.3-34 through 4.3-37 are bar graphs for selenium, lead, arsenic, and copper like those plotted for the characteristic parameters. All of these elements are associated with EMF facility activities and were found in the ore at concentrations above soil representative concentrations. Hence, their presence in above-representative concentrations in soil samples taken near the EMF facilities is not unexpected. However, in plotting their concentrations, no steady decline with distance from the EMF facilities is seen. Rather, the values fluctuate over distance. This fluctuation suggests that the concentrations measured beyond the area that appears to be associated with EMF particulate deposition are likely due to sources other than releases from the EMF facilities.

Lead-210 activities (actual values) exceeded the lead-210 representative level in 11 of the 12 samples collected beyond the first mile in the northeast quadrant. Polonium-210 (a decay product of lead-210) also exceeded its representative level in 4 of these samples. However, these radionuclides were in secular equilibrium with uranium-238 in all 12 samples. This pattern, coupled with the absence of the major inorganic EMF-related constituents in this region, suggests that the lead-210 is naturally occurring.

Lead-210 may have been slightly enriched in surface soils relative to uranium-238 through the natural process of the decay of radon-222 migrating from underlying granitic rocks present throughout the Bannock Range southwest and south of the facilities. Granitic rocks naturally contain uranium-238 (and its daughters including radon-222) at activities ranging up to 7 pCi/g (EPA, 1978a and 1978b). Uranium-238 daughters maintain an equilibrium except for gaseous radon which migrates to the surface. The potential for radon and radon daughters to accumulate in surface soils (due to occasional saturation or winter freeze conditions) was discussed with leading academic researchers in environmental radon issues (Dr. Robert F. Holub of the U.S. Bureau of Mines, CO; Dr. Steven Cherry of New Mexico Institute of Mining, NM; Dr. Bernie Cohen of the University of Pittsburgh; and Dr. Linda Gundersen of the USGS in Reston, VA).

These individuals agreed that such accumulation could occur. The representative levels for lead-210 and polonium-210, daughters of radon, were derived by EPA using data from subsurface soil samples. It is possible that these subsurface samples understate the representative levels for these previously described factors. Further discussion of the deviation of representative levels is presented in Section 4.2.1.

#### *4.3.2.2 Southeastern Quadrant*

The southeastern quadrant encompasses the 113-, 120-, 125-, 130-, 135-, 158-, and 180-degree radials. The samples along these radials have a suffix of 2 or higher because the first mile falls within the Simplot facility boundaries. (Results of surface soil sampling performed within facility boundaries are provided in Section 4.2). Discussion of constituent distributions within the southeastern quadrant is presented by examination of sampling results along each radial coupled with a discussion of local topography.

***Along the 113-Degree Radial.*** There were three sampling points along the 113-degree radial at the northeastern base of the Bannock foothills along a railroad track (Figure 4.3-18a). Points 2B and 3A were just to the west and east, respectively, of a waste disposal site, unrelated to the EMF facilities, with heavy metals contamination (lead) that is currently the subject of a CERCLA study. The samples contained one or more above-representative level concentrations of the six characteristic EMF constituents plus boron, copper, iron, lead, manganese, mercury, molybdenum, nickel and thallium (Table 4.3-4). Cadmium, total chromium, copper, total phosphorus, and zinc were above representative levels in all three samples, but concentrations were nevertheless significantly below those generally detected in the northeastern quadrant. The lower concentrations suggest relatively little EMF impact.

The 113(2A) soil sample contained 4.93 ± 2.34 pCi/g of polonium-210. Lead-210 and uranium-238, based on their actual values, were in secular equilibrium with polonium-210. No radionuclide analyses were performed on the samples collected at 113(2B), and no radionuclides were detected at 113(3A). Using actual values, the three radionuclides were also in secular

equilibrium in this latter sample. Lead-210 exceeded representative levels in both, and polonium-210 exceeded representative levels in the sample from location 2A.

The 113-degree radial may be within the zone of easterly winds described in the discussion of the 90-degree radial of the northeastern quadrant. As such, samples within the 2-mile segment may have been influenced by deposition of ore from the former Simplot ore pile.

***Along the 120- and 125-Degree Radials.*** One sample was collected along each of radials 120 and radial 125. These sampling locations are in the northeastern portion of the foothills south of radial 113 (Figure 4.3-18a). The locations are shielded from direct wind contact from the operations area of the facilities by the hills to the west. The only constituents detected above representative levels were cadmium, copper, total phosphorus and zinc (Table 4.3-4). Concentrations were only slightly above representative levels and as such suggest little EMF impact relative to the northeastern quadrant.

Both lead-210 (6.67 ± 6.3 ρCi/g ) and polonium-210 (11.7 ± 4.66 ρCi/g) were detected at station 120(2C). Uranium-238 was not detected. Station 125(3A) also had detectable levels of polonium-210 (5.49 ± 2.28 ρCi/g), but neither lead-210 nor uranium-238 was detected. The three radionuclides were not in secular equilibrium in the sample collected at location 120-2C; polonium-210 was enriched, and both lead-210 and polonium-210 exceeded representative levels. The three radionuclides were in secular equilibrium in the sample from location 125-3A; however, both lead-210 and polonium-210 exceeded representative levels.

***Along the 130- and 135-Degree Radials.*** Sampling locations along radials 130- and 135 are on a ridge immediately east of the gypsum stack. Because the land surface rises steadily to the south away from the facilities, the sampling locations are not shielded from the facilities by intervening topography. Cadmium, copper, total phosphorous and zinc concentrations were slightly above representative levels in all samples; manganese and thallium exceeded representative levels in a few sporadic samples (Table 4.3-4). These results suggest relatively little EMF impact.

Polonium-210 was detected in two soil samples collected along radial 135 (6.15 ± 2.2 ρCi/g at 135[2A] and 9.13 ± 3.89 ρCi/g at 135[3B]). Lead-210 and uranium-238 were not detected (Table 4.3-1). Two samples (2A and 3B) were not in secular equilibrium. Polonium-210 was enriched in both and also exceeded representative levels in all three samples collected along the 135-degree radial. This suggests deposition from a source enriched in polonium-210 relative to the other radionuclides.

***Along the 158-Degree Radial.*** Offsite sampling along radial 158 began at the top of a draw immediately south of the gypsum stack and continued first uphill (to 158[3A]) and then along the back, or south-facing, slope (Figures 4.3-18a and 4.3-18b). Total chromium, copper, iron, manganese, total phosphorus and zinc exceeded representative levels in several of the samples; all other above-representative level concentrations were infrequent and sporadic (Table 4.4-4). The relatively low concentrations of the constituents which did exceed representative levels indicate minimal or no effect from the gypsum stack on the surficial soils along this radial. Of particular note is that no fluoride concentration was above the representative soil levels. This indicates that there has been no fluoride enrichment of the soil occurring in this area.

Polonium-210 was detected above its representative level in two 158-degree radial samples (5.74 ± 2.15 ρCi/g in 158[2B] and 6.3 ± 2.89 ρCi/g in 158[3B]). These measurements are not high compared with the activities detected in the northeastern quadrant. Lead-210 was detected in one sample (5.24 ± 5.14 ρCi/g in 158[2B]). Uranium-238 was not detected in any sample tested.

Based on actual values, both polonium-210 and lead-210 exceed representative levels in these samples. The sample collected at location 3B is also enriched in lead-210 and polonium-210.

***Along the 180-Degree Radial.*** Sampling locations along the 180-degree radial lie primarily upwind along the top of a ridge due south of the EMF facilities (Figures 4.3-18a and 4.3-18b). Copper, iron, lead, manganese, total phosphorus and zinc exceed representative levels

in several samples along this radial; all other above-representative level concentrations are infrequent and sporadic (Table 4.3-4). The relatively low concentrations of the constituents which do exceed representative levels indicate minimal or no effect on the surficial soils in this area from industrial operations at the EMF facilities.

Polonium-210 was detected above its representative level in the soil sample taken at 180(2B) (7.5(J) ± 3.74 ρCi/g) and at 180(3A) (5.79 ± 1.11 ρCi/g). Neither of the other radionuclides analyzed was detected. The samples collected at locations 2B and 4A contained the three radionuclides in secular equilibrium, with lead-210 and polonium-210 activities both exceeding representative levels. The sample collected at location 3A was not in secular equilibrium, with polonium-210 enriched and also above representative levels.

***Southeastern Quadrant Summary.*** Enrichment of EMF-related parameters was observed along the base of the Bannock Range in samples taken along the 113-degree radial. Aside from lead-210 and polonium-210, the remainder of the soil samples collected in this quadrant showed no measurable EMF-related effect. Of specific interest, those sampling points that were in a position to measure potential emissions and subsequent deposition from the gypsum stack, particularly potential gaseous emissions of fluorides, did not show any indication of enrichment. The enrichment of lead-210 and polonium-210 may be related to natural radon decay, as was discussed in the summary for the northeast quadrant.

Unlike the patterns found for the northeastern quadrant, bar graphs for selected constituents detected in samples collected along the radials of the southeastern quadrant do not display, for the most part, the asymptotic relationship of high concentrations near the source and declining concentrations with distance (Figures 4.3-38 to 4.3-47). The only radial displaying this pattern (113) is strongly linked to EMF influence. This further illustrates the lack of significant impact the EMF operations have had on surficial soils in the southeast.

The results of all subsurface sample analyses for this quadrant are in Table 4.3-4. These results do not appear to be significant. They are either marginally greater than representative concentrations or are not associated with EMF-related constituents.

#### *4.3.2.3 Southwestern Quadrant*

The southwestern quadrant encompasses the 203-, 205-, 225-, 230-, 240-, 248-, and 270-degree radials. In Phase I, samples were collected along radials 203, 225, 248, and 270. Eight additional samples were collected along the 205, 230, and 240 radials (and in some cases at greater distances than during Phase I) during Phase II to further investigate results obtained during Phase I.

As in the southeastern quadrant, the first sampling point in the southwest is over 1 mile from the designated center point of the sampling grid. Hence, all southwestern radials have a "2" or greater suffix. The exception to this is radial 270, which runs in an east/west direction north of FMC near I-86.

***Along the 203-Degree Radial.*** Three sampling points were located along radial 203 (3A, 3B, and 4A). See Figures 4.3-18a and 4.3-18b for locations. There has been a marginal EMF-related enrichment of all three samples (Table 4.3-5), as determined by the presence of constituents at levels marginally above representative levels. Ranges of these parameters were as follows: cadmium (up to 5.9 mg/kg), total phosphorus (up to 1,640 mg/kg), vanadium (up to 36.7 mg/kg), and zinc (up to 90.3 mg/kg). The concentrations detected of both the characteristic parameters and other elements were not great enough to be able to identify the potential source.

Beryllium, total chromium, copper and total phosphorus were detected above representative levels in the 2 foot samples taken along radial 203 (Table 4.3-5). Since these are not accompanied by other parameters generally associated with EMF activities, they are probably unrelated to the site.

Samples from locations 203(3A) and 203(4A) were analyzed for the presence of lead-210, polonium-210, and uranium-238. Polonium-210 was detected in both samples (polonium-210: 7.35 ± 2.82 and 5.03 ±1.31 ρCi/g, respectively; while uranium-238 and lead-210 were not detected (Table 4.3-1).

The radionuclides in the sample collected at 3A were in secular equilibrium, and based on actual values, uranium-238, lead-210, and polonium-210 exceeded representative levels. The radionuclides in the sample from 4A were not in secular equilibrium, and polonium-210 was both enriched and above its representative level.

***Along the 205-Degree Radial.*** During Phase II, three additional samples were taken along the 205-degree radial (3A, 3B, and 4A). There is a faint suggestion of the suite of EMF characteristic constituents in the 3A and 3B samples and possibly in the sample from location 4A (Table 4.3-5). Constituents characteristic of EMF particulate sources found in marginally above-representative concentrations were fluoride (732 mg/kg at 3B) and total phosphorus (1060 mg/kg at 3A and 1,520 mg/kg at 3B).

Several parameters were slightly above representative levels in the subsurface samples taken along this radial (Table 4.3-5). Because of the lack of above representative levels of associated EMF parameters, the presence of these parameters cannot be attributed to EMF activities.

Lead-210 (5.77 ± 1.35 ρCi/g) and polonium-210 (1.59 ± 0.31 ρCi/g) were detected in the 3B sample but were not detected in the other two surficial samples. Polonium-210 was also present in the 3B subsurface sample at a very low level (1.05 ± 0.547 ρCi/g). The activity of lead-210 in the 3B sample exceeded its representative level, and lead-210 was also enriched relative to uranium-238 and polonium-210 in this sample.

***Along the 225-Degree Radial.*** Samples were collected along the 225-degree radial at five locations (2A, 2B, 2C, 3A, and 3B). See Figures 4.3-18a and 4.3-18b for these locations. The EMF characteristic parameters are present in all five samples at above-representative

concentrations (Table 4.3-5). The range of concentrations was as follows: cadmium (up to 28.1 mg/kg), total chromium (up to 87.7 mg/kg), fluoride (up to 1,680 mg/kg), total phosphorus (up to 4,860 mg/kg), vanadium (up to 95.8 mg/kg), and zinc (up to 209 mg/kg). Also at slightly enriched levels were antimony (up to 43.2 mg/kg), manganese (up to 552 mg/kg), molybdenum (up to 8.4 mg/kg), silver (up to 2.3 mg/kg), nickel (up to 20.4 mg/kg), and copper (up to 16.2 mg/kg).

Initial examination of the data for locations 2A and 2B suggested that the source might be either precipitator dust or slag, but, as described below, a closer examination does not lead to this conclusion. The location of this line of samples is south/southwest of the old pond area where uncovered precipitator slurry pond 1E and precipitator dust storage area 9S are situated. The radial is also near the slag pile.

Because data on calcium and potassium were not available for these samples, identification based only on major characteristic constituents was not possible. However, the radioactivity results for samples from the 225-degree radial are not characteristic of slag. Slag contains measurable levels of uranium-238 (22.1 ± 12.68 pCi/g to 30.7 ± 17.8 pCi/g in the slag samples tested), whereas uranium-238 was not detected in the samples from the 225-degree radial (the actual value reported—2.13 ± 3.82 pCi/g—was below the reporting limit of 5 pCi/g). Polonium-210 was detected at 11.6 ± 1.85 pCi/g in the sample collected at 2A while the actual value of lead-210 in this sample was 3.84 ± 7.04 pCi/g.

As shown in Figure 4.3-12, polonium-210 is enriched in this sample, and both polonium-210 and lead-210 exceed representative levels (Table 4.3-1). The three radionuclides were in secular equilibrium in the sample collected at location 2C, although lead-210 and polonium-210 exceeded representative levels. These radionuclides were not in secular equilibrium in the sample collected at location 3B, with polonium-210 being enriched and also above representative levels. Further examination of these data, combined with the emission characterization study,

suggest a potential source other than slag or precipitator dusts. This analysis is presented in the air modeling study (Part III, Volume 2 of the EMF RI).

Antimony (75.1 mg/kg at BS225[3B]), boron (23.4J mg/kg at BS225[2C]), fluoride (848 mg/kg at BS225[2C]), molybdenum (up to 6.4 mg/kg), and vanadium (46.4 mg/kg at BS225[2A]) were the only parameters detected at concentrations above representative levels in the below-surface samples along the 225 radial.

As described in Appendix M, Pond 4E received precipitator dusts and other phossy wastes between 1967 and 1980, when it was dried and the dried material was sold. The area was used occasionally between 1980 and 1982 to store waste materials. It is possible that dried waste materials were locally distributed during the process of removing the dried materials from the site. This might explain the cadmium concentration detected at sampling location 225-2A.

***Along the 230-Degree Radial.*** During Phase II, three samples (3A, 3B, and 4A) were collected along a 230-degree radial, immediately southwest of the 225-degree radial samples (Figures 4.3-18a and 4.3-18b). Several samples indicated possible EMF influence with slightly above-representative concentrations of cadmium, fluoride, and total phosphorus.

Uranium-238, lead-210, and polonium-210 were within representative levels in the samples collected at locations 3A and 4A. Lead-210 was above representative levels in sample 3B; both lead-210 and polonium-210 were enriched in this sample.

***Along the 240-Degree Radial.*** In Phase II, two samples were collected near Michaud Creek along the 240-degree radial (Figures 4.3-18a and 4.3-18b). Cadmium, copper, total phosphorus, thallium and zinc were marginally above representative levels.

Radionuclides were also within the representative range in the sample collected at location 3A, while lead-210 exceeded representative levels in the sample from 3B.

***Along the 248-Degree Radial.*** Two samples were collected along the 248-degree radial (Figures 4.3-18a and 4.3-18b). Sampling point 248(3B) is near Michaud Creek, and sampling

point 248(4A) is approximately 0.67 mile to the west. Cadmium, total phosphorus and zinc concentrations were marginally above representative levels, indicating a possible EMF effect.

The three radionuclides were in secular equilibrium, although both uranium-238 (4.58 ± 3.42 pCi/g) and polonium-210 (5.08 pCi/g ± 1.14) exceeded their representative levels.

***Along the 270-Degree Radial.*** The northernmost samples collected in this quadrant were along the 270-degree radial, which begins at the far northeastern portion of the FMC property (near I-86) and extends west to the Pocatello airport (Figures 4.3-18a and 4.3-18b). Sampling point 270(1D) is located on a line due north of the FMC southwestern pond area, between the drag strip and I-86. There are a number of constituents present in this sample at greater than representative concentrations (Table 4.3-5). The mix in constituents suggests an EMF effect. Sample 270(2A) lies approximately 0.3 mile to the west of 270(1D), 0.3 mile due north of the facility fenceline, and just to the north of I-86 near a dirt road. The constituent concentrations in this sample indicate a possible EMF influence, with above-representative values of cadmium (8 mg/kg), silver (1.4 mg/kg), vanadium (36.5 mg/kg), and zinc (170 mg/kg). Sample point 270(2B) is approximately 0.5 mile due southwest of 270(2A). It too is just north of I-86 and in an agricultural field.

In the 270(2C) soil sample, which was collected near the airport and northwest of 270(2B), the following EMF characteristic constituents were present at above-representative levels: cadmium (4.6 mg/kg), total chromium (55.8 mg/kg), fluoride (1,900 mg/kg), total phosphorus (1,610 mg/kg), vanadium (60.3 mg/kg), and zinc (77 mg/kg). While these concentrations do suggest some EMF influence, they are only slightly greater than representative levels. Soil sample 270(3A) was taken just to the southwest (Figures 4.3-18a and 4.3-18b). Characteristic constituent concentrations were within representative surface soil levels with the exception of concentrations of total phosphorus (822 mg/kg) and zinc (74.7 mg/kg). This soil sample does not appear to have been significantly impacted by EMF activities. The last soil sample taken in the 270-degree radial series was 270(3B). No constituent detected in this sample was above the representative level

except thallium. Hence, it can generally be concluded that there is no EMF impact in the vicinity of this sample.

Three subsurface samples were taken along the 270-degree radial. They were 270(1D), 270(2A), and 270(3B). With the exception of antimony (52.9 mg/kg in sample 270[3B]), calcium (75,800 mg/kg in sample 270[3B]), lithium (16.2 mg/kg in sample 270[3B]), molybdenum (8.9 mg/kg in sample 270[1D]), and thallium (12.7 mg/kg in sample 270[3B]) in soil sample 270(3B), no other constituents were above representative levels. This finding suggests, as has been demonstrated before, that there is little evidence of subsurface migration of EMF-related constituents in the soils.

Uranium-238, polonium-210, and lead-210 were analyzed in five of the 270-degree radial surface soil samples (1D, 2B, 2C, 3A, 3B) (Table 4.3-1). Radionuclides in all but the sample from location 1D were in secular equilibrium. Polonium-210 (8.87 ± 3.57 ρCi/g) was enriched in this sample. Polonium-210 and lead-210 exceeded their representative levels in the samples collected at locations 1D and 2C. Lead-210 also exceeded its representative level in the other samples.

**Southwestern Quadrant Summary**

With the exception of radial 270, the southwestern quadrant sample locations are upwind to crosswind of the predominant wind patterns. There is, nevertheless, some indication of EMF influence in the surficial soils. The concentrations of EMF-related parameters diminish with distance from the site, as shown in Figures 4.3-48 through 4.3-57. There was no apparent EMF effect on subsurface soil samples.

The 270-degree radial is north of the EMF facilities area and hence crosswind to partially downwind. Above-representative concentrations of EMF-related parameters were detected in the samples collected in the eastern portion of the radial (closer to the central portion of the EMF facility). These concentrations diminished with distance to the west. There was no apparent EMF effect on subsurface soil samples, indicating no vertical migration is occurring.

The activities of lead-210 and polonium-210 (ranging between approximately 5 to 9 pCi/g) in the samples collected in the southwest quadrant may be attributable to natural radon decay. The soils in this area are underlain by rhyolitic volcanic rocks, which are comparable to granite in chemical composition. As noted in the summary discussion for samples collected in the 2- to 3-mile segment of the northeast quadrant, both lead-210 and polonium-210 are decay products of radon-222, which is emitted as a gas in the uranium-238 decay series. These radionuclides are probably not EMF-related in these soils.

#### *4.3.2.4 Northwestern Quadrant*

Samples were collected along three radials in the northwestern quadrant: 293, 315, and 338 degrees. The northwestern quadrant is subject to evening breezes from the adjoining valleys as well as winds generated during winter inversions that flow north to northwest across the study area, in addition to the stronger predominant winds that blow from the southwest.

***Along the 293-Degree Radial.*** Soil samples taken within the first mile along radial 293 lie just to the north of the FMC ore pile and extend westerly to just north of the drag strip at I-86 (Figures 4.3-18a and 4.3-18b). Four samples were collected in this area during Phase I. An additional eight samples were collected in the same area during Phase II. These additional samples were collected to estimate the variance of metals in the area after it was observed that cadmium levels detected in some Phase I samples exceeded 100 mg/kg.

The results follow the trend seen in the samples collected in the northeastern quadrant. Constituents in the "A" samples, which are located on the FMC property, were above representative values, though activities declined significantly with increasing distance from the facilities (Table 4.3-6). Constituents exceeding representative levels included: arsenic (up to 18.4 mg/kg at 1A), cadmium (up to 189 mg/kg at 1A03), total chromium (up to 608 mg/kg at 1A03), fluoride (up to 18,600 mg/kg at 1A03), lead (up to 109 mg/kg at 1A02), mercury (up to 0.69 mg/kg at 1A04), molybdenum (up to 19.1 mg/kg at 1A03), nickel (up to 124 mg/kg at

1A03), total phosphorus (up to 51,500 mg/kg at 1A02), potassium (up to 4920 mg/kg at 1A04), selenium (up to 10.9 mg/kg at 1A03), silver (up to 108 mg/kg at 1A03), vanadium (up to 713 mg/kg at 1A03), and zinc (up to 1540 mg/kg at 1A03). Aluminum, barium, beryllium, boron, calcium, copper, iron and manganese often exceeded representative levels but did not appear to be EMF-related given their lack of correspondence with any of the EMF characteristic constituents. The additional samples confirmed the presence of elevated cadmium concentrations in the "A" and "B" areas.

With several exceptions in the "A" and "B" area, samples taken in the 2-foot horizon were at or below the representative range. The above-representative samples did not contain elevated concentrations relative to those detected in samples from overlying surface soils. Because they are found in the area where road construction activities have taken place over the years, their presence is probably due to mechanical mixing rather than leaching.

As expected, a similar pattern for radionuclides is seen (Table 4.3-1). The maximum activity detected for polonium-210 was 26.1 ± 7.49 pCi/g at 1A03. Polonium-210 exceeded its representative level in 7 of the nine samples collected within the first mile segment along the 293-degree radial. The maximum activity for lead-210 was 50.8 ± 24.5 pCi/g at 1A01; lead-210 exceeded its representative level in 8 of the 9 samples. Uranium-238 was also detected but less frequently; the highest activity was 22.2 ± 5.25 pCi/g at 1A03. Uranium-238 exceeded its representative level in 7 of the 9 samples. As summarized in Table 4.3-2, radionuclides in 4 of the 9 samples collected within the first mile segment were not in secular equilibrium, with polonium-210 being enriched in one and lead-210 enriched in 3 of these samples.

There is a slight indication of EMF influence in the soil samples taken within the 1- to 2-mile radius (samples 293[2A], 293[2B], and 293[2C]) (Table 4.3-6). This indication is fainter in the samples collected along the 2- to 3-mile segment of the radial, in which most of the constituents are below representative levels. Only phosphorus and zinc continued to exceed representative levels, and generally by only a factor of two or less.

Uranium-238, lead-210, and polonium-210 were in secular equilibrium in all three of the samples collected within the 2- to 3-mile segment. Polonium-210 activities marginally exceeded representative levels in the first two samples (2C and 3A), as seen in Figure 4.3-15c. Given secular equilibrium and the marginal exceedance of representative levels, the polonium-210 activities in this segment are likely not EMF-related.

Radial 293 trends approximately east to west, along the northern boundary of the FMC facility. The north to south distance between the facility boundary and the radial is fairly constant. Concentrations of EMF-related parameters are much higher in samples collected in the east than in the western segment of the radial that directly fronts along the facility. This suggests that the source was in the eastern part of the FMC facility (such as the ore pile), and not in the western portion of FMC or Bannock Paving.

The mix of inorganic constituents detected (arsenic, calcium, fluoride, total phosphorus, lead, vanadium, and zinc, plus low potassium) is characteristic of phosphate ore. The elevated lead-210 activity (50.8 ± 24.5 pCi/g) in the sample collected at 1A01, and the absence of secular equilibrium with uranium-238 (9.81 ± 1.15 pCi/g) is, however, uncharacteristic of ore. The potential source of lead-210 is discussed in the air modeling study (Part III, Volume 2 of this report).

***Along the 315-Degree Radial.*** The southernmost sampling location along this radial is south of I-86 (Figures 4.3-18a and 4.3-18b). As expected, this sample contained elevated concentrations relative to representative levels of ore-related constituents (Table 4.3-6). All six of the EMF characteristic constituents exceeded representative levels in the first mile. Four of them exceeded representative levels in the second mile, although by smaller margins. Total phosphorus and zinc exceeded representative levels in the third mile, by still smaller margins.

There was some indication of EMF-related constituents in the subsurface soil sample collected at the southernmost location (315[1A]), although no other subsurface sample collected along the

radial contained above-representative concentrations of EMF characteristic constituents (Table 4.3-6). Some samples contained above-representative concentrations of individual parameters, such as lead, total chromium, or zinc, but rarely in the same sample and not in association with cadmium, fluoride, or total phosphorus. Hence, these are not considered EMF-related.

The activity of one or more radionuclide was elevated above representative levels in seven of the nine samples collected along the 315-degree radial (Table 4.3-1). The radionuclides in samples collected within the first mile (1A and 1C) were not in secular equilibrium, and polonium-210 was enriched in both. However, uranium-238, lead-210, and polonium-210 all exceeded representative levels in the sample collected at location 1A, whereas only polonium-210 exceeded representative levels in the sample from location 1C (Figure 4.3-16a).

The three radionuclides were in secular equilibrium in the first six samples collected beyond the first mile (2A, 2C, 3B, 3B01, 3B02, 3B03), but lead-210 was enriched in the seventh sample (3B04). Lead-210 exceeded representative levels in the last two samples (3B03 and 3B04). Lead-210 was not detected in the first two (2A and 2C), but the detection levels exceeded the representative level. Polonium-210 marginally exceeded its representative level in the samples collected at location 1C and 3B, as shown in Figures 4.3-16a and b.

During Phase I, an anomalously high polonium-210 activity (29.8 ± 15.5 ρCi/g) was detected in the subsurface sample taken at 315(3B). This was the only activity great enough to be detected in the subsurface samples on this radial among the Phase I samples. During Phase II, four additional samples were taken in the immediate vicinity of this sample to determine if the previously detected polonium-210 activity was an outlier. No above-representative activities were found in these samples (Table 4.3-1), and it can be concluded that the reported value of 29.8 ρCi/g was probably due to measurement uncertainties.

***Along the 338-Degree Radial.*** The last radial in the northwestern quadrant is 338, which runs along the western side of the Portneuf River (Figures 4.3-18a and 4.3-18b). The first

sampling point (1A) along this radial is just north of I-86. This soil sample contained above-representative levels of EMF-related parameters: aluminum (15,300 mg/kg), cadmium (22 mg/kg), total chromium (90.7 mg/kg), copper (20.7 mg/kg), fluoride (2,600 mg/kg), lithium (16.7 mg/kg), mercury (0.17 mg/kg), total phosphorus (3,880 mg/kg), nickel (21.9 mg/kg), thallium (0.52 mg/kg), vanadium (97 mg/kg), and zinc (183 mg/kg). With several exceptions, the concentrations of these constituents detected in samples collected further along the radial decreased with distance from the site.

However, unlike other radials, five constituents did not fall below representative concentrations in samples collected within the 2- to 3-mile segment of the radial. Sample 338(3B), the last sampling point on the radial, contained above-representative concentrations of cadmium (4.2 mg/kg), copper (13.8 mg/kg), fluoride (1,300 mg/kg), total phosphorus (1,530 mg/kg), and zinc (81.9 mg/kg).

Four samples collected along this radial were analyzed for radionuclides. Uranium-238, lead-210, and polonium-210 were not in secular equilibrium in the first two samples (1B and 1D). Polonium-210 was enriched in both samples (5.46 ± 1.17 ρCi/g and 7.21 ± 1.32 ρCi/g, respectively), and lead-210 and polonium-210 exceeded representative levels in both samples, as shown in Figure 4.3-17.

The three radionuclides were in secular equilibrium in the two samples collected beyond the first mile (2B and 2C), although lead-210 and polonium-210 exceeded their representative levels in the first sample and polonium-210 and uranium-238 radionuclides exceeded representative levels in the second sample. It should be noted that sample location 338(2C) is within the Portneuf River floodplain and, in fact, appears to be aligned with a former course of the river. It is also near an active gravel pit. These observations, made subsequent to review of the sample data, suggest that surface soil sample 338(2C) may have been influenced not only by fallout, but by river siltation as well. The sample may also reflect emissions from the gravel pit, particularly if

the gravels are derived from granitic rock which would be expected to contain higher levels of uranium-238 than the surrounding loess or floodplain soils.

Subsurface sample constituent concentrations were generally below representative levels. The one parameter that did not follow this pattern is fluoride, which has higher values with distance (Table 4.3-6). Radionuclide activity was measured at three sampling points in the subsurface (1B, 1D, and 2C). No activity was detected above representative levels.

The enriched concentrations of fluoride in samples collected along the entire radial 338, along with the presence of total phosphorus suggest a stack or vent emission as a potential source. On the other hand, polonium-210 in the samples collected at locations 2B and 2C appears not to be due to stack or vent emissions because it is apparently in secular equilibrium with uranium-238. This is discussed further in the air modeling study (Part III, Volume 2 of this report).

***Northwestern Quadrant Summary.*** Examination of bar graphs for selected constituents detected in samples within the northwestern quadrant shows a strong asymptotic relationship along the 293- and 315-degree radials, which is comparable to the pattern found along the other prevailing downwind radials in the northeastern quadrant (Figures 4.3-58 through 4.3-67). However, as was discussed above, constituents detected in samples collected along the 338-degree radial show a less pronounced asymptotic pattern, suggesting a nonfugitive dust, point or stack source.

Representative levels are seen in samples collected along the 293 and 315 degree radials beyond 2 miles from the facilities, except for the elevated activity of lead-210 in two samples from the 315-degree radial (3B03 and 3B04). This isolated occurrence of lead-210 and the absence of other EMF-related constituents indicates that the lead-210 activities are not EMF-related.

Subsurface soils, with some exceptions in the "1A" range of the 293-degree radial, do not appear to have been affected by EMF activities. However, above-representative concentrations of

fluoride in many of the 338-degree radial samples are found in subsurface soils, including those taken within the 3-mile segment from the facilities.

### 4.3.3 CONCLUSIONS

The greatest concentrations of EMF-related constituents are found within a 1-mile radius to the immediate north and east of the operational areas, where windblown ore has accumulated over the years. Most of this area is within FMC or Simplot property boundaries. These concentrations generally taper off with distance to where they are either below or closely approaching representative levels beyond 2 miles. This pattern is best illustrated by examining EMF signature parameters.

Figure 4.3-68 displays cadmium concentrations both in plan view and using map-related histograms. The histograms provide a schematic view of the data "looking" at the site from the southwest (top part of the figure) and the northeast (bottom part of the figure). The map illustrates the relatively low concentrations found in the southern quadrants (generally upwind) compared with those in the downwind northern quadrants. The only noticeable excursions in the south are those connected with the samples just to the south of the FMC pond area.

Figures 4.3-69 through 4.3-76 present the same views for total chromium, fluoride, total phosphorus, zinc, lead, selenium, vanadium, and arsenic. Patterns similar to those seen in the distribution of cadmium can be observed.

Radionuclides follow the same distribution pattern as the inorganic constituents. Where EMF-related parameters were elevated, above-representative radionuclide activity levels were also noted. Above-representative levels of radionuclides—most commonly lead-210 and/or polonium-210—were detected in samples collected beyond the first mile segment of many radials. As noted previously, these radionuclides were either frequently in secular equilibrium with uranium-238 or not associated with other EMF-related constituents. The implication of an EMF-related source, such as deposition from a stack emission, cannot be unequivocally

dismissed in these cases. However, an enrichment through radon-222 decay is a plausible explanation, as discussed previously.

Subsurface soils, with some exceptions in the area near I-86, do not appear to have been impacted by deposition of EMF-related constituents. The one exception is fluoride detected in samples along the 338-degree radial, which appears at above-representative concentrations in most of the subsurface soils out to the 2- to 3-mile range from the facilities.

Constituent concentrations distribution in samples collected along the 338-degree radial did not show a pronounced asymptotic pattern as did the distribution along other downwind radials. This is also the only radial that contained detectable activities of polonium-210 along its entire length. One possible explanation is that the constituents detected in samples collected along the outer reaches of the radial did not originate as fugitive dust.

Further evaluation of the surface soil data and their potential relationship to air emissions from the EMF facilities are provided in the air modeling study presented in Part III, Volume 2 of this report.

# Surface and Subsurface Characterizations Tables for Section 4.3

**Table 4.3-1**
**Radiological Results for Surface Soil Samples (pCi/g)**

| Station ID | Sample ID [a] | Lead-210 [b] | | | | Polonium-210 [b] | | | | Uranium-238 [b] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy |
| 000-1A | SS0001AA | 1.47 | U | -1.92 | 4.86 | 15.2 | | 10.35 | 20.05 | 6.38 | U | -0.2 | 12.96 |
| | BS0001A | 5.39 | U | | | 2.54 | | 0.69 | 4.39 | 0.932 | U | -1.228 | 3.092 |
| 000-1C | SS0001C | 7.51 | U | -0.88 | 15.9 | 10.4 | J | 5.83 | 14.97 | 5.17 | | 1.11 | 9.23 |
| | BS0001C | 5.96 | U | | | 0.224 | U | 0.033 | 0.415 | 1.16 | U | -1.55 | 3.87 |
| 000-2A | SS0002AA | 3.01 | U | -2.81 | 8.83 | 5.35 | | 3.43 | 7.27 | 1.99 | U | -1.89 | 5.87 |
| | BS0002A | 6.05 | U | | | 1.74 | J | 1.092 | 2.388 | 1.31 | U | -1.26 | 3.88 |
| 000-2C | SS0002C | 4.91 | U | | | 1.62 | UJ | 0.33 | 2.91 | 0.099 | U | -1.831 | 2.029 |
| | BS0002C | 6.3 | U | | | 2.27 | UJ | 1.403 | 3.137 | 3.15 | U | -1 | 7.3 |
| 000-3B | SS0003B | 6.85 | U | | | 1.61 | J | 0.15 | 3.07 | 3.18 | U | -0.24 | 6.6 |
| | BS0003B | 5.85 | U | | | 1.39 | | 0.503 | 2.277 | 2 | U | -0.72 | 4.72 |
| 023-1B | SS0231B | 5.65 | U | -0.82 | 12.12 | 19.1 | | 10.9 | 27.3 | 2.86 | U | -0.65 | 6.37 |
| | BS0231B | 4.9 | U | | | 2.22 | | 0.28 | 4.16 | 1.28 | U | -0.91 | 3.47 |
| 023-1D | SS0231D | 0.441 | U | -3.799 | 4.681 | 9.75 | J | 5.73 | 13.77 | 1.25 | U | -1.34 | 3.84 |
| 023-2B | SS0232B | 8.07 | U | | | 5.02 | J | 3 | 7.04 | 1.46 | U | -1.62 | 4.54 |
| | BS0232B | 5.72 | U | | | 1.55 | | 0.949 | 2.151 | 0.315 | U | -2.105 | 2.735 |
| 023-3A | SS0233A | 7.43 | U | | | 1.1 | | 0.266 | 1.934 | 2.11 | U | -2.31 | 6.53 |
| | BS0233AA | 5.58 | U | | | 1.79 | J | 0.43 | 3.15 | 1.43 | U | -0.31 | 3.17 |
| 045-1A | SS0451A | 24.7 | | 10.6 | 38.8 | 28.1 | | 16.8 | 39.4 | 14.4 | | 8.47 | 20.33 |
| | BS0451A | 5.91 | U | | | 3.09 | | 0.98 | 5.2 | 0.971 | U | -1.989 | 3.931 |
| 045-1A01 | SS0451A1 | 15.7 | | 12.58 | 18.82 | 9.67 | | 6.69 | 12.65 | 4.36 | U | 2.07 | 6.65 |
| | BS0451A1 | 4.84 | U | | | 0.784 | | 0.198 | 1.37 | 0.89 | U | -0.11 | 1.89 |
| 045-1A02 | SS0451A2 | 35.1 | | 17.5 | 52.7 | 19.1 | | 12.76 | 25.44 | 9.88 | | 6.91 | 12.85 |
| | BS0451A2 | 6.55 | U | | | 1.26 | | 0.548 | 1.972 | 1.93 | U | 0.33 | 3.53 |
| 045-1A03 | SS0451A3 | 36.3 | | 12.3 | 60.3 | 9.93 | | 7.62 | 12.24 | 20.1 | | 14.54 | 25.66 |
| | BS0451A3 | 7.04 | U | | | 1.49 | | 0.725 | 2.255 | 1.84 | U | | |
| 045-1A04 | SS0451A4 | 10.4 | | 8.37 | 12.43 | 11.6 | | 9.25 | 13.95 | 3.16 | U | 1.42 | 4.9 |
| | BS0451A4 | 0.912 | U | 0.339 | 1.485 | 0.825 | | 0.482 | 1.168 | 0.41 | U | 0.05 | 0.77 |
| 045-1B | SS0451B | 7.62 | | 0.82 | 14.42 | 12.9 | | 8.27 | 17.53 | 5.84 | | 1.1 | 10.58 |
| | BS0451B | 6.26 | U | | | 1.87 | | 0.21 | 3.53 | 1.04 | U | -1.21 | 3.29 |
| 045-1C | SS0451C | 5.6 | U | -0.2 | 11.4 | 0.879 | U | -0.211 | 1.969 | 3.8 | U | -0.12 | 7.72 |
| 045-2A | SS0452A | 5.61 | U | -1.8 | 13.02 | 6.44 | J | 3.21 | 9.67 | 1.73 | U | -1.33 | 4.79 |
| | BS0452A | 5.38 | U | | | 2.58 | J | 0.83 | 4.33 | 0.235 | U | -1.485 | 1.955 |
| 045-2C | SS0452C | 7.79 | U | | | 2.76 | J | 2.208 | 3.312 | 3.5 | U | -0.51 | 7.51 |
| 045-3B | SS0453B | 8.22 | U | | | 2.65 | UJ | 1.882 | 3.418 | 2.5 | U | -0.87 | 5.87 |
| | BS0453B | 3.43 | U | -2.19 | 9.05 | 10.7 | J | 8.51 | 12.89 | 3.88 | U | -0.07 | 7.83 |
| 068-1B | SS0681B | 4.59 | U | -5.81 | 14.99 | 18 | | 12.09 | 23.91 | 11.4 | | 5.49 | 17.31 |
| | BS0681B | 4.87 | U | | | 1.74 | | 0.57 | 2.91 | 1.68 | U | -0.78 | 4.14 |
| 068-1D | SS0681D | 7.06 | U | | | 4.54 | J | 3.35 | 5.73 | 3.9 | U | | |
| | BS0681D | 7.22 | U | | | 3.36 | J | 1.51 | 5.21 | 2.81 | U | -0.26 | 5.88 |
| 068-2B | SS0682B | 8.09 | | 0.33 | 15.85 | 3.74 | U | 2.01 | 5.47 | 4.06 | U | -0.34 | 8.46 |
| | BS0682B | 0.916 | U | -2.034 | 3.866 | 1.6 | J | 0.965 | 2.235 | 1.58 | U | -0.71 | 3.87 |
| 068-3B | SS0683B | 7.65 | U | | | 4.43 | J | 2.55 | 6.31 | 1.35 | U | -1.45 | 4.15 |
| | BS0683B | 4.65 | U | | | 1.02 | U | 0.105 | 1.935 | 2.7 | U | | |

(a) Sample ID numbering scheme: first two letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").
(b) Soil representative levels for lead-210, polonium-210, and uranium-238 are 3.03, 3.58, and 3.88 pCi/g, respectively.

**Table 4.3-1 (continued)**
**Radiological Results for Surface Soil Samples (pCi/g)**

| Station ID | Sample ID [a] | Lead-210 [b] | | | | Polonium-210 [b] | | | | Uranium-238 [b] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy |
| 090-1B | SS0901B | 11.2 | | 0.2 | 22.2 | 50.9 | J | 33.5 | 68.3 | 26.4 | | 19.26 | 33.54 |
| | BS0901B | 1.1 | U | -3.41 | 5.61 | 10.2 | J | 7.49 | 12.91 | 3.5 | U | 0.98 | 6.02 |
| 090-1B01 | SS0901B1 | 1.87 | U | -2.3 | 6.04 | 2.95 | | 1.88 | 4.02 | 2.11 | U | 0.92 | 3.3 |
| | BS0901B1 | 3.66 | U | -1.33 | 8.65 | 0.839 | | 0.309 | 1.369 | 1.24 | U | 0.12 | 2.36 |
| 090-1B02 | SS0901B2 | 21.5 | | 9.8 | 33.2 | 26.3 | | 22.48 | 30.12 | 16.5 | | 12.98 | 20.02 |
| 090-1B03 | SS0901B3 | 20.3 | | 3.7 | 36.9 | 26.7 | | 17.8 | 35.6 | 26.9 | | 21.68 | 32.12 |
| 090-1B04 | SS0901B4 | 15.2 | | 3.8 | 26.6 | 26.2 | | 21.71 | 30.69 | 14.5 | | 10.26 | 18.74 |
| 090-1B05 | SS0901B5 | 1.56 | U | -5.75 | 8.87 | 5.5 | | 4.02 | 6.98 | 5.32 | | 3.49 | 7.15 |
| | BS0901B5 | 7.07 | U | | | 1.03 | | 0.583 | 1.477 | 0.23 | U | -1.25 | 1.71 |
| 090-1C05 | SS0901C5 | 1.54 | U | -6.65 | 9.73 | 1.96 | | 1.313 | 2.607 | 2.8 | U | 0.45 | 5.15 |
| | BS0901C5 | 6.88 | U | | | 0.75 | | 0.193 | 1.307 | 1 | U | -0.49 | 2.49 |
| 090-1D | SS0901D | 4.75 | U | -0.33 | 9.83 | 8.11 | J | 3.27 | 12.95 | 2.66 | U | 0.25 | 5.07 |
| | BS0901D | 3.03 | U | -1.8 | 7.86 | 1.75 | J | 0.4 | 3.1 | 3.36 | U | | |
| 090-2B | SS0902B | 3.96 | U | -2.59 | 10.51 | 4.95 | J | 2.47 | 7.43 | 2.48 | U | -0.71 | 5.67 |
| 090-3A | SS0903AA | 2.71 | U | -2.56 | 7.98 | 3.29 | J | 1.76 | 4.82 | 1.09 | U | -1.39 | 3.57 |
| | BS0903A | 6.04 | U | | | 1.02 | J | 0.239 | 1.801 | 4.21 | U | 0.64 | 7.78 |
| 113-2A | SS1132A | 4.81 | U | -2.23 | 11.85 | 4.93 | J | 2.59 | 7.27 | 3.01 | U | 0.15 | 5.87 |
| | BS1132A | 7.16 | U | | | 1.62 | U | 1.1 | 2.14 | 3.49 | U | -0.18 | 7.16 |
| 113-3A | SS1133A | 7.28 | U | | | 2.62 | U | 0.59 | 4.65 | 1.1 | U | -1.8 | 4 |
| | BS1133A | 5.56 | U | | | 6.92 | J | 3.53 | 10.31 | 1.56 | U | -1.25 | 4.37 |
| 120-2C | SS1202C | 6.67 | | 0.38 | 12.96 | 11.7 | J | 7.04 | 16.36 | 2.15 | U | -1.02 | 5.32 |
| | BS1202C | 6.37 | U | | | 0.808 | U | 0.081 | 1.535 | 1.33 | U | -1.32 | 3.98 |
| 125-3A | SS1253AA | 6.57 | U | -0.34 | 13.48 | 5.49 | | 3.21 | 7.77 | 2.27 | U | -0.81 | 5.35 |
| | BS1253A | 5.15 | U | | | 1.92 | | 0.59 | 3.25 | 1.85 | U | -0.64 | 4.34 |
| 135-2A | SS1352A | 3.35 | U | -2.59 | 9.29 | 6.15 | | 3.95 | 8.35 | 1.63 | U | -0.8 | 4.06 |
| | BS1352A | 6.66 | U | | | 1.53 | U | 0.894 | 2.166 | 1.61 | U | -1 | 4.22 |
| 135-2C | SS1352C | 1.32 | U | -3.22 | 5.86 | 6.01 | J | 2.98 | 9.04 | 3.59 | U | | |
| | BS1352C | 6.51 | U | | | 5.13 | | 4.12 | 6.14 | 0.583 | U | -1.647 | 2.813 |
| 135-3B | SS1353B | 2.47 | U | -3.89 | 8.83 | 9.13 | | 5.24 | 13.02 | 3.44 | U | | |
| | BS1353B | 5.55 | U | | | 0.989 | U | 0.026 | 1.952 | 0.621 | U | -1.609 | 2.851 |
| 158-2B | SS1582BA | 5.24 | | 0.1 | 10.38 | 5.74 | J | 3.59 | 7.89 | 3.29 | U | 0.04 | 6.54 |
| | BS1582B | 5.97 | U | | | 2.15 | J | 1.477 | 2.823 | 2.33 | U | -0.3 | 4.96 |
| 158-3B | SS1583B | 7.86 | U | | | 6.3 | J | 3.41 | 9.19 | 0.56399 | U | -1.84601 | 2.97399 |
| | BS1583B | 6.13 | U | | | 2.53 | J | 1.765 | 3.295 | 1.64 | U | -0.83 | 4.11 |
| 180-2B | SS1802BA | 5.48 | U | -0.51 | 11.47 | 7.51 | J | 3.77 | 11.25 | 3.26 | U | -0.97 | 7.49 |
| 180-3A | SS1803A | 3.31 | U | -0.83 | 7.45 | 5.79 | | 4.68 | 6.9 | 1.16 | U | -0.76 | 3.08 |
| | BS1803A | 1.6 | U | -2.18 | 5.38 | 3.92 | U | 2.25 | 5.59 | 5.42 | | 0.88 | 9.96 |
| 180-4A | SS1804A | 4.92 | U | -1.47 | 11.31 | 5.56 | J | 2.73 | 8.39 | 1.32 | U | -1.49 | 4.13 |
| 203-3A | SS2033AA | 8.41 | U | -3.09 | 19.91 | 7.35 | J | 4.53 | 10.17 | 7.08 | U | | |
| | BS2033A | 5.13 | U | | | 2.31 | J | 0.9 | 3.72 | 3.03 | U | 0.29 | 5.77 |
| 203-4A | SS2034A | 0.728 | U | -5.862 | 7.318 | 5.02 | J | 3.71 | 6.33 | 3.04 | U | | |
| | BS2034A | 4.76 | U | -0.16 | 9.68 | 2.15 | J | 0.92 | 3.38 | 0.572 | U | -1.298 | 2.442 |

(a) Sample ID numbering scheme: first two letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").
(b) Soil representative levels for lead-210, polonium-210, and uranium-238 are 3.03, 3.58, and 3.88 pCi/g, respectively.

**Table 4.3-1 (continued)**
**Radiological Results for Surface Soil Samples (pCi/g)**

| Station ID | Sample ID [a] | Lead-210[b] | | | | Polonium-210[b] | | | | Uranium-238[b] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy |
| 205-3A | SS2053A | 1.6 | U | -3.32 | 6.52 | 0.387 | U | 0.052 | 0.722 | 1.46 | U | 0.07 | 2.85 |
| | BS2053AA | 4.54 | U | | | 0.432 | U | 0.135 | 0.729 | 0.17 | U | -0.8 | 1.14 |
| 205-3B | SS2053B | 5.77 | | 4.42 | 7.12 | 1.59 | | 0.969 | 2.211 | 1.61 | U | 0.7 | 2.52 |
| | BS2053B | 0.746 | U | -0.264 | 1.756 | 1.05 | | 0.503 | 1.597 | 1.33 | U | -0.11 | 2.77 |
| 205-4A | SS2054AA | 1.43 | U | 0.642 | 2.218 | 0.438 | U | 0.236 | 0.64 | 2.95 | U | 0.92 | 4.98 |
| | BS2054A | 1.26 | U | 0.563 | 1.957 | 1.01 | | 0.241 | 1.779 | 1.16 | U | | |
| 225-2A | SS2252A | 3.84 | U | -3.2 | 10.88 | 11.6 | J | 9.75 | 13.45 | 2.13 | U | -1.68 | 5.94 |
| | BS2252A | 0.741 | U | -4.469 | 5.951 | 2.07 | | 1.368 | 2.772 | 0.795 | U | -1.585 | 3.175 |
| 225-2C | SS2252C | 9.68 | | 2.1 | 17.26 | 5.99 | | 3.06 | 8.92 | 3.34 | U | 0.04 | 6.64 |
| | BS2252C | 5.43 | U | | | 1.41 | | 0.31 | 2.51 | 2.85 | U | | |
| 225-3B | SS2253BA | 2.95 | U | -3.6 | 9.5 | 5.26 | | 3.42 | 7.1 | 0.0111 | U | -2.6489 | 2.6711 |
| | BS2253B | 4.95 | U | | | 1.74 | | 1.118 | 2.362 | 1.07 | U | -1.24 | 3.38 |
| 230-3A | SS2303A | 0.546 | U | -1.014 | 2.106 | 0.848 | | 0.418 | 1.278 | 1.2 | U | -0.93 | 3.33 |
| | BS2303A | 1.06 | U | 0.291 | 1.829 | 0.724 | | 0.37 | 1.078 | 1.05 | U | -0.3 | 2.4 |
| 230-3B | SS2303B | 4.92 | U | 3.53 | 6.31 | 3.34 | | 2.419 | 4.261 | 0.7 | U | -0.47 | 1.87 |
| | BS2303B | 3.9 | U | -1.53 | 9.33 | 1.06 | | 0.475 | 1.645 | 0.45 | U | -0.54 | 1.44 |
| 230-4A | SS2304A | 2.69 | U | 1.66 | 3.72 | 1.33 | | 0.828 | 1.832 | 1.22 | U | 0.49 | 1.95 |
| | BS2304A | 1.24 | U | 0.517 | 1.963 | 0.665 | UJ | 0.37 | 0.96 | 0.8 | U | 0.17 | 1.43 |
| 240-3A | SS2403A | 3.31 | U | 2.13 | 4.49 | 2.24 | | 1.486 | 2.994 | 1.04 | U | 0.33 | 1.75 |
| | BS2403A | 0.749 | U | | | 0.917 | | 0.223 | 1.611 | 2.05 | U | 0.21 | 3.89 |
| 240-3B | SS2403B | 4.15 | U | 2.98 | 5.32 | 2.32 | | 1.391 | 3.249 | 0.89 | U | 0.17 | 1.61 |
| | BS2403B | 5.13 | U | | | 0.922 | | 0.553 | 1.291 | 0.88 | U | -0.3 | 2.06 |
| 248-3B | SS2483B | 3.63 | U | -2.2 | 9.46 | 5.08 | J | 3.94 | 6.22 | 4.58 | U | 1.15 | 8.01 |
| | BS2483B | 5.89 | U | | | 1.44 | | 0.952 | 1.928 | 1.14 | U | -1.57 | 3.85 |
| 270-1D | SS2701D | 6.17 | U | -1.11 | 13.45 | 8.87 | | 5.3 | 12.44 | 1.46 | U | -2.3 | 5.22 |
| | BS2701D | 4.85 | U | | | 3.37 | | 1.71 | 5.03 | 0.223 | U | -1.517 | 1.963 |
| 270-2B | SS2702B | 7.98 | U | | | 2.9 | | 1.996 | 3.804 | 1.32 | U | -2.18 | 4.82 |
| 270-2C | SS2702C | 9.52 | | 1.06 | 17.98 | 7.55 | J | 5.18 | 9.92 | 2.77 | U | -1.23 | 6.77 |
| 270-3A | SS2703A | 8.45 | U | | | 3.35 | | 2.496 | 4.204 | 1.79 | U | -1.32 | 4.9 |
| 270-3B | SS2703B | 5.88 | U | | | 1.99 | J | 1.13 | 2.85 | 1.97 | U | -1.21 | 5.15 |
| | BS2703BA | 2.37 | U | -5.1 | 9.84 | 1.4 | | 0.908 | 1.892 | 2.5 | U | -0.53 | 5.53 |
| 293-1A01 | SS2931A1 | 50.8 | | 26.3 | 75.3 | 19.9 | | 15.1 | 24.7 | 9.81 | | 8.66 | 10.96 |
| | BS2931A1 | 7.83 | U | -1.14 | 16.8 | 2.41 | | 1.767 | 3.053 | 1.81 | U | 0.87 | 2.75 |
| 293-1A02 | SS2931A2 | 23.2 | | 8.8 | 37.6 | 20.3 | | 16.13 | 24.47 | 11.4 | | 7.99 | 14.81 |
| | BS2931A2 | 7.71 | U | | | 1.65 | | 0.776 | 2.524 | 2 | U | 1.11 | 2.89 |
| 293-1A03 | SS2931A3 | 41.4 | | 21.5 | 61.3 | 26.1 | | 18.61 | 33.59 | 22.2 | | 16.95 | 27.45 |
| | BS2931A3 | 7.42 | U | | | 0.843 | | 0.393 | 1.293 | 2.71 | U | 1.07 | 4.35 |
| 293-1A04 | SS2931A4 | 18.3 | | 5.6 | 31 | 10.8 | | 8.86 | 12.74 | 15.34 | | 12.82 | 17.86 |
| | BS2931A4 | 1.88 | U | 1.12 | 2.64 | 1.17 | | 0.527 | 1.813 | 0.84 | U | 0.11 | 1.57 |
| 293-1B01 | SS2931B1 | 35.2 | | 19.8 | 50.6 | 12.7 | | 8.48 | 16.92 | 9.41 | | 6.56 | 12.26 |
| | BS2931B1 | 0.74 | U | | | 1.09 | | 0.493 | 1.687 | 0.45 | U | | |

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").
(b) Soil representative levels for lead-210, polonium-210, and uranium-238 are 3.03, 3.58, and 3.88 pCi/g, respectively.

**Table 4.3-1 (continued)**
**Radiological Results for Surface Soil Samples (pCi/g)**

| Station ID | Sample ID [a] | Lead-210 [b] | | | | Polonium-210 [b] | | | | Uranium-238 [b] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy | Actual Value | Qualifier | Actual Value Minus Accuracy | Actual Value Plus Accuracy |
| 293-1B03 | SS2931B3 | 0.96 | U | -3.01 | 4.93 | 2.21 | | 1.442 | 2.978 | 0.98 | U | 0.1 | 1.86 |
| | BS2931B3 | 7.17 | U | | | 0.624 | | 0.258 | 0.99 | 1.93 | U | | |
| 293-1B04 | SS2931B4 | 9.7 | | 7.25 | 12.15 | 7.73 | | 6.43 | 9.03 | 5.33 | U | 3.72 | 6.94 |
| | BS2931B4 | 0.7 | U | | | 0.473 | U | 0.063 | 0.883 | 0.92 | U | 0.25 | 1.59 |
| 293-1B05 | SS2931B5 | 17.2 | | 7.76 | 26.64 | 7.02 | | 5.34 | 8.7 | 3.9 | U | 3.25 | 4.55 |
| | BS2931B5 | 3.98 | U | -2.76 | 10.72 | 0.839 | | 0.202 | 1.476 | 0.641 | U | 0.165 | 1.117 |
| 293-1D | SS2931D | 7.93 | U | -2.57 | 18.43 | 1.85 | J | 1.029 | 2.671 | 3.92 | U | -0.05 | 7.89 |
| | BS2931D | 6.43 | U | | | 12.4 | | 10.3 | 14.5 | 3.3 | U | | |
| 293-2C | SS2932C | 1.28 | U | -4.11 | 6.67 | 5.61 | J | 3.38 | 7.84 | 2.78 | U | 0.24 | 5.32 |
| | BS2932C | 5.5 | U | | | 0.359 | U | -0.182 | 0.9 | 1.73 | U | -0.6 | 4.06 |
| 293-3A | SS2933A | 1.41 | U | -3.83 | 6.65 | 4.11 | | 3.01 | 5.21 | 1.63 | U | -1.1 | 4.36 |
| 293-3B | SS2933B | 1.95 | U | -3.12 | 7.02 | 3.05 | | 2.079 | 4.021 | 3.87 | U | 0.24 | 7.5 |
| | BS2933B | 1.85 | U | -5.81 | 9.51 | 3.24 | | 1.91 | 4.57 | 0.437 | U | -2.833 | 3.707 |
| 315-1A | SS3151A | 7.84 | U | -4.56 | 20.24 | 31.4 | | 27.24 | 35.56 | 19.5 | | 12.28 | 26.72 |
| | BS3151A | 5.75 | U | | | 2.13 | | 0.51 | 3.75 | 1.81 | U | -0.63 | 4.25 |
| 315-1C | SS3151CA | 1.53 | U | -2.49 | 5.55 | 5.02 | J | 3.49 | 6.55 | 2.76 | U | | |
| 315-2A | SS3152A | 6.27 | U | | | 2.66 | U | 0.67 | 4.65 | 2.62 | U | -0.34 | 5.58 |
| | BS3152A | 6.03 | U | | | 1.64 | UJ | 0.988 | 2.292 | 0.578 | U | -1.692 | 2.848 |
| 315-2C | SS3152C | 6.28 | U | | | 1.27 | J | 0.741 | 1.799 | 1.32 | U | -1.18 | 3.82 |
| | BS3152C | 4.84 | U | | | 1.02 | U | -0.02 | 2.06 | 1.76 | U | -0.14 | 3.66 |
| 315-3B | SS3153B | 3.5 | U | -1.92 | 8.92 | 5.01 | J | 1.99 | 8.03 | 1.5 | U | -1.18 | 4.18 |
| | BS3153B | 4.86 | U | | | 29.8 | J | 22.05 | 37.55 | 1.19 | U | -1.06 | 3.44 |
| 315-3B01 | SS3153B1 | 2.08 | U | 1.277 | 2.883 | 2.02 | | 1.445 | 2.595 | 1.25 | U | -0.38 | 2.88 |
| | BS3153B1 | 4.54 | U | | | 1.08 | | 0.586 | 1.574 | 0.68 | U | -0.25 | 1.64 |
| 315-3B02 | SS3153B2 | 0.64 | U | | | 0.843 | | 0.405 | 1.281 | 0.54 | U | 0.08 | 1 |
| | BS3153B2 | 3.88 | U | -2.09 | 9.85 | 1.6 | | 0.765 | 2.435 | 0.78 | U | -0.17 | 1.73 |
| 315-3B03 | SS3153B3 | 5.84 | UJ | -1.06 | 12.74 | 1.01 | | 0.552 | 1.468 | 2.19 | U | 0.08 | 4.3 |
| | BS3153B3 | 0.86 | U | | | 0.746 | | 0.364 | 1.128 | 0.74 | U | -0.94 | 2.42 |
| 315-3B04 | SS3153B4 | 11 | | 3.87 | 18.13 | 1.82 | | 1.155 | 2.485 | 1.28 | U | 0.18 | 2.38 |
| | BS3153B4 | 0.709 | U | | | 0.751 | | 0.173 | 1.329 | 0.06 | U | 0 | 0.12 |
| 338-1B | SS3381B | 6.16 | U | | | 5.46 | J | 4.29 | 6.63 | 1.97 | U | -0.17 | 4.11 |
| | BS3381B | 5.91 | U | | | 1.8 | J | 1.096 | 2.504 | 1.07 | U | -1.59 | 3.73 |
| 338-1D | SS3381D | 3.92 | U | -1.89 | 9.73 | 7.21 | | 5.89 | 8.53 | 2.62 | U | -0.05 | 5.29 |
| | BS3381D | 5.71 | U | | | 3.79 | J | 2.61 | 4.97 | 2.97 | U | | |
| 338-2B | SS3382B | 5.98 | U | -0.01 | 11.97 | 7.92 | | 5.21 | 10.63 | 3.45 | U | 0.44 | 6.46 |
| 338-2C | SS3382C | 3.98 | U | -3.5 | 11.46 | 8.68 | J | 4.82 | 12.54 | 6.79 | | 1.65 | 11.93 |
| | BS3382C | 2.57 | U | -3.14 | 8.28 | 2.1 | J | 0.37 | 3.83 | 0.262 | U | -1.608 | 2.132 |
| SSBKGD01 | SSBKGD01 | 0.741 | U | 0.111 | 1.371 | 0.769 | | 0.421 | 1.117 | 1.13 | U | | |
| SSBKGD02 | SSBKGD02 | 3.16 | U | 2.175 | 4.145 | 1.87 | | 1.257 | 2.483 | 0.65 | U | 0 | 1.3 |
| SSBKGD03 | SSBKGD03 | 1.14 | U | 0.453 | 1.827 | 1.02 | | 0.615 | 1.425 | 1.163 | U | -0.707 | 3.033 |
| SSBKGD04 | SSBKGD04 | 1.21 | U | 0.441 | 1.979 | 0.849 | | 0.438 | 1.26 | 1.11 | U | | |
| SSBKGD05 | SSBKGD05 | 1.85 | U | 1.029 | 2.671 | 0.756 | | 0.49 | 1.022 | 1.35 | U | 0.52 | 2.18 |

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").
(b) Soil representative levels for lead-210, polonium-210, and uranium-238 are 3.03, 3.58, and 3.88 pCi/g, respectively.

**TABLE 4.3-2**
**SECULAR EQUILIBRIUM RELATIONSHIPS OF RADIONUCLIDES IN SURFACE SOILS**

| STATION ID | RADIONUCLIDES IN SECULAR EQUILIBRIUM[a] | RADIONUCLIDES ENRICHED RELATIVE TO U-238 | RADIONUCLIDES THAT EXCEED REPRESENTATIVE LEVELS[b] |
|---|---|---|---|
| **Northeast Quadrant: First Mile from Grid Origin** | | | |
| 000-1A | no | Po | U and Po |
| 000-1C | yes | | U, Pb, Po |
| 023-1B | no | Po | Pb and Po |
| 023-1D | no | Po | Po |
| 045-1A | yes | | U, Pb, Po |
| 045-1A01 | no | Pb and Po | U, Pb, Po |
| 045-1A02 | no | Pb and Po | U, Pb, Po |
| 045-1A03 | yes | | U, Pb, Po |
| 045-1A04 | no | Pb and Po | Pb and Po |
| 045-1B | yes | | U, Pb, Po |
| 045-1C | yes | | U and Pb |
| 068-1B | yes | | U, Pb, Po |
| 068-1D | yes | | Pb and Po |
| 090-1B | no | Po | U, Pb, Po |
| 090-1B01 | yes | | none |
| 090-1B02 | no | Po | U, Pb, Po |
| 090-1B03 | yes | | U, Pb, Po |
| 090-1B04 | no | Po | U, Pb, Po |
| 090-1B05 | yes | | none |
| 090-1C05 | yes | | none |
| 090-1D | yes | | Pb, Po |
| **Northeast Quadrant: Beyond First Mile from Grid Origin** | | | |
| 000-2A | yes | | Po |
| 000-2C | yes | | Pb |
| 000-3B | yes | | Pb |
| 023-2B | yes | | Pb and Po |
| 023-3A | yes | | Pb |
| 045-2A | yes | | Pb and Po |
| 045-2C | yes | | Pb |
| 045-3B | yes | | Pb |
| 068-2B | yes | | Pb |
| 068-3B | yes | | Pb and Po |
| 090-2B | yes | | Pb and Po |
| 090-3A | yes | | none |

(a) Uranium-238, lead-210, and polonium-210.

(b) A radionuclide is listed as exceeding its soil representative level if the "actual value" reported was greater than the representative level. Figures 4.3-2 through -17 show that the analytical confidence interval for many of these cases extends below representative levels, indicating that the activity may actually be less than the representative level.

TABLE 4.3-2 *(continued)*
SECULAR EQUILIBRIUM RELATIONSHIPS OF RADIONUCLIDES IN SURFACE SOILS

| STATION ID | RADIONUCLIDES IN SECULAR EQUILIBRIUM[a] | RADIONUCLIDES ENRICHED RELATIVE TO U-238 | RADIONUCLIDES THAT EXCEED REPRESENTATIVE LEVELS[b] |
|---|---|---|---|
| **Southeast Quadrant** | | | |
| 113-2A | yes | | Pb and Po |
| 113-3A | yes | | Pb |
| 120-2C | no | Po | Pb and Po |
| 125-3A | yes | | Pb and Po |
| 135-2A | no | Po | Po |
| 135-2C | yes | | Po |
| 135-3B | no | Po | Po |
| 158-2B | yes | | Pb and Po |
| 158-3B | no | Pb and Po | Pb and Po |
| 180-2B | yes | | Pb and Po |
| 180-3A | no | Po | Po |
| 180-4A | yes | | Pb and Po |
| **Southwest Quadrant** | | | |
| 203-3A | yes | | U, Pb, Po |
| 203-4A | no | Po | Po |
| 205-3A | yes | | none |
| 205-3B | no | Pb | Pb |
| 205-4A | yes | | none |
| 225-2A | no | Po | Pb and Po |
| 225-2C | yes | | Pb and Po |
| 225-3B | no | Po | Po |
| 230-3A | yes | | none |
| 230-3B | no | Pb and Po | Pb |
| 230-4A | yes | | none |
| 240-3A | no | Pb | none |
| 240-3B | no | Pb | Pb |
| 248-3B | yes | | U, Po |
| 270-1D | no | Po | Pb and Po |
| 270-2B | yes | | Pb |
| 270-2C | yes | | Pb and Po |
| 270-3A | yes | | Pb |
| 270-3B | yes | | Pb |

(a) Uranium-238, lead-210, and polonium-210.

(b) A radionuclide is listed as exceeding its soil representative level if the "actual value" reported was greater than the representative level. Figures 4.3-2 through -17 show that the analytical confidence interval for many of these cases extends below representative levels, indicating that the activity may actually be less than the representative level.

TABLE 4.3-2 (*continued*)
SECULAR EQUILIBRIUM RELATIONSHIPS OF RADIONUCLIDES IN SURFACE SOILS

| STATION ID | RADIONUCLIDES IN SECULAR EQUILIBRIUM[a] | RADIONUCLIDES ENRICHED RELATIVE TO U-238 | RADIONUCLIDES THAT EXCEED REPRESENTATIVE LEVELS[b] |
|---|---|---|---|
| **Northwest Quadrant: First Mile from Grid Origin** | | | |
| 293-1A01 | no | Pb | U, Pb, Po |
| 293-1A02 | no | Po | U, Pb, Po |
| 293-1A03 | yes | | U, Pb, Po |
| 293-1A04 | yes | | U, Pb, Po |
| 293-1B01 | no | Pb | U, Pb, Po |
| 293-1B03 | yes | | none |
| 293-1B04 | yes | | U, Pb, Po |
| 293-1B05 | no | Pb | Pb and Po |
| 293-1D | yes | | Pb and U |
| 315-1A | no | Po | U, Pb, Po |
| 315-1C | no | Po | Po |
| 338-1B | no | Po | Pb and Po |
| 338-1D | no | Po | Pb and Po |
| **Northwest Quadrant: Beyond First Mile from Grid Origin** | | | |
| 293-2C | yes | | Po |
| 293-3A | yes | | Po |
| 293-3B | yes | | |
| 315-2A | yes | | Pb |
| 315-2C | yes | | Pb |
| 315-3B | yes | | Po |
| 315-3B01 | yes | | none |
| 315-3B02 | yes | | none |
| 315-3B03 | yes | | Pb |
| 315-3B04 | no | Pb | Pb |
| 338-2B | yes | | Pb and Po |
| 338-2C | yes | | U, Pb, Po |

(a) Uranium-238, lead-210, and polonium-210.

(b) A radionuclide is listed as exceeding its soil representative level if the "actual value" reported was greater than the representative level. Figures 4.3-2 through -17 show that the analytical confidence interval for many of these cases extends below representative levels, indicating that the activity may actually be less than the representative level.

## Table 4.3-3
## Analytical Results for Surface Soil Samples - Northeastern Quadrant

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0001AA | 12,800 J | 11.7 UJ | 3.3 | 137 J | 1.4 | 1.3 U | 45.3 | NA | 80.5 J | 3.3 | 21.6 | 3,450 | 13,100 J | 33.9 U | 11.7 |
| SS0001B | 10,800 | 6.1 UJ | 3.8 U | 87.8 | 0.81 | 2.9 | 12.9 J | NA | 99.4 J | 4.4 UJ | 15.9 J | 1,490 | 13,400 J | 24.1 J | 11.4 |
| SS0001C | 11,900 | 4.6 UJ | 7.4 | 150 | 0.72 | 15.6 | 24.6 J | 33900 J | 68.4 | 5.7 | 61.9 | 2,340 | 13,600 J | 68.1 | 11.8 |
| SS0001D | 9,190 | 6.1 UJ | 5.8 | 154 J | 0.3 | 3.43 | 13.1 | NA | 28.8 | 6.4 | 14.8 | 940 | 10,400 | 20.8 | 12.3 |
| SS0002A | 10,100 | 11.2 J | 3 | 154 | 0.56 | 8.3 | 12 | NA | 35.7 | 5.6 | 17.5 | 1,290 | 13,200 | 17.2 J | 13.9 J |
| SS0002B | 14,500 | 4.4 U | 5.4 | 161 | 0.88 J | 2.5 | 2.1 | NA | 26.5 | 8.7 | 13.9 | 575 | 14,800 J | 12.3 J | 20.1 J |
| SS0002C | 11,700 | 4.2 UJ | 3.2 | 192 J | 0.63 U | 1.76 | 1.3 | NA | 19.2 | 5 U | 13.2 | 458 | 16,000 | 21.5 | 18.4 |
| SS0003A | 12,700 | 4 U | 1.8 U | 140 | 0.67 J | 3.8 | 1.4 U | NA | 21.3 | 7.8 U | 13.9 | 438 | 14,300 J | 21.6 J | 15.4 J |
| SS0003B | 11,100 | 5.1 U | 8.8 | 129 | 0.84 J | 5.6 | 0.93 U | NA | 19.4 | 8.9 U | 12.3 | 305 | 12,400 J | 26 J | 15.3 J |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0001AA | NA | 367 J | 0.11 | 5.5 U | 29.3 | 5 | 12,200 | NA | 2.1 | 3.2 | NA | 0.3 | 151 | 321 J |
| SS0001B | NA | 361 J | 0.1 U | 9.1 | 45.5 | 2.8 | 3,050 | NA | 1.7 U | 0.71 U | NA | 0.41 J | 28.3 J | 128 J |
| SS0001C | 6,740 | 367 J | 0.48 U | 5.6 U | 21 | 20 | 6,010 | NA | 1.2 | 0.91 U | NA | 7.2 U | 83.6 | 331 J |
| SS0001D | NA | 463 | 0.16 U | 3 | 13.4 | 12 | 3,980 | NA | 0.85 | 0.41 J | NA | 0.44 | 20.3 | 114 |
| SS0002A | NA | 650 J | 0.1 | 1.2 U | 14.3 | 10 | 3,400 | NA | 0.56 | 1.6 | NA | 0.23 | 54.7 | 134 |
| SS0002B | NA | 425 | 0.1 | 1.2 U | 13.3 | 6.6 | 955 | NA | 2.5 U | 1 | NA | 0.06 U | 31.6 | 81.6 |
| SS0002C | NA | 447 | 0.08 U | 1.2 U | 11.1 U | 13 | 737 | NA | 1 | 1.1 J | NA | 0.11 U | 28.8 | 69.6 |
| SS0003A | NA | 417 | 0.08 | 2.7 U | 12.6 | 12.7 | 782 | NA | 2.2 U | 0.8 | NA | 0.16 | 22.7 | 65.8 |
| SS0003B | NA | 469 | 0.2 | 5.1 U | 9.9 | 5.9 | 458 | NA | 5.2 | 0.42 | NA | 0.11 | 27 | 58.5 |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0001A | 10,500 J | 11.9 UJ | 6.4 | 143 J | 0.56 | 3.6 | 1.7 | NA | 14.5 J | 3.4 | 9.4 | 385 | 14,400 J | 9.4 J | 14 |
| BS0001B | 7,960 | 6.6 UJ | 1.8 U | 123 | 0.88 | 1.6 | 0.31 UJ | NA | 14.7 J | 4.2 UJ | 9.3 J | 470 | 12,000 J | 12.1 J | 12.7 |
| BS0001C | 11,700 | 4.2 UJ | 6.2 | 145 | 0.64 | 3.9 | 0.99 J | NA | 19.9 | 5.7 | 10.4 | 403 | 12,300 | 11.9 J | 14.8 |
| BS0002AA | 8,460 | 12.9 J | 3.4 | 121 | 0.34 | 15.4 | 1.4 | NA | 15.6 | 3.9 | 12.6 | 445 | 13,200 | 29.3 J | 17.9 J |
| BS0002B | 13,500 | 4.7 U | 6.7 | 164 | 0.86 J | 1.3 | 0.38 | NA | 21.8 | 8.4 | 11.8 | 408 | 15,500 J | 20.5 J | 20.2 J |
| BS0002C | 7,840 | 4 UJ | 2.4 | 137 J | 0.47 U | 0.79 | 0.28 | NA | 14.1 | 4.1 U | 9 | 455 | 10,700 | 9.8 J | 13.5 |
| BS0003A | 10,900 | 4.8 U | 4.2 U | 167 | 0.57 UJ | 2.4 | 0.55 | NA | 20.2 | 8.2 U | 12.5 | 383 | 14,200 J | 17.2 J | 15 J |
| BS0003B | 7,810 | 4.8 U | 4.3 U | 126 | 0.65 UJ | 2.8 | 0.31 | NA | 15.3 | 8 U | 8.7 | 360 | 9,990 J | 16.6 J | 11.6 J |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0001A | NA | 369 J | 0.09 | 2.1 U | 10.4 | 1 | 928 | NA | 0.27 U | 0.35 | NA | 0.08 | 30.8 | 48.4 J |
| BS0001B | NA | 299 J | 0.08 U | 1.9 U | 9.5 | 0.6 | 667 | NA | 2.1 U | 0.22 U | NA | 0.17 UJ | 68.1 J | 39.7 J |
| BS0001C | NA | 465 | 0.26 | 1.2 UJ | 12 | 4.9 | 648 | NA | 2.2 | 0.99 J | NA | 0.29 J | 26.9 | 45.9 |
| BS0002AA | NA | 501 J | 0.13 | 4.1 | 10.8 | 5.3 | 1,260 | NA | 0.4 | 1.2 | NA | 0.16 J | 30.6 | 49.2 |
| BS0002B | NA | 457 | 0.15 | 2.3 U | 9.4 | 0.8 | 404 | NA | 3.1 | 0.63 | NA | 0.15 | 25 | 52 |
| BS0002C | NA | 298 | 0.27 U | 1.1 U | 9.3 U | 0.05 U | 460 | NA | 0.3 | 1.1 J | NA | 0.1 UJ | 26.8 | 34.1 |
| BS0003A | NA | 342 | 0.1 | 4.8 U | 13.1 | 2 | 491 | NA | 2.7 | 0.89 | NA | 0.1 | 31.5 | 45.8 |
| BS0003B | NA | 299 | 0.09 | 3.2 U | 9.8 | 1 | 431 | NA | 3.1 | 1 | NA | 0.1 | 25.8 | 36.2 |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-3

## Table 4.3-3 (continued)
## Analytical Results for Surface Soil Samples - Northeastern Quadrant

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0231A | 12,900 J | 13.1 UJ | 5 | 186 | J 0.52 | 5.8 | 36.6 | NA | 73.9 J | 2.2 | 19.9 | 3,420 | 11,300 J | 23.2 J | 11.2 |
| SS0231B | 8,770 J | 14.6 UJ | 4.7 | 95.6 | J 0.86 | 3.2 | 43.5 | NA | 87.5 J | 2.5 | 16.4 | 2,500 | 9,530 J | 32.3 J | 7 |
| SS0231C | 1,150 | 4.1 UJ | 5.9 | 375 | J 0.68 U | 2.47 | 16.9 | NA | 48.9 | 4.8 U | 18.5 | 1,590 | 14,400 | 19.3 | 15.3 |
| SS0231D | 13,600 | 6.6 U | 7.4 | 166 | 0.79 J | 4.1 | 9.7 | NA | 34.4 | 5.5 | 14.2 | 1,280 | 14,300 J | 30.7 J | 15.4 J |
| SS0232A | 12,100 | 4.1 UJ | 6.3 | 157 | 0.34 | 7.3 | 4.9 | NA | 26 | 4.2 | 33.6 | 528 | 20,000 | 39.9 J | 10.8 J |
| SS0232B | 13,600 | 4 U | 4.3 U | 145 | 0.8 J | 2.8 | 4.5 | NA | 30.7 | 6.3 | 13.4 | 708 | 13,300 J | 25.9 J | 17.8 J |
| SS0232C | 11,400 | 15.4 J | 6.1 | 181 | 0.63 | 7.3 | 2.4 | NA | 19 | 4.2 | 13.7 | 468 | 13,700 | 17.5 J | 12.3 J |
| SS0233A | 9,910 | 4.8 U | 5.1 | 130 | 0.4 UJ | 3.8 | 0.64 U | NA | 17 | 7.6 U | 13 | 368 | 10,500 J | 20.5 J | 13.2 J |
| SS0233BA | 9,270 | 4.2 U | 2.6 | 153 | 0.07 UJ | 6.4 | 0.49 | NA | 13.3 | 7.2 U | 10.8 | 448 | 11,400 J | 19.3 J | 12.4 J |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0231A | NA | 350 J | 0.08 | 5.9 U | 22.9 | 6.7 | 11700 | NA | 1.1 | 2.7 | NA | 0.26 | 133 | 267 J |
| SS0231B | NA | 295 J | 0.09 | 5.3 U | 19.2 | 8 | 11400 | NA | 2.6 | 2.5 | NA | 0.42 | 124 | 307 J |
| SS0231C | NA | 439 | 0.15 U | 2.7 U | 17.2 | 10.3 | 5110 | NA | 0.59 | 1.5 J | NA | 0.31 | 68.1 | 148 |
| SS0231D | NA | 433 | 0.07 | 2 U | 14.3 | 12.3 | 2640 | NA | 3.1 | 1.3 | NA | 0.2 J | 45.2 | 117 |
| SS0232A | NA | 400 | 0.1 | 1.2 UJ | 12.6 | 39.6 | 1910 | NA | 0.99 | 1.2 J | NA | 0.15 | 27.4 | 135 |
| SS0232B | NA | 301 | 0.07 | 1.3 U | 11.8 | 10.6 | 1840 | NA | 1.7 U | 0.9 | NA | 0.2 | 38.1 | 91.3 |
| SS0232C | NA | 413 | 0.1 | 1.2 UJ | 12.8 | 6.2 | 1120 | NA | 0.87 | 1.4 J | NA | 0.15 | 23.8 | 72.6 |
| SS0233A | NA | 416 | 0.15 | 1.4 U | 11 | 19.2 | 782 | NA | 1.2 U | 0.64 | NA | 0.1 | 24.9 | 57.9 |
| SS0233BA | NA | 370 | 0.09 | 1.2 U | 9.8 | 9 | 745 | NA | 3.2 | 1.5 | NA | 0.13 | 22.5 | 50.3 |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0231A | 11400 J | 12.3 UJ | 5 | 148 | J 0.58 | 8.9 | 2 | NA | 12.4 J | 3.5 | 10.2 | 600 | 12400 J | 7.5 J | 12.9 |
| BS0231B | 8770 J | 21.5 UJ | 3.4 | 124 | J 0.48 | 2.4 | 0.83 | NA | 9.7 R | 3.5 | 8.1 | 375 | 11200 J | 4.9 J | 10.2 |
| BS0232A | 8560 | 8.1 J | 8.7 | 188 | 0.29 | 3.9 | 1.2 | NA | 16 | 3.7 | 8.3 | 380 | 11600 | 6.4 J | 10.3 J |
| BS0232B | 9900 | 4.2 U | 4.5 U | 150 | 0.7 J | 1.9 | 0.39 | NA | 18.3 | 6.3 U | 8.7 | 463 | 10160 J | 14.6 J | 13.9 J |
| BS0232C | 9140 | 12.2 J | 5.8 | 121 | 0.31 | 3.7 | 0.99 | NA | 15.6 | 4.1 | 8.5 | 363 | 12000 | 11.5 J | 10.4 J |
| BS0233A | 8150 | 4.8 U | 9 | 123 | 0.32 UJ | 4 | 0.28 | NA | 15 | 8.3 U | 11 | 390 | 13300 J | 14.3 J | 12.5 J |
| BS0233B | 8500 | 4.3 U | 1.2 | 114 | 0.07 UJ | 3.5 | 0.27 | NA | 15.1 | 7.6 | 9.3 | 510 | 11600 J | 11 J | 9.8 J |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0231A | NA | 385 J | 0.09 | 4.3 U | 8.9 | 1.8 | 944 | NA | 0.29 U | 0.65 | NA | 0.11 | 34.7 | 54.2 J |
| BS0231B | NA | 326 J | 0.06 | 3.5 U | 9.1 | 2.3 | 543 | NA | 0.25 U | 0.35 | NA | 0.09 | 27.7 | 39.2 J |
| BS0232A | NA | 330 | 0.11 | 1.2 UJ | 12.5 | 0.8 | 607 | NA | 0.86 | 1.9 J | NA | 0.13 | 27.8 | 34.1 |
| BS0232B | NA | 318 | 0.08 | 4.9 U | 9.8 | 0.5 | 539 | NA | 4.6 | 1.1 | NA | 0.1 | 24 | 34.5 |
| BS0232C | NA | 354 | 0.11 | 1.3 UJ | 12.1 | 3.7 | 584 | NA | 1.5 | 1.2 J | NA | 0.16 | 23.7 | 36 |
| BS0233A | NA | 398 | 0.16 | 1.4 U | 10.2 | 1.1 | 464 | NA | 0.84 U | 0.96 | NA | 0.07 | 25.7 | 41.7 |
| BS0233B | NA | 354 | 0.11 | 1.2 U | 11.1 | 0.5 | 496 | NA | 0.3 U | 0.78 | NA | 0.05 UJ | 27.1 | 39.2 |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-3

## Table 4.3-3 (continued)
## Analytical Results for Surface Soil Samples - Northeastern Quadrant

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0451A | 13200 J | 13.2 UJ | 9.3 | 325 J | 1.6 | 2.9 | 112 | NA | 243 J | 3.5 | 47.7 | 9880 | 12200 J | 95 J | 9.8 |
| SS0451A1 | 13600 | 4.1 U | 9.8 | 151 | 0.93 | 29.7 | 65.6 | 80300 | 190 | 4.4 | 29.4 J | 6020 | 10700 | 45.1 | 12.8 |
| SS0451A2 | 14900 | 4.1 U | 13.6 | 770 | 1.3 | 51.3 | 108 | 113000 | 404 | 2.8 | 56.9 J | 12600 | 11500 | 89.5 | 10.1 |
| SS0451A3 | 13400 | 4 U | 16.7 | 224 | 1.4 | 38.4 | 163 | 141000 | 443 | 1.9 | 64.7 J | 16900 | 8720 | 57.3 | 9.3 |
| SS0451A4 | 13100 | 4.2 U | 8.4 | 189 | 0.76 | 17.9 J | 62.8 | 84100 | 136 | 4.2 | 26.5 | 5350 | 10900 | 29.3 | 11.3 |
| SS0451B | 12400 J | 12.8 UJ | 5.4 | 144 J | NA | 2 | 38.7 | NA | 96.8 J | 2.6 | 22.5 | 3130 | 10200 J | 27.6 J | 11.7 |
| SS0451CA | 10400 | 4.6 UJ | 5.2 | 178 | 0.66 | 15.8 | 20.2 J | 51800 J | 57.3 | 4.4 | 17.9 | 2820 | 10400 J | 17.1 | 13.4 |
| SS0451D | 9300 | 5.2 J | 3.1 | 131 | 0.39 | 3.8 | 6 | NA | 27.6 | 5.7 | 12.5 | 765 | 11400 | 62.7 J | 12.1 J |
| SS0452A | 13700 | 5.3 U | 1.3 U | 160 | 0.79 J | 5.9 | 12.7 | NA | 51.6 | 6.5 | 16.3 | 1300 | 18100 J | 31.4 J | 19.2 J |
| SS0452B | 13200 | 3.8 U | 3.6 U | 145 | 0.95 J | 4.6 | 2.3 | NA | 26.2 | 6.3 | 13.1 | 510 | 12200 J | 16.5 J | 15.6 J |
| SS0452C | 13800 | 4 U | 2.8 | 157 | 0.94 | 6.5 | 10.2 | NA | 35.6 | 6 | 15.5 | 793 | 13900 | 20.2 J | 13.8 J |
| SS0453A | 17100 | 4.3 UJ | 3 | 185 J | 0.5 U | 1.47 | 2.8 | NA | 26.8 | 6.2 U | 15.7 | 510 | 16800 | 59.5 J | 20.7 |
| SS0453B | 10900 | 4.1 UJ | 2.7 | 173 J | 0.68 U | 1.8 | 1.5 | NA | 25.8 | 5.7 U | 13.5 | 475 | 14100 | 64.4 | 16.6 |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0451A | NA | 288 J | 0.07 | 12.5 U | 72.3 | 65.1 | 40400 | NA | 4.1 | 6.8 | NA | 0.77 | 425 | 735 J |
| SS0451A1 | 9590 | 287 J | 0.18 U | 5.1 U | 45.2 | 1.11 | 15900 | 3530 | 3.4 | 2.9 | 9730 | 1 J | 222 | 497 |
| SS0451A2 | 5020 | 251 J | 0.33 U | 11.5 | 81.9 | 75.4 | 40000 | 4370 | 6.6 | 5.3 | 20 U | 1.93 J | 463 | 906 |
| SS0451A3 | 4020 | 279 J | 1.2 | 14.8 | 96.3 | 21 | 52600 | 4180 | 6.6 | 8.1 | 160 | 3 J | 559 | 1220 |
| SS0451A4 | 9690 | 314 | 0.19 U | 2.8 | 41 | 10.4 | 16900 | 3240 | 2 | 3 U | 20 U | 1 | 180 | 452 |
| SS0451B | NA | 302 J | 0.08 | 6.7 U | 28.7 | 10.2 | 19100 | NA | 2.5 | 3 | NA | 0.42 | 167 | 263 J |
| SS0451CA | 9040 | 292 J | 0.33 U | 2.1 U | 19.8 | 9.8 | 10100 | NA | 1.6 | 0.95 U | NA | 7.2 U | 82 | 180 J |
| SS0451D | NA | 399 J | 0.08 | 2 | 14.2 | 4.5 | 1660 | NA | 1 | 1.4 | NA | 0.19 J | 38.7 | 81.1 |
| SS0452A | NA | 277 | 0.12 | 3.3 U | 16.2 | 9.9 | 2960 | NA | 2.6 U | 1.5 | NA | 0.23 | 53.4 | 137 |
| SS0452B | NA | 381 | 0.12 | 1.1 U | 11.2 | 11.6 | 1010 | NA | 2.5 U | 1.1 | NA | 0.09 | 32.3 | 78.6 |
| SS0452C | NA | 571 J | 0.11 | 1.1 U | 14.5 | 11 | 2030 | NA | 0.5 | 1.1 | NA | 0.12 J | 54.3 | 113 |
| SS0453A | NA | 409 | 0.15 U | 1.2 U | 12.8 | 12.3 | 1000 | NA | 0.27 U | 0.57 J | NA | 0.1 U | 32.6 | 82 |
| SS0453B | NA | 422 | 0.22 U | 1.2 U | 11.8 U | 12.2 | 778 | NA | 0.26 U | 0.14 UJ | NA | 0.1 U | 29.1 | 90.7 |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0451A | 9670 J | 11.3 UJ | 7 | 162 J | 0.4 | 0.78 | 0.8 | NA | 11 J | 2 | 9.2 | 533 | 12400 J | 8.1 J | 11.7 |
| BS0451A1 | 10900 | 4.5 U | 5 | 140 | 0.58 | 8.6 U | 0.61 | 46700 | 15.4 | 5.3 | 7.8 J | 470 | 11900 | 7.73 | 10.7 |
| BS0451A2 | 12300 | 4.5 U | 5.1 | 168 | 0.64 | 14.4 U | 2 | 88400 | 19.7 | 5.7 | 10.5 J | 610 | 12000 | 8.2 | 13 |
| BS0451A3 | 17300 | 4.4 U | 4.9 | 154 | 0.87 | 32.2 | 4.3 | 35000 | 29.2 | 6.8 | 15.5 J | 990 | 15400 | 11.3 | 18.2 |
| BS0451A4 | 6690 | 4.3 U | 5.8 | 87.4 | 0.43 | 8.8 J | 0.39 | 32600 | 9.8 | 4 | 7.2 | 470 | 8620 | 6.4 | 6.6 |
| BS0451B | 12800 J | 13.9 UJ | 4.6 | 193 J | 0.88 | 5.5 | 2.6 | NA | 16.6 J | 4.4 | 11.3 | 458 | 13500 J | 7.5 J | 15.7 |
| BS0452A | 11900 | 4.3 U | 7.5 | 175 | 0.57 UJ | 2.8 | 0.5 | NA | 19.4 | 6.6 | 10.8 | 448 | 12200 J | 13.9 J | 17.1 J |
| BS0452B | 9110 | 4.4 U | 0.79 U | 157 | 0.81 J | 3.8 | 0.34 | NA | 18.9 | 7.2 | 9.1 | 358 | 14700 J | 12.7 J | 11.8 J |
| BS0453A | 12300 | 4.4 UJ | 3.6 | 186 J | 0.59 U | 1.19 | 0.74 | NA | 17.9 | 5.8 U | 12 | 413 | 14200 | 55.1 J | 15.5 |
| BS0453B | 9300 | 4.9 U | 2.8 U | 164 | 0.73 J | 4.2 | 0.36 U | NA | 16 | 6.2 U | 11.8 | 395 | 9430 J | 14.8 J | 14.3 J |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated

U - Not detected

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

## Table 4.3-3 (continued)
## Analytical Results for Surface Soil Samples - Northeastern Quadrant

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0451A | NA | 366 J | 0.07 | 4 U | 10.6 | 2.7 | 622 | NA | 1.3 | 0.88 | NA | 0.05 U | 41 | 47.2 J |
| BS0451A1 | 16600 | 360 J | 0.05 U | 1.5 U | 12 | 0.7 | 598 | 2180 | 0.73 U | 0.35 UJ | 3320 | 0.81 J | 21.3 | 46.2 |
| BS0451A2 | 12700 | 296 J | 0.11 U | 1.5 U | 12.5 | 20.2 | 779 | 3020 | 0.7 U | 0.34 U | 240 | 0.35 J | 23.8 | 57.9 |
| BS0451A3 | 11000 | 418 J | 0.08 U | 1.5 U | 16.2 | 3.4 | 1950 | 4450 | 1.3 U | 0.34 UJ | 1390 | 0.53 J | 41.1 | 68.4 |
| BS0451A4 | 10800 | 250 | 0.07 U | 1.4 U | 9.3 | 2.1 | 570 | 1510 | 0.57 U | 0.33 U | 20 U | 0.21 | 14.7 | 31.3 |
| BS0451B | NA | 401 J | 0.1 | 5.1 U | 10.4 | 4.7 | 1040 | NA | 0.28 U | 0.58 | NA | 0.09 | 35.1 | 60.2 J |
| BS0452A | NA | 311 | 0.11 | 3.6 U | 11.9 | 0.6 | 464 | NA | 1.5 U | 1.8 | NA | 0.1 J | 27.9 | 41.1 |
| BS0452B | NA | 469 | 0.14 | 2.2 U | 8.8 | 0.7 | 447 | NA | 1.6 U | 1.5 | NA | 0.1 J | 25.6 | 36.3 |
| BS0453A | NA | 389 | 0.2 U | 1.3 U | 11.6 U | 0.5 U | 454 | NA | 0.29 U | 0.89 J | NA | 0.11 U | 26.6 | 50.1 |
| BS0453B | NA | 236 | 0.15 | 1.6 U | 10 | 0.5 | 474 | NA | 1 U | 1.5 | NA | 0.11 | 26.7 | 38.1 |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0681A | 16900 | 6.1 UJ | 7.8 | 288 | 1.3 | 3.9 | 29.4 J | NA | 141 J | 3.9 UJ | 25.7 J | 4780 | 15900 J | 29.2 J | 14.2 |
| SS0681B | 12000 J | 19.1 UJ | 3.3 | 157 J | 0.89 | 4.6 | 59.3 | NA | 195 J | 2.2 | 31.3 | 6730 | 11600 J | 61.3 J | 9.1 |
| SS0681C | 10800 J | 21.2 UJ | 3.9 | 155 J | 0.08 U | 8.8 | 10 | NA | 20.2 J | 1.9 | 13.2 | 1040 | 10700 J | 10.9 J | 10.9 |
| SS0681D | 9860 | 14 J | 4 | 247 | 0.41 | 5.1 | 8.3 | NA | 54.8 | 4.4 | 14.4 | 1180 | 12800 | 39.4 J | 13.5 J |
| SS0682A | 11300 | 17.4 J | 3.8 | 160 | 0.68 | 6.9 | 7.2 | NA | 32.6 | 5.2 | 15.3 | 913 | 13300 | 18.7 J | 12.9 J |
| SS0682B | 14600 | 4.2 UJ | 3.3 | 184 | 0.49 | 5.5 | 5.2 | NA | 38.9 | 4.9 | 14.3 | 685 | 15100 | 17.7 J | 14.6 |
| SS0682C | 12600 | 14 J | 2.3 | 159 | 1.2 | 6.6 | 3.9 | NA | 28 | 6.5 | 14.9 | 490 | 13900 | 23.7 J | 16.9 J |
| SS0683A | 11600 | 3.9 UJ | 3.1 | 186 J | 0.46 U | 3.65 | 2.9 | NA | 23.9 | 6.2 U | 14.7 | 670 | 15900 | 56.7 J | 16.1 |
| SS0683B | 13100 | 4 UJ | 3.5 | 161 | 0.54 | 6.7 | 4 | NA | 31.7 | 4.5 | 16.3 | 618 | 15000 | 24.4 J | 13.3 |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0681A | NA | 391 J | 0.24 U | 1.7 U | 25.6 | 24.9 | 17600 | NA | 3.1 U | 2 U | NA | 0.63 | 163 J | 329 J |
| SS0681B | NA | 213 J | 0.06 | 8.2 U | 38.4 | 39.4 | 28100 | NA | 2.6 | 4.3 | NA | 0.37 | 257 | 538 J |
| SS0681C | NA | 322 J | 0.1 | 5.9 U | 12.4 | 35.3 | 3970 | NA | 0.35 U | 1.1 | NA | 0.15 | 65.4 | 123 J |
| SS0681D | NA | 337 J | 0.12 | 4.9 | 18.1 | 11.6 | 3260 | NA | 0.71 | 2.1 | NA | 0.23 J | 25.4 | 114 |
| SS0682A | NA | 504 J | 0.14 | 3.8 | 16.3 | 8.7 | 2560 | NA | 0.36 | 1.5 | NA | 0.33 J | 51.3 | 112 |
| SS0682B | NA | 499 | 0.05 U | 1.2 UJ | 18 | 10 | 2300 | NA | 1.6 U | 1.4 U | NA | 0.18 | 38.3 | 101 J |
| SS0682C | NA | 598 J | 0.14 | 1.3 U | 14.9 | 2.1 | 1320 | NA | 0.8 | 1.2 | NA | 0.12 UJ | 47.4 | 91.3 |
| SS0683A | NA | 438 | 0.14 U | 1.1 U | 12 U | 25.2 | 1420 | NA | 1.5 | 0.92 J | NA | 0.1 UJ | 32.7 | 94.9 |
| SS0683B | NA | 484 | 0.05 U | 1.1 UJ | 14.5 | 18.8 | 1930 | NA | 1.7 U | 1.3 U | NA | 0.15 | 27.5 | 104 J |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0681A | 13900 | 13.4 UJ | 3.2 U | 128 | 1 | 4.3 | 4.4 J | NA | 49 J | 3.6 UJ | 15.4 J | 953 | 14100 J | 23.4 J | 14.2 |
| BS0681B | 8700 J | 7.2 UJ | 3.7 | 86.4 J | 0.36 | 2.4 | 0.5 | NA | 8.2 J | 4.5 | 10 | 405 | 12500 J | 8.1 J | 20.3 |
| BS0681C | 7290 J | 18.5 UJ | 4 | 287 J | 0.11 U | 4 | 1.5 | NA | 6.3 J | 0.96 U | 11.4 | 310 | 7980 J | 3.9 J | 9.5 |
| BS0681D | 8540 | 9.8 J | 3.5 | 153 | 0.38 | 3.6 | 0.38 J | NA | 16.2 | 4.6 | 7.5 | 470 | 11400 | 32.4 J | 14.4 J |
| BS0682A | 10200 | 12.1 J | 2.3 | 166 | 0.75 | 5.4 | 0.38 J | NA | 16.2 | 5.3 | 13.7 | 388 | 12800 | 20.8 J | 12.5 J |
| BS0682B | 10100 | 4.8 UJ | 3.6 | 161 | 0.32 | 2.5 | 0.42 J | NA | 20.8 | 3.5 | 9 | 363 | 11800 | 5 J | 10.7 |
| BS0682C | 9140 | 14.3 J | 2.4 | 151 | 0.82 | 4.2 | 0.34 J | NA | 13.1 | 4.3 | 8.8 | 237 | 11000 | 10.1 J | 11.3 J |
| BS0683A | 10400 | 4.5 UJ | 3.9 | 200 J | 0.61 U | 1.18 | 0.4 | NA | 17.5 | 5.5 U | 11.2 | 360 | 13200 | 19.1 | 14.6 |
| BS0683B | 11100 | 4.2 UJ | 4.7 | 160 | 0.49 | 3.5 | 0.48 J | NA | 21.3 | 4.5 | 8.8 | 393 | 12400 | 8.3 J | 12.7 |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-3

## Table 4.3-3 (continued)
## Analytical Results for Surface Soil Samples - Northeastern Quadrant

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0681A | NA | 398 J | 0.21 U | 2.1 U | 16.7 | 5.2 | 2320 | NA | 1.8 U | 0.21 U | NA | 0.32 J | 44.2 J | 95.7 J |
| BS0681B | NA | 343 J | 0.07 | 4.3 U | 8.8 | 3 | 610 | NA | 0.76 | 0.12 U | NA | 0.06 U | 23.7 | 48 J |
| BS0681C | NA | 267 J | 0.13 | 5.4 U | 5.2 | 1.3 | 907 | NA | 0.41 U | 0.98 | NA | 0.06 U | 26.1 | 43.1 J |
| BS0681D | NA | 420 J | 0.1 | 4.5 | 12.8 | 0.5 U | 505 | NA | 1 | 1.6 | NA | 0.19 J | 1.1 U | 35 |
| BS0682A | NA | 391 J | 0.17 | 4.5 | 15.1 | 2.8 | 580 | NA | 0.94 | 1.4 | NA | 0.25 | 29.4 | 51.8 |
| BS0682B | NA | 303 | 0.18 | 1.4 UJ | 11.7 | 0.8 | 507 | NA | 3 | 1.6 U | NA | 0.11 U | 24.1 | 35.2 J |
| BS0682C | NA | 385 J | 0.11 | 1.2 U | 10.3 | 1.7 | 361 | NA | 0.86 | 1.2 | NA | 0.1 UJ | 33.3 | 35.2 |
| BS0683A | NA | 403 | 0.18 U | 1.3 U | 11 U | 0.5 | 431 | NA | 2.4 | 1.4 J | NA | 0.12 UJ | 27.2 | 43.3 |
| BS0683B | NA | 349 | 0.07 U | 1.2 UJ | 12.4 | 0.5 | 625 | NA | 0.92 U | 2.1 | NA | 0.13 J | 21 | 41.3 J |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0901B | 8710 | 4.1 U | 9.1 | 296 | 1.8 J | 2.4 UJ | 78.4 | NA | 342 J | 6.5 J | 67.9 | 20400 | 6040 | 142 | 6.1 |
| SS0901B1 | 10400 | 4.5 U | 5.2 | 120 | 0.64 | 11.4 U | 7.8 | 57900 | 41.4 | 5 | 15.7 J | 2100 | 13300 | 10.6 | 11.1 |
| SS0901B2 | 7660 | 4.2 U | 12.2 | 242 | 1.4 | 27 U | 78.5 | 203000 | 365 | 0.43 U | 84.4 J | 26800 | 6130 | 69.3 | 6.2 |
| SS0901B3 | 8030 | 3.8 UJ | 15.3 | 139 | 1.6 | 77.4 | 87.4 | 0.49 U | 471 | 0.39 U | 80.2 J | 27200 | 6110 | 47.6 | 6.8 |
| SS0901B4 | 9570 | 4.1 U | 9.8 | 340 | 1.4 | 36.3 | 72.5 | 179000 | 369 | 0.42 U | 65.3 J | 19600 | 7000 | 31.4 | 7.2 |
| SS0901B5 | 15500 | 5.1 UJ | 4.1 J | 171 | 0.96 | 25.2 | 14.5 | 97100 | 93.3 | 4.3 | 16.5 | 4040 | 10400 | 19.1 | 13.6 |
| SS0901C | 13500 | 6.8 | 4.5 | 559 | 1.3 | 4.1 J | 29 | NA | 22.4 J | 3.1 J | 29.9 | 5720 | 10800 | 50 J | 7.4 |
| SS0901C5 | 9990 | 8.4 U | 3.7 J | 160 | 0.57 | 11.6 | 4.5 | 18400 | 26.1 | 4.8 | 12.6 | 1000 | 13000 | 12 | 11.1 |
| SS0901D | 13200 | 4.1 U | 2.8 | 153 | 0.96 J | 8.3 J | 5.5 | NA | 34 J | 9.5 J | 14.2 | 1460 | 10800 | 5.7 J | 8.8 |
| SS0902A | 11000 | 11.2 J | 3.2 | 235 | 0.4 | 6.4 | 9.8 | NA | 40.8 | 5.3 | 15.4 | 448 | 14100 | 63.3 J | 12.9 J |
| SS0902B | 18900 | 4 UJ | 4.6 | 224 | 0.67 | 4.6 | 3.3 | NA | 36.3 | 6.1 | 17.8 | 575 | 16100 | 16.2 J | 16.4 |
| SS0902C | 14000 | 4 UJ | 5 | 174 | 0.54 | 5 | 2.1 | NA | 29.6 | 4.9 | 12.3 | 495 | 14100 | 8.5 J | 14.1 |
| SS0903A | 14600 | 4.1 UJ | 4.2 | 179 | 0.69 | 5.8 | 0.92 | NA | 26.3 | 4.6 | 12.1 | 405 | 15200 | 9.6 J | 15.4 |
| SS0903B | 15100 | 4.3 UJ | 4.3 | 175 | 0.64 | 4.5 | 4.3 J | NA | 28.8 | 5.3 | 13.3 | 488 | 15100 | 15.2 J | 16.9 |
| Representative | 13,900 | 14.3 | 7.7 | 188.0 | 1.0 | 12.8 | 1.9 | 75,800 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 | 16.1 |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS0901B | NA | 125 | 0.45 | 11.6 | 67.8 | 154 | 52400 | NA | 10.5 | 6 | NA | 1 J | 580 J | 827 J |
| SS0901B1 | 11600 | 353 J | 0.1 U | 1.5 U | 17.2 | 8.5 | 6510 | 2470 | 1.6 | 0.35 U | 290 | 0.38 J | 63.9 | 120 |
| SS0901B2 | 4910 | 145 J | 0.68 | 12.8 | 71.4 | 34.7 | 76600 | 2380 | 10.3 | 6.5 | 3820 | 1.7 J | 491 | 858 |
| SS0901B3 | 3810 | 144 J | 0.43 U | 14.3 | 99.4 | 20.4 | 84900 | 2770 | 16.3 | 7.1 | 200 | 2.6 J | 729 | 1100 |
| SS0901B4 | 3600 | 169 J | 0.45 U | 9.9 U | 72.8 | 15.6 | 72200 | 3060 | 6.5 | 5.2 | 100 | 1.4 J | 525 | 938 |
| SS0901B5 | 7760 | 294 | 0.3 U | 1.7 U | 21.8 | 13.5 | 9590 | 4060 J | 2.2 | 2 | 20 U | 0.28 J | 113 | 207 |
| SS0901C | NA | 355 | 0.14 | 3.8 | 33.2 | 33.4 | 20400 | NA | 2.4 | 3 | NA | 0.5 J | 232 J | 357.4 J |
| SS0901C5 | 6310 | 345 | 0.23 U | 1.3 U | 13.3 | 11.8 | 2760 | 3040 J | 0.73 | 0.42 | 20 U | 0.17 J | 28 | 81.5 |
| SS0901D | NA | 328 | 0.09 | 2.1 | 12.7 | 12.6 | 4560 | NA | 2.3 | 1.8 | NA | 0.13 | 56.8 J | 78.7 J |
| SS0902A | NA | 484 J | 0.11 | 4 | 16.5 | 4.9 | 3190 | NA | 0.73 | 1.6 | NA | 0.34 | 23.1 J | 124 |
| SS0902B | NA | 895 | 0.11 | 1.1 UJ | 16.1 | 10 | 1260 | NA | 0.6 | 1.7 | NA | 0.17 | 37.4 | 95.9 J |
| SS0902C | NA | 438 | 0.1 | 1.1 UJ | 12.9 | 13 | 1140 | NA | 0.84 | 1.4 | NA | 0.1 U | 33.5 | 64.7 J |
| SS0903A | NA | 446 | 0.1 | 1.2 UJ | 13.2 | 6.6 | 819 | NA | 0.67 | 1.2 | NA | 0.13 J | 25.5 | 58.7 J |
| SS0903B | NA | 481 | 0.05 U | 1.2 UJ | 14.5 | 24 | 896 | NA | 1.1 U | 1 U | NA | 0.21 J | 28.5 | 71.2 J |
| Representative | 22,000 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672 | 3,562 | 3.05 | 1.9 | NC | 0.27 | 45.4 | 52.8 |

Notes:

Results in mg/kg

NA - Not analyzed.

NC - Not calculated.

U - Not detected

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

## Table 4.3-3 (continued)
## Analytical Results for Surface Soil Samples - Northeastern Quadrant

| Sample Id [a] | Aluminium | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0901B | 7900 | 4 U | 5.9 | 2240 | 1 J | 1.9 UJ | 25.7 | NA | 166 J | 8.1 J | 36 | 3320 | 10600 | 64.9 J | 6.6 |
| BS0901B1 | 8150 | 4.4 U | 4.8 | 121 | 0.47 | 7.9 U | 0.38 | 38300 | 13.5 | 5 | 10.7 J | 540 | 11100 | 7.9 | 9.1 |
| BS0901B5 | 8460 | 7.3 U | 5.7 J | 112 | 0.36 | 9.5 | 0.94 | 38400 | 12.6 | 4.8 | 7.6 | 601 | 10200 | 7.8 | 9.6 |
| BS0901C | 9870 | 4.3 U | 2.5 | 119 | 0.58 | 2 J | 0.87 | NA | 27.5 J | 4.6 J | 9.8 | 283 | 11600 | 29.1 J | 7.7 |
| BS0901C5 | 11100 | 7 U | 3.9 J | 128 | 0.6 | 15.3 | 0.99 | 39500 | 13.3 | 5.3 | 12.8 | 562 | 11700 | 9.6 | 14.3 |
| BS0901D | 9740 | 4.3 U | 2.6 | 172 | 0.85 J | 2.4 UJ | 0.14 | NA | 25.6 J | 8.8 J | 11.5 | 267 | 10100 | 30.6 J | 9.7 |
| BS0902A | 7350 | 20.5 J | 2.9 | 114 | 0.3 | 12.8 | 0.38 J | NA | 14.4 | 4.9 | 9 | 1500 | 11400 | 53.9 J | 12.9 J |
| BS0903A | 10400 | 4.7 UJ | 4.2 | 175 | 0.24 | 5.2 | 0.38 J | NA | 20.4 | 4.1 | 10.4 | 333 | 10400 | 5.1 J | 11.8 |
| BS0903B | 13100 | 4.7 UJ | 4.5 | 151 | 0.55 | 3.8 | 0.43 | NA | 23.4 | 4.9 | 9.9 | 360 | 12600 | 5.3 J | 13 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188.0** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS0901B | NA | 252 | 0.36 | 5.3 | 34.4 | 97 | 23600 | NA | 4.3 | 3.4 | NA | 0.58 | 220 J | 296 J |
| BS0901B1 | 10900 | 359 J | 0.3 U | 1.5 U | 9.6 | 1.2 | 672 | 1950 | 0.29 U | 0.34 U | 120 | 0.24 J | 18.3 | 42.1 |
| BS0901B5 | 10600 | 350 | 0.07 U | 1.6 U | 10.5 | 2.8 | 855 | 2310 J | 0.62 U | 0.55 | 320 | 0.13 J | 17.2 | 38.5 |
| BS0901C | NA | 396 | 0.06 | 2.2 | 7.8 | 2.3 | 656 | NA | 0.5 | 0.14 U | NA | 0.11 U | 31.1 J | 47.3 J |
| BS0901C5 | 9220 | 311 | 0.8 | 1.5 U | 11.1 | 1.4 | 1110 | 3160 J | 0.89 | 0.35 | 660 | 0.12 UJ | 15 | 46.9 |
| BS0901D | NA | 366 | 0.09 | 1.4 | 10 | 2.9 | 624 | NA | 0.68 | 2.2 | NA | 0.11 UJ | 28.5 J | 37.6 J |
| BS0902A | NA | 306 J | 0.09 | 5.3 | 12.4 | 1.1 | 491 | NA | 2.6 | 1.5 | NA | 0.71 J | 1.1 U | 32 |
| BS0903A | NA | 260 | 0.11 | 1.3 UJ | 9.8 | 0.6 | 419 | NA | 0.6 | 1.6 | NA | 0.11 UJ | 25.1 | 35.5 J |
| BS0903B | NA | 339 | 0.06 U | 1.3 UJ | 12.3 | 0.9 | 554 | NA | 0.98 U | 1.5 U | NA | 0.12 U | 29 | 43.1 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

## Table 4.3-4
## Analytical Results for Surface Soil Samples - Southeastern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1132A | 10400 | 3.7 UJ | 4.4 | 159 | 0.55 | 4.3 | 7.8 | 39.4 | 5 | 17.6 | 1020 | 10300 | 2030 J |
| SS1132BA | 17100 | 4 UJ | 4.2 | 178 | 0.67 | 5.66 | 7.3 | 40 | 5.7 | 20.2 | 733 | 15800 | 26.1 J |
| SS1133A | 10800 | 4.7 UJ | 2.4 | 144 | 0.23 | 14.9 | 2.7 | 28.8 | 4.5 | 16.2 | 443 | 12700 | 52.8 J |
| Representative | 13,900 | 14.3 | 7.7 | 188 | 1.0 | 12.8 | 1.9 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1132A | 13.2 | 444 | 0.35 | 1 UJ | 12.7 | 9.3 | 2690 | 1 | 0.98 J | 0.35 J | 42.2 | 127 |
| SS1132BA | 12 | 512 | 0.13 | 1.1 UJ | 15.6 | 23.2 | 1350 | 1.7 | 1.1 | 0.24 | 43.6 | 123 J |
| SS1133A | 10.8 | 402 | 0.11 U | 4.7 | 10.9 | 14.7 | 937 | 1.5 U | 1.1 | 0.14 J | 27.2 | 84.8 J |
| Representative | 16.1 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672.0 | 3.05 | 1.9 | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1132A | 13000 | 3.9 UJ | 5 | 151 | 0.58 | 4.5 | 0.71 J | 22.1 | 5.8 | 12.1 | 455 | 12500 | 17.1 J |
| BS1133A | 9770 | 4.3 UJ | 3 | 116 | 0.43 | 10 | 0.52 | 19.7 | 5.6 | 10.9 | 315 | 13700 | 9.6 J |
| Representative | 13,900 | 14.3 | 7.7 | 188 | 1.0 | 12.8 | 1.9 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1132A | 14.3 | 374 | 0.34 | 1.3 | 12.6 | 0.5 U | 775 | 1.2 | 1.3 | 0.26 J | 33.8 | 42.5 |
| BS1133A | 12.8 | 535 | 0.13 | 1.2 UJ | 10.1 | 1.1 | 442 | 0.53 | 0.57 U | 0.14 | 22 | 49.8 J |
| Representative | 16.1 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672.0 | 3.05 | 1.9 | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1202C | 11000 | 4 UJ | 4.4 | 126 | 0.6 | 5.6 | 4.1 | 26.3 | 5.5 | 13.2 | 445 | 13000 | 21.6 J |
| SS1253A | 11800 | 5.4 J | 4.6 | 128 | 0.54 | 4.7 | 0.95 | 21.9 | 4.3 | 13.2 | 443 | 13700 | 0.8 J |
| Representative | 13,900 | 14.3 | 7.7 | 188 | 1.0 | 12.8 | 1.9 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1202C | 8.7 | 494 | 0.1 | 1.1 UJ | 12.1 | 18.4 | 878 | 0.7 | 0.87 U | 0.19 | 25.4 | 84.9 J |
| SS1253A | 11.1 J | 469 | 0.08 | 2 | 13.5 | 8.4 | 1230 | 0.97 | 0.95 J | 0.14 | 25.1 | 68.4 |
| Representative | 16.1 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672.0 | 3.05 | 1.9 | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1202C | 8610 | 4.2 UJ | 4.7 | 181 | 0.42 | 5.9 | 0.29 J | 16.9 | 4.4 | 7.5 | 388 | 10400 | 6.3 J |
| BS1253AA | 8130 | 10.9 J | 3.8 | 164 | 0.41 | 2.6 | 0.37 J | 15.3 | 3.7 | 7.5 | 403 | 9740 | 6.3 J |
| Representative | 13,900 | 14.3 | 7.7 | 188 | 1.0 | 12.8 | 1.9 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1202C | 9.8 | 324 | 0.12 | 1.2 UJ | 9.9 | 0.4 | 466 | 0.75 | 1.6 | 0.1 U | 24.3 | 33.6 J |
| BS1253AA | 9.6 J | 305 | 0.09 | 1.2 UJ | 11.8 | 0.5 U | 648 | 0.78 | 1.4 J | 0.13 | 23.9 | 30.2 |
| Representative | 16.1 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672.0 | 3.05 | 1.9 | 0.27 | 45.4 | 52.8 |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-4

## Table 4.3-4 (continued)
## Analytical Results for Surface Soil Samples - Southeastern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1303B | 12800 | 14.6 J | 2.4 | 126 | 0.67 | 5 | 1 | 19.3 | 4.7 | 14.4 | 395 | 14100 | 14.4 J |
| SS1352A | 12800 | 3.8 J | 3.8 | 195 | 0.7 | 3.7 | 6.3 | 23.6 | 5.7 | 14.9 | 575 | 13200 | 31.9 J |
| SS1352B | 10400 | 4 UJ | 11 | 130 | 0.79 | 3.2 | 4.2 | 25.3 | 4.8 | 13.4 | 515 | 13100 | 29.1 J |
| SS1352C | 12300 | 10 J | 6.7 | 145 | 0.71 | 3.3 | 1.8 | 25.1 | 5.1 | 12.9 | 300 | 13400 | 27.4 J |
| SS1353A | 9180 | 4 UJ | 5 | 234 | 1 | 4.3 | 1.3 | 16.4 | 4.7 | 13.5 | 288 | 12400 | 15.3 J |
| SS1353B | 13200 | 4 UJ | 6 | 124 | 0.74 | 3.6 | 1 | 21.2 | 4.6 | 13.3 | 355 | 14800 | 16 J |
| Representative | 13,900 | 14.3 | 7.7 | 188 | 1.0 | 12.8 | 1.9 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1303B | 11.4 J | 477 | 0.09 | 1.1 UJ | 15.6 | 14.7 | 890 | 0.63 | 0.73 J | 0.14 J | 22 | 55.9 |
| SS1352A | 17.9 | 579 | 0.31 | 1.1 UJ | 12.9 | 8.8 | 1430 | 0.26 U | 0.96 J | 0.39 J | 37.7 | 91.6 |
| SS1352B | 12.6 | 523 | 0.11 | 1.1 UJ | 12.6 | 13.3 | 1190 | 9.7 | 0.46 J | 0.19 J | 25.8 | 78 |
| SS1352C | 14.3 | 462 | 0.12 | 1 UJ | 12.8 | 5.7 | 874 | 0.94 | 0.71 J | 0.33 J | 28.4 | 63.7 |
| SS1353A | 9.8 | 1330 | 0.05 U | 1.1 UJ | 9.9 | 12.1 | 772 | 0.9 U | 0.54 U | 0.33 | 22.8 | 61 J |
| SS1353B | 12.5 J | 504 | 0.08 | 1.1 UJ | 12.2 | 10 | 695 | 1.1 | 0.67 J | 0.12 | 26.2 | 60.2 |
| Representative | 16.1 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672.0 | 3.05 | 1.9 | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1303B | 11800 | 4.3 | 3.1 | 177 | 0.5 | 3.3 | 0.38 | 19.7 | 3.9 | 9.8 | 358 | 11800 | 6.1 J |
| BS1352A | 11900 | 6.9 J | 4.6 | 214 | 0.69 | 3.1 | 0.48 J | 19.1 | 4.5 | 12 | 438 | 12600 | 10.7 J |
| BS1352B | 10600 | 6.5 UJ | 3.9 | 240 | 0.86 | 3.4 | 0.97 J | 25.4 | 6.8 | 13.1 | 415 | 14200 | 19.5 J |
| BS1352C | 10400 | 4.1 UJ | 8.4 | 175 | 0.68 | 2.1 | 0.54 J | 21.3 | 4.5 | 10.5 | 455 | 11000 | 7.8 |
| BS1353B | 14100 | 4.3 UJ | 7.3 | 184 | 0.5 | 3.7 | 0.45 | 19.5 | 4.6 | 12.4 | 445 | 13500 | 9.4 J |
| Representative | 13,900 | 14.3 | 7.7 | 188 | 1.0 | 12.8 | 1.9 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1303B | 11.3 J | 301 | 0.09 | 1.2 UJ | 11.1 | 0.5 U | 672 | 1.3 | 1.5 J | 0.12 | 30.7 | 33.6 |
| BS1352A | 13.4 | 435 | 0.27 | 1.2 UJ | 11 | 0.5 | 360 | 1.7 | 1.7 | 0.21 J | 28.3 | 37.7 |
| BS1352B | 16.7 | 572 | 0.18 | 1.8 UJ | 17.3 | 0.5 U | 527 | 0.44 U | 2.2 | 0.29 J | 44.1 | 52.8 |
| BS1352C | 14.8 | 368 | 0.14 | 1.1 UJ | 11.7 | 0.6 | 625 | 5.3 | 1.3 | 0.24 J | 33.1 | 49.4 |
| BS1353B | 12.9 | 334 | 0.11 U | 1.2 UJ | 11.3 | 0.7 | 501 | 0.84 U | 1.6 U | 0.15 | 22.2 | 41.7 J |
| Representative | 16.1 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672.0 | 3.05 | 1.9 | 0.27 | 45.4 | 52.8 |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1582B | 12800 | 4 UJ | 3.4 | 146 | 0.94 | 4.4 | 2.4 | 86 | 6.1 | 14 | 418 | 14200 | 24.6 |
| SS1582CA | 11800 | 4 UJ | 2 | 159 | 0.73 | 3.5 | 1.2 J | 19.9 | 7.2 | 14 | 353 | 14000 | 23.1 J |
| SS1583A | 13200 | 4 UJ | 4.9 | 140 | 1.1 | 2.7 | 1.5 J | 19.2 | 5.8 | 14.5 | 360 | 14000 | 18.3 |
| SS1583B | 14200 | 4 UJ | 4 | 195 | 0.87 | 4.7 | 1.5 J | 47.1 | 5.9 | 15.9 | 450 | 15900 | 21.5 |
| SS1584A | 10900 | 4 UJ | 4.5 | 141 | 0.54 | 4.7 | 0.54 | 21.4 | 5.2 | 13.7 | 378 | 15000 | 14 J |
| Representative | 13,900 | 14.3 | 7.7 | 188 | 1.0 | 12.8 | 1.9 | 27.5 | 7.6 | 12.6 | 600 | 14,400 | 29.1 |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1582B | 14.5 | 563 | 0.1 | 1.1 UJ | 12.4 | 13.4 | 820 | 0.26 U | 0.81 J | 0.26 J | 32.3 | 68.9 |
| SS1582CA | 14.7 | 554 | 0.24 | 1.1 UJ | 11.9 | 7.3 | 507 | 0.75 | 0.73 J | 0.27 J | 10.6 | 61.2 |
| SS1583A | 16.6 | 567 | 0.19 | 1.1 UJ | 10.4 | 9.2 | 409 | 1.5 | 0.66 J | 0.3 J | 22.6 | 67.6 |
| SS1583B | 16 | 758 | 0.23 | 1.1 UJ | 11.1 | 9.9 | 458 | 0.8 | 0.8 J | 0.26 J | 26.1 | 71.3 |
| SS1584A | 11.1 | 485 | 0.1 U | 1.1 UJ | 12.6 | 8.7 | 766 | 0.73 U | 0.81 U | 0.15 | 22.9 | 58.5 J |
| Representative | 16.1 | 482 | 0.16 | 2.15 | 15.5 | 3.7 | 672.0 | 3.05 | 1.9 | 0.27 | 45.4 | 52.8 |

Notes:

Results in mg/kg

NA - Not analyzed.

NC - Not calculated

U - Not detected.

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

## Table 4.3-4 (continued)
## Analytical Results for Surface Soil Samples - Southeastern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1582B | 7860 | 4.1 UJ | 6.5 | 150 | 0.76 | 1.6 | 0.62 J | 16.3 | 4.3 | 7.6 | 400 | 9700 | 13 J |
| BS1582C | 8400 | 4.2 UJ | 3.6 | 149 | 0.71 | 3.7 | 0.63 J | 17.5 | 3.8 | 8.7 | 483 | 9710 | 15.6 J |
| BS1583B | 14000 | 4.2 UJ | 4.7 | 130 | 0.77 | 3.3 | 0.49 J | 24.3 | 6.7 | 12 | 398 | 15900 | 12.7 |
| BS1584A | 8340 | 4.2 UJ | 4.7 | 156 | 0.42 | 2.8 | 0.37 | 21.1 | 4.4 | 8.4 | 443 | 11900 | 5.9 J |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1582B | 12.1 | 346 | 0.11 | 1.2 UJ | 9.9 | 0.5 | 447 | 0.9 | 1.4 | 0.17 J | 28.3 | 32 |
| BS1582C | 15.5 | 332 | 0.25 | 1.2 UJ | 10.9 | 0.5 U | 573 | 0.27 U | 1.6 | 0.23 J | 31.7 | 32.4 |
| BS1583B | 15.8 | 482 | 0.35 | 1.2 UJ | 15.5 | 1.3 | 493 | 2.5 | 0.7 J | 0.29 J | 29.5 | 47.5 |
| BS1584A | 10.2 | 294 | 0.11 U | 1.2 UJ | 10.6 | 0.5 U | 690 | 0.92 U | 1.4 | 0.11 | 27.4 | 36.5 J |
| **Representative** | **16.1** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672.0** | **3.05** | **1.9** | **0.27** | **45.4** | **52.6** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1802BA | 13000 | 3.9 UJ | 0.51 UJ | 178 J | 0.91 U | 4.16 | 2.9 | 14.3 | 5.2 U | 14.7 | 433 | 15400 | 21.1 J |
| SS1802C | 12300 | 3.9 UJ | 3 | 172 J | 1.2 | 3.63 | 1.8 | 13.1 | 4.4 U | 13.8 | 348 | 14100 | 33 J |
| SS1803A | 12700 | 3.7 UJ | 3.3 | 183 J | 1 | 2.06 | 1.7 | 14.2 | 5.4 U | 12.9 | 345 | 15800 | 30.9 J |
| SS1803B | 17100 | 3.7 UJ | 2.5 | 187 J | 0.98 U | 1.42 | 1.7 | 18.2 | 5.7 U | 15.4 | 390 | 14900 | 38.2 J |
| SS1804A | 13400 | 4 UJ | 5 | 163 | 1.1 | 6 | 1.9 UJ | 19.2 | 5.4 | 15.2 | 380 | 17200 | 18.3 J |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** |

| Sample Id | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS1802BA | 17.3 | 682 | 0.09 U | 1.1 U | 8.4 U | 11.9 | 1080 | 0.26 U | 0.33 J | 0.1 UJ | 28.1 | 75.8 |
| SS1802C | 14.5 | 618 | 0.16 U | 1.1 U | 7.4 U | 10.5 | 954 | 0.5 | 0.2 J | 0.1 | 24.3 | 67.3 |
| SS1803A | 13.4 | 634 | 0.13 U | 1.1 U | 7.8 U | 18.9 | 901 | 0.98 | 0.37 J | 0.1 UJ | 23 | 70.2 |
| SS1803B | 22.7 | 660 | 0.22 U | 1 U | 9.8 U | 20.3 | 1070 | 0.99 | 0.55 J | 0.1 U | 28.9 | 75.8 |
| SS1804A | 14.6 | 559 | 0.12 | 1.1 UJ | 11.6 | 3.7 | 701 | 0.5 | 0.94 U | 0.2 | 20.8 | 61.1 J |
| **Representative** | **16.1** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672.0** | **3.05** | **1.9** | **0.27** | **45.4** | **52.6** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1803A | 9110 | 3.8 UJ | 5.1 | 179 J | 0.89 U | 1.15 | 0.57 | 15.9 | 4.4 U | 10.8 | 423 | 11700 | 19.2 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** |

| Sample Id [a] | Lithium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS1803A | 12.5 | 333 | 0.11 U | 1.1 U | 9.5 U | 0.7 | 490 | 1.3 | 1.4 J | 0.1 U | 26 | 37.4 |
| **Representative** | **16.1** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672.0** | **3.05** | **1.9** | **0.27** | **45.4** | **52.6** |

Notes:
- Results in mg/kg.
- NA - Not analyzed.
- NC - Not calculated.
- U - Not detected.
- J - Estimated value.
- R - Rejected value.
- (a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-5

## Table 4.3-5
## Analytical Results for Surface Soil Samples - Southwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2033A | 12500 U | 4 U | 3.3 U | 141 | 2 | 3.3 UJ | 5.8 | NA | 34.4 J | 6 J | 14.5 | 555 | 13600 | 27.3 J | 7.8 |
| SS2033B | 13500 | 4 U | 4 | 135 | 1.1 | 2.4 J | 5.9 | NA | 32.2 | 4.5 J | 13.4 | 573 | 13000 | 23.2 J | 7.9 |
| SS2034A | 13500 | 4.1 U | 3.2 | 142 | 0.89 | 3 J | 3.1 | NA | 28.8 J | 3.9 J | 13.8 | 561 | 13200 | 18.8 J | 10.1 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2033A | NA | 564 | 0.05 UJ | 2 | 10.9 | 23.7 | 1470 | NA | 0.6 | 0.61 | NA | 0.1 U | 33 J | 90.3 J |
| SS2033B | NA | 404 | 0.05 UJ | 2 | 11.8 | 4.8 | 1640 | NA | 0.29 | 0.87 | NA | 0.12 | 38.7 J | 79.8 J |
| SS2034A | NA | 458 | 0.05 UJ | 2.7 | 9.8 | 13.2 | 1270 | NA | 0.26 U | 0.61 | NA | 0.1 U | 29.3 J | 81.8 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2033A | 12200 | 10.5 J | 4.2 | 176 | 2 | 6.4 J | 0.42 J | NA | 23.8 J | 4.4 J | 12.6 | 391 | 12900 | 13.3 J | 10 |
| BS2033BA | 8120 | 4.1 U | 4.3 | 154 | 1 | 5.2 J | 0.1 J | NA | 24.4 | 3.8 J | 9.5 | 486 | 10900 | 11.5 J | 9.5 |
| BS2034A | 12300 | 5.6 | 2.3 | 145 | 0.83 | 1.8 J | 0.52 J | NA | 81.7 | 4.7 J | 16.9 | 401 | 14200 | 16.2 J | 9.4 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2033A | NA | 333 | 0.05 UJ | 1.4 | 10.9 | 1.3 | 647 | NA | 0.8 | 1.6 | NA | 0.11 U | 41.4 J | 42.1 J |
| BS2033BA | NA | 314 | 0.05 UJ | 1.4 | 8.3 | 1.5 | 491 | NA | 0.73 | 1.1 | NA | 0.1 UJ | 30.4 J | 34.8 J |
| BS2034A | NA | 453 | 0.06 UJ | 1.2 U | 10.4 | 7.2 | 842 | NA | 0.33 | 0.28 | NA | 0.1 UJ | 33.3 J | 50.4 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2053A | 15500 | 3.8 UJ | 4.6 | 138 | 0.73 | 25.8 J | 2.6 | 24100 | 21.1 | 7.6 | 15.1 | 541 | 13700 | 10.2 | 15.6 |
| SS2053B | 11700 | 3.9 UJ | 4.6 | 118 | 0.69 | 15.1 J | 3.9 | 13400 | 24.3 | 5.6 | 14.3 | 732 | 12000 | 11.5 | 10.3 |
| SS2054AA | 13300 | 9.8 UJ | 4 | 137 J | 0.75 | 13 | 1 | NA | 18 | 5.7 | 10.9 | 430 | 13300 | 9.7 | 11.9 J |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

## Table 4.3-5 (continued)
## Analytical Results for Surface Soil Samples - Southwestern Quadrant

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2053A | 7990 | 435 | 0.08 U | 1.3 U | 15.3 | 5.4 | 1060 | 4480 | 0.51 U | 0.3 U | 20 U | 0.25 | 29.3 | 67.6 |
| SS2053B | 5700 | 408 | 0.07 U | 1.3 U | 13.7 | 12.8 | 1520 | 3960 | 0.51 U | 0.3 U | 20 U | 0.24 | 30.4 | 87.5 |
| SS2054AA | NA | 391 | 0.16 | 1.3 U | 14.3 | 0.5 U | 719 | 3570 | 0.52 U | 0.4 U | 90 | 0.24 | 22 | 54.2 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2053AA | 12000 | 4 UJ | 5.9 | 120 | 0.68 | 21.5 J | 0.68 U | 80700 | 15.1 | 5.3 | 8.6 | 441 | 11100 | 6.8 | 11.7 |
| BS2053B | 11000 | 4.3 UJ | 3.8 | 136 | 0.75 | 13 J | 0.69 | 54600 | 12.3 | 7 | 10.8 | 567 | 11600 | 9 | 13.7 |
| BS2054A | 12300 | 6.5 UJ | 4.5 | 128 J | 0.77 | 9.9 U | 0.31 U | NA | 16.5 | 5.7 | 10.1 | 420 | 12900 | 8.1 | 10.9 J |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2053AA | 13700 | 297 | 0.06 U | 1.3 U | 11.7 | 0.7 | 671 | 2980 | 0.53 U | 0.31 U | 20 U | 0.25 | 21 | 39.2 |
| BS2053B | 8960 | 325 | 0.58 | 1.4 U | 13.7 | 1.8 | 756 | 3380 | 0.57 | 0.35 U | 20 U | 0.28 | 18.7 | 45.3 |
| BS2054A | NA | 304 | 0.32 | 1.3 U | 12.3 | 0.5 U | 528 | 3300 | 0.53 U | 0.41 U | 20 | 0.23 | 20.6 | 47.4 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2252A | 13000 J | 8.1 U | 4.5 J | 142 | 0.56 | 4.3 J | 26.2 J | NA | 79.5 J | 5.9 | 17.7 | 1590 | 12800 | 18.5 J | 8.7 |
| SS2252B | 13400 J | 26.6 J | 5.4 J | 136 | 0.84 | 2 J | 28.1 J | NA | 87.7 J | 5 | 16.2 | 1680 | 12000 | 19.7 J | 8.7 |
| SS2252C | 11400 J | 11.7 U | 4.3 J | 127 | 0.22 | 5.7 J | 13.4 J | NA | 42.7 J | 6.4 | 14.7 | 438 | 12000 | 15.9 J | 8.6 |
| SS2253A | 10200 J | 6.2 U | 5.2 J | 130 | 0.62 | 5.2 J | 13.3 J | NA | 36.4 J | 5.4 | 13.1 | 1160 | 11500 | 20.5 J | 7.7 |
| SS2253B | 10700 J | 43.2 U | 3.1 J | 117 | 0.14 | 4.5 J | 8.7 J | NA | 30.8 J | 6.6 | 13.2 | 1150 | 11600 | 20.7 J | 7.4 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2252A | NA | 465 | 0.05 U | 4.4 U | 20 | 4.5 | 4430 | NA | 1.1 J | 2.3 | NA | 0.12 J | 95.6 | 204 J |
| SS2252B | NA | 472 | 0.05 U | 8.4 U | 20.4 | 5.3 | 4860 | NA | 1.3 J | 2.3 | NA | 0.11 J | 91.7 | 209 J |
| SS2252C | NA | 525 | 0.05 | 6.6 U | 14.8 | 6.5 | 2800 | NA | 1 J | 1.3 | NA | 0.06 J | 44.6 | 129 J |
| SS2253A | NA | 552 | 0.05 U | 6.2 U | 13.4 | 4 | 2520 | NA | 0.61 J | 1.1 | NA | 0.08 J | 35.1 | 117 J |
| SS2253B | NA | 546 | 0.05 U | 6.9 U | 11.9 | 6.9 | 1670 | NA | 0.87 J | 0.76 | NA | 0.5 J | 30.9 | 92.9 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

## Table 4.3-5 (continued)
## Analytical Results for Surface Soil Samples - Southwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2252A | 10400 J | 4.6 U | 6.1 J | 132 | 0.68 | 5.7 J | 0.76 J | NA | 22.5 J | 6.4 | 9.7 | 438 | 12300 | 11.9 J | 8.6 |
| BS2252B | 10600 J | 8.9 U | 3.3 J | 119 | 0.47 | 2.6 J | 0.13 J | NA | 18.6 J | 6.4 | 10.4 | 383 | 12200 | 9.3 J | 8.1 |
| BS2252C | 9610 J | 4.2 U | 4.9 J | 139 | 0.28 | 23.4 J | 0.42 J | NA | 19.4 J | 5.9 | 9.5 | 848 | 10600 | 10.4 J | 9.8 |
| BS2253A | 8140 J | 4.2 U | 5.1 J | 122 | 0.14 | 4.1 J | 0.2 J | NA | 14.9 J | 5.2 | 9 | 448 | 9910 | 10 J | 6.7 |
| BS2253B | 8320 J | 75.1 U | 4.8 J | 114 | 0.55 | 9.2 J | 0.28 J | NA | 14.1 J | 6.8 | 10 | 458 | 10100 | 9.5 J | 6.6 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2252A | NA | 351 | 0.05 U | 5.3 U | 13.8 | 0.5 U | 658 | NA | 0.34 J | 1.2 | NA | 0.06 J | 46.4 | 43.5 J |
| BS2252B | NA | 419 | 0.05 U | 4.8 U | 9.5 | 0.6 | 462 | NA | 0.34 J | 0.89 | NA | 0.26 J | 38.4 | 46.2 J |
| BS2252C | NA | 321 | 0.05 U | 4.9 U | 9.3 | 1.7 | 560 | NA | 0.38 J | 1.4 | NA | 0.05 J | 34.6 | 38.9 J |
| BS2253A | NA | 381 | 0.05 | 6.4 U | 7.6 | 0.5 U | 533 | NA | 0.46 J | 1.1 | NA | 0.04 J | 33.9 | 36.5 J |
| BS2253B | NA | 383 | 0.05 U | 6.1 U | 8.7 | 0.5 U | 448 | NA | 0.54 J | 1.2 | NA | 0.04 J | 26.6 | 36.3 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2303A | 13200 | 3.9 UJ | 4.4 | 125 | 0.73 | 11.3 J | 4.8 | 15200 | 22.8 | 5.9 | 13.8 | 668 | 12700 | 15.3 | 11.5 |
| SS2303B | 13300 | 4 UJ | 4.5 | 124 | 0.73 | 10.7 J | 5.2 | 10500 | 25.2 | 5.9 | 14.6 | 681 | 13300 | 12.1 | 11.4 |
| SS2304A | 11400 | 3.8 UJ | 5.2 | 127 | 0.68 | 9 J | 2.7 | 9040 | 16.4 | 5.7 | 13.1 | 597 | 12600 | 13.7 | 11.5 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2303A | 7490 | 448 | 0.09 U | 1.3 U | 13.7 | 5 | 1520 | 3380 | 0.5 U | 0.3 U | 20 U | 0.28 | 30.8 | 77.7 |
| SS2303B | 6660 | 444 | 0.93 | 1.3 U | 14.3 | 8.1 | 1560 | 3720 | 0.51 U | 0.3 U | 20 U | 0.24 | 33.4 | 88.5 |
| SS2304A | 7070 | 483 | 0.88 | 1.3 U | 12.7 | 4.6 | 1420 | 3410 | 0.51 U | 0.3 U | 20 U | 0.28 | 22.9 | 66.5 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2303A | 12600 | 4.3 UJ | 4.7 | 112 | 0.72 | 12.8 J | 0.78 U | 75800 | 16.7 | 5.7 | 9.9 | 420 | 11300 | 9.5 | 11 |
| BS2303B | 10800 | 4.1 UJ | 5.8 | 126 | 0.69 | 9.8 J | 0.6 U | 77900 | 14.3 | 5.5 | 9.2 | 516 | 10900 | 6.3 | 10.5 |
| BS2304A | 8010 | 4.1 UJ | 5.9 | 97.4 | 0.49 | 6.3 UJ | 0.44 U | 60600 | 10.3 | 4.9 | 9.8 | 440 | 10000 | 17.1 | 8.5 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2303A | 13100 | 289 | 0.12 U | 1.4 U | 11.4 | 1.1 | 700 | 3170 | 0.55 U | 0.41 U | 20 U | 0.28 | 23.3 | 40 |
| BS2303B | 14300 | 308 | 0.08 U | 1.4 U | 10.5 | 0.9 | 747 | 2680 | 0.53 U | 0.59 U | 20 U | 0.28 | 19 | 41.4 |
| BS2304A | 10900 | 277 | 0.21 U | 1.4 U | 10.2 | 1.2 | 695 | 2760 | 0.54 U | 0.32 U | 20 | 0.2 | 14.5 | 39.9 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

Notes:
- Results in mg/kg.
- NA - Not analyzed.
- NC - Not calculated.
- U - Not detected.
- J - Estimated value.
- R - Rejected value.
- (a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-5

## Table 4.3-5 (continued)
## Analytical Results for Surface Soil Samples - Southwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2403A | 13400 | 3.9 UJ | 5.7 | 130 | 0.75 | 10.2 J | 2.6 | 21200 | 18.9 | 6 | 13.4 | 589 | 13100 | 13.2 | 12 |
| SS2403B | 13800 | 4 UJ | 3.9 | 133 | 0.74 | 10 J | 4 | 7070 | 21 | 6 | 14.6 | 538 | 13600 | 14.2 | 11.8 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2403A | 7960 | 400 | 0.09 U | 1.3 U | 13.5 | 7.6 | 1010 | 3460 | 0.51 U | 0.3 U | 20 U | 0.3 | 25.9 | 67.9 |
| SS2403B | 5730 | 500 | 0.37 | 1.3 U | 14.6 | 10.1 | 1230 | 3740 | 0.52 U | 0.31 U | 20 U | 0.3 | 28.3 | 81.3 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2403A | 11100 | 4 UJ | 3.9 | 110 | 0.65 | 8.3 J | 0.62 U | 28100 | 14.3 | 5.3 | 9.8 | 477 | 11200 | 7.5 | 10.7 |
| BS2403B | 10900 | 4.4 UJ | 5.3 | 115 | 0.64 | 9 J | 0.69 U | 82700 | 13.5 | 5.4 | 10.4 | 415 | 11100 | 7.7 | 10.1 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2403A | 9110 | 336 | 0.74 | 1.3 U | 12.2 | 1.2 | 770 | 3120 | 0.53 U | 0.31 U | 20 U | 0.26 | 19.6 | 43.4 |
| BS2403B | 12400 | 302 | 0.08 U | 1.5 U | 12.5 | 1 | 697 | 2850 | 0.55 U | 0.51 U | 20 U | 0.33 | 17.1 | 43.4 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2483B | 8850 | 11.8 J | 3.6 | 97.4 | 0.59 | 4.7 | 3.8 | NA | 22 | 4.7 | 9.7 | 463 | 10200 | 17.5 J | 10.3 J |
| SS2484A | 10400 | 4.7 U | 5.8 | 119 | 0.79 J | 1.8 | 1.6 | NA | 21.8 | 5.7 | 11.2 | 400 | 10600 J | 18.2 J | 14.8 J |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2483B | NA | 350 J | 0.08 | 1.1 U | 10.5 | 5.8 | 994 | NA | 0.44 | 0.92 | NA | 0.13 J | 35.5 | 61.9 |
| SS2484A | NA | 422 | 0.09 | 1.3 U | 10.1 | 4.9 | 874 | NA | 1.8 U | 0.39 | NA | 0.13 J | 36.9 | 64.7 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

## Table 4.3-5 (continued)
## Analytical Results for Surface Soil Samples - Southwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2483B | 10200 | 17.4 J | 2.8 | 131 | 0.67 | 5.2 | 0.34 J | NA | 15.9 | 5.6 | 9.2 | 425 | 11400 | 11.6 J | 12.7 J |
| BS2484A | 11500 | 12.9 J | 3.4 | 125 | 0.86 | 6.3 | 0.36 J | NA | 18 | 5.2 | 11.4 | 338 | 11700 | 11.1 J | 13.3 J |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2483B | NA | 373 J | 0.07 | 1.1 U | 10.3 | 0.5 U | 675 | NA | 0.41 | 1.1 | NA | 0.1 UJ | 33.5 | 37.9 |
| BS2484A | NA | 516 J | 0.13 | 1.2 U | 10.9 | 1 | 613 | NA | 1.8 | 0.93 | NA | 0.12 UJ | 38.1 | 48.2 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2701D | 13000 J | 61.5 U | 5.4 J | 183 | 0.07 U | 3.3 J | 26.1 J | NA | 103 J | 5.6 | 23 | 1870 | 12200 | 16.8 J | 9 |
| SS2702A | 12100 | 4.5 UJ | 1 | 198 J | 0.6 U | 2.1 | 8 | NA | 26.5 | 5.4 U | 16.6 | 593 | 13800 | 27.9 J | 18.5 |
| SS2702B | 18900 J | 7.8 UJ | 4.1 | 171 J | 0.85 | 18.3 | 1.3 | 15200 J | 21.9 | 6.9 | 17.1 | 530 | 16200 J | 10.7 | 18.5 |
| SS2702C | 13200 J | 7.7 UJ | 4.1 | 122 J | 0.65 | 18.9 | 4.6 | 30500 J | 55.8 | 4.3 | 13.7 | 1900 | 10500 J | 18.7 | 11.2 |
| SS2703A | 16400 J | 7.9 UJ | 3.7 | 147 J | 0.75 | 13.5 | 1.8 | 5850 J | 19.6 | 6.4 | 14.7 | 470 | 15400 J | 12.3 | 14.9 |
| SS2703B | 8700 J | 7.8 UJ | 5.4 U | 121 J | 0.83 U | 7.3 | 0.51 U | 68200 J | 9.3 | 5 | 8.7 | 420 | 10300 J | 6.9 | 13.1 J |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2701D | NA | 510 | 0.07 | 9 U | 22.3 | 52.4 | 6910 | NA | 1.2 J | 2.8 | NA | 0.08 J | 133 | 209 J |
| SS2702A | NA | 435 | 0.15 U | 1.3 U | 13 | 24.5 | 1320 | NA | 1.1 | 1.4 J | NA | 0.26 | 36.5 | 170 |
| SS2702B | 8290 J | 468 J | 0.06 U | 1.3 U | 15.5 | 16.3 | 899 | NA | 0.59 UJ | 0.41 U | NA | 12.2 U | 31.5 | 79.9 |
| SS2702C | 5030 J | 314 J | 0.08 U | 1.3 U | 16.6 | 7.6 | 1610 | NA | 0.89 UJ | 0.4 U | NA | 12 U | 60.3 | 77 |
| SS2703A | 5890 J | 482 J | 0.05 U | 1.3 U | 14.3 | 7.5 | 822 | NA | 0.41 UJ | 0.41 U | NA | 12.3 U | 29.3 | 74.7 |
| SS2703B | 15000 J | 305 J | 0.12 U | 1.3 U | 10.7 | 0.9 | 368 | NA | 0.97 U | 0.41 U | NA | 12.2 U | 15.8 J | 43.7 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - *Estimated value.*

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-5

## Table 4.3-5 (continued)
## Analytical Results for Surface Soil Samples - Southwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2701D | 10800 J | 52.9 U | 4.2 J | 178 | 0.06 U | 6 J | 0.48 J | NA | 20.6 J | 6.2 | 10.7 | 398 | 11500 | 6.7 J | 9 |
| BS2702A | 9080 | 8.1 J | 7.7 | 129 | 0.41 | 4.8 | 0.46 | NA | 15.2 | 4.4 | 9.6 | 343 | 10500 | 5.3 J | 11.6 J |
| BS2703B | 9570 J | 8.1 UJ | 5.7 U | 136 J | 0.84 U | 10 | 0.53 U | 75800 J | 10.4 | 4.4 | 9.7 | 540 | 10000 J | 4.6 | 16.2 J |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2701D | NA | 326 | 0.05 U | 8.9 U | 9.6 | 0.9 | 535 | NA | 1.9 J | 1.3 | NA | 0.04 J | 42 | 45 J |
| BS2702A | NA | 358 | 0.1 | 1.4 UJ | 10.6 | 1 | 395 | NA | 0.91 | 1.5 J | NA | 0.12 U | 21.9 | 37.9 |
| BS2703B | 22000 J | 260 J | 0.11 U | 1.4 U | 10.5 | 1.5 | 193 | NA | 0.87 U | 0.42 U | NA | 12.7 U | 19.3 J | 35.8 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

Notes:

Results in mg/kg.

NA - Not analyzed.

NC - Not calculated.

U - Not detected.

J - Estimated value.

R - Rejected value.

(a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

## Table 4.3-6
## Analytical Results for Surface Soil Samples - Northwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2931A | 14500 J | 102 U | 18.4 J | 189 | 0.26 | 5.2 J | 102 J | NA | 591 J | 4.6 | 59.2 | 9700 | 11000 | 60.9 J | 8.2 |
| SS2931A1 | 14300 | 6.1 U | 16.1 J | 272 | 1.4 | 40.2 | 177 | 141000 | 470 | 2.5 | 61.7 | 13000 | 9620 | 55.8 | 9 |
| SS2931A2 | 14300 | 4 U | 15.2 | 206 | 1.5 | 47.8 | 182 | 148000 | 542 | 2.5 | 70.9 J | 164 | 9920 | 109 | 9.7 |
| SS2931A3 | 15900 | 3.9 U | 15.3 | 141 | 1.7 | 67.7 | 189 | 167000 | 608 | 2.1 | 75.7 J | 18600 | 8400 | 35.8 | 11.1 |
| SS2931A4 | 16400 | 5.6 U | 12.3 J | 157 | 1.2 | 32.6 | 120 | 94200 | 309 | 4.1 | 44.3 | 8940 | 11700 | 30.5 | 12.2 |
| SS2931B | 13500 J | 4.2 U | 12.1 | 156 | 0.21 | 6.1 J | 159 J | NA | 474 J | 4.4 | 48.3 | 8980 | 9330 | 80.1 J | 7.2 |
| SS2931B1 | 15100 | 5.5 J | 12.7 J | 153 | 1.2 | 31.1 | 124 | 90100 | 242 | 4.1 | 40.5 | 7540 | 11200 | 94.6 | 11.5 |
| SS2931B3 | 11500 | 4 UJ | 4.9 J | 138 | 0.76 | 10.4 | 10.8 | 31000 | 35.2 | 4.9 | 15.2 | 1230 | 11900 | 14.3 | 11.4 |
| SS2931B4 | 14800 | 4 UJ | 7.4 J | 149 | 0.92 | 20.8 | 55.3 | 51100 | 138 | 5.2 | 28.3 | 4040 | 13600 | 63.9 | 11.9 |
| SS2931B5 | 16700 | 3.9 UJ | 6.4 J | 154 | 1.1 | 24.4 | 55.5 | 63300 | 281 | 6 | 61.5 | 6290 | 14700 | 76.1 | 13.1 |
| SS2931C | 14200 | 6.1 UJ | 3.6 U | 119 | 0.81 | 5 | 7.5 J | NA | 63.1 J | 4.4 UJ | 41.1 J | 1130 | 16200 J | 33.2 J | 14.4 |
| SS2931D | 12000 | 6.2 UJ | 1.3 U | 118 | 0.94 | 8 | 29.3 J | NA | 79.7 J | 2.7 UJ | 21.1 J | 1900 | 12000 J | 54.3 J | 13.1 |
| SS2932A | 12600 | 4 UJ | 6.4 | 126 | 0.4 | 6.9 | 3.7 | NA | 23.3 | 5.1 | 12.4 | 450 | 15100 | 9.3 J | 13.7 J |
| SS2932B | 12900 J | 4.1 UJ | 3.2 | 146 J | 0.68 | 5.4 | 5.1 | NA | 18.4 J | 5 | 13.4 | 708 | 14600 J | 17.7 J | 16 |
| SS2932C | 15000 | 4.1 U | 3.5 | 164 | 0.96 J | 8 J | 5.9 | NA | 20.2 J | 10.9 J | 14.5 | 383 | 13300 | 29.8 | 10.8 |
| SS2933A | 14100 J | 7.9 UJ | 4.4 U | 154 J | 0.94 U | 9.7 | 1.1 U | 4680 J | 16.3 | 6.2 | 13.9 | 370 | 14600 J | 12.3 | 14.3 J |
| SS2933B | 17000 J | 7.9 UJ | 4 | 295 J | 0.75 | 15 | 1.7 | 7120 J | 20.2 | 6.8 | 16.1 | 480 | 15700 J | 19 | 15.5 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS2931A | NA | 358 | 0.13 | 17.9 | 105 | 19.1 | 30100 | NA | 5.7 J | 8.3 | NA | 3.6 J | 630 | 911 J |
| SS2931A1 | 4140 | 307 | 0.51 | 13.4 | 105 | 17.2 | 49800 | 4070 J | 6.7 | 8.7 | 20 U | 2.4 J | 555 | 1210 |
| SS2931A2 | 4060 | 278 J | 0.31 U | 17.2 | 115 | 14.1 | 51500 | 4040 | 4.6 | 8.3 | 215 | 2.9 J | 649 | 1300 |
| SS2931A3 | 3590 | 224 J | 0.28 U | 19.1 | 124 | 18.1 | 45400 | 4780 | 10.9 | 10.8 | 90 | 3.5 J | 713 | 1540 |
| SS2931A4 | 5770 | 345 | 0.69 | 8.7 | 69.4 | 9.2 | 28900 | 4920 J | 4.3 | 5.9 | 140 | 0.73 J | 364 | 861 |
| SS2931B | NA | 306 | 0.11 | 11.2 U | 74.9 | 25.9 | 26300 | NA J | 5 | 9.2 | NA | 0.72 J | 527 | 977 J |
| SS2931B1 | 5830 | 339 | 0.7 | 7.6 | 61.1 | 14 | 22500 | 4140 J | 4.7 | 5.4 | 20 U | 0.57 J | 298 | 854 |
| SS2931B3 | 7450 | 376 | 0.07 U | 1.3 U | 18.8 | 4.1 | 3900 | 3010 J | 0.65 | 0.65 | 20 U | 0.29 J | 48.8 | 128 |
| SS2931B4 | 6560 | 412 | 0.1 U | 3 | 38.2 | 13.3 | 11500 | 4020 J | 1.8 | 3.4 | 20 U | 1.1 J | 160 | 534 |
| SS2931B5 | 8090 | 431 | 0.07 U | 8.7 | 70.4 | 7 | 11500 | 4550 J | 2.5 | 4.9 | 20 U | 0.31 J | 281 | 593 |
| SS2931C | NA | 523 J | 0.43 | 2 U | 24.3 | 31 | 2960 | NA | 1.8 U | 1.4 U | NA | 0.36 | 20.4 J | 153 J |
| SS2931D | NA | 420 J | 0.16 U | 1.8 U | 17.2 | 15.6 | 6070 | NA | 2 U | 2 U | NA | 0.85 J | 19.7 J | 1250 J |
| SS2932A | NA | 488 | 0.09 | 1.3 | 14.4 | 32.3 | 1120 | NA | 1.6 | 0.86 J | NA | 0.15 | 31.9 | 71.2 |
| SS2932B | NA | 52.6 J | 0.06 | 2 U | 10.9 | 19.9 | 1660 | NA | 0.27 U | 0.2 | NA | 0.05 U | 44.1 | 83.8 J |
| SS2932C | NA | 478 | 0.08 | 1.4 | 12.6 | 9.4 | 1750 | NA | 0.67 | 0.89 | NA | 0.1 U | 36.3 J | 88.6 J |
| SS2933A | 5020 J | 513 J | 0.12 U | 1.3 U | 11.7 | 10.3 | 300 | NA | 1 U | 0.41 U | NA | 12.3 U | 25.1 J | 63 J |
| SS2933B | 5950 J | 530 J | 0.06 U | 1.3 U | 13.4 | 12.6 | 859 | NA | 0.46 UJ | 0.41 U | NA | 12.3 U | 30.3 | 71.8 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | | **1.9** | **NC** | **0.3** | **45.4** | **52.8** |

Notes:
- Results in mg/kg.
- NA - Not analyzed.
- NC - Not calculated.
- U - Not detected.
- J - Estimated value.
- R - Rejected value.
- (a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-6

## Table 4.3-6 (continued)
## Analytical Results for Surface Soil Samples - Northwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2931A | 14500 J | 112 U | 5.3 | 173 | 0.08 U | 2.5 J | 8.6 J | NA | 54.2 J | 6.7 | 15.4 | 868 | 13100 | 21.3 J | 10.6 |
| BS2931A1 | 14200 | 4.4 UJ | 5.5 J | 173 | 0.85 | 25.5 | 3 | 43500 | 18.5 | 6.5 | 12 | 618 | 14100 | 9 | 16.3 |
| BS2931A2 | 15600 | 4.4 U | 4.4 | 153 | 0.82 | 22.9 U | 5 | 29300 | 27.1 | 6.3 | 13.7 J | 680 | 14800 | 10.8 | 16.2 |
| BS2931A3 | 14300 | 4.4 U | 4.8 | 154 | 0.77 | 21.8 U | 1.8 | 34000 | 18.7 | 6 | 11.6 J | 650 | 13800 | 8.8 | 15.4 |
| BS2931A4 | 13900 | 4.4 UJ | 4.3 J | 154 | 0.83 | 13.5 | 2.3 | 58000 | 18.5 | 6.4 | 11 | 848 | 13900 | 9.2 | 14.9 |
| BS2931B | 7720 J | 3.9 U | 5 J | 96.2 | 0.06 U | 3.8 J | 7 J | NA | 35.2 J | 5.6 | 11.8 | 1210 | 9930 | 21.6 J | 5.9 |
| BS2931B1 | 13200 | 4.8 J | 5.4 J | 146 | 0.87 | 14.3 | 2.8 | 55100 | 18.2 | 6.4 | 10.9 | 773 | 13600 | 10.7 | 14 |
| BS2931B3 | 12100 | 4.4 UJ | 5.5 J | 131 | 0.74 | 10.1 | 0.68 | 53700 | 13.7 | 5.9 | 11.9 | 574 | 12900 | 9.7 | 13.4 |
| BS2931B4 | 12800 | 4.6 UJ | 4.8 J | 145 | 0.74 | 18.2 | 0.98 | 49900 | 15.5 | 5.7 | 10 | 555 | 12600 | 8.7 | 15.1 |
| BS2931B5 | 14200 | 4.4 UJ | 4.6 J | 163 | 0.81 | 17.2 | 1 | 51300 | 17.2 | 6.2 | 10.9 | 589 | 13900 | 9.1 | 14.1 |
| BS2931C | 4270 | 6.6 U | 3.3 U | 98.6 | 0.66 | 4.9 | 0.19 UJ | NA | 14.9 J | 4 UJ | 9.7 J | 423 | 11100 J | 12.7 J | 12 |
| BS2931D | 8530 | 6.4 UJ | 2.1 U | 111 | 0.85 | 8.8 | 0.21 UJ | NA | 31 J | 4.4 UJ | 11.4 J | 433 | 12400 J | 14.2 J | 14.1 |
| BS2932A | 12000 | 10.4 J | 3.6 | 172 | 0.4 | 4.1 | 1.9 | NA | 18.6 | 4.2 | 10 | 358 | 13000 | 6.3 J | 12.5 J |
| BS2932B | 10800 J | 4.1 UJ | 7.7 | 133 J | 0.41 | 14.3 | 0.43 | NA | 11 J | 3.2 | 9.7 | 518 | 12100 J | 7.6 J | 14 |
| BS2932C | 11700 | 4.1 U | 4.1 | 128 | 0.89 J | 14.8 R | 0.07 | NA | 34.5 J | 11.2 J | 9.8 | 257 | 11000 | 11.1 J | 9.8 |
| BS2933B | 15600 J | 7.9 UJ | 4.3 | 152 J | 0.74 | 16.4 | 0.51 U | 37800 J | 16 | 6.5 | 11.3 | 460 | 14300 J | 5 | 15.7 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS2931A | NA | 388 | 0.06 U | 12.3 U | 16 | 1.2 | 2310 | NA | 1.1 J | 1.7 | NA | 0.07 J | 59.3 | 106 J |
| BS2931A1 | 11300 | 420 | 0.93 | 1.5 U | 13.9 | 2.9 | 1150 | 3860 J | 0.58 U | 0.34 U | 20 U | 0.12 UJ | 23.2 | 64.6 |
| BS2931A2 | 10100 | 444 J | 0.08 U | 1.5 U | 14.9 | 0.6 | 1520 | 4180 | 0.43 U | 0.34 U | 4780 | 0.15 J | 36.8 | 84.5 |
| BS2931A3 | 9750 | 405 J | 0.06 U | 1.5 U | 13.7 | 1.1 | 897 | 3830 | 0.6 U | 0.34 UJ | 3060 | 0.33 J | 25.9 | 60.4 |
| BS2931A4 | 12700 | 383 | 0.04 U | 1.5 U | 13.6 | 1.6 | 903 | 3040 J | 1 | 0.71 | 20 U | 0.11 UJ | 23.6 | 59.1 |
| BS2931B | NA | 287 | 0.05 U | 8.4 U | 15.4 | 2.6 | 2770 | NA J | 1 J | 1 | NA | 0.03 J | 38.7 | 81.1 J |
| BS2931B1 | 11200 | 396 | 0.98 | 1.5 U | 14.3 | 0.7 | 1100 | 3060 J | 0.83 | 0.35 U | 340 | 0.11 UJ | 22.7 | 62.1 |
| BS2931B3 | 11200 | 373 | 0.17 U | 1.5 U | 13.1 | 0.6 | 737 | 3410 J | 0.53 U | 0.34 U | 120 | 0.15 J | 17.9 | 47.6 |
| BS2931B4 | 13000 | 376 | 0.24 U | 1.5 U | 12.9 | 1.5 | 805 | 3400 J | 1.9 | 0.35 U | 470 | 0.11 UJ | 21 | 49.8 |
| BS2931B5 | 11900 | 384 | 0.03 U | 1.5 U | 13.5 | 0.5 | 738 | 3780 J | 0.57 U | 0.44 | 130 U | 0.11 UJ | 22.1 | 53.1 |
| BS2931C | NA | 300 J | 0.09 U | 1.9 U | 8.5 U | 1.1 | 427 | NA | 0.96 U | 0.22 U | NA | 0.14 U | 45.4 J | 40 J |
| BS2931D | NA | 333 J | 0.07 U | 1.8 U | 17.5 | 2.1 | 524 | NA | 1.5 U | 0.21 U | NA | 0.13 UJ | 87.8 J | 44.8 J |
| BS2932A | NA | 339 | 0.11 | 1.4 UJ | 10.8 | 0.7 | 478 | NA | 4.1 | 1.6 J | NA | 0.12 | 29.6 | 41.9 |
| BS2932B | NA | 316 J | 0.07 | 3.4 U | 8.3 | 0.5 U | 609 | NA | 4.2 | 0.89 | NA | 0.06 | 43.8 | 39 J |
| BS2932C | NA | 350 | 0.07 | 2 | 10.9 | 3.3 | 532 | NA | 0.75 | 1.2 | NA | 0.1 U | 40.2 J | 40.4 J |
| BS2933B | 10500 J | 383 J | 0.19 U | 1.3 U | 14 | 3 | 543 | NA | 0.45 UJ | 0.41 U | NA | 12.3 U | 24.7 | 51.4 |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | | **1.9** | **NC** | **0.3** | **45.4** | **52.8** |

Notes:
- Results in mg/kg.
- NA - Not analyzed.
- NC - Not calculated.
- U - Not detected.
- J - Estimated value.
- R - Rejected value.
- (a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-6

## Table 4.3-6 (continued)
## Analytical Results for Surface Soil Samples - Northwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS3151A | 14000 J | 67.8 U | 17.5 J | 390 | 0.2 | 2 J | 78.8 J | NA | 510 J | 5.1 | 54.5 | 8600 | 10200 | 57.6 J | 7.5 |
| SS3151B | 14900 | 6.3 U | 5.4 U | 160 | 2 | 5.5 | 16.4 J | NA | 74.7 J | 5.5 J | 40 J | 1740 | 18300 J | 23.1 J | 19.3 |
| SS3151CA | 9800 | 6.1 UJ | 2.5 U | 77.4 | 0.81 | 3.2 | 1.1 J | NA | 16.9 J | 4.3 UJ | 21 J | 568 | 13000 J | 12.6 J | 14.3 |
| SS3151D | 13200 | 4.2 UJ | 6.6 | 181 | 0.92 | 4.8 | 8.8 | NA | 52.6 | 5.9 | 39.3 | 745 | 13400 | 15.7 J | 17.4 |
| SS3152A | 10500 | 4.1 UJ | 3.1 | 186 J | 0.61 U | 1.68 | 3 | NA | 21.5 | 5 U | 14.9 | 513 | 15300 | 19.9 | 17.6 |
| SS3152B | 13300 | 4 UJ | 4.9 | 148 | 0.4 | 5.1 | 5.8 | NA | 28.7 | 4.4 | 13.7 | 540 | 14800 | 12.7 J | 12.8 J |
| SS3152C | 13300 | 4.1 U | 3.3 | 161 | 1.1 J | 4.7 UJ | 3.6 | NA | 23.2 J | 11.3 J | 14 | 259 | 14700 | 26.2 | 9.5 |
| SS3153A | 9900 J | 69 U | 2.9 J | 126 | 0.86 | 4.7 J | 1.5 J | NA | 17.4 J | 5.2 | 13.2 | 423 | 12200 | 4.6 J | 7.5 |
| SS3153B | 13400 | 4 U | 2.2 | 146 | 0.79 | 1.9 J | 1.3 | NA | 24.3 | 4.9 J | 14.5 | 352 | 14700 | 36.2 J | 8.2 |
| SS3153B1 | 11500 | 4 UJ | 3.5 | 126 | 0.48 | 8.6 J | 1.6 U | 4500 | 15.9 | 5.9 | 12.8 | 338 | 13400 | 11.6 | 10.6 |
| SS3153B2 | 13400 | 4.5 UJ | 4.8 | 129 J | 0.96 | 15.9 | 0.34 U | 29500 | 15.1 J | 6.3 | 10.5 | 450 | 14500 | 7.3 | 13.5 |
| SS3153B3 | 16000 | 4 UJ | 4.5 | 145 J | 1 | 14.5 | 0.32 J | 8070 | 18.9 J | 7.7 | 14.3 | 450 | 17300 | 10.1 | 13.6 |
| SS3153B4 | 14100 | 4 UJ | 4 | 153 J | 0.95 | 11.2 | 0.69 J | 5120 | 17.5 J | 7.2 | 14.5 | 400 | 15900 | 12.1 | 11.4 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS3151A | NA | 397 | 0.07 | 17.6 | 90 | 12.6 | 42400 | NA | 3.2 J | 6.9 | NA | 3.9 J | 550 | 771 J |
| SS3151B | NA | 365 J | 0.16 U | 1.8 U | 21.9 | 22.2 | 4850 | NA | 1.9 U | 1.9 U | NA | 0.51 | 75.6 J | 180 J |
| SS3151CA | NA | 305 J | 0.18 U | 1.7 U | 8.8 U | 13.9 | 1050 | NA | 1.8 U | 0.51 U | NA | 0.19 U | 28.5 J | 60.8 J |
| SS3151D | NA | 462 | 0.24 | 1.2 UJ | 16.1 | 12.1 | 1960 | NA | 2.8 | 2.3 | NA | 0.46 J | 55.2 | 158 |
| SS3152A | NA | 376 | 0.08 U | 1.2 U | 11.4 U | 13.3 | 1070 | NA | 1.3 | 1.8 J | NA | 0.16 | 25.9 | 86.8 |
| SS3152B | NA | 528 | 0.09 | 1.1 UJ | 14.2 | 13.5 | 1450 | NA | 0.87 | 1.1 J | NA | 0.16 | 34.4 | 83.5 |
| SS3152C | NA | 558 | 0.06 | 1.4 | 11.8 | 10 | 899 | NA | 0.25 U | 0.68 | NA | 0.1 UJ | 25 J | 76 J |
| SS3153A | NA | 531 | 0.06 U | 11.5 U | 10.3 | 9.1 | 842 | NA | 0.57 J | 0.43 | NA | 0.02 J | 30.2 | 63.4 J |
| SS3153B | NA | 541 | 0.06 | 2 | 10 | 30.2 | 1650 | NA | 0.33 | 0.4 | NA | 0.1 U | 26.4 J | 66.8 |
| SS3153B1 | 4260 | 445 | 0.07 U | 1.3 U | 11.3 | 12.2 | 842 | 3260 | 0.5 U | 0.3 U | 20 U | 0.16 | 22.7 | 59.7 |
| SS3153B2 | 8830 | 377 | 0.43 | 1.5 U | 12.5 | 14.9 | 794 | 2420 | 0.57 U | 0.34 U | 20 | 0.17 J | 22.7 J | 53.5 J |
| SS3153B3 | 6680 | 489 | 0.07 U | 1.3 U | 16.8 | 12 | 694 | 4520 | 0.5 U | 0.31 U | 20 | 0.14 J | 26.7 J | 70.8 J |
| SS3153B4 | 5070 | 594 | 0.1 U | 1.3 U | 13.3 | 16.3 | 621 | 4220 | 0.5 U | 0.3 U | 20 U | 0.14 J | 24.2 J | 74.3 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | | **1.9** | **NC** | **0.3** | **45.4** | **52.8** |

Notes:
- Results in mg/kg.
- NA - Not analyzed.
- NC - Not calculated.
- U - Not detected.
- J - Estimated value.
- R - Rejected value.
- (a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-6

## Table 4.3-6 (continued)
## Analytical Results for Surface Soil Samples - Northwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS3151A | 13000 J | 71.7 U | 5.3 J | 155 | 0.08 U | 7 J | 2.1 J | NA | 28.5 J | 6.6 | 12.6 | 540 | 13900 | 7.9 J | 10.9 |
| BS3151B | 7240 | 6.8 UJ | 1.2 U | 73.2 | 0.45 U | 3.1 | 0.29 UJ | NA | 20.8 J | 2 UJ | 8.6 J | 458 | 10500 J | 12.1 J | 11.1 |
| BS3151D | 8650 | 4.6 UJ | 5.4 | 142 | 0.69 | 2.6 | 0.26 J | NA | 16.1 | 4.9 | 10.9 | 523 | 9740 | 13.7 J | 15.1 |
| BS3152A | 8610 | 4.5 UJ | 2.7 | 172 J | 0.45 U | 1.61 | 0.34 | NA | 14.4 | 5.9 U | 11.2 | 395 | 13300 | 15.6 | 18 |
| BS3152C | 13500 | 4 U | 2.6 | 162 | 1 J | 3.9 J | 0.13 | NA | 26.9 J | 11.3 J | 11.8 | 190 | 15100 | 14.5 J | 11.2 |
| BS3153AA | 9880 J | 55.6 U | 4 J | 139 | 0.07 U | 6.8 J | 0.42 J | NA | 18.7 J | 6.5 | 9.7 | 510 | 11300 | 9.9 J | 10.3 |
| BS3153B | 10500 | 4.2 U | 2.9 | 135 | 0.83 | 3.3 J | 0.27 J | NA | 29.4 | 4.8 J | 8.6 | 339 | 13100 | 29.9 J | 8.7 |
| BS3153B1 | 13000 | 4.4 UJ | 5 | 153 J | 0.95 | 11.1 | 0.34 U | 22800 | 13.7 J | 6.6 | 11.4 | 350 | 14800 | 8.9 | 12.3 |
| BS3153B2 | 11700 | 4 UJ | 3 | 132 J | 0.83 | 8.6 | 0.79 J | 4350 | 15.5 J | 6.5 | 12.8 | 360 | 14000 | 10.6 | 9.8 |
| BS3153B3 | 10400 | 4.3 UJ | 4.1 | 123 J | 0.84 | 13.2 | 0.33 U | 69100 | 14.4 J | 5.8 | 9.8 | 510 | 12200 | 12.6 | 13.3 |
| BS3153B4 | 12200 | 4.4 UJ | 4.8 | 136 J | 0.95 | 7.5 U | 0.34 U | 47100 | 16.4 J | 7.1 | 15 | 380 | 14800 | 9.2 | 10.9 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS3151A | NA | 395 | 0.06 U | 10 U | 13.4 | 3 | 1090 | NA | 0.55 J | 1 | NA | 0.06 J | 47.8 | 61.1 J |
| BS3151B | NA | 280 J | 0.07 U | 2.3 U | 10.2 | 1.2 | 443 | NA | 1.7 U | 0.23 U | NA | 0.16 U | 87.8 J | 35.9 J |
| BS3151D | NA | 304 | 0.31 | 1.3 UJ | 11.1 | 0.5 U | 451 | NA | 3.1 | 1.3 | NA | 0.23 J | 29.9 | 35.2 |
| BS3152A | NA | 338 | 0.09 U | 1.3 U | 10.3 U | 1.2 | 501 | NA | 1.1 | 0.91 J | NA | 0.1 U | 22.7 | 42.7 |
| BS3152C | NA | 421 | 0.08 | 1.1 U | 13.1 | 1.7 | 396 | NA | 0.27 U | 0.67 | NA | 0.1 UJ | 24.2 J | 49.6 J |
| BS3153AA | NA | 340 | 0.05 U | 7 U | 10.7 | 1.2 | 583 | NA | 0.94 J | 1.1 | NA | 0.05 J | 36.6 | 42.9 J |
| BS3153B | NA | 377 | 0.09 | 1.4 | 11.6 | 1 | 512 | NA | 0.27 U | 0.97 | NA | 0.1 UJ | 31.2 J | 40.1 J |
| BS3153B1 | 6740 | 407 | 0.54 | 1.5 U | 14.4 | 2.22 | 684 | 2780 | 0.56 U | 0.34 U | 30 | 0.17 J | 19.8 J | 53.5 J |
| BS3153B2 | 4410 | 537 | 0.04 U | 1.3 U | 14.5 | 10.1 | 808 | 3150 | 0.51 U | 0.31 U | 20 | 0.14 J | 21.4 J | 63.7 J |
| BS3153B3 | 15100 | 325 | 0.07 U | 1.4 U | 14.7 | 1.77 | 483 | 2210 | 0.75 | 0.33 U | 20 U | 0.24 J | 18.1 J | 44.5 J |
| BS3153B4 | 7870 | 400 | 2.3 | 1.5 U | 14.6 | 1.62 | 413 | 2390 | 0.57 U | 0.34 U | 20 U | 0.17 J | 22.8 J | 47.8 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | | **1.9** | **NC** | **0.3** | **45.4** | **52.8** |

Notes:
- Results in mg/kg.
- NA - Not analyzed.
- NC - Not calculated.
- U - Not detected.
- J - Estimated value.
- R - Rejected value.
- (a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

Table 4.3-6

## Table 4.3-6 (continued)
## Analytical Results for Surface Soil Samples - Northwestern Quadrant

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS3381A | 15300 | 5.7 UJ | 6.8 | 129 | 1 | 3.3 | 22 J | NA | 90.7 J | 3.6 UJ | 20.7 J | 2600 | 14200 J | 27.1 J | 16.7 |
| SS3381B | 12400 | 5.8 UJ | 4.2 U | 96.8 | 0.67 | 2.5 | 19.1 J | NA | 61.4 J | 3.5 UJ | 17.3 J | 2010 | 12600 J | 0.86 J | 12.8 |
| SS3381C | 12900 | 3.8 UJ | 5.7 | 208 J | 0.57 U | 3.09 | 25.8 | NA | 67 | 5.4 U | 19.9 | 1720 | 14600 | 20.3 | 15.3 |
| SS3381D | 13200 | 5.9 UJ | 4 U | 69.8 | 1.1 | 4.1 | 13.1 J | NA | 107 J | 2.8 UJ | 14.9 J | 1150 | 15200 J | 26.6 J | 12.8 |
| SS3382A | 12200 | 10 J | 4 | 113 | 0.47 | 5.5 | 8.7 | NA | 38.1 | 3.9 | 12.8 | 653 | 13800 | 13.2 J | 11.2 J |
| SS3382B | 7210 | 4.2 U | 9.2 | 103 | 0.62 UJ | 3.1 | 9 | NA | 36.6 | 4.6 U | 13.4 | 820 | 8880 J | 40.8 J | 10.3 J |
| SS3382C | 12700 | 6.1 U | 8.2 | 181 | 0.71 J | 92.2 R | 10.6 | NA | 24.3 J | 11 J | 16.8 | 540 | 10600 | 54.4 | 55.2 |
| SS3383A | 9470 J | 8.5 UJ | 2.3 | 114 J | 0.71 | 197 | 5.6 | NA | 14.4 J | 2.2 | 10.9 | 725 | 10500 J | 14.8 J | 34.7 |
| SS3383B | 10400 J | 11.9 UJ | 3.3 | 144 J | 0.91 | 7.9 | 4.2 | NA | 10.7 J | 1.8 | 13.8 | 1300 | 10100 J | 9.8 J | 65.6 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

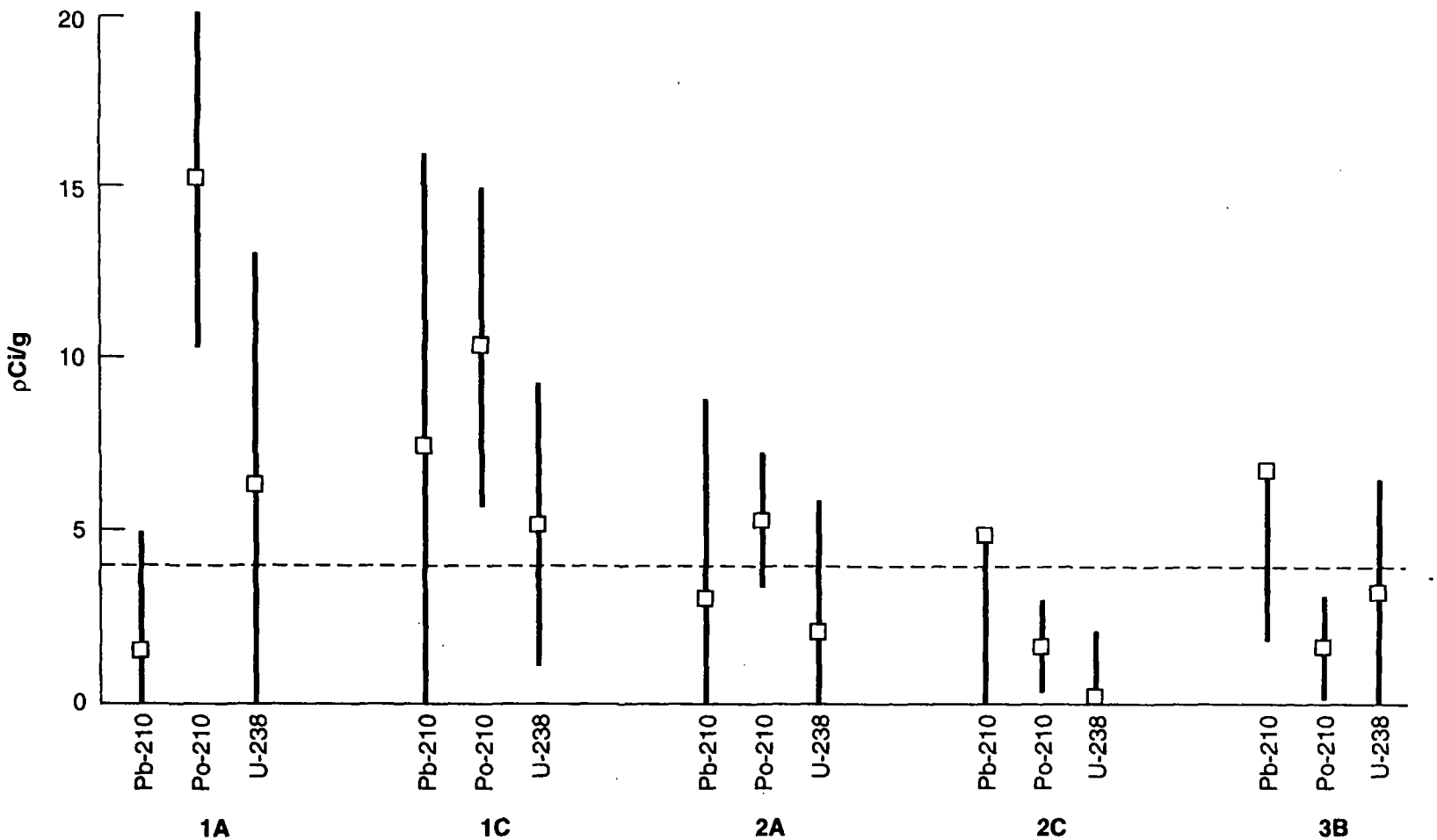
| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS3381A | NA | 382 J | 0.17 U | 1.6 U | 21.9 | 1.8 | 3880 | NA | 2.7 U | 1.8 U | NA | 0.52 | 97 J | 183 J |
| SS3381B | NA | 368 J | 0.14 U | 1.6 U | 15.8 | 3.8 | 4690 | NA | 1.9 U | 6.6 | NA | 0.22 UJ | 21.1 J | 164 J |
| SS3381C | NA | 469 | 0.19 U | 3.8 U | 20.9 | 6.1 | 4670 | NA | 0.62 | 2 J | NA | 0.4 | 90.6 | 215 |
| SS3381D | NA | 415 J | 0.16 U | 1.7 U | 32.5 | 5 | 3370 | NA | 1.6 U | 0.2 U | NA | 0.37 J | 55.1 J | 126 J |
| SS3382A | NA | 410 | 0.09 | 1.1 UJ | 13.6 | 8.8 | 1920 | NA | 0.43 | 1 J | NA | 0.17 | 44.1 | 94.9 |
| SS3382B | NA | 250 | 0.06 | 1.2 U | 11.7 | 11 | 2820 | NA | 2 U | 0.76 | NA | 0.16 J | 37.5 | 108 |
| SS3382C | NA | 546 | 0.16 | 1.7 U | 11.5 | 9.9 | 1540 | NA | 2 | 1.5 | NA | 0.31 | 67.6 J | 132 J |
| SS3383A | NA | 53.4 J | 0.1 | 2.8 U | 7.9 | 11 | 1550 | NA | 0.93 | 0.35 | NA | 0.07 | 33.2 | 86.3 J |
| SS3383B | NA | 44.9 J | 0.08 | 3.5 U | 6.7 | 17.5 | 1530 | NA | 0.28 U | 0.56 | NA | 0.13 | 34.4 | 81.9 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

| Sample Id [a] | Aluminum | Antimony | Arsenic | Barium | Beryllium | Boron | Cadmium | Calcium | Chromium | Cobalt | Copper | Fluoride | Iron | Lead | Lithium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS3381A | 10300 | 6.3 UJ | 5.4 U | 92.6 | 1.2 | 2.7 | 2.2 J | NA | 25.4 J | 4 UJ | 12.2 J | 660 | 13200 J | 11.4 J | 15.8 |
| BS3381B | 9970 | 6.8 UJ | 2.7 U | 134 | 0.56 | 11.5 | 0.45 UJ | NA | 17.6 J | 3.3 UJ | 11.3 J | 605 | 10900 J | 3 J | 15.2 |
| BS3381D | 9900 | 6.4 U | 5.5 U | 96.5 | 1.1 | 3.1 | 0.16 UJ | NA | 19 J | 2.3 UJ | 9.3 J | 423 | 12100 J | 10.1 J | 12.4 |
| BS3382A | 10600 | 4.1 UJ | 4.9 | 172 | 0.28 | 9.4 | 1.7 | NA | 18.2 | 4.3 | 10.1 | 420 | 12000 | 6.9 J | 15.3 J |
| BS3382C | 8600 | 5.2 U | 4.3 | 193 | 0.43 J | 13.4 R | 0.09 UJ | NA | 8.5 J | 8 J | 11 | 888 | 5790 | 9 | 57.1 |
| BS3383A | 12500 J | 6.7 UJ | 8.7 | 116 J | 0.22 U | 91.7 | 0.74 | NA | 10.2 J | 3 | 11.8 | 605 | 12100 J | 7 J | 32.6 |
| BS3383B | 7620 J | 15.8 UJ | 3.9 | 196 J | 0.18 U | 6.7 | 0.05 U | NA | 4.9 J | 0.79 U | 7.2 | 1230 | 6580 J | 1.3 J | 56.8 |
| **Representative** | **13,900** | **14.3** | **7.7** | **188** | **1.0** | **12.8** | **1.9** | **75,800** | **27.5** | **7.6** | **12.6** | **600** | **14,400** | **29.1** | **16.1** |

| Sample Id [a] | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Orthophosphate | Total Phosphorus | Potassium | Selenium | Silver | Sulfate | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BS3381A | NA | 396 J | 0.12 U | 1.8 U | 12.7 | 1.9 | 805 | NA | 2.3 U | 0.21 U | NA | 0.22 UJ | 32.6 J | 59.1 J |
| BS3381B | NA | 242 J | 0.16 U | 1.9 U | 8.1 | 2.1 | 485 | NA | 2.4 U | 0.56 U | NA | 0.1 U | 92.6 J | 39.1 J |
| BS3381D | NA | 319 J | 0.13 U | 1.8 U | 7.3 U | 0.7 | 637 | NA | 1.3 U | 0.21 U | NA | 0.1 U | 32.9 J | 37.6 J |
| BS3382A | NA | 316 | 0.09 | 1.2 UJ | 12 | 2.7 | 595 | NA | 0.37 | 1.6 J | NA | 0.13 | 27 | 39.3 |
| BS3382C | NA | 129 | 0.09 | 1.7 | 6.5 | 1 | 332 | NA | 0.64 | 2 | NA | 0.13 UJ | 27.6 J | 28.9 J |
| BS3383A | NA | 263 J | 0.08 | 3.7 U | 9.6 | 10 | 543 | NA | 3.5 | 0.96 | NA | 0.05 U | 48.9 | 39.2 J |
| BS3383B | NA | 198 J | 0.09 | 3.5 U | 2.5 | 0.5 U | 394 | NA | 0.48 | 1.5 | NA | 0.89 | 32.5 | 29 J |
| **Representative** | **22,000** | **482** | **0.16** | **2.15** | **15.5** | **3.7** | **672** | **3,562** | **3.05** | **1.9** | **NC** | **0.27** | **45.4** | **52.8** |

Notes:
- Results in mg/kg.
- NA - Not analyzed.
- NC - Not calculated.
- U - Not detected.
- J - Estimated value.
- R - Rejected value.
- (a) Sample ID numbering scheme: first row letters, "SS" or "BS", stand for "surface soil" (top 6") or "below-surface soil" (approximately two feet); first three numbers indicate radial in degrees (e.g., "045" equals 45° radial); fourth number indicates mile from centerpoint within which sample was collected; remaining letters indicate where sample falls in sequence of samples collected along same radial within same mile (e.g., sample with suffix "A" is closer to centerpoint than sample with suffix "B").

# Surface and Subsurface Characterizations
# Figures for Section 4.3




**Legend:**

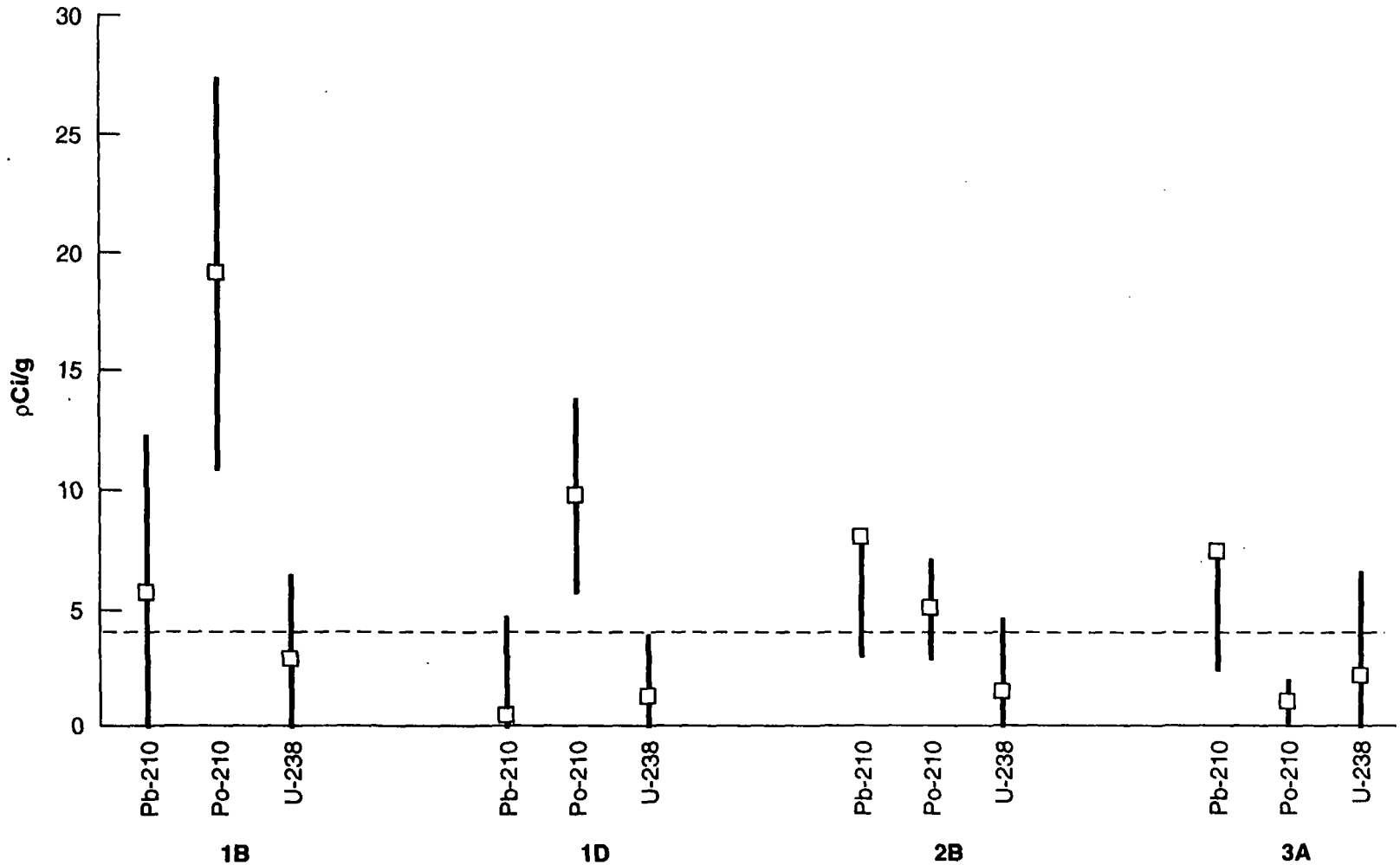
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 000** | | | |
| | JOB No. | DRAWING NO. | REV. |
| | 21372 | FIGURE 4.3-2 | |

95-1302b.004




***Legend:***

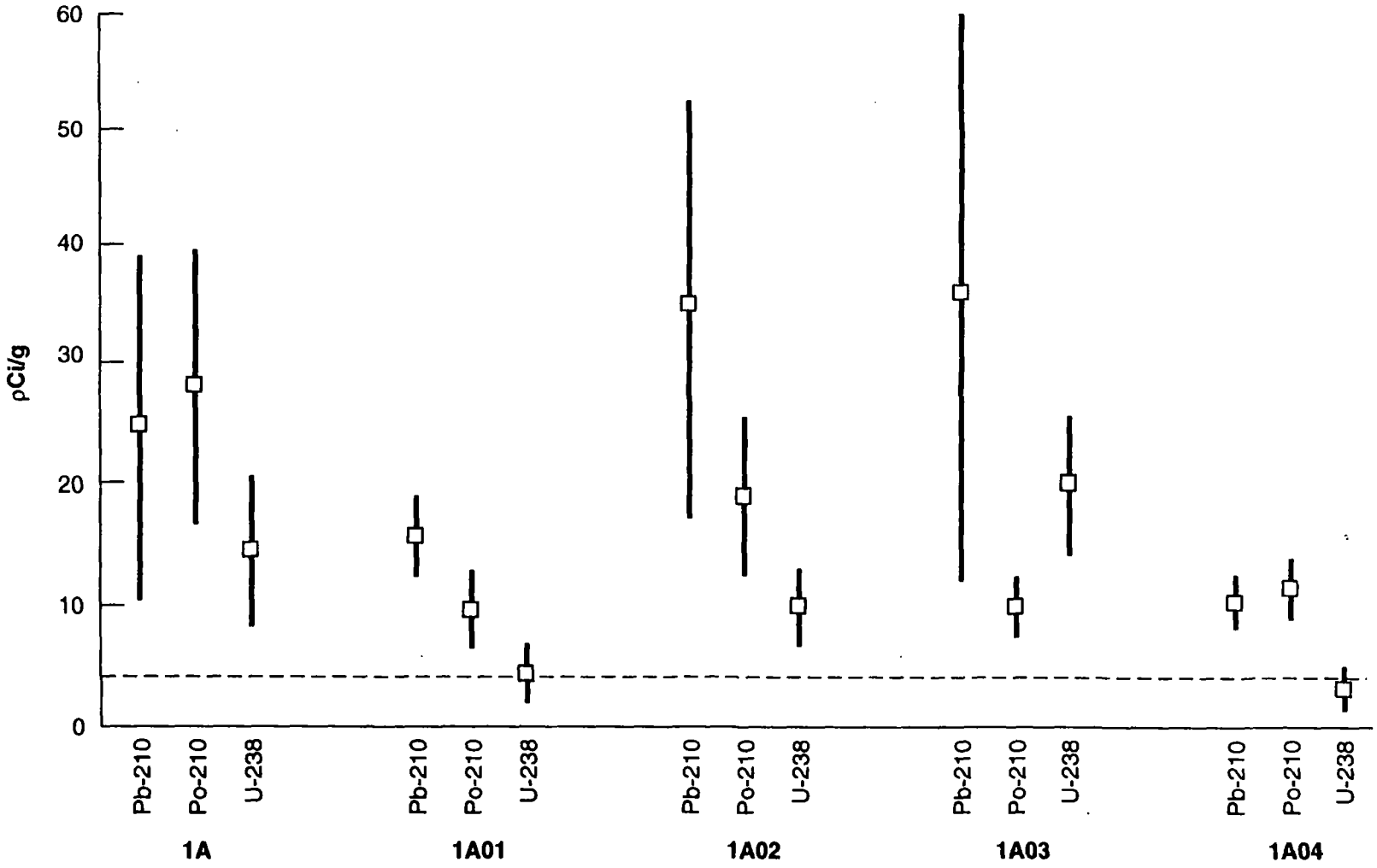
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 023** | | |
| JOB No. | DRAWING NO. | REV. |
| 21372 | FIGURE 4.3-3 | |

95-1302b.006




**Legend:**

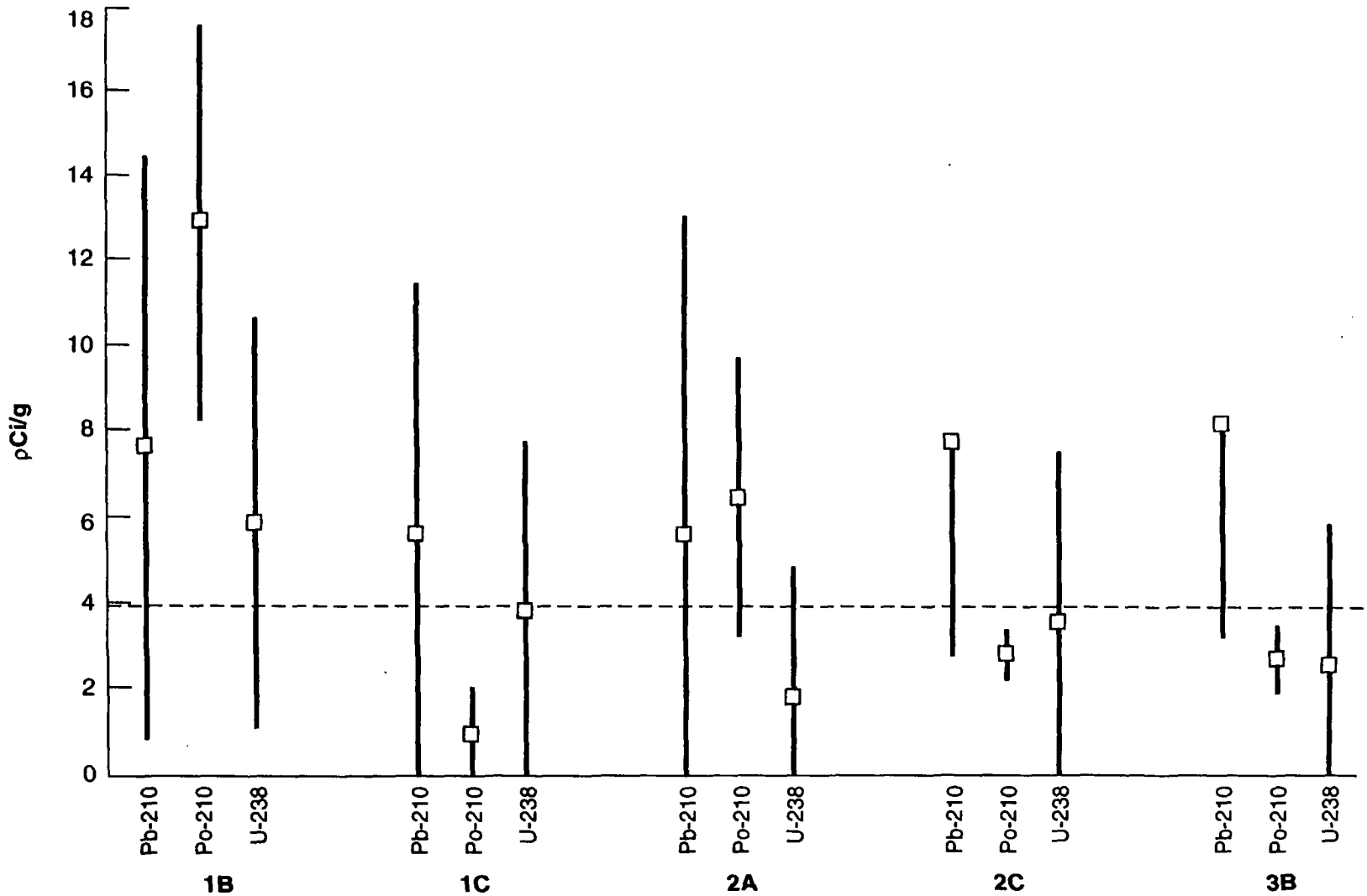
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 045** | | |
| JOB No. | DRAWING NO. | REV. |
| 21372 | FIGURE 4.3-4a | |

95-1302b.007




**Legend:**

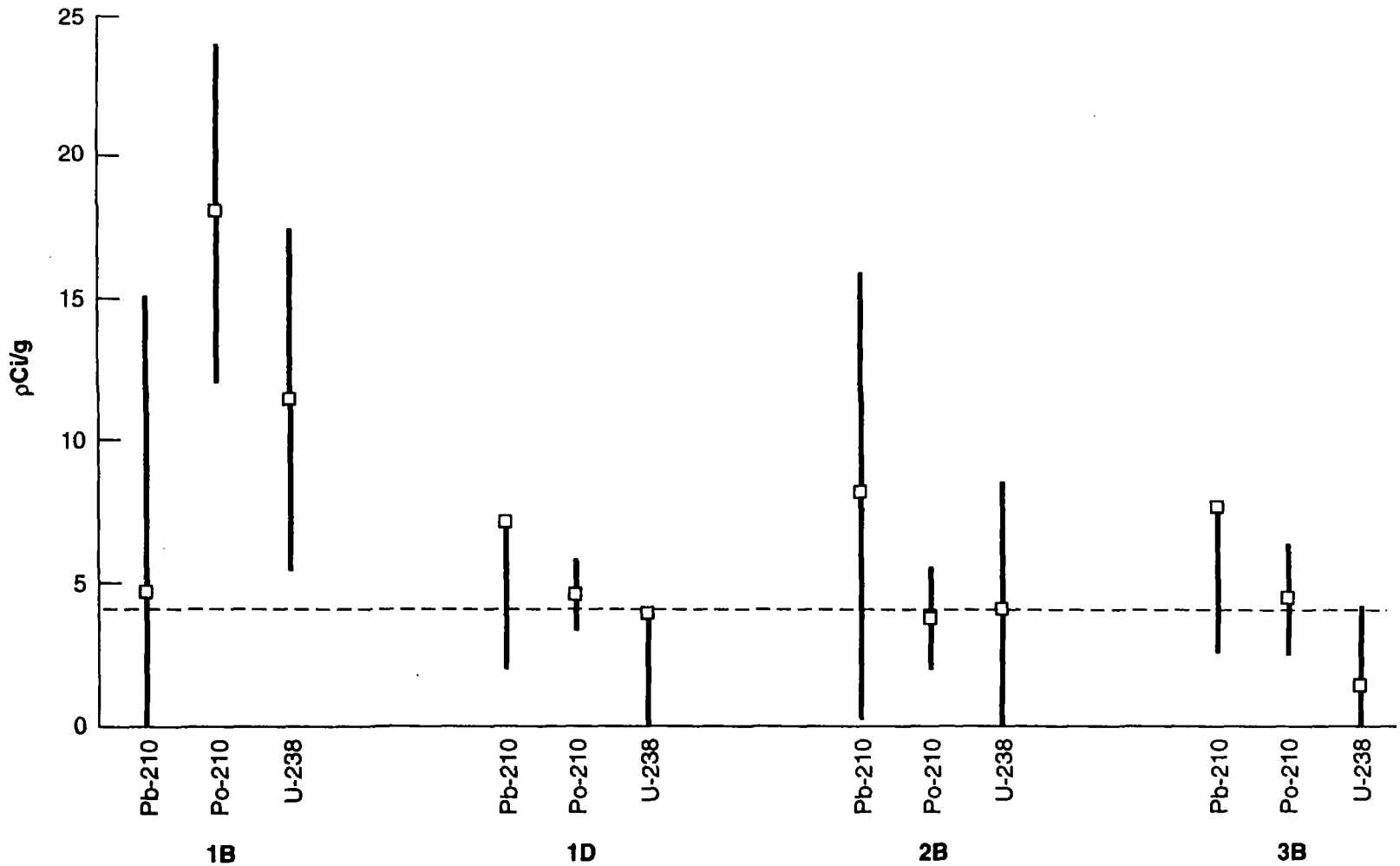
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 045** | | |
| JOB No. | DRAWING NO. | REV. |
| 21372 | FIGURE 4.3-4b | |

95-1302b.008




**Legend:**

Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

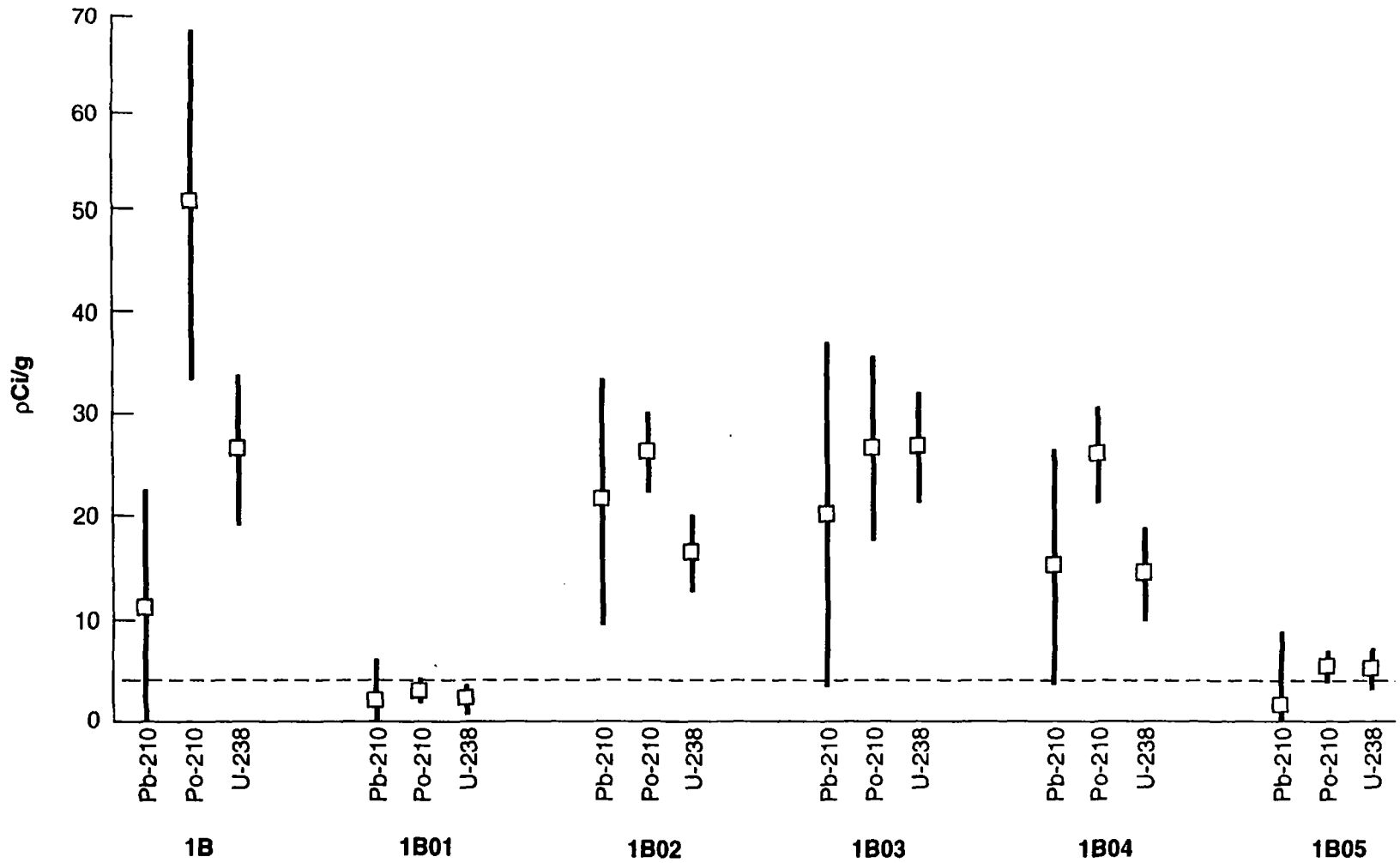
**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Pb-210 / Po-210 / U-238**
**Activities in Surface Soil Along Radial 068**

| JOB No. | DRAWING NO. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-5 | |

95-1302b.009




**Legend:**

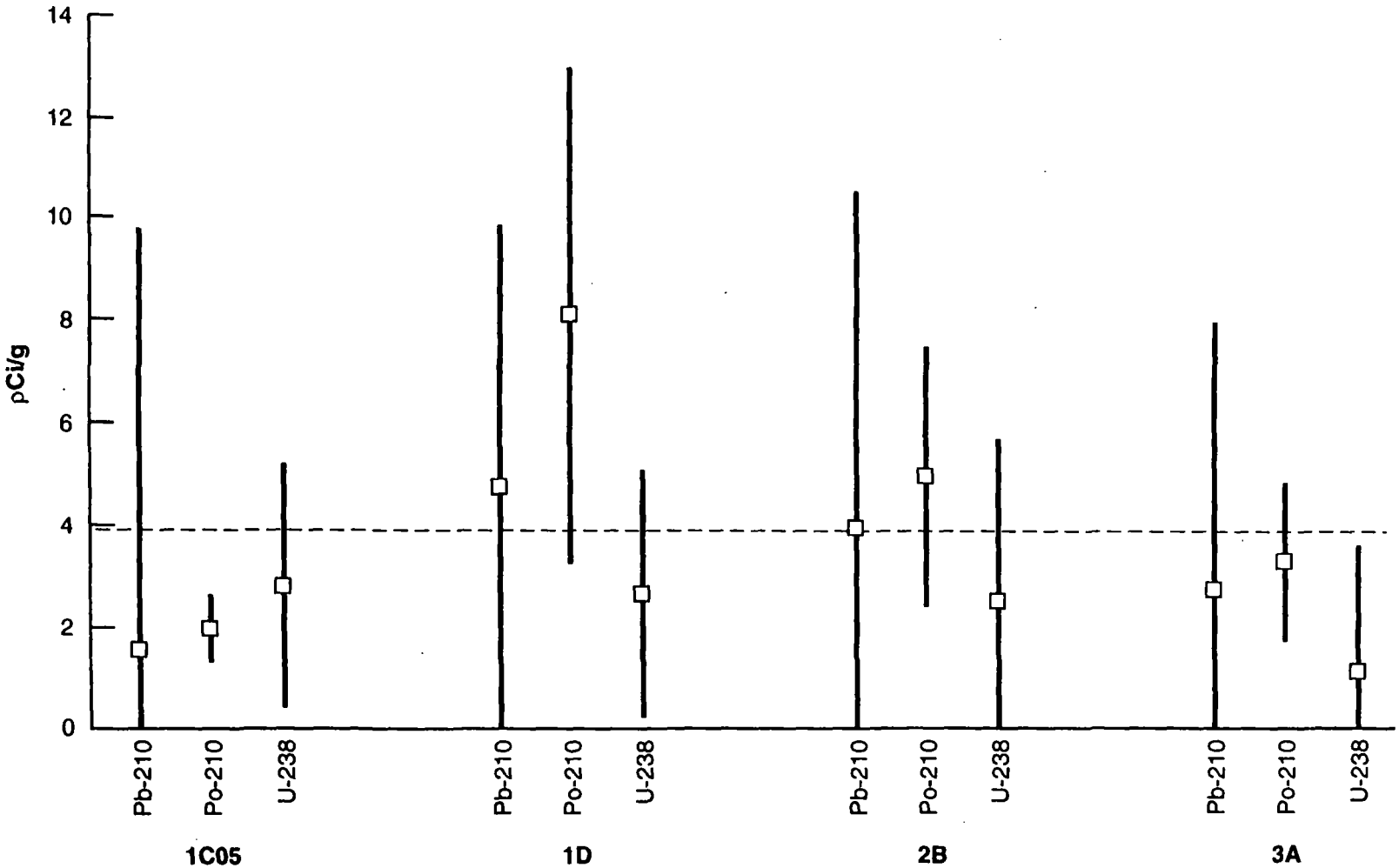
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 090** | | |
| JOB No. | DRAWING NO. | REV. |
| 21372 | FIGURE 4.3-6a | |

95-1302b.010




**Legend:**

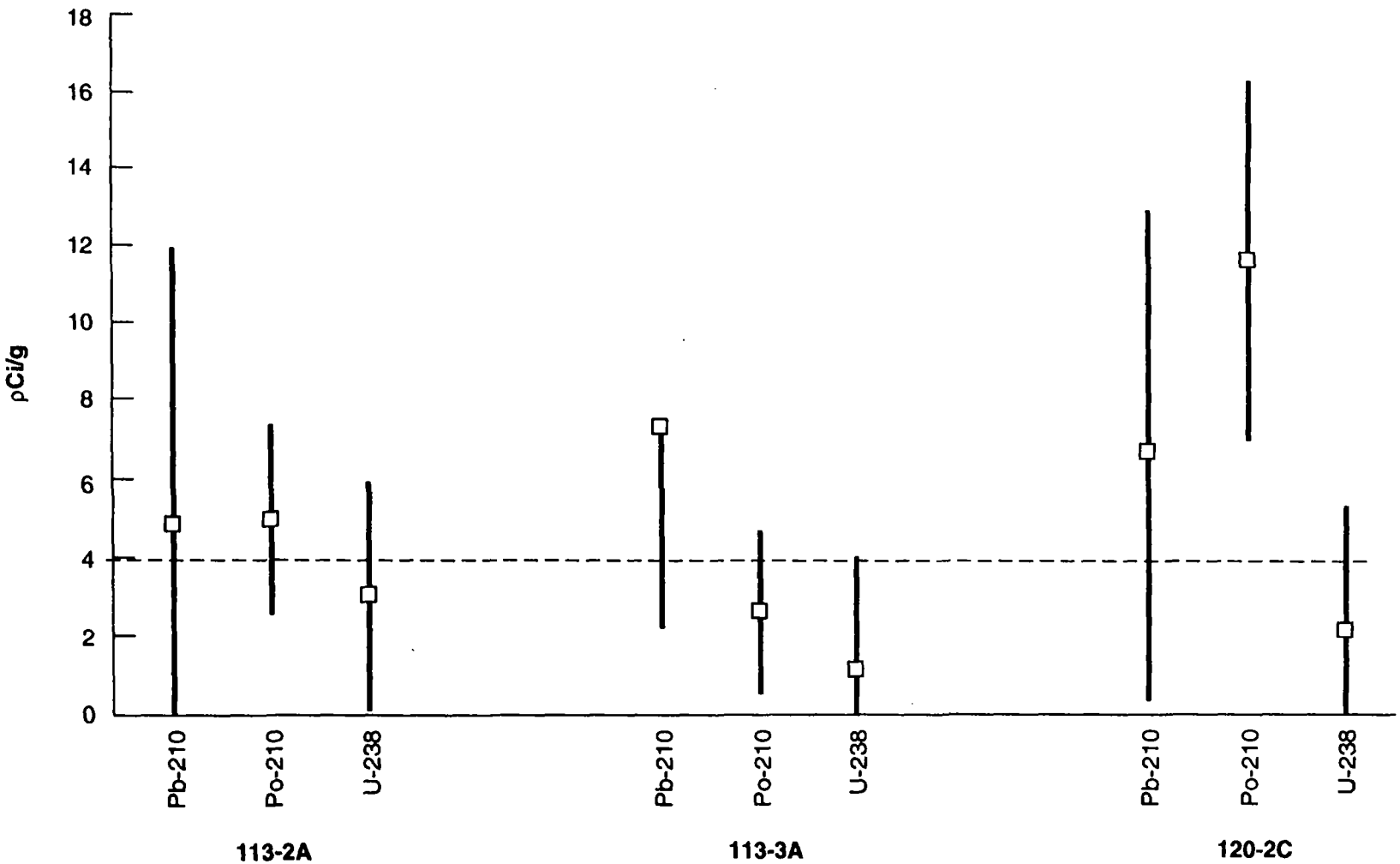
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 090** | | |
| JOB No. | DRAWING NO. | REV. |
| 21372 | FIGURE 4.3-6b | |

95-1302b.011




***Legend:***

Actual Value — Plus 2 SD / Minus 2 SD

– – – Representative Level

**2A** Sampling Location

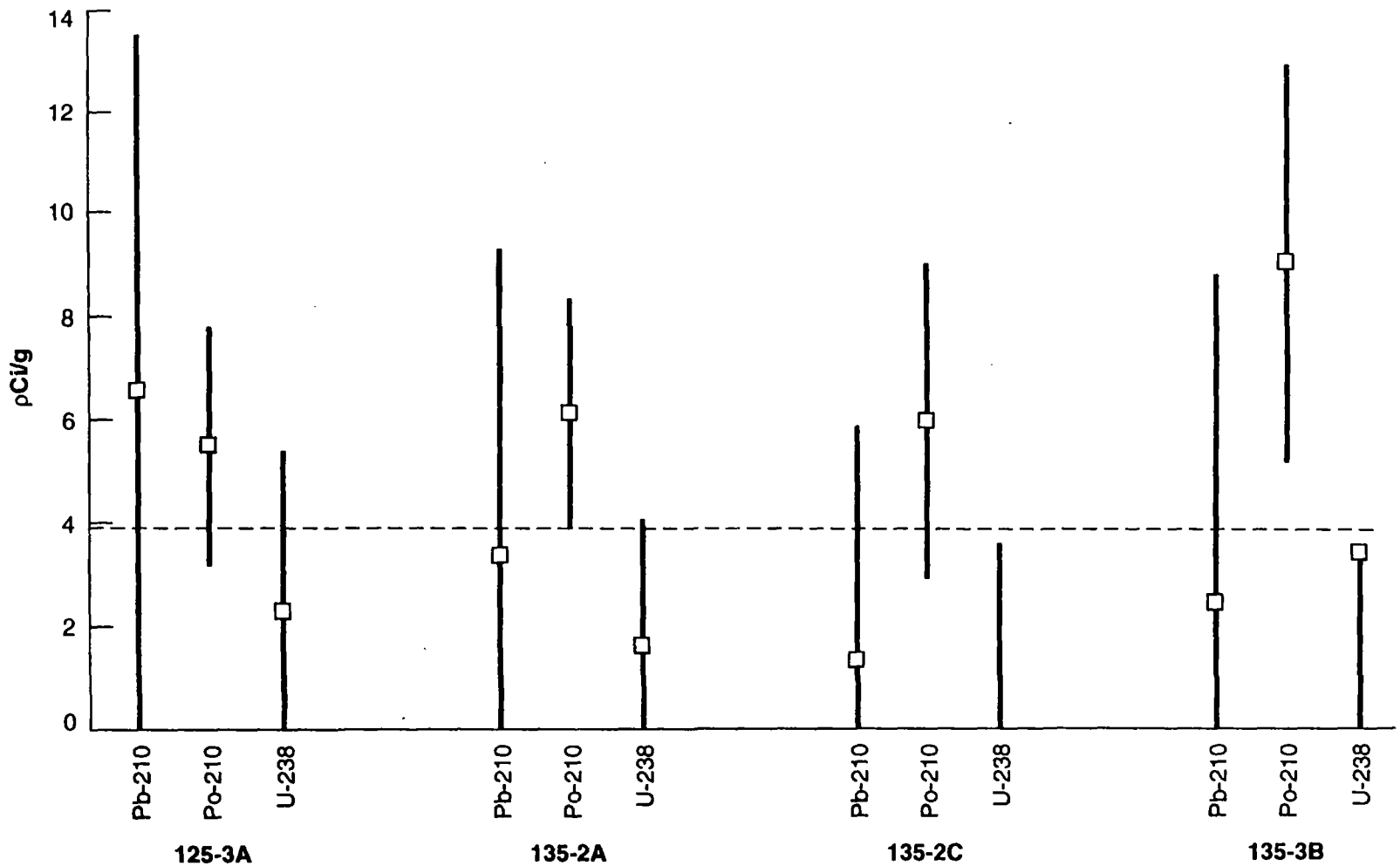
**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Pb-210 / Po-210 / U-238**
**Activities in Surface Soil Along Radial 113**

| JOB No. | DRAWING NO. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-7 | |

95-1302b.012




**Legend:**

Actual Value — Plus 2 SD / Minus 2 SD

– – – Representative Level

**2A** Sampling Location

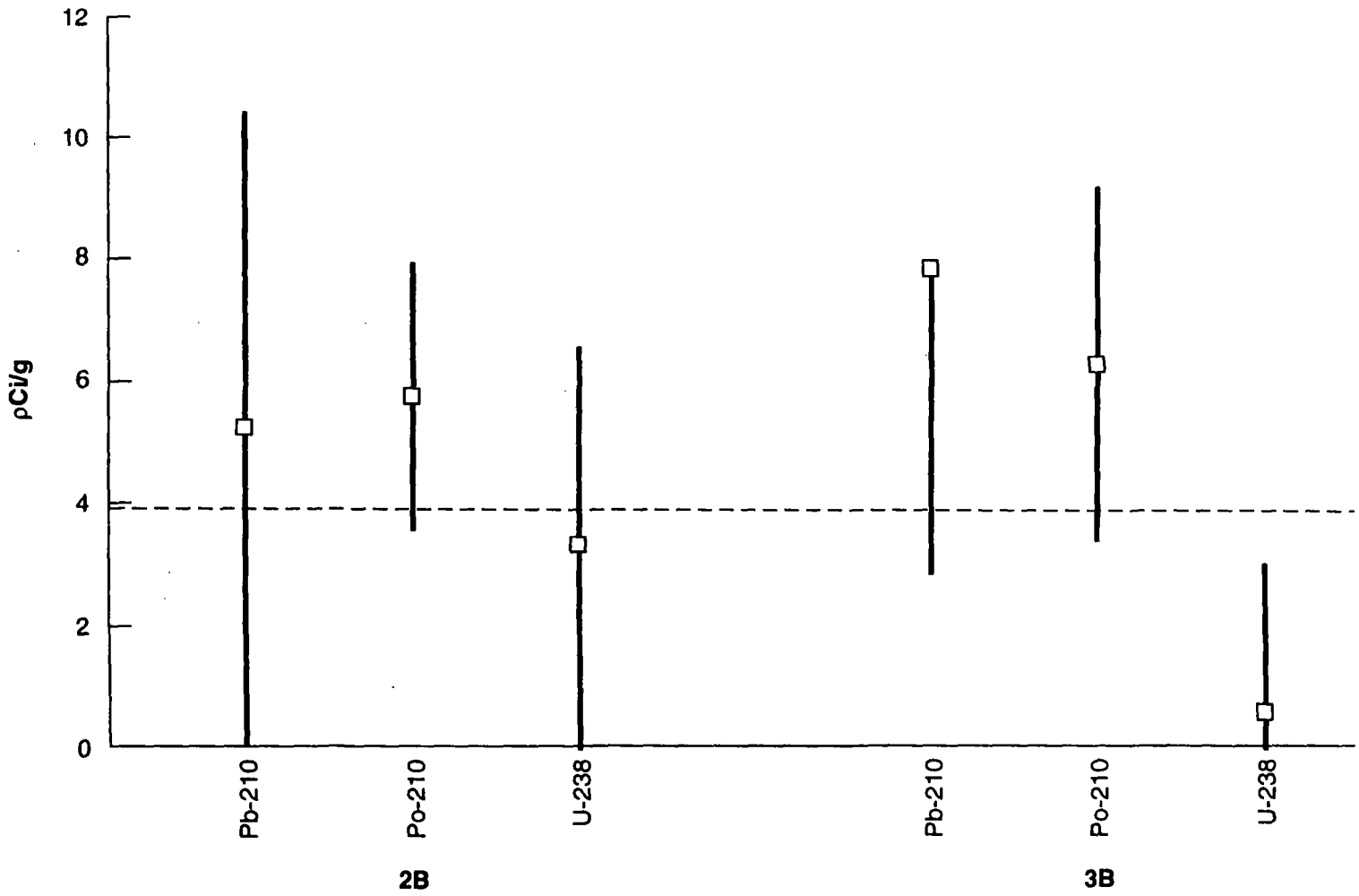
**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Pb-210 / Po-210 / U-238**
**Activities in Surface Soil Along Radial 135**

| JOB No. | DRAWING NO. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-8 | |

95-1302b.013




**Legend:**

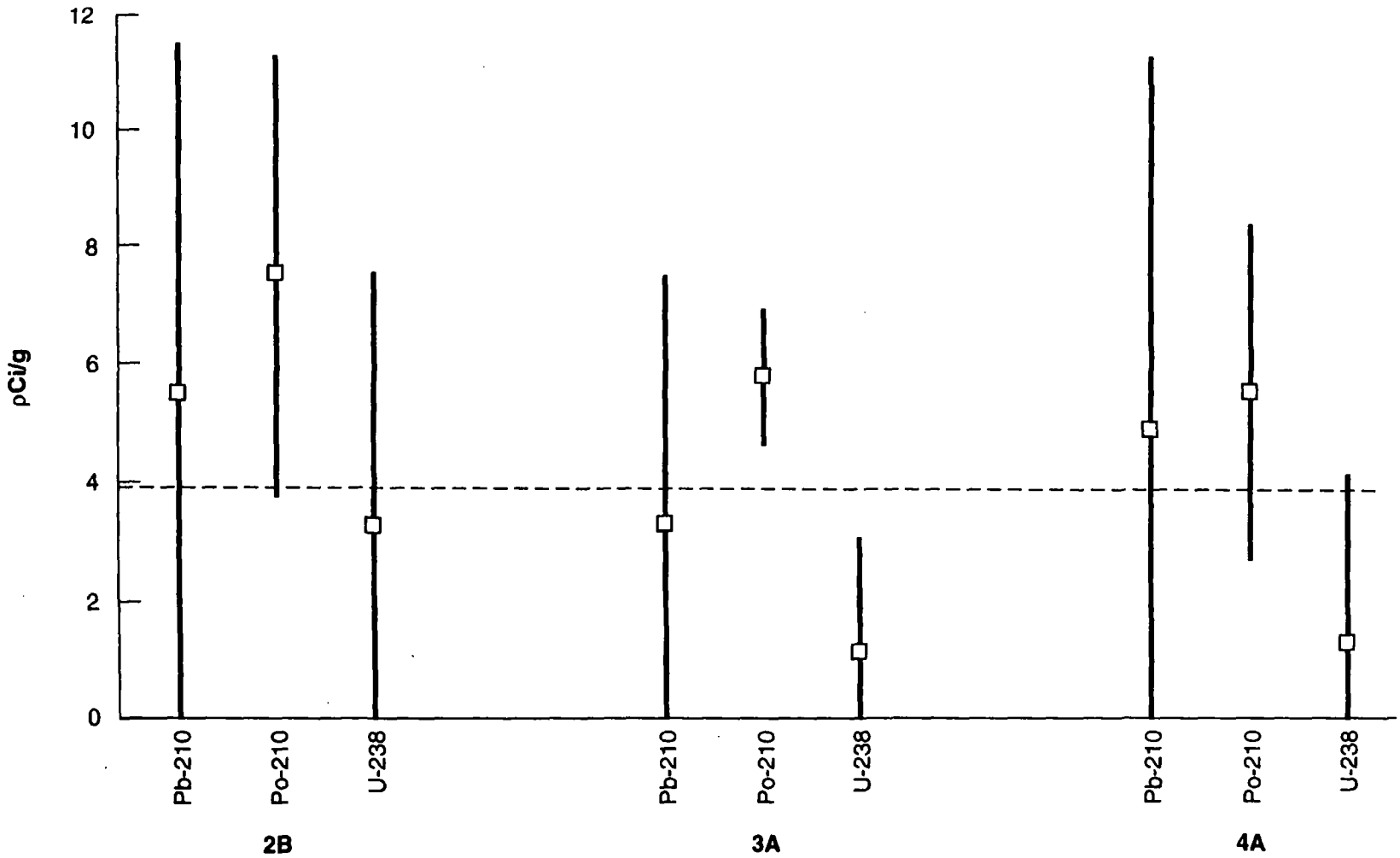
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 158** | | | |
| BECHTEL | JOB No. | DRAWING NO. | REV. |
| | 21372 | FIGURE 4.3-9 | |

95-1302b.014




***Legend:***

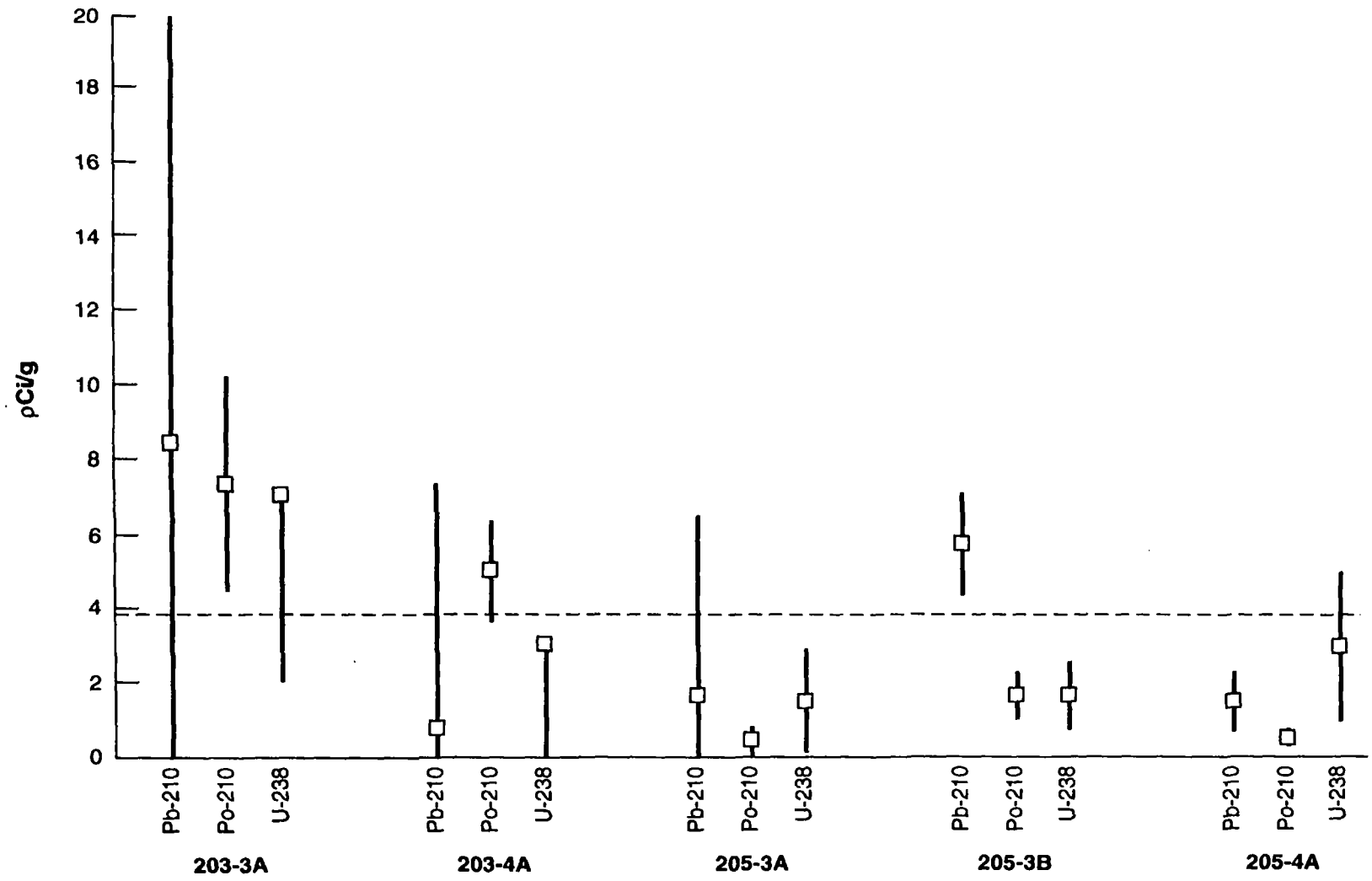
Actual Value — Plus 2 SD / Minus 2 SD

– – – Representative Level

**2A** Sampling Location

| | | | |
|---|---|---|---|
| **BECHTEL ENVIRONMENTAL, INC.** SAN FRANCISCO | | | |
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 180** | | | |
| BECHTEL | JOB No. | DRAWING NO. | REV. |
| | 21372 | FIGURE 4.3-10 | |

95-1302b.015




**Legend:**

Actual Value — Plus 2 SD / Minus 2 SD

Representative Level

**2A** Sampling Location

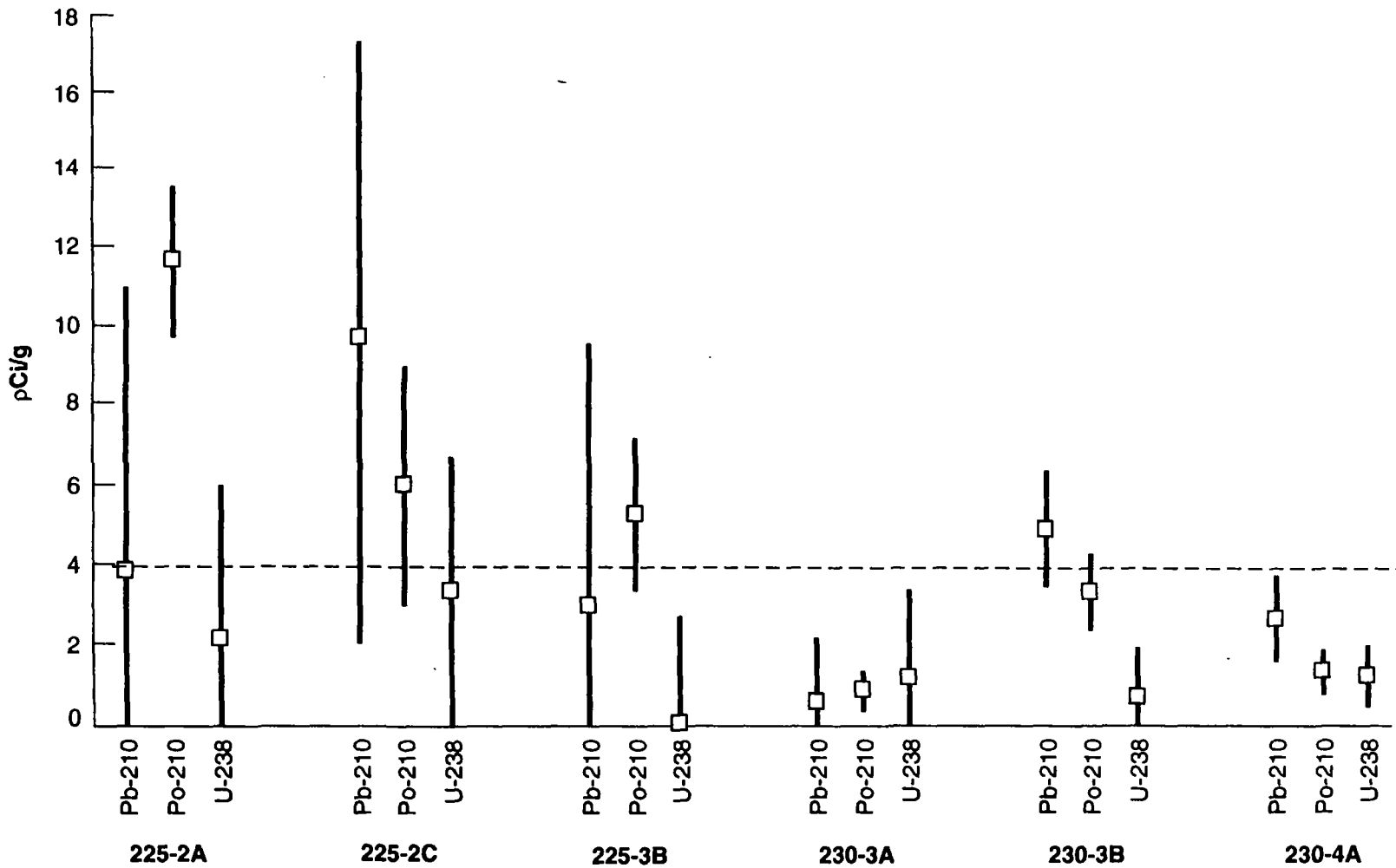
**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Pb-210 / Po-210 / U-238**
**Activities in Surface Soil Along Radial 203**

| JOB No. | DRAWING NO. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-11 | |

95-1302b.016




***Legend:***

Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

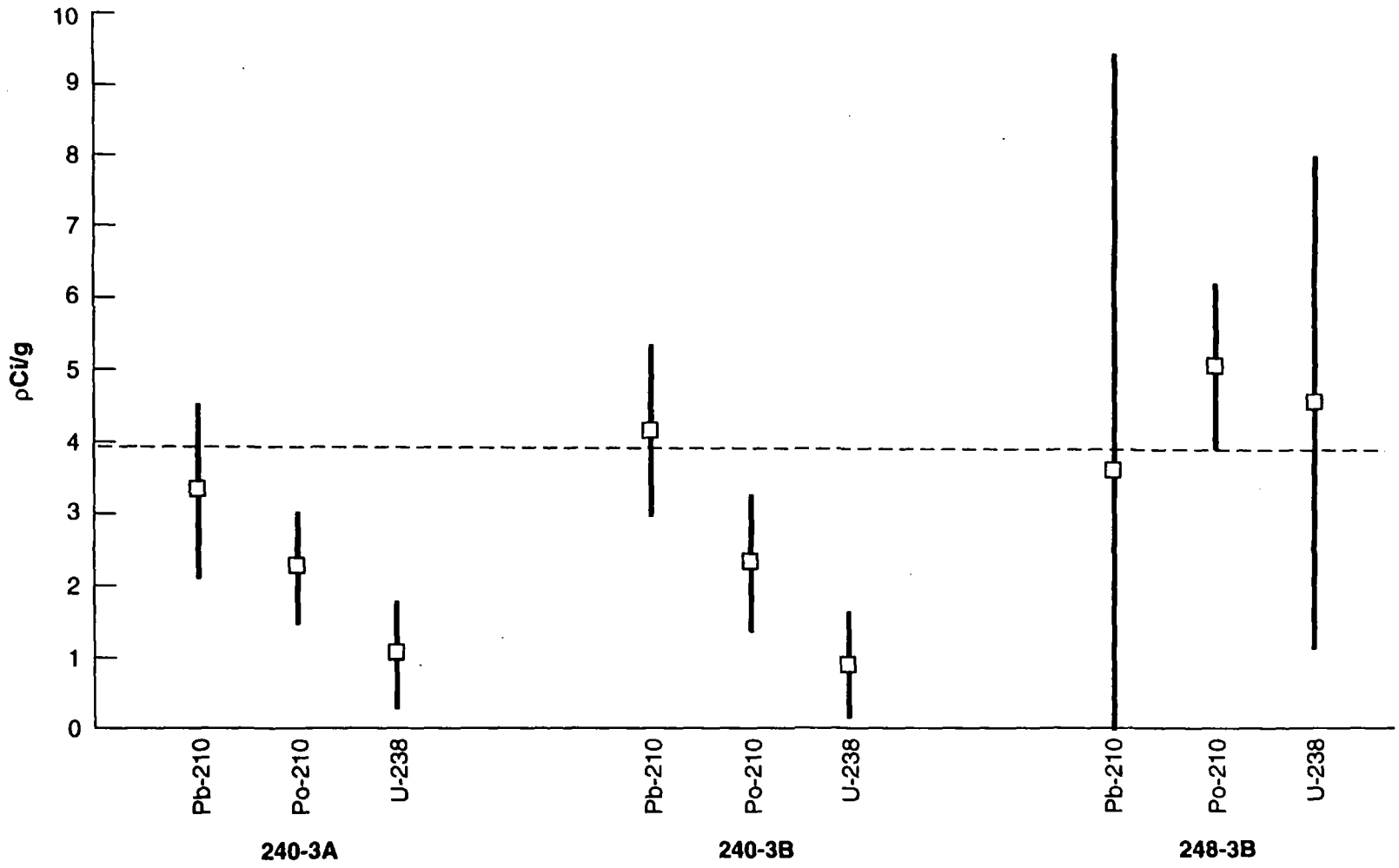
**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Pb-210 / Po-210 / U-238**
**Activities in Surface Soil Along Radial 225**

| JOB No. | DRAWING NO. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-12 | |

95-1302b.003




***Legend:***

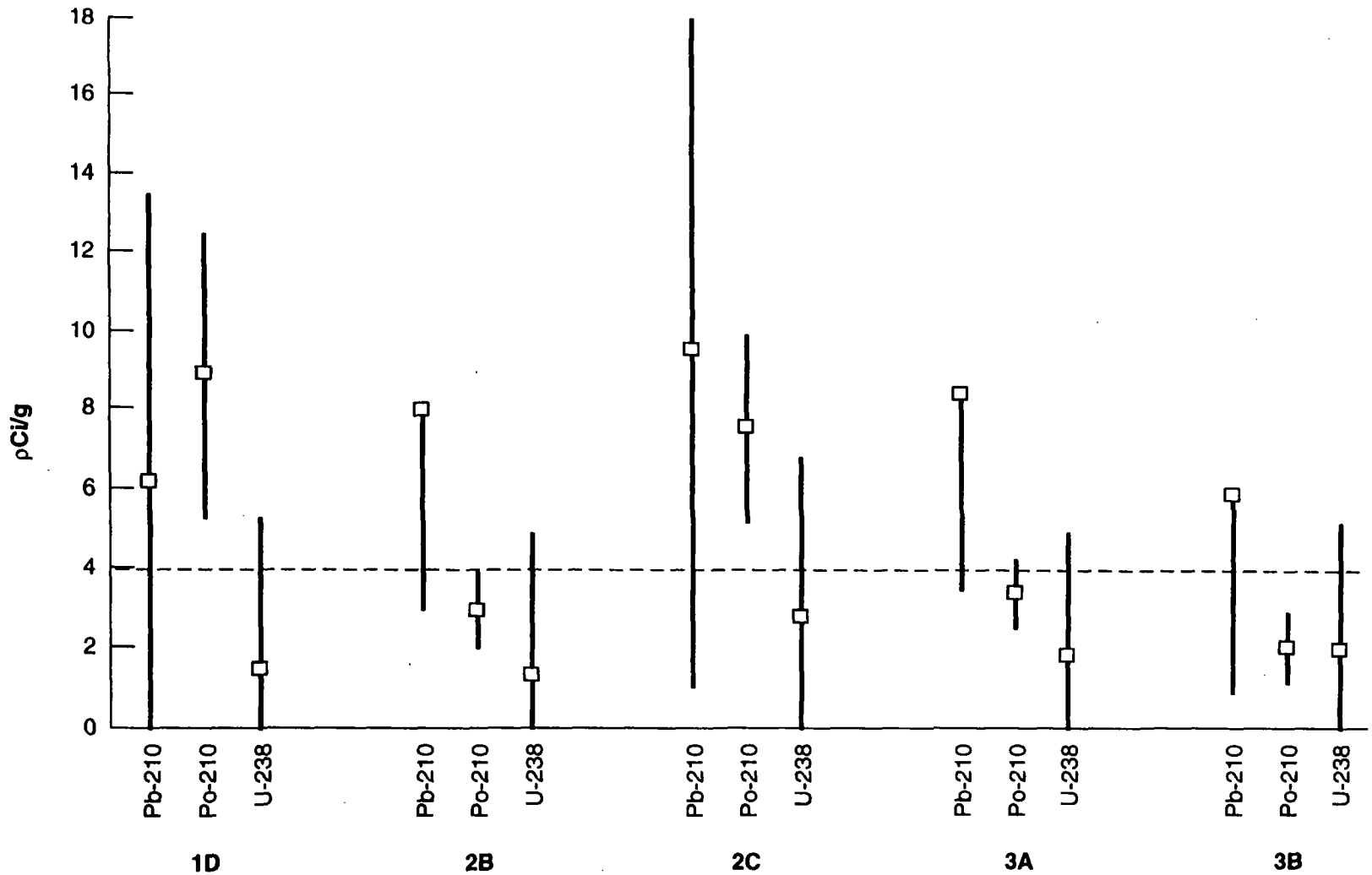
Actual Value — Plus 2 SD / Minus 2 SD

– – – Representative Level

**2A** Sampling Location

| | | | |
|---|---|---|---|
| **BECHTEL ENVIRONMENTAL, INC.** SAN FRANCISCO | | | |
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 248** | | | |
| BECHTEL | JOB No. | DRAWING NO. | REV. |
| | 21372 | FIGURE 4.3-13 | |

95-1302b.017




**Legend:**

Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

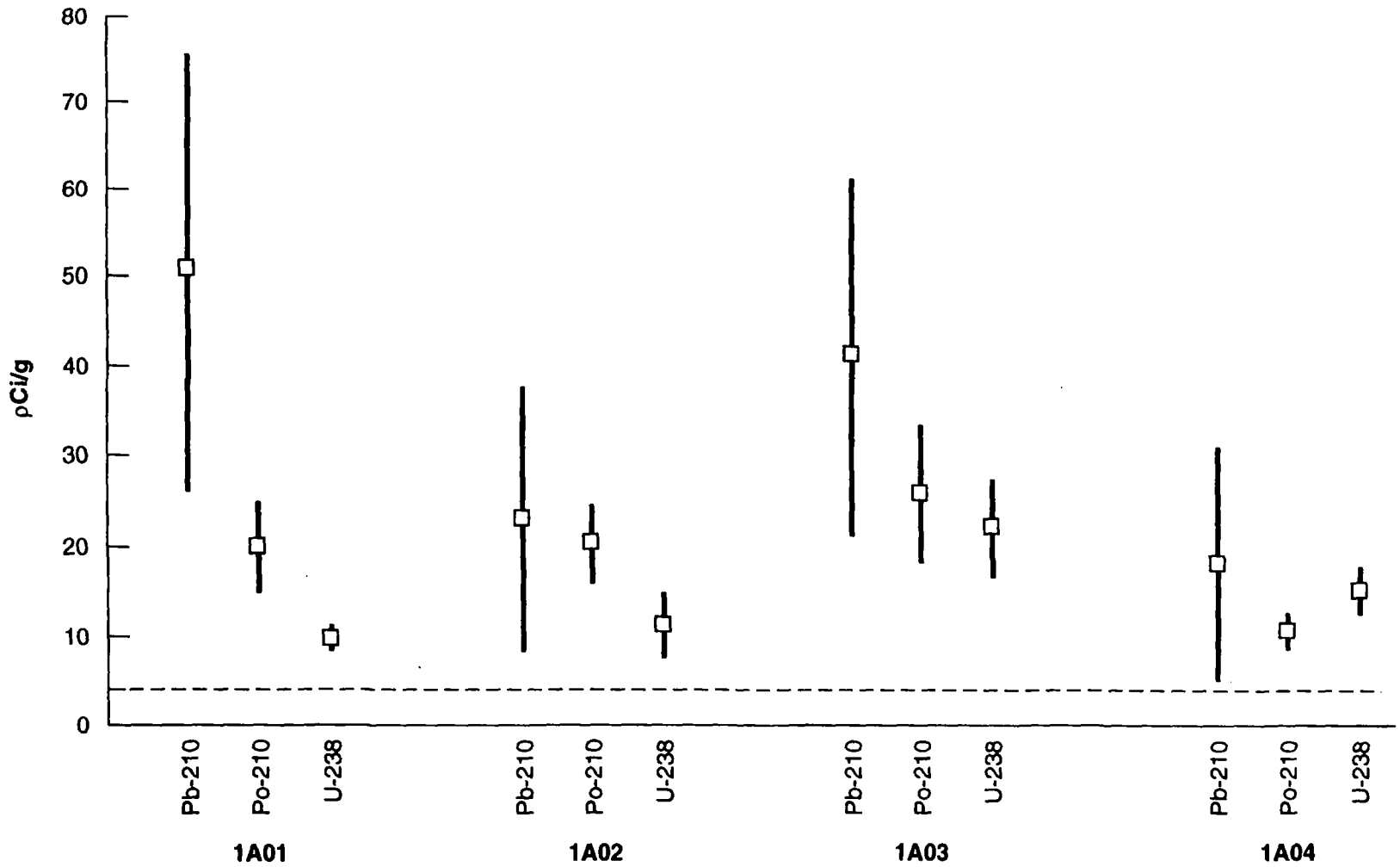
**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Pb-210 / Po-210 / U-238**
**Activities in Surface Soil Along Radial 270**

| JOB No. | DRAWING NO. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-14 | |

95-1302b.018




**Legend:**

Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

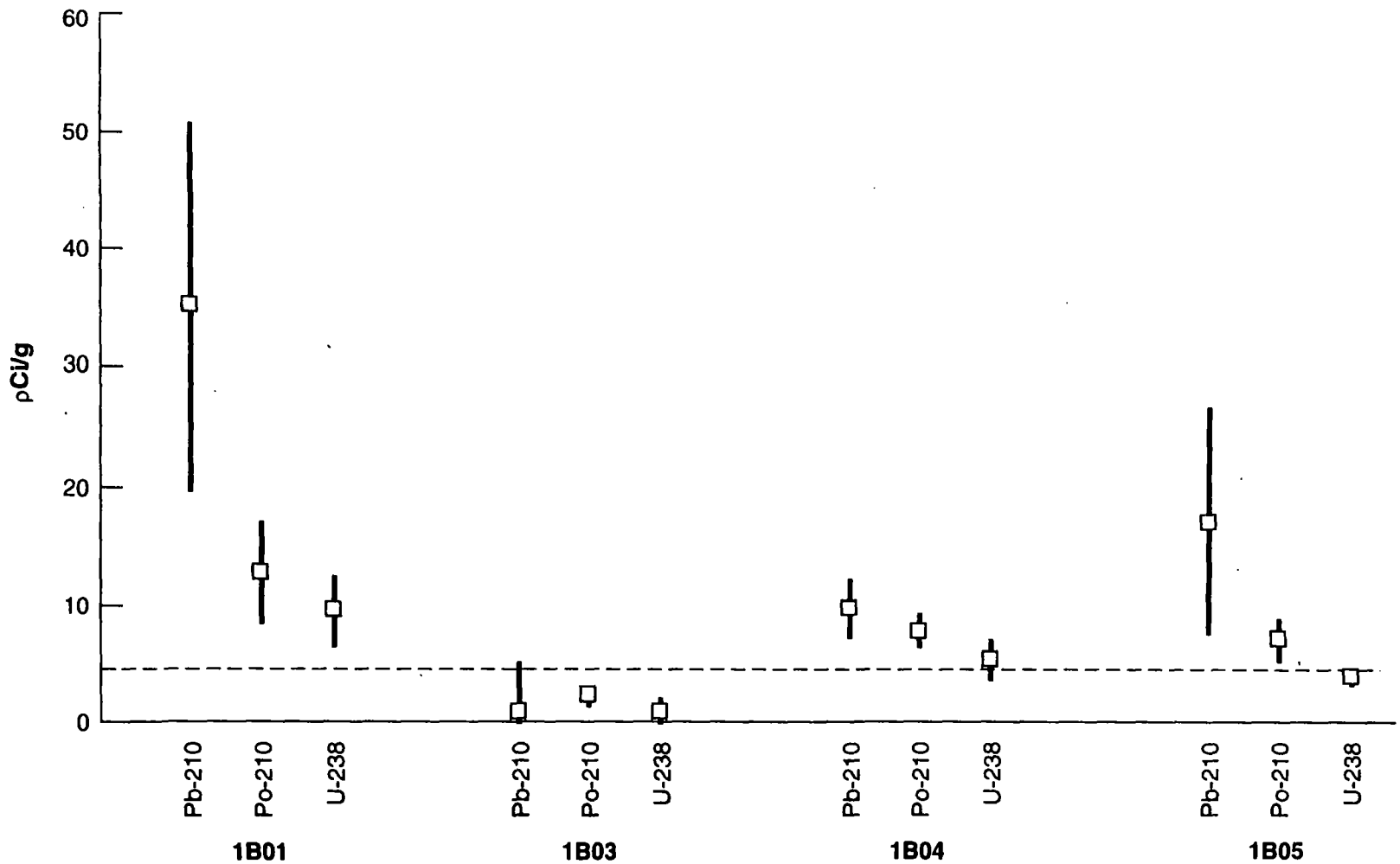
**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Pb-210 / Po-210 / U-238**
**Activities in Surface Soil Along Radial 293**

| JOB No. | DRAWING NO. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-15a | |

95-1302b.019




**Legend:**

Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

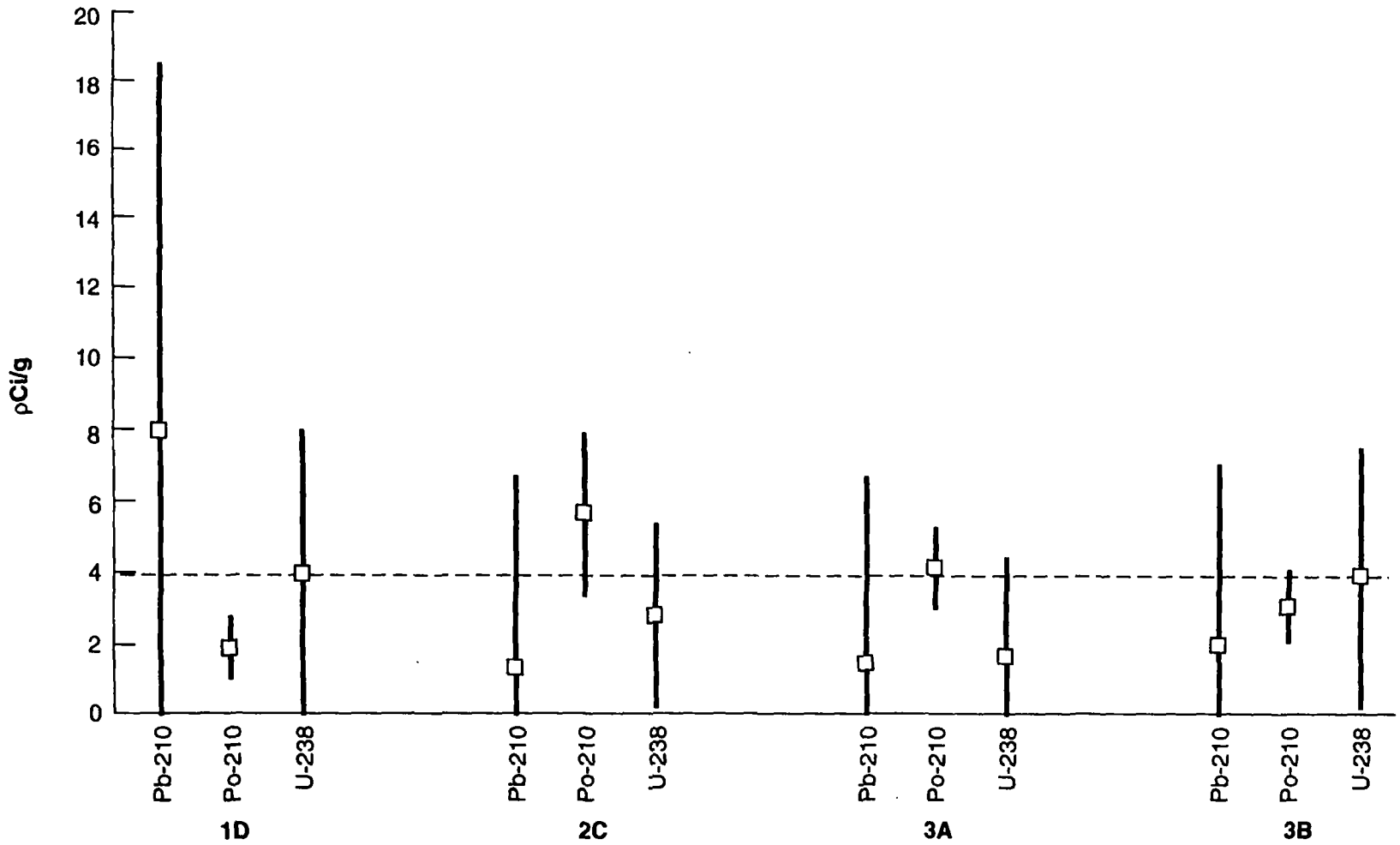
**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Pb-210 / Po-210 / U-238**
**Activities in Surface Soil Along Radial 293**

| JOB No. | DRAWING NO. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-15b | |

95-1302b.020




**Legend:**

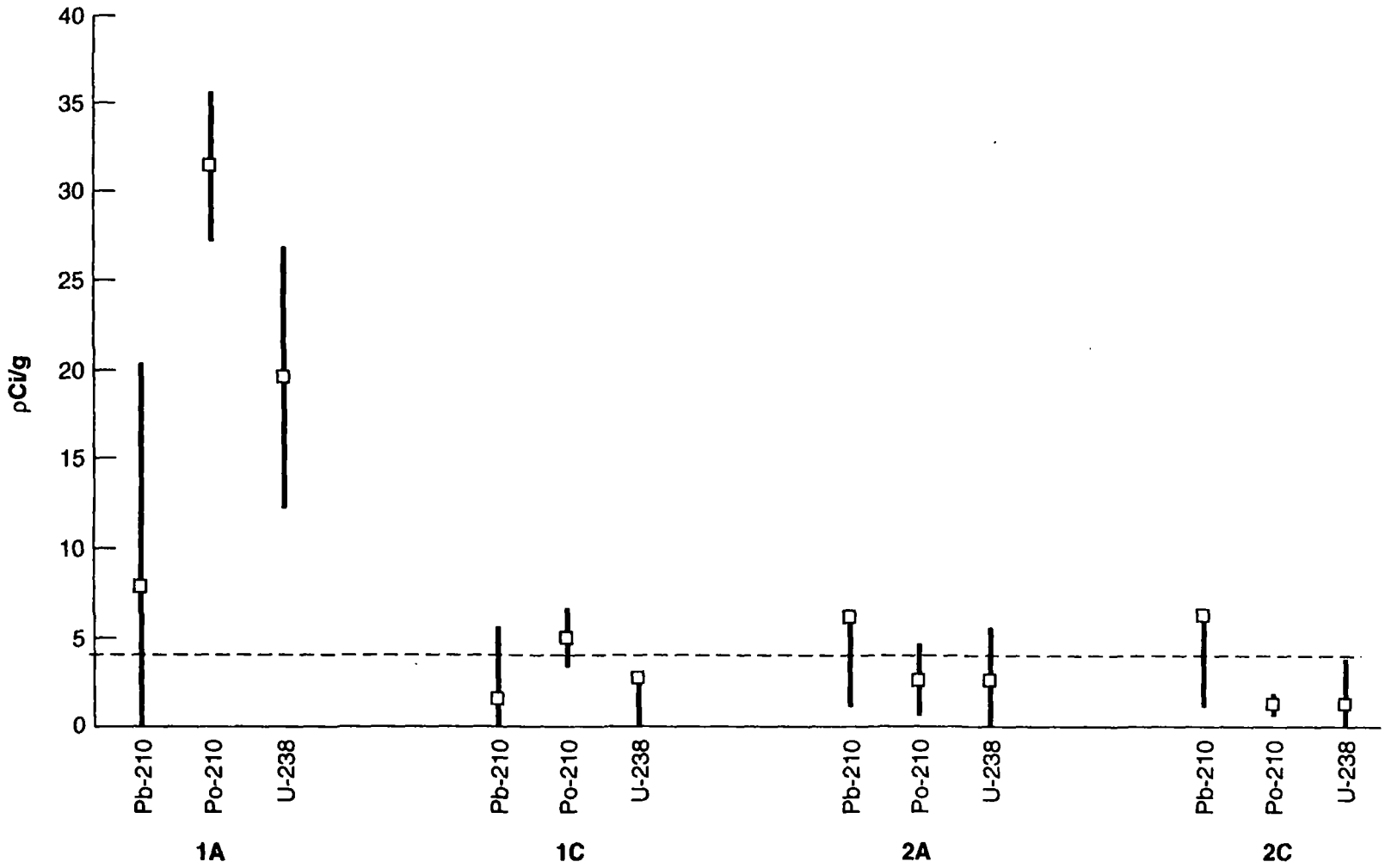
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 293** | | | |
| | JOB No. | DRAWING NO. | REV. |
| | 21372 | FIGURE 4.3-15c | |

95-1302b.021




**Legend:**

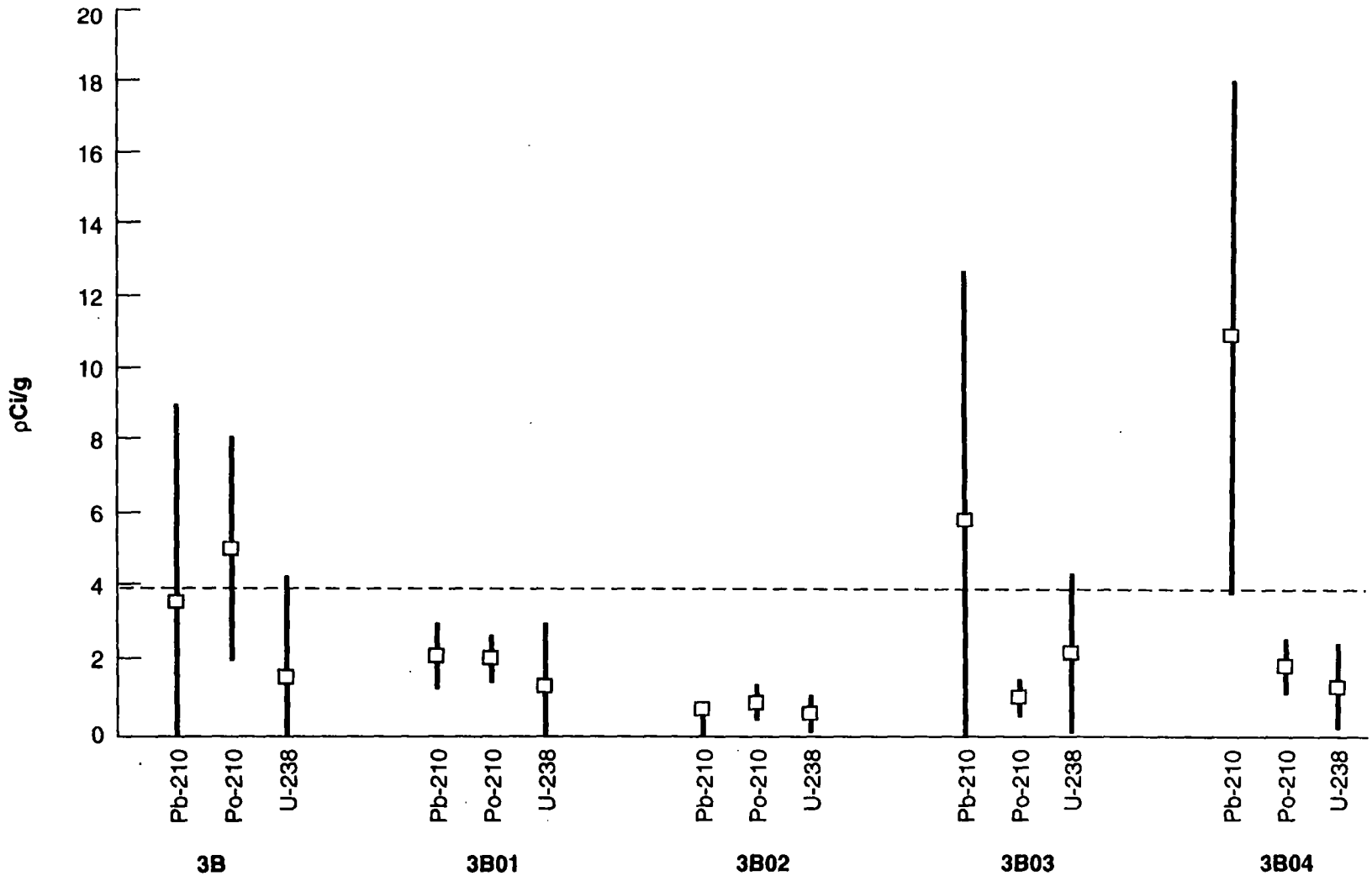
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 315** | | | |
| | JOB No. | DRAWING NO. | REV. |
| | 21372 | FIGURE 4.3-16a | |

95-1302b.022




**Legend:**

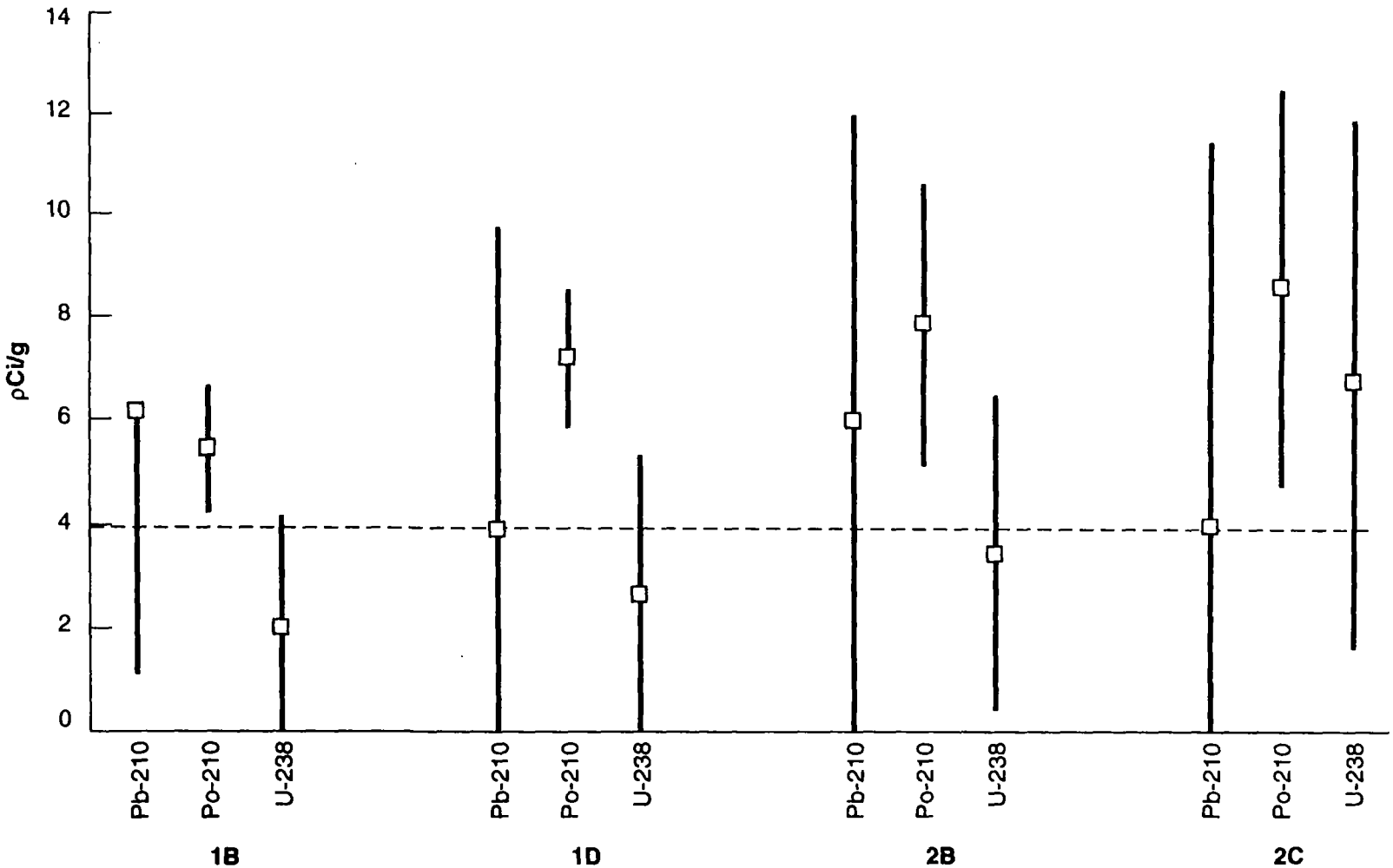
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 315** | | |
| JOB No. | DRAWING NO. | REV. |
| 21372 | FIGURE 4.3-16b | |

95-1302b.023




**Legend:**

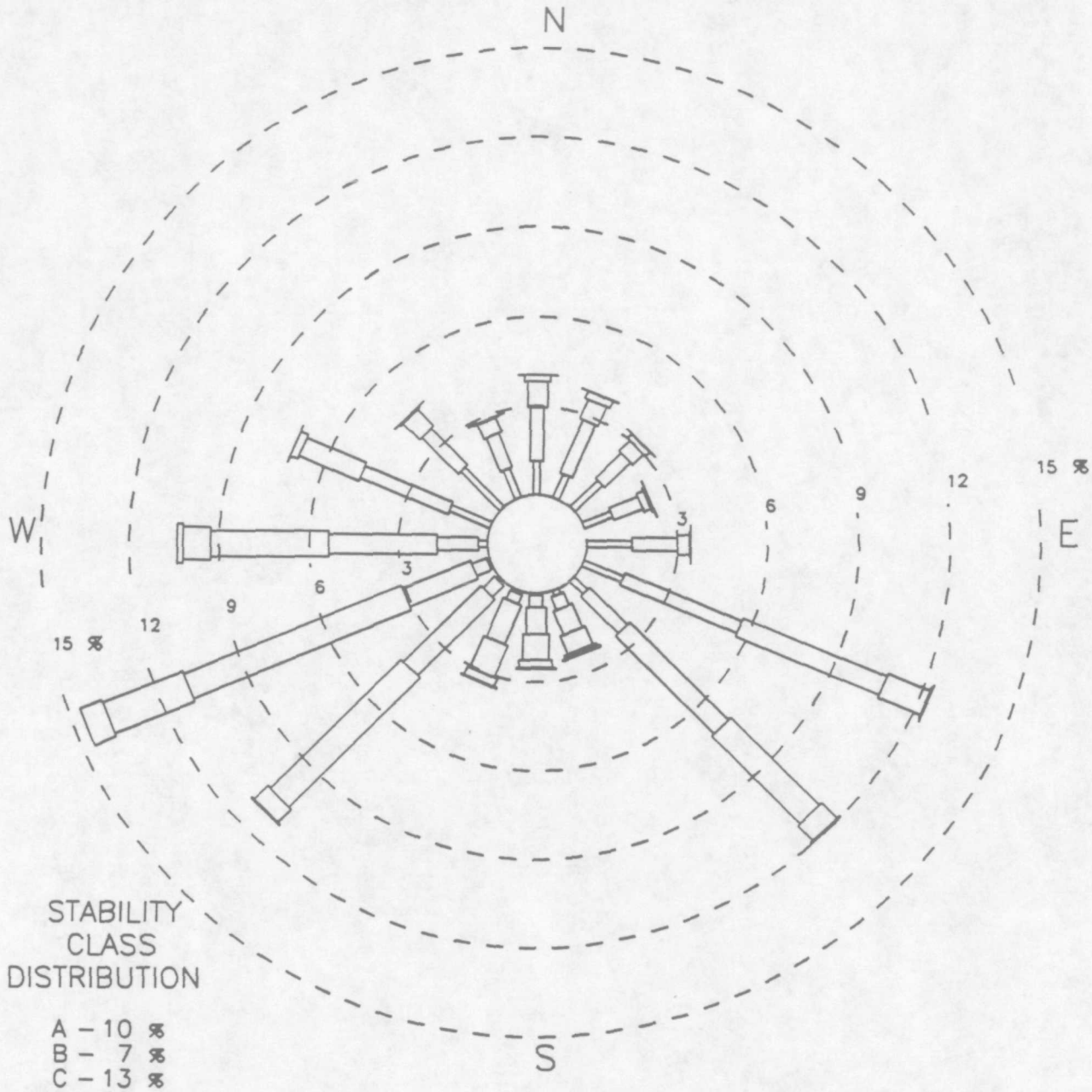
Actual Value — Plus 2 SD / Minus 2 SD

--- Representative Level

**2A** Sampling Location

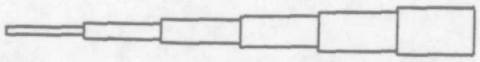
| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| **Pb-210 / Po-210 / U-238 Activities in Surface Soil Along Radial 338** | | | |
| BECHTEL | JOB No. | DRAWING NO. | REV. |
| | 21372 | FIGURE 4.3-17 | |

95-1302b.002




STABILITY
CLASS
DISTRIBUTION

A – 10 %
B – 7 %
C – 13 %
D – 53 %
E – 7 %
F – 10 %

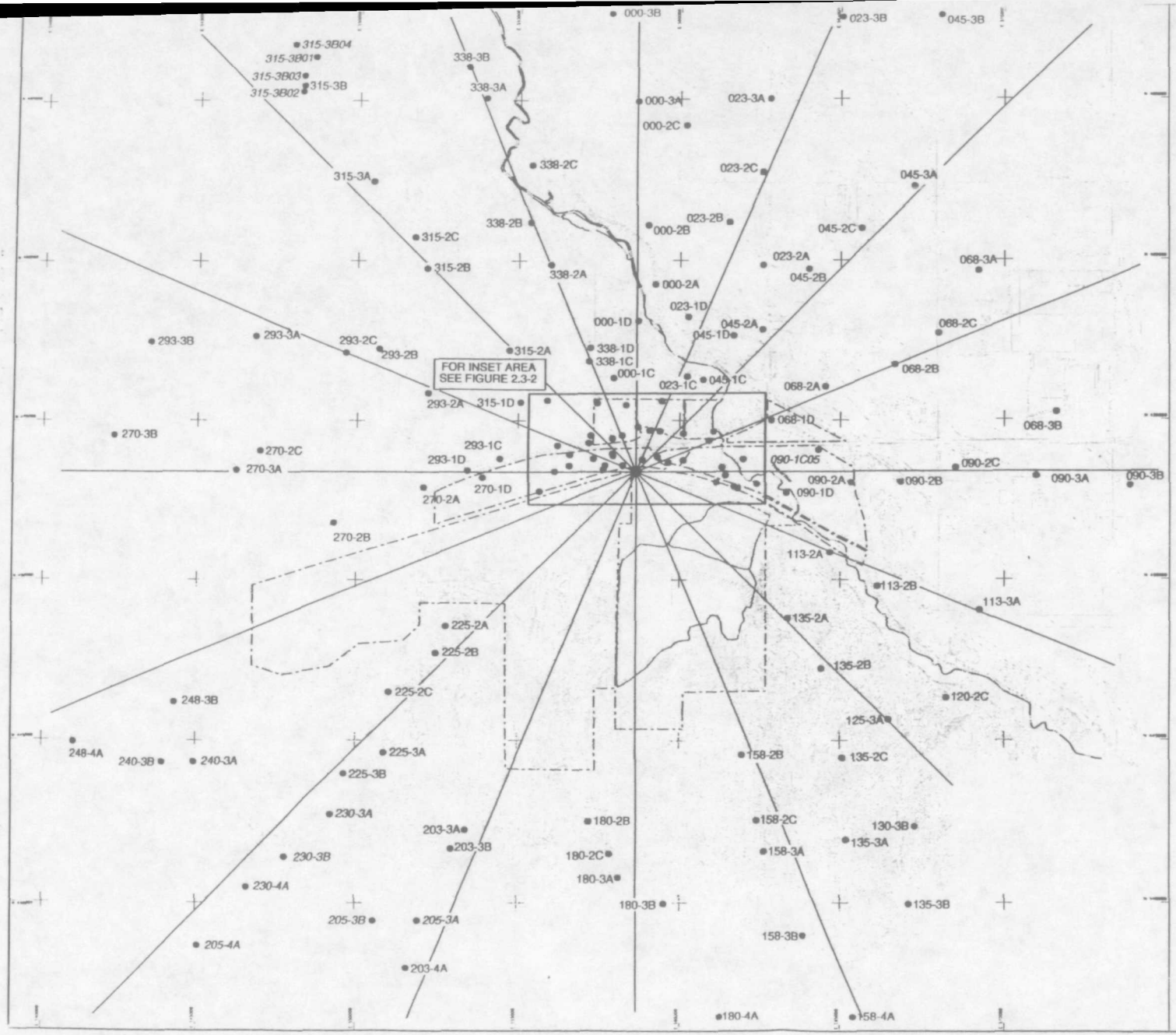


0–3 4–6 7–10 11–16 17–21 22–99
(13 %) (23 %) (29 %) (28 %) (6 %) (1 %)

WIND SPEED SCALE (KNOTS)

NOTE – WIND DIRECTION IS THE DIRECTION WIND IS BLOWING FROM

**Figure 4.3-17a**
**Site 1 – Wind Direction**
**October 1993 to September 1994**
**Calms 3.3%**

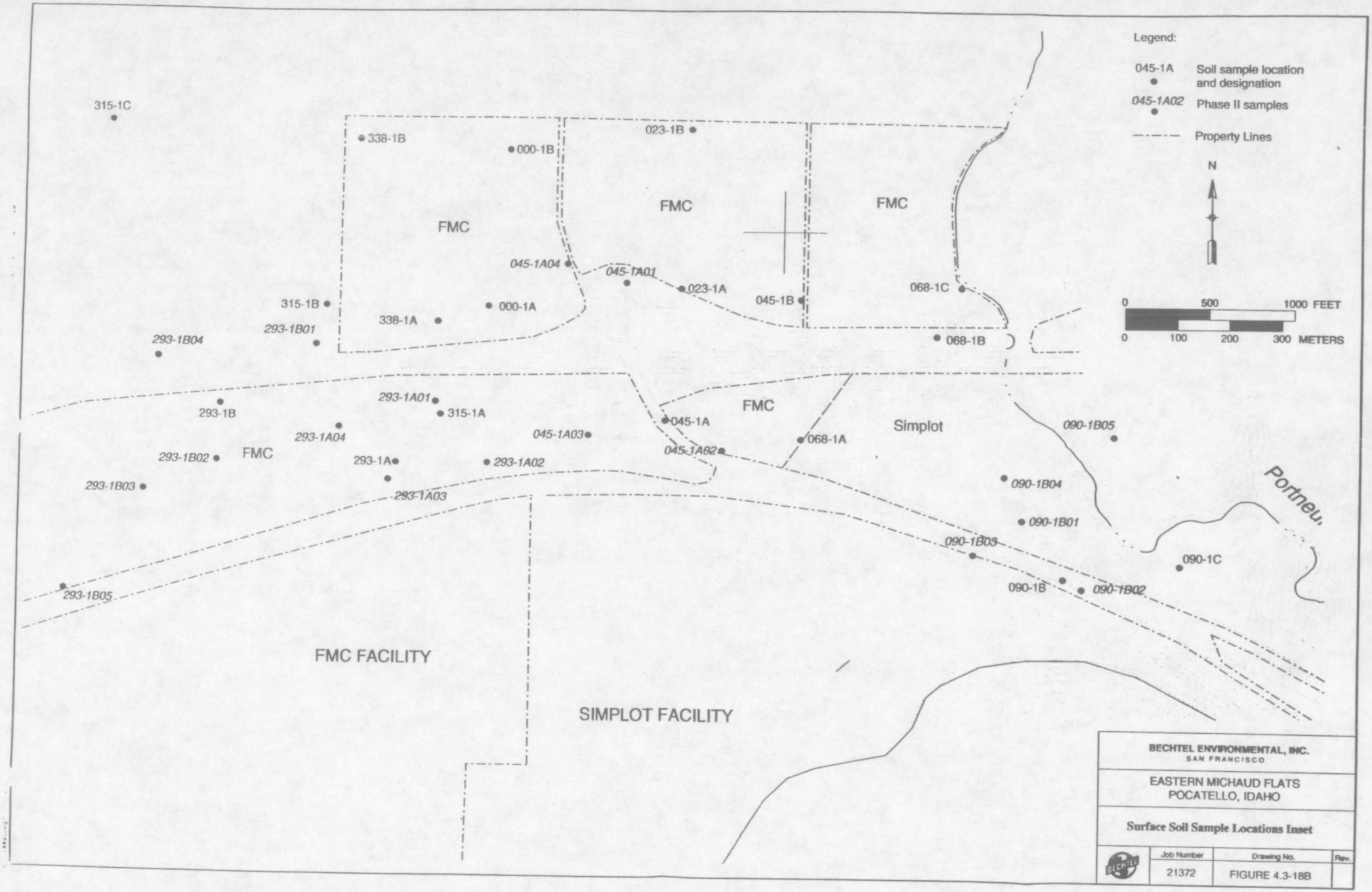


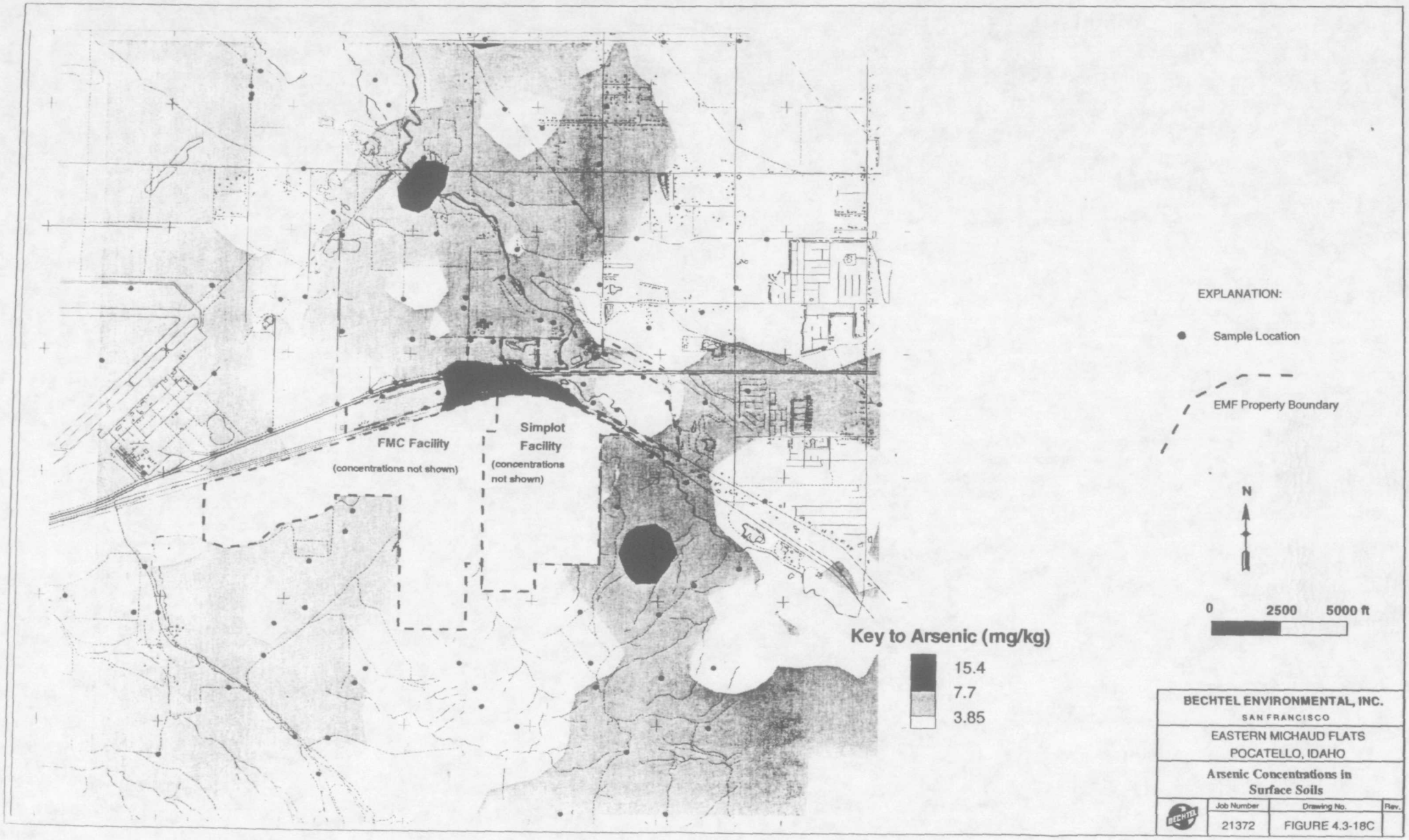

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

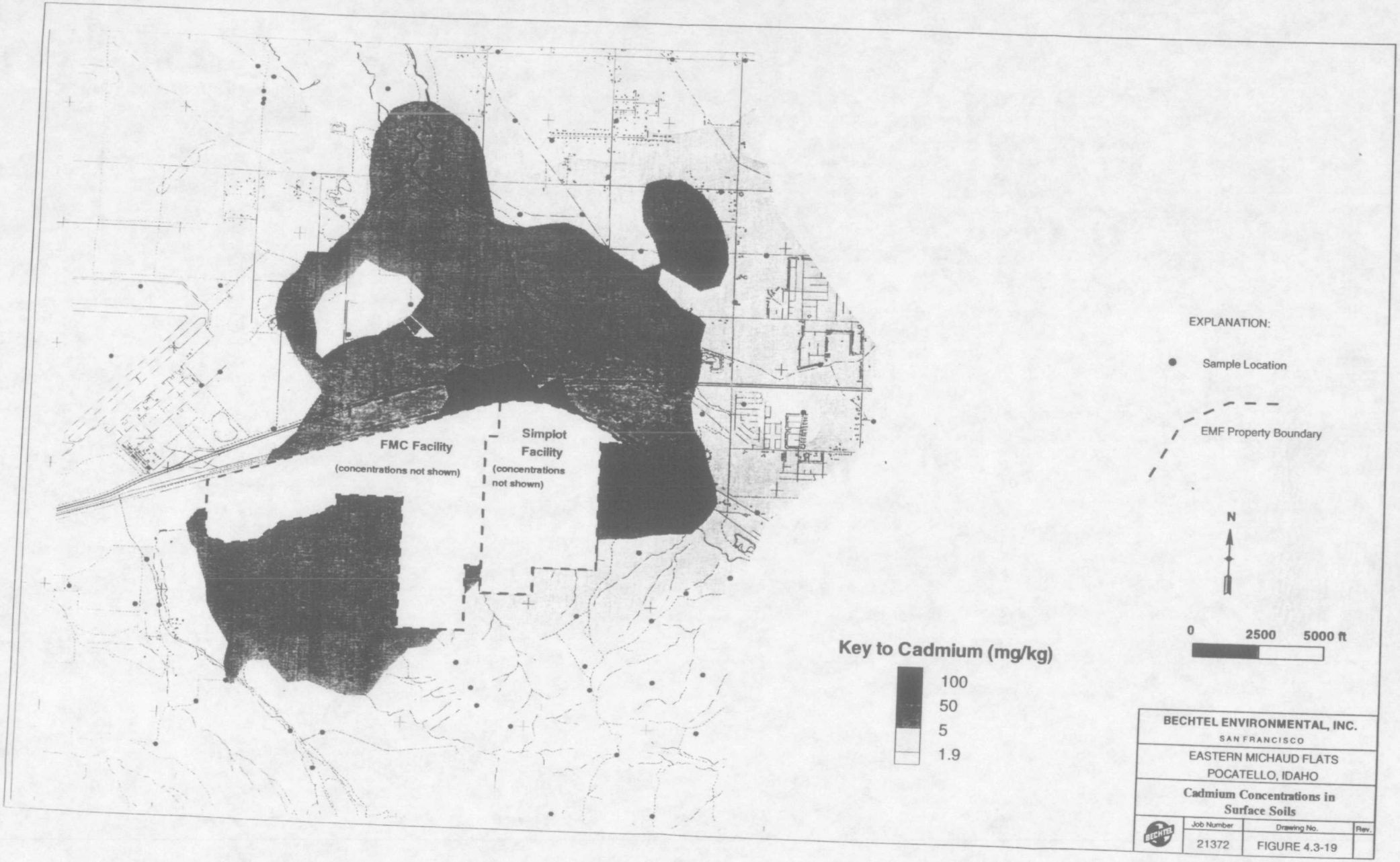
**Surface Soil Sample Locations**

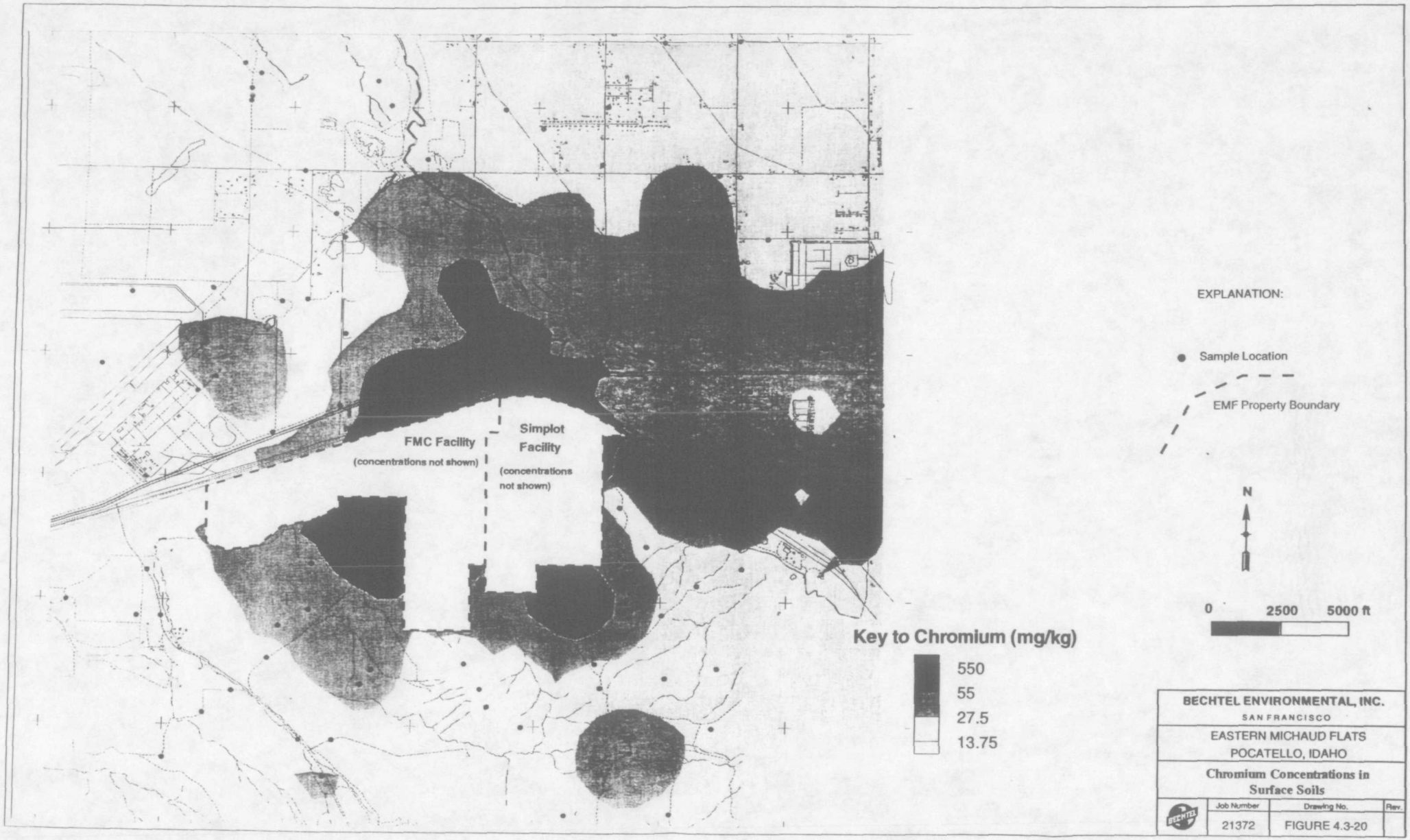
| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.3-18A | |


Legend:
045-1A Soil sample location and designation
045-1A02 Phase II samples
Property Lines
N
0 500 1000 FEET
0 100 200 300 METERS
315-1C
338-1B
000-1B
023-1B
FMC
FMC
FMC
045-1A04
045-1A01
023-1A
045-1B
068-1C
315-1B
338-1A
000-1A
293-1B01
293-1B04
068-1B
293-1A01
293-1B
315-1A
FMC
045-1A
Simplot
090-1B05
293-1A04
045-1A03
068-1A
293-1B02
FMC
293-1A
293-1A02
045-1A02
293-1B03
293-1A03
090-1B04
Portneu
090-1B01
090-1B03
090-1C
293-1B05
090-1B
090-1B02
FMC FACILITY
SIMPLOT FACILITY
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Surface Soil Sample Locations Inset
Job Number
21372
Drawing No.
FIGURE 4.3-18B
Rev.




| | | |
|---|---|---|
| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| Arsenic Concentrations in Surface Soils | | |
| Job Number | Drawing No. | Rev. |
| 21372 | FIGURE 4.3-18C | |


FMC Facility
(concentrations not shown)
Simplot Facility
(concentrations not shown)
EXPLANATION:
Sample Location
EMF Property Boundary
N
0
2500
5000 ft
Key to Cadmium (mg/kg)
100
50
5
1.9
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Cadmium Concentrations in Surface Soils
Job Number
21372
Drawing No.
FIGURE 4.3-19
Rev.

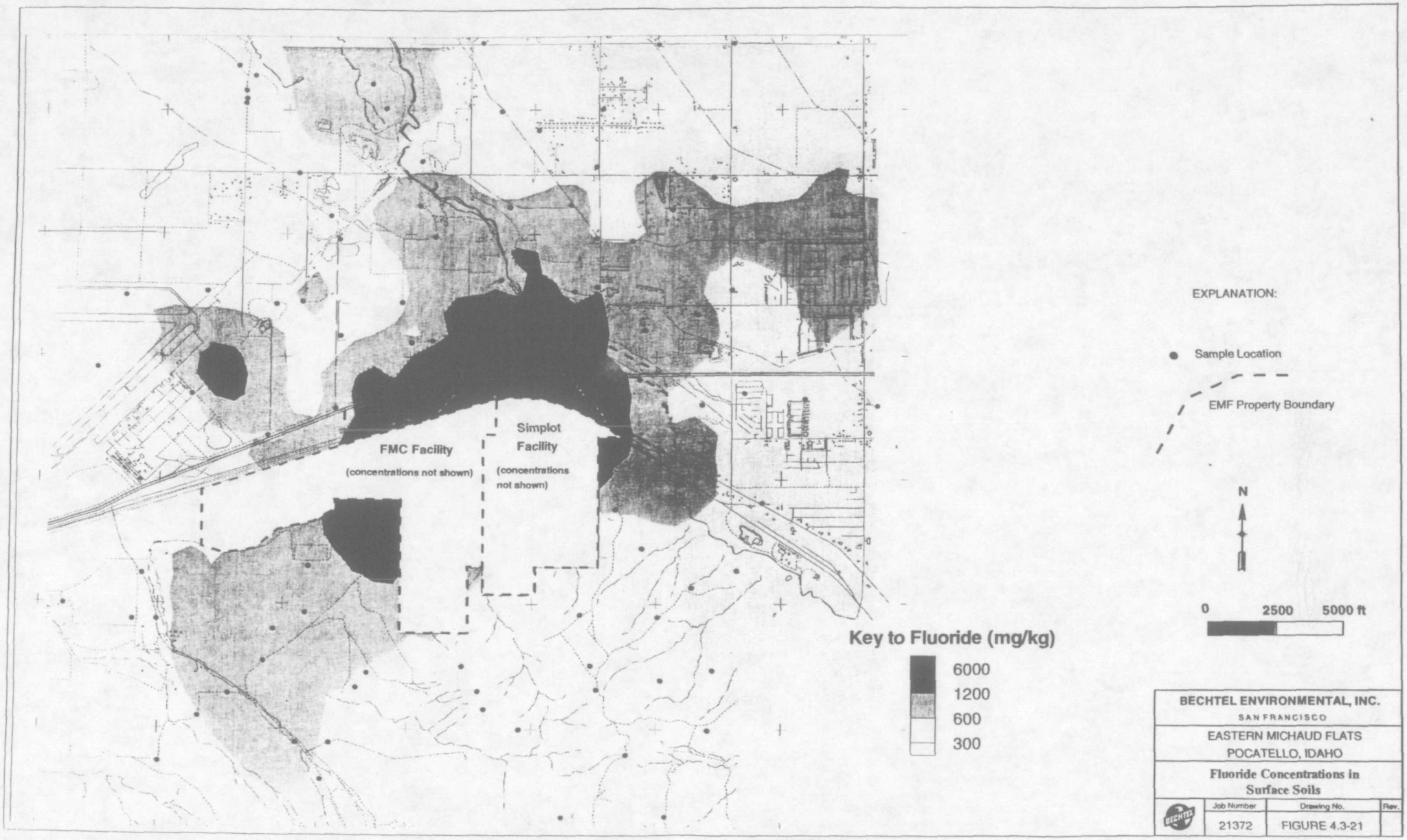



BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Chromium Concentrations in Surface Soils**

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.3-20 | |

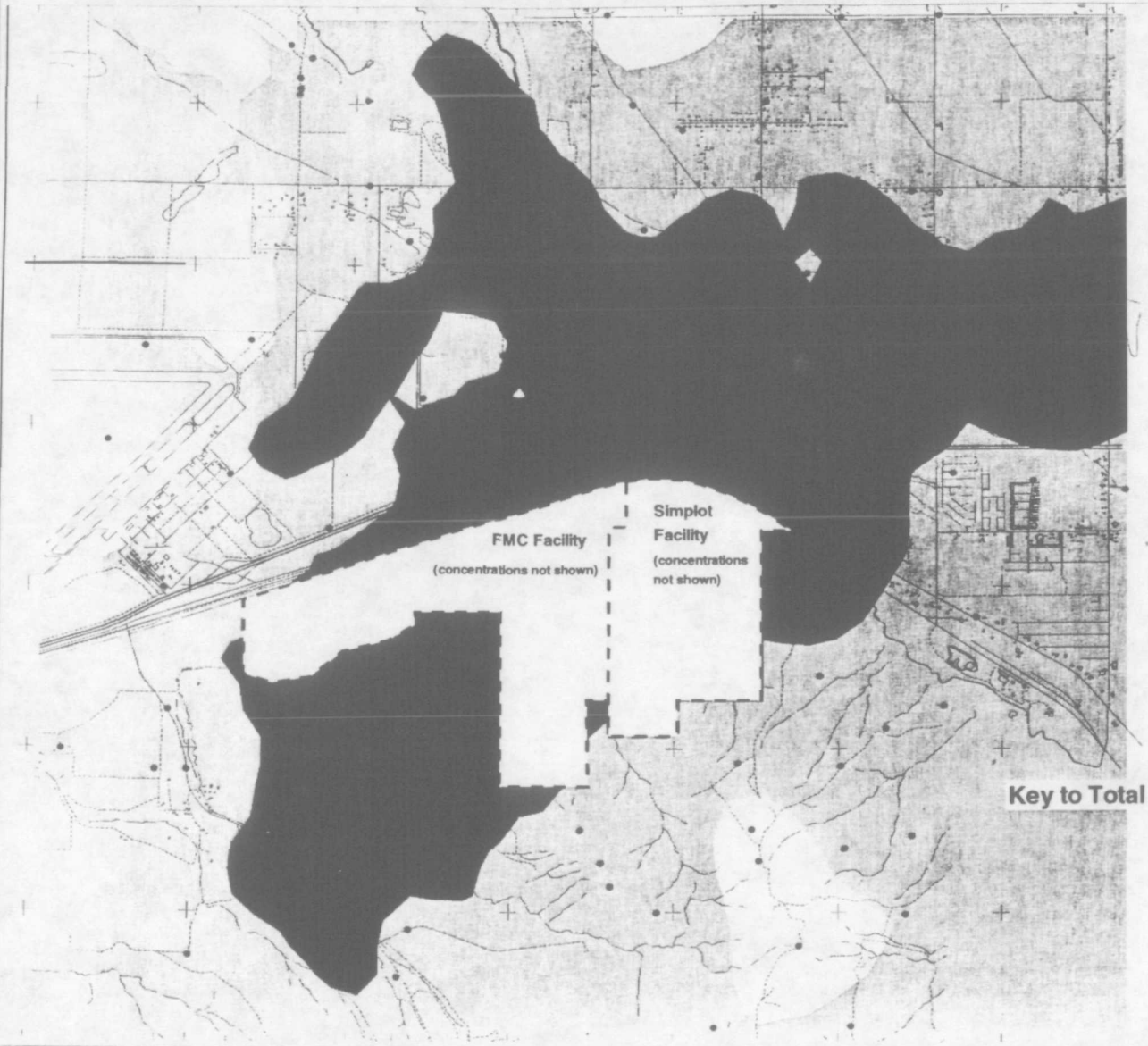



BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Fluoride Concentrations in Surface Soils**

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.3-21 | |




EXPLANATION:

Sample Location

EMF Property Boundary

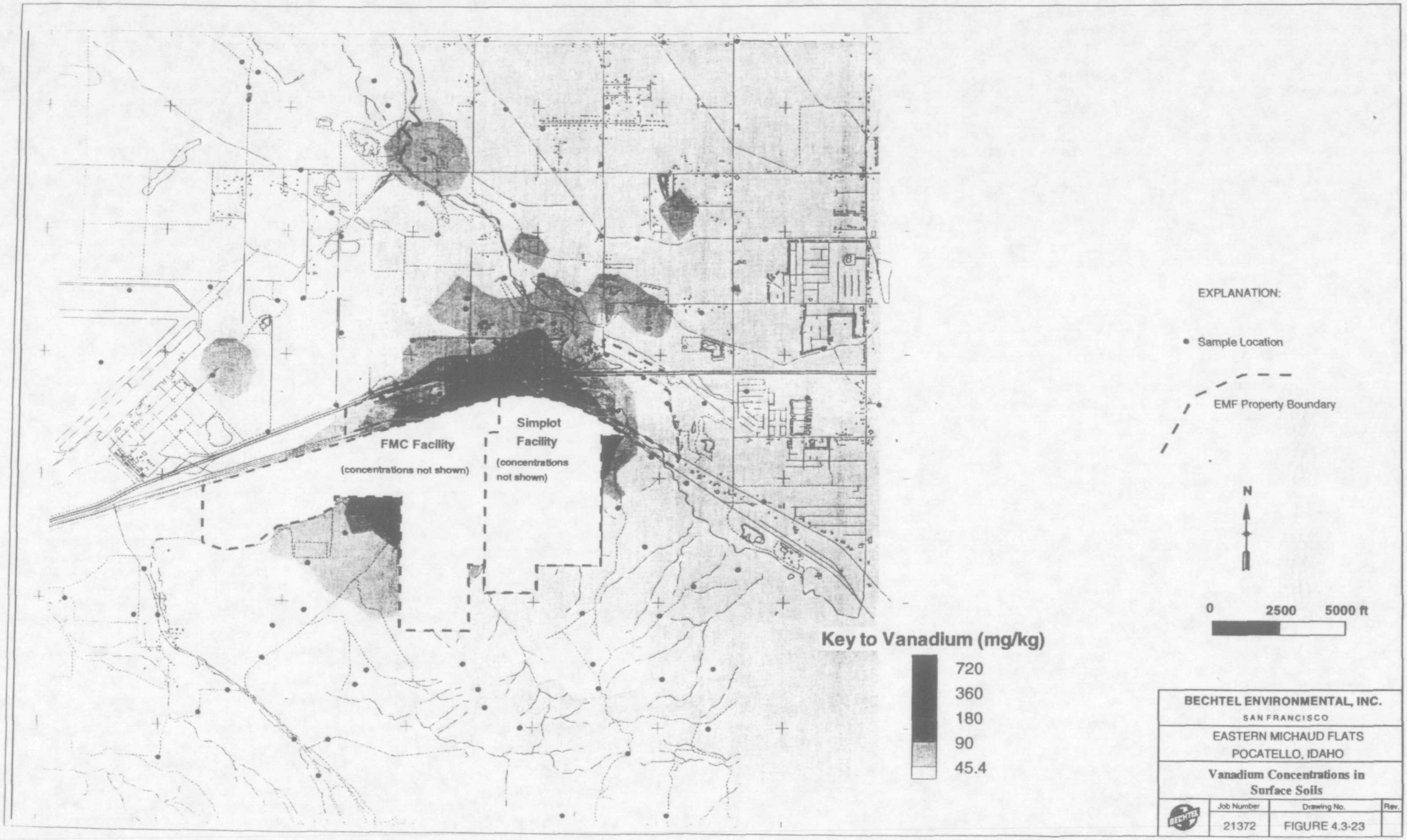
N

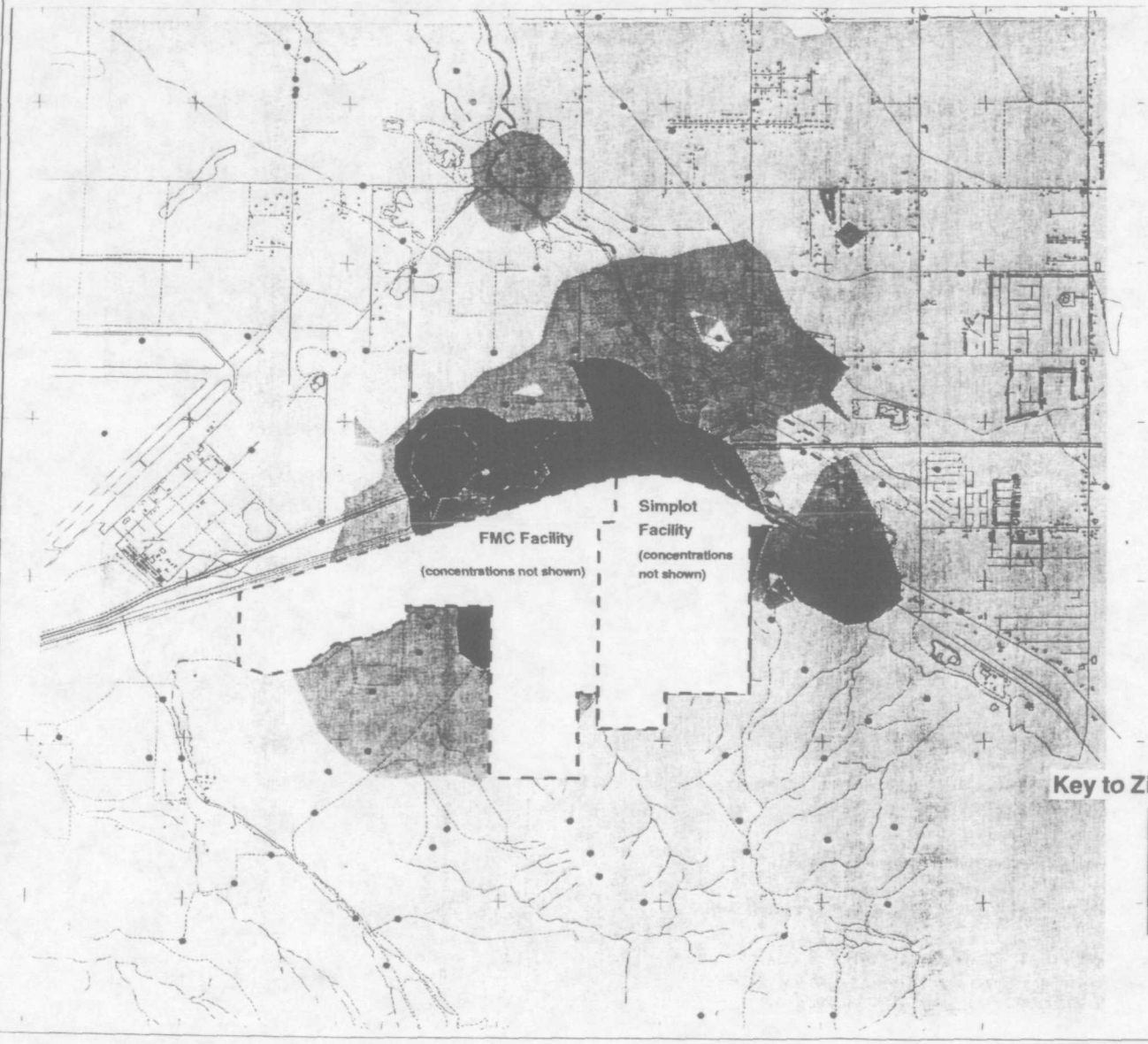
0 2500 5000 ft

**Key to Total Phosphorus (mg/kg)**

50000
26000
1344
672

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| **Total Phosphorus Concentrations in Surface Soils** | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.3-22 | |


FMC Facility
(concentrations not shown)
Simplot Facility
(concentrations not shown)
Key to Vanadium (mg/kg)
720
360
180
90
45.4
EXPLANATION:
Sample Location
EMF Property Boundary
N
0
2500
5000 ft
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Vanadium Concentrations in Surface Soils
Job Number
21372
Drawing No.
FIGURE 4.3-23
Rev.



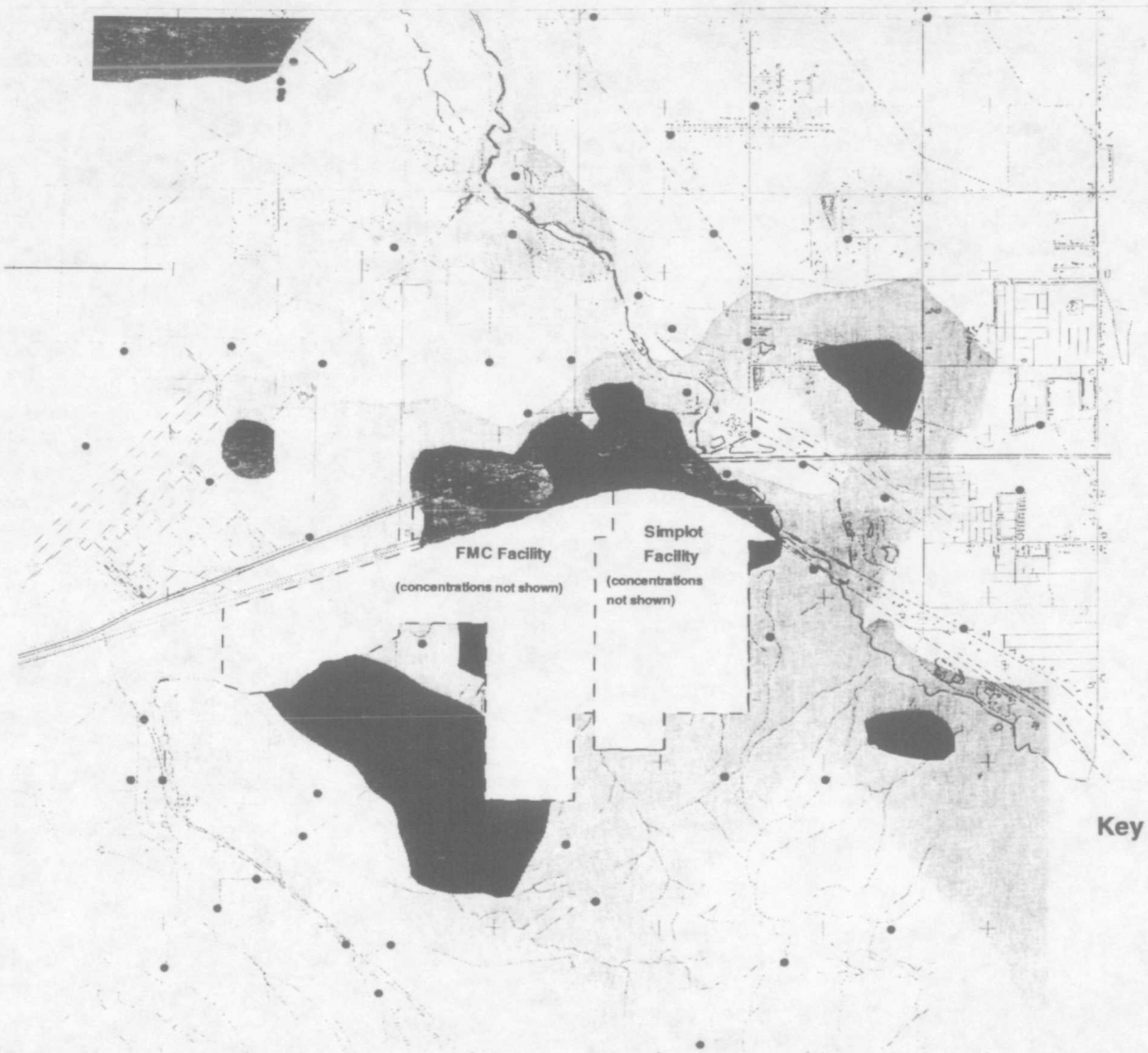

EXPLANATION:

- Sample Location
- EMF Property Boundary

N

0 2500 5000 ft

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Zinc Concentrations in Surface Soils | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.3-24 | |




EXPLANATION:

Sample Location

EMF Property Boundary

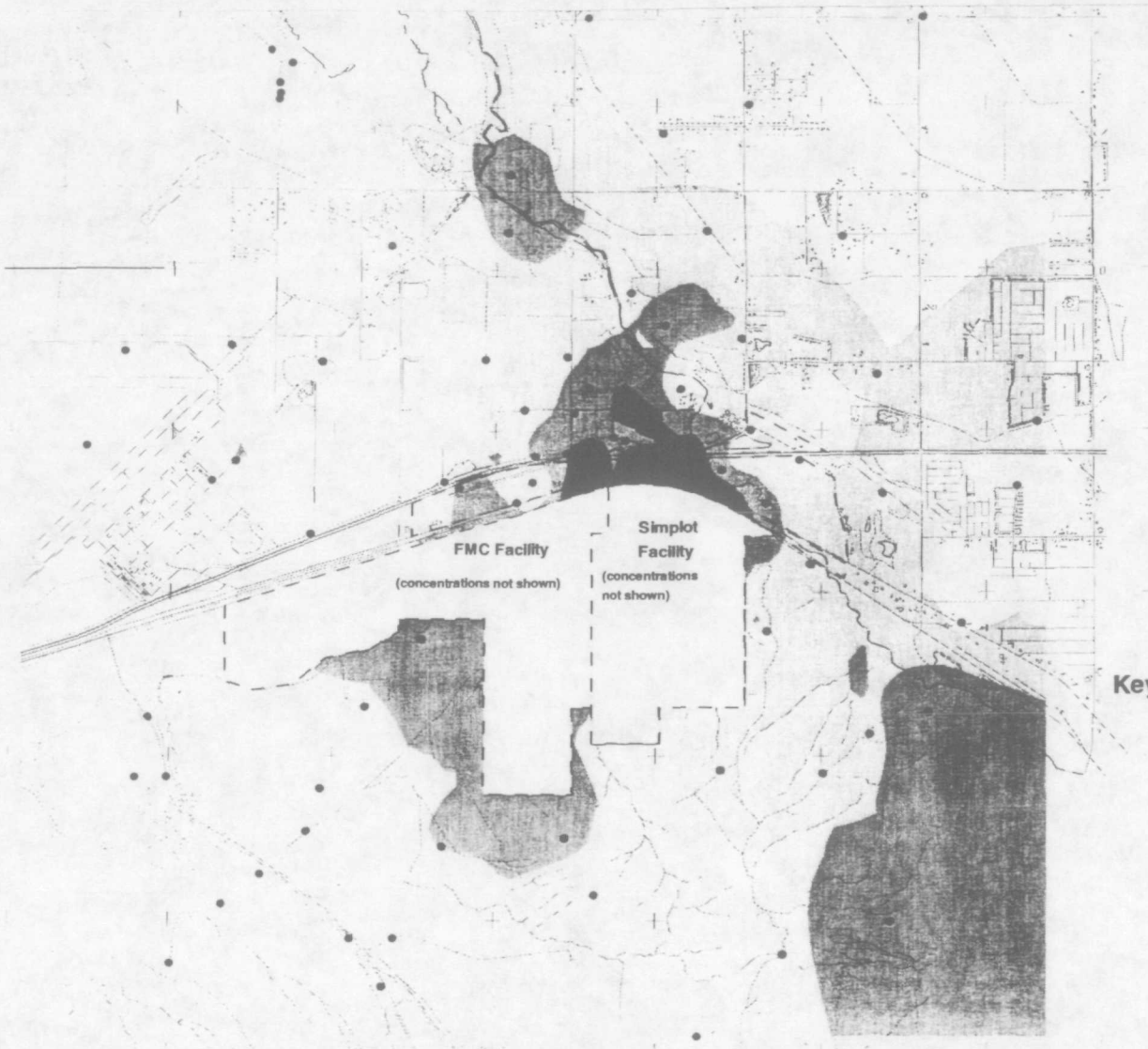
N

0 2500 5000 ft

Key to Lead-210 (pCi/gm)

24
12
6
3.03

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Lead-210 Activities in Surface Soils | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.3-25 | |




Key to Polonium-210 (pCi/gm)

28
21
14
7
3.58

EXPLANATION:

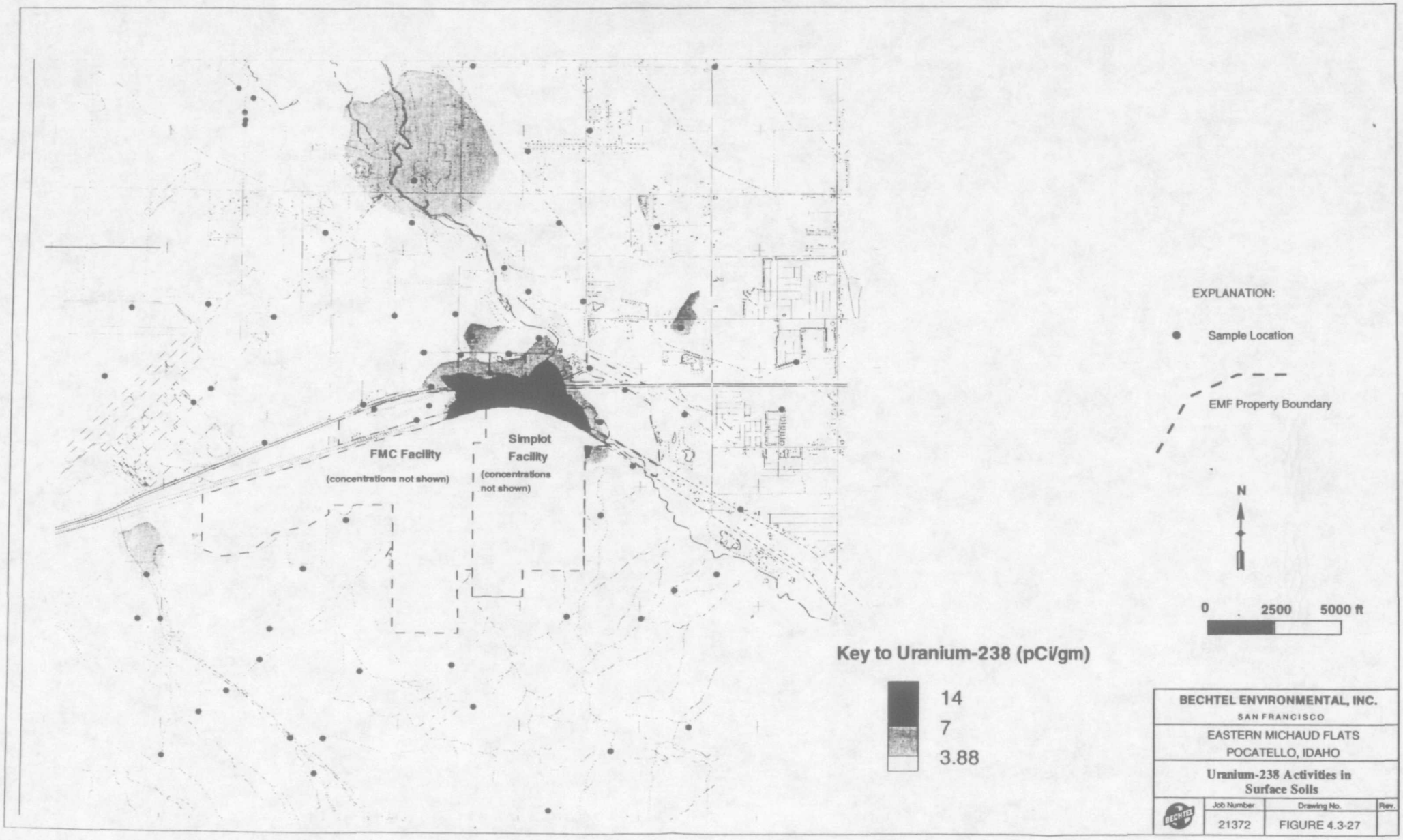
Sample Location

EMF Property Boundary

N

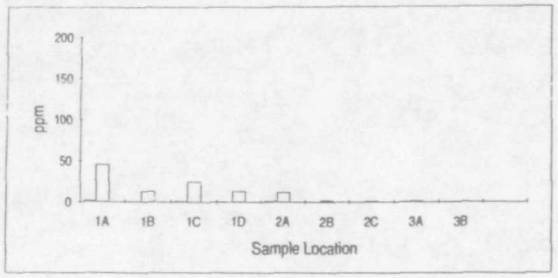
0 2500 5000 ft

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Polonium-210 Activities in Surface Soils | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.3-26 | |


FMC Facility
(concentrations not shown)
Simplot Facility
(concentrations not shown)
EXPLANATION:
Sample Location
EMF Property Boundary
N
0
2500
5000 ft
Key to Uranium-238 (pCi/gm)
14
7
3.88
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Uranium-238 Activities in Surface Soils
Job Number
21372
Drawing No.
FIGURE 4.3-27
Rev.

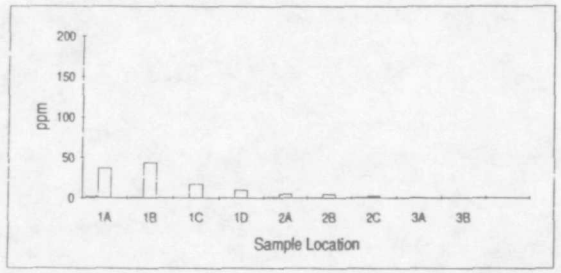
Cadmium in Surface Soils
Bearing 000

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 1.7 | 45.3 |
| 1B | 0.31 | 12.9 |
| 1C | 0.99 | 24.6 |
| 1D | | 13.1 |
| 2A | 1.4 | 12 |
| 2B | 0.38 | 2.1 |
| 2C | 0.28 | 1.3 |
| 3A | 0.55 | 1.4 |
| 3B | 0.31 | 0.93 |



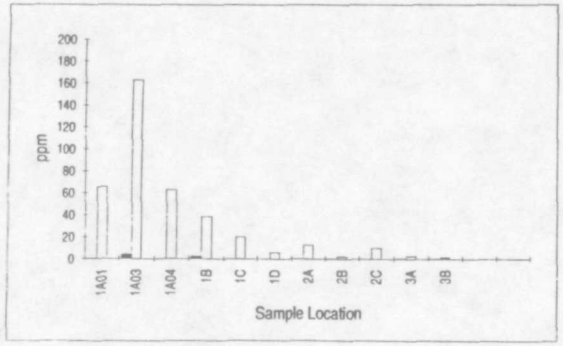

Cadmium in Surface Soils
Bearing 023

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 2 | 36.6 |
| 1B | 0.83 | 43.5 |
| 1C | | 16.9 |
| 1D | | 9.7 |
| 2A | 1.2 | 4.9 |
| 2B | 0.39 | 4.5 |
| 2C | 0.99 | 2.4 |
| 3A | 0.28 | 0.64 |
| 3B | 0.27 | 0.49 |



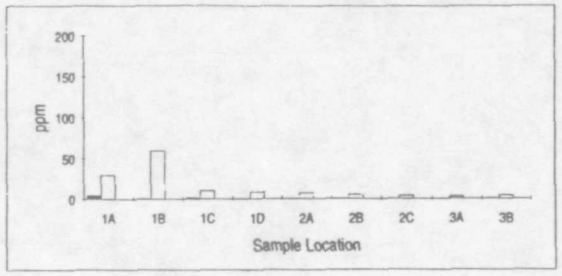

Cadmium in Surface Soils
Bearing 045

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 0.8 | 112 |
| 1A01 | 0.61 | 65.6 |
| 1A03 | 4.3 | 163 |
| 1A04 | 0.39 | 62.8 |
| 1B | 2.6 | 38.7 |
| 1C | | 20.2 |
| 1D | | 6 |
| 2A | 0.5 | 12.7 |
| 2B | 0.34 | 2.3 |
| 2C | | 10.2 |
| 3A | 0.74 | 2.8 |
| 3B | 0.36 | 1.5 |



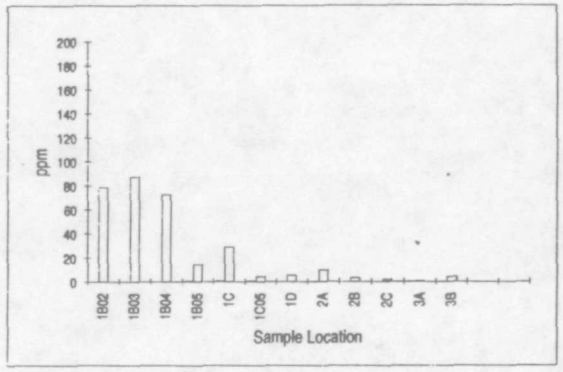

Cadmium in Surface Soils
Bearing 068

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 4.4 | 29.4 |
| 1B | 0.5 | 59.3 |
| 1C | 1.5 | 10 |
| 1D | 0.38 | 8.3 |
| 2A | 0.38 | 7.2 |
| 2B | 0.42 | 5.2 |
| 2C | 0.34 | 3.9 |
| 3A | 0.4 | 2.9 |
| 3B | 0.48 | 4 |




Cadmium in Surface Soils
Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 25.7 | 78.4 |
| 1B02 | | 78.5 |
| 1B03 | | 87.4 |
| 1B04 | | 72.5 |
| 1B05 | 0.94 | 14.5 |
| 1C | 0.87 | 29 |
| 1C05 | 0.99 | 4.5 |
| 1D | 0.14 | 5.5 |
| 2A | 0.38 | 9.8 |
| 2B | | 3.3 |
| 2C | | 2.1 |
| 3A | 0.38 | 0.92 |
| 3B | 0.43 | 4.3 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Cadmium Versus Distance From EMF Facilities, NE Quadrant**

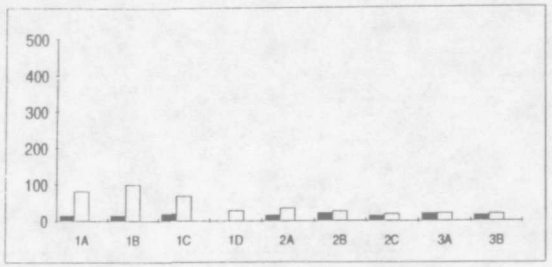
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-28 | |

93-1477b.225
12-3-93 WK 3

Chromium in Surface Soils

Bearing 000

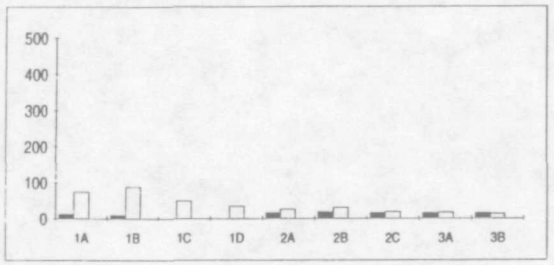
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 14.5 | 80.5 |
| 1B | 14.7 | 99.4 |
| 1C | 19.9 | 68.4 |
| 1D | | 28.8 |
| 2A | 15.6 | 35.7 |
| 2B | 21.8 | 26.5 |
| 2C | 14.1 | 19.2 |
| 3A | 20.2 | 21.3 |
| 3B | 15.3 | 19.4 |




Chromium in Surface Soils

Bearing 023

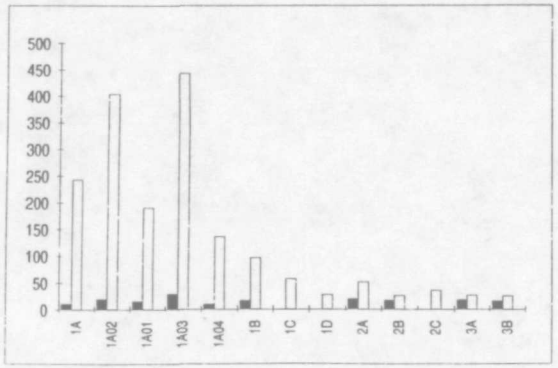
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 12.4 | 73.9 |
| 1B | 9.7 | 87.5 |
| 1C | | 48.9 |
| 1D | | 34.4 |
| 2A | 16 | 26 |
| 2B | 18.3 | 30.7 |
| 2C | 15.6 | 19 |
| 3A | 15 | 17 |
| 3B | 15.1 | 13.3 |




Chromium in Surface Soils

Bearing 045

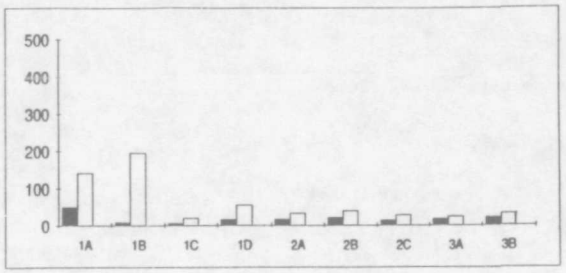
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 11 | 243 |
| 1A02 | 19.7 | 404 |
| 1A01 | 15.4 | 190 |
| 1A03 | 29.2 | 443 |
| 1A04 | 9.8 | 136 |
| 1B | 16.6 | 96.8 |
| 1C | | 57.3 |
| 1D | | 27.6 |
| 2A | 19.4 | 51.6 |
| 2B | 16.9 | 26.2 |
| 2C | | 35.8 |
| 3A | 17.9 | 26.8 |
| 3B | 16 | 25.8 |




Chromium in Surface Soils

Bearing 068

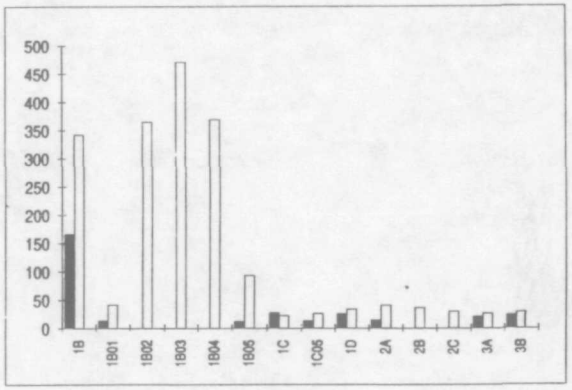
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 49 | 141 |
| 1B | 8.2 | 195 |
| 1C | 6.3 | 20.2 |
| 1D | 16.2 | 54.8 |
| 2A | 16.2 | 32.6 |
| 2B | 20.8 | 38.9 |
| 2C | 13.1 | 28 |
| 3A | 17.5 | 23.9 |
| 3B | 21.3 | 31.7 |




Chromium in Surface Soils

Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 166 | 342 |
| 1B01 | 13.5 | 41.4 |
| 1B02 | | 365 |
| 1B03 | | 471 |
| 1B04 | | 369 |
| 1B05 | 12.6 | 93.3 |
| 1C | 27.5 | 22.4 |
| 1C05 | 13.3 | 26.1 |
| 1D | 25.6 | 34 |
| 2A | 14.4 | 40.8 |
| 2B | | 36.3 |
| 2C | | 29.6 |
| 3A | 20.4 | 26.3 |
| 3B | 23.4 | 28.8 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Chromium Versus Distance From EMF Facilities, NE Quadrant**

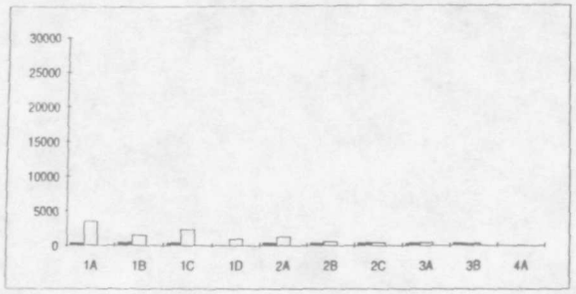
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-29 | |

93-1477b.226
12-8-93 /W: 3

Fluoride in Surface Soil

Bearing 000

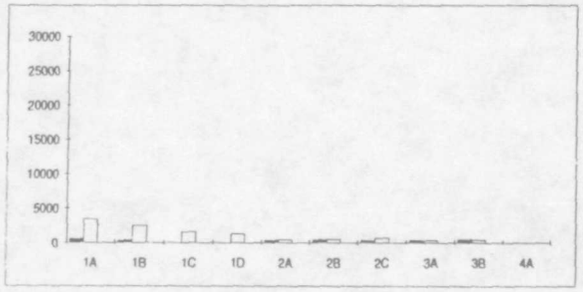
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 385 | 3450 |
| 1B | 470 | 1490 |
| 1C | 403 | 2340 |
| 1D | | 940 |
| 2A | 445 | 1290 |
| 2B | 408 | 575 |
| 2C | 455 | 458 |
| 3A | 383 | 438 |
| 3B | 360 | 305 |
| 4A | | |




Fluoride in Surface Soil

Bearing 023

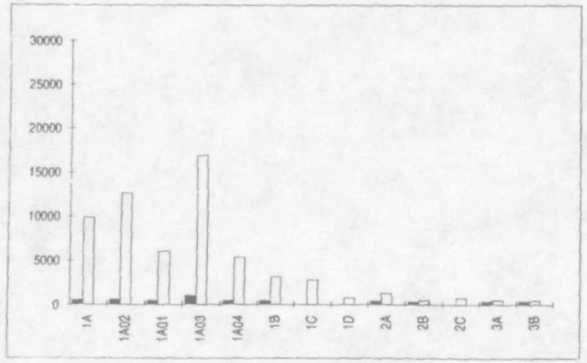
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 600 | 3420 |
| 1B | 375 | 2500 |
| 1C | | 1590 |
| 1D | | 1280 |
| 2A | 380 | 468 |
| 2B | 463 | 528 |
| 2C | 363 | 708 |
| 3A | 390 | 368 |
| 3B | 510 | 448 |
| 4A | | |




Fluoride in Surface Soil

Bearing 045

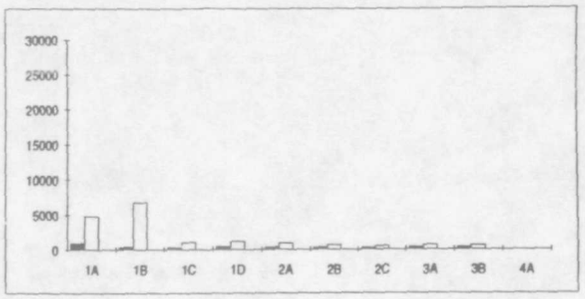
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 533 | 9880 |
| 1A02 | 610 | 12600 |
| 1A01 | 470 | 6020 |
| 1A03 | 990 | 16900 |
| 1A04 | 470 | 5350 |
| 1B | 458 | 3130 |
| 1C | | 2820 |
| 1D | | 765 |
| 2A | 448 | 1300 |
| 2B | 358 | 510 |
| 2C | | 793 |
| 3A | 413 | 510 |
| 3B | 395 | 475 |




Fluoride in Surface Soil

Bearing 068

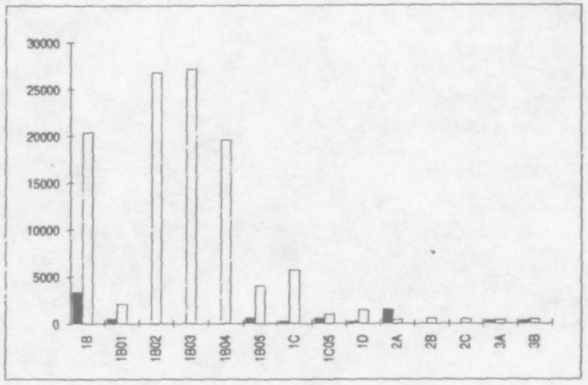
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 953 | 4780 |
| 1B | 405 | 6730 |
| 1C | 310 | 1040 |
| 1D | 470 | 1180 |
| 2A | 388 | 913 |
| 2B | 363 | 685 |
| 2C | 237 | 490 |
| 3A | 360 | 670 |
| 3B | 393 | 618 |
| 4A | | |




Fluoride in Surface Soil

Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 3320 | 20400 |
| 1B01 | 540 | 2100 |
| 1B02 | | 26800 |
| 1B03 | | 27200 |
| 1B04 | | 19600 |
| 1B05 | 601 | 4040 |
| 1C | 283 | 5720 |
| 1C05 | 562 | 1000' |
| 1D | 267 | 1460 |
| 2A | 1500 | 448 |
| 2B | | 575 |
| 2C | | 495 |
| 3A | 333 | 405 |
| 3B | 360 | 468 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

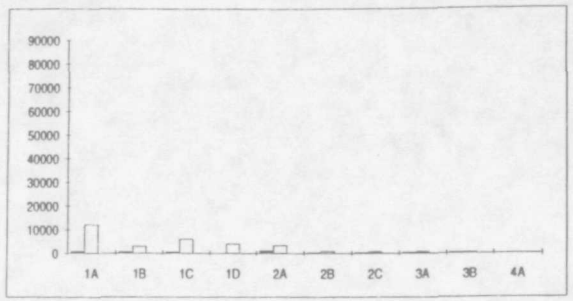
**Concentration of Fluoride Versus Distance From EMF Facilities, NE Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-30 | |

Total Phosphorus in Surface Soil

Bearing 000

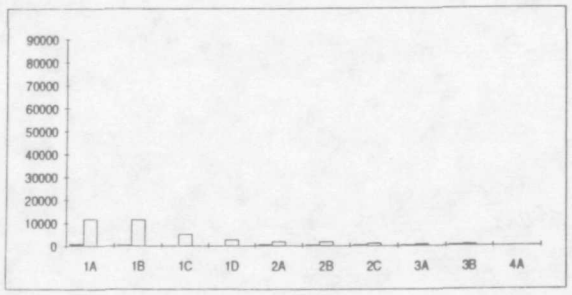
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 928 | 12200 |
| 1B | 667 | 3050 |
| 1C | 648 | 6010 |
| 1D | | 3980 |
| 2A | 1260 | 3400 |
| 2B | 404 | 955 |
| 2C | 460 | 737 |
| 3A | 491 | 782 |
| 3B | 431 | 458 |
| 4A | | |




Total Phosphorus in Surface Soil

Bearing 023

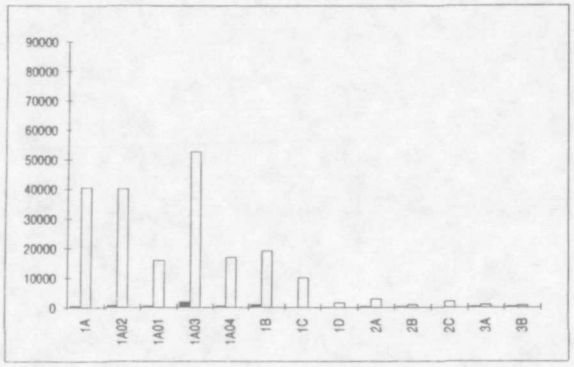
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 944 | 11700 |
| 1B | 543 | 11400 |
| 1C | | 5110 |
| 1D | | 2640 |
| 2A | 607 | 1910 |
| 2B | 539 | 1840 |
| 2C | 584 | 1120 |
| 3A | 464 | 782 |
| 3B | 496 | 745 |
| 4A | | |




Total Phosphorus in Surface Soil

Bearing 045

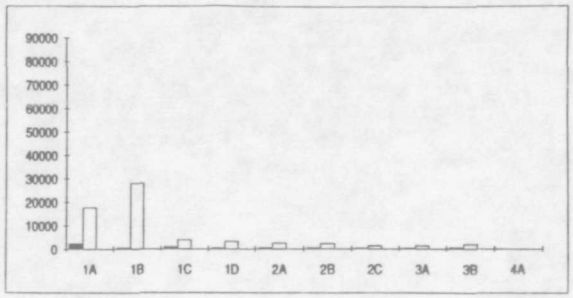
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 622 | 40400 |
| 1A02 | 779 | 40000 |
| 1A01 | 598 | 15900 |
| 1A03 | 1950 | 52600 |
| 1A04 | 570 | 16900 |
| 1B | 1040 | 19100 |
| 1C | | 10100 |
| 1D | | 1660 |
| 2A | 464 | 2960 |
| 2B | 447 | 1010 |
| 2C | | 2030 |
| 3A | 454 | 1000 |
| 3B | 474 | 778 |




Total Phosphorus in Surface Soil

Bearing 068

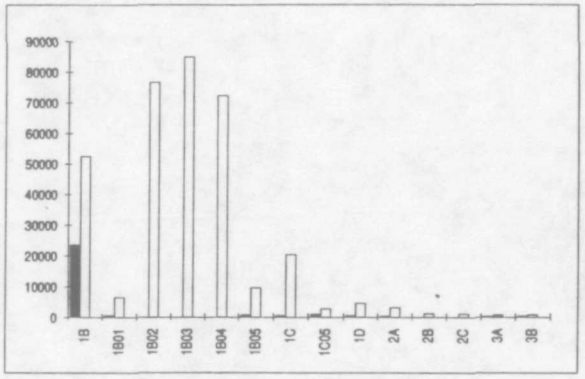
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 2320 | 17600 |
| 1B | 610 | 28100 |
| 1C | 907 | 3970 |
| 1D | 505 | 3260 |
| 2A | 580 | 2560 |
| 2B | 507 | 2300 |
| 2C | 361 | 1320 |
| 3A | 431 | 1420 |
| 3B | 625 | 1930 |
| 4A | | |




Total Phosphorus in Surface Soil

Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 23600 | 52400 |
| 1B01 | 672 | 6510 |
| 1B02 | | 76600 |
| 1B03 | | 84900 |
| 1B04 | | 72200 |
| 1B05 | 855 | 9590 |
| 1C | 656 | 20400 |
| 1C05 | 1110 | 2760 |
| 1D | 624 | 4560 |
| 2A | 491 | 3190 |
| 2B | | 1260 |
| 2C | | 1140 |
| 3A | 419 | 819 |
| 3B | 554 | 896 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Total Phosphorus Versus Distance From EMF Facilities, NE Quadrant**

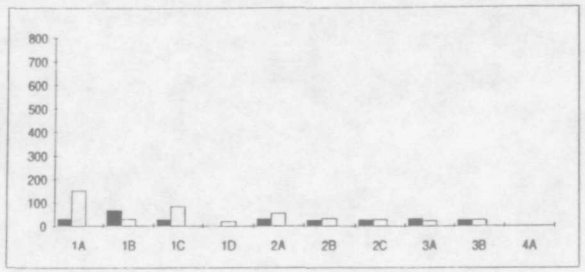
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-31 | |

93-1477b.228
2-6-93 VK 1

Vanadium in Surface Soils

Bearing 000

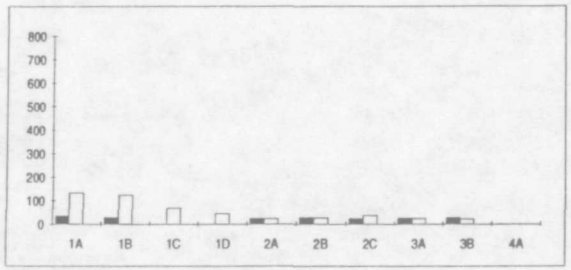
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 30.8 | 151 |
| 1B | 66.1 | 28.3 |
| 1C | 26.9 | 83.6 |
| 1D | | 20.3 |
| 2A | 30.6 | 54.7 |
| 2B | 25 | 31.6 |
| 2C | 26.8 | 28.8 |
| 3A | 31.5 | 22.7 |
| 3B | 25.8 | 27 |
| 4A | | |




Vanadium in Surface Soils

Bearing 023

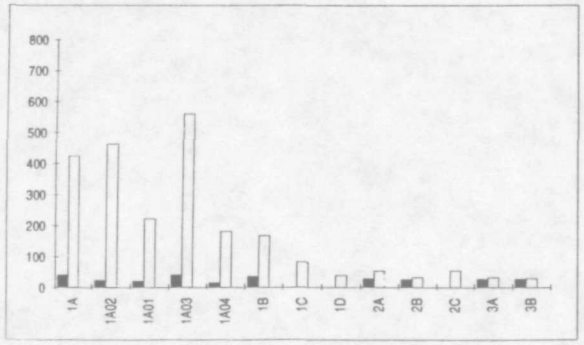
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 34.7 | 133 |
| 1B | 27.7 | 124 |
| 1C | | 68.1 |
| 1D | | 45.2 |
| 2A | 23.7 | 23.8 |
| 2B | 27.8 | 27.4 |
| 2C | 24 | 38.1 |
| 3A | 25.7 | 24.9 |
| 3B | 27.1 | 22.5 |
| 4A | | |




Vanadium in Surface Soils

Bearing 045

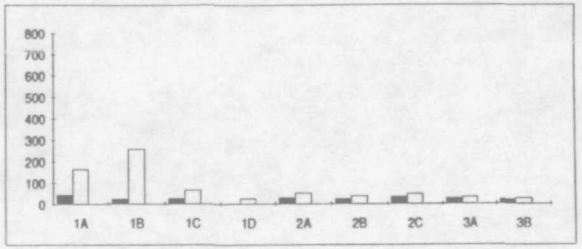
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 41 | 425 |
| 1A02 | 23.8 | 463 |
| 1A01 | 21.3 | 222 |
| 1A03 | 41.1 | 559 |
| 1A04 | 14.7 | 180 |
| 1B | 35.1 | 167 |
| 1C | | 82 |
| 1D | | 38.7 |
| 2A | 27.9 | 53.4 |
| 2B | 25.6 | 32.3 |
| 2C | | 54.3 |
| 3A | 26.6 | 32.6 |
| 3B | 26.7 | 29.1 |




Vanadium in Surface Soils

Bearing 068

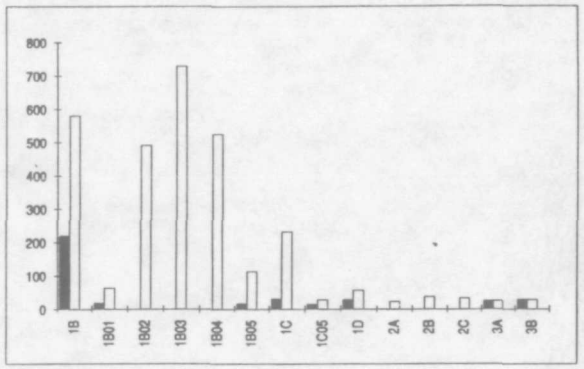
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 44.2 | 163 |
| 1B | 23.7 | 257 |
| 1C | 26.1 | 65.4 |
| 1D | 1.1 | 25.4 |
| 2A | 29.4 | 51.3 |
| 2B | 24.1 | 38.3 |
| 2C | 33.3 | 47.4 |
| 3A | 27.2 | 32.7 |
| 3B | 21 | 27.5 |
| 4A | | |




Vanadium in Surface Soils

Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 220 | 580 |
| 1B01 | 18.3 | 63.9 |
| 1B02 | | 491 |
| 1B03 | | 729 |
| 1B04 | | 525 |
| 1B05 | 17.2 | 113 |
| 1C | 31.1 | 232 |
| 1C05 | 15 | 28 |
| 1D | 28.5 | 56.8 |
| 2A | 1.1 | 23.1 |
| 2B | | 37.4 |
| 2C | | 33.5 |
| 3A | 25.1 | 25.5 |
| 3B | 29 | 28.5 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Vandium Versus Distance From EMF Facilities, NE Quadrant**

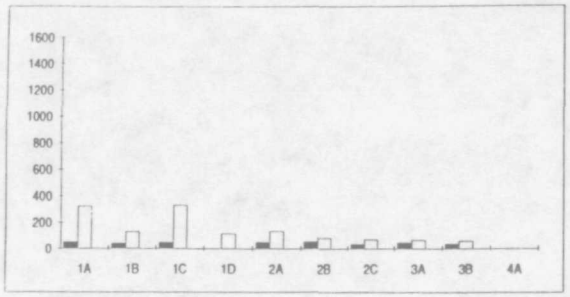
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-32 | |

93-1477b 229
12-6-93 VK 1

Zinc in Surface Soils

Bearing 000

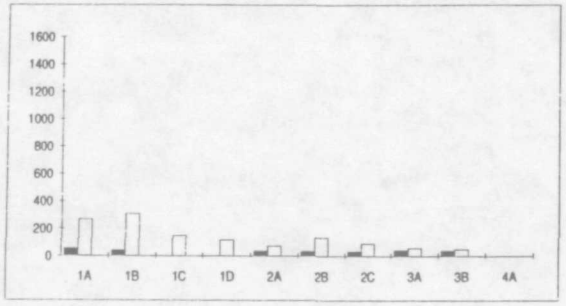
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 48.4 | 321 |
| 1B | 39.7 | 128 |
| 1C | 45.9 | 331 |
| 1D | | 114 |
| 2A | 49.2 | 134 |
| 2B | 52 | 81.6 |
| 2C | 34.1 | 69.6 |
| 3A | 45.8 | 65.8 |
| 3B | 36.2 | 58.5 |
| 4A | | |




Zinc in Surface Soils

Bearing 023

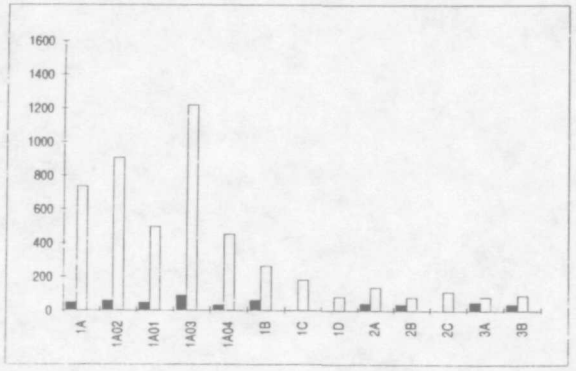
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 54.2 | 267 |
| 1B | 39.2 | 307 |
| 1C | | 148 |
| 1D | | 117 |
| 2A | 36 | 72.6 |
| 2B | 34.1 | 135 |
| 2C | 34.5 | 91.3 |
| 3A | 41.7 | 57.9 |
| 3B | 39.2 | 50.3 |
| 4A | | |




Zinc in Surface Soils

Bearing 045

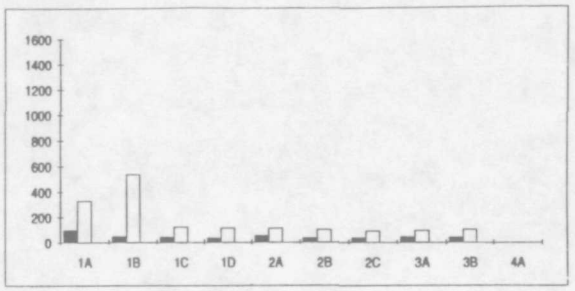
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 47.2 | 735 |
| 1A02 | 57.9 | 906 |
| 1A01 | 46.2 | 497 |
| 1A03 | 88.4 | 1220 |
| 1A04 | 31.3 | 452 |
| 1B | 60.2 | 263 |
| 1C | | 180 |
| 1D | | 81.1 |
| 2A | 41.1 | 137 |
| 2B | 36.3 | 78.6 |
| 2C | | 113 |
| 3A | 50.1 | 82 |
| 3B | 38.1 | 90.7 |




Zinc in Surface Soils

Bearing 068

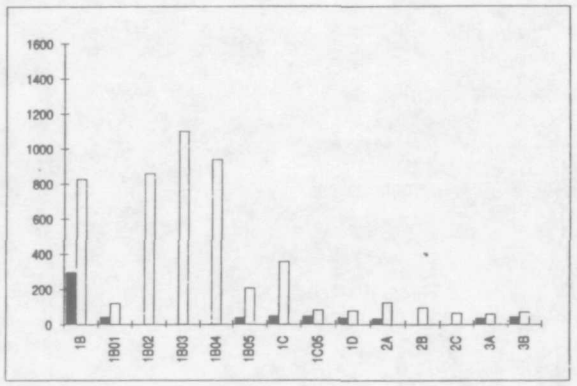
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 95.7 | 329 |
| 1B | 48 | 538 |
| 1C | 43.1 | 123 |
| 1D | 35 | 114 |
| 2A | 51.8 | 112 |
| 2B | 35.2 | 101 |
| 2C | 35.2 | 91.3 |
| 3A | 43.3 | 94.9 |
| 3B | 41.3 | 104 |
| 4A | | |




Zinc in Surface Soils

Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 296 | 827 |
| 1B01 | 42.1 | 120 |
| 1B02 | | 858 |
| 1B03 | | 1100 |
| 1B04 | | 938 |
| 1B05 | 38.5 | 207 |
| 1C | 47.3 | 357.4 |
| 1C05 | 46.9 | 81.5 |
| 1D | 37.6 | 78.7 |
| 2A | 32 | 124 |
| 2B | | 95.9 |
| 2C | | 64.7 |
| 3A | 35.5 | 58.7 |
| 3B | 43.1 | 71.2 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

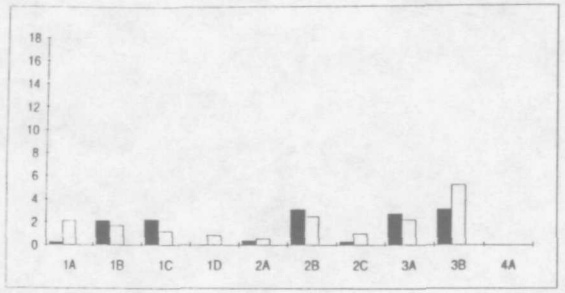
**Concentration of Zinc Versus Distance From EMF Facilities, NE Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-33 | |

Selenium in Surface Soils

Bearing 000

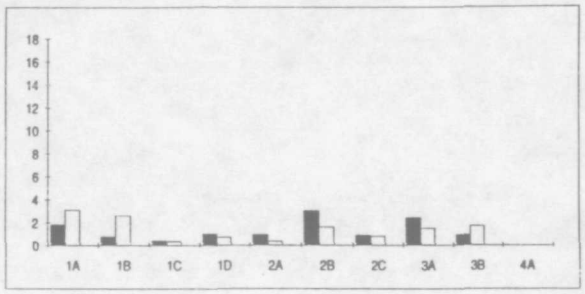
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 0.27 | 2.1 |
| 1B | 2.1 | 1.7 |
| 1C | 2.2 | 1.2 |
| 1D | | 0.85 |
| 2A | 0.4 | 0.56 |
| 2B | 3.1 | 2.5 |
| 2C | 0.3 | 1 |
| 3A | 2.7 | 2.2 |
| 3B | 3.1 | 5.2 |
| 4A | | |




Selenium in Surface Soils

Bearing 068

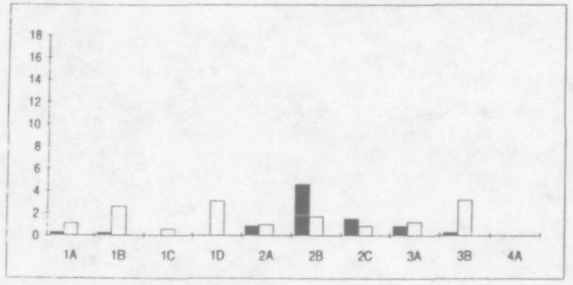
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 1.8 | 3.1 |
| 1B | 0.76 | 2.6 |
| 1C | 0.41 | 0.35 |
| 1D | 1 | 0.71 |
| 2A | 0.94 | 0.36 |
| 2B | 3 | 1.6 |
| 2C | 0.86 | 0.8 |
| 3A | 2.4 | 1.5 |
| 3B | 0.92 | 1.7 |
| 4A | | |




Selenium in Surface Soils

Bearing 023

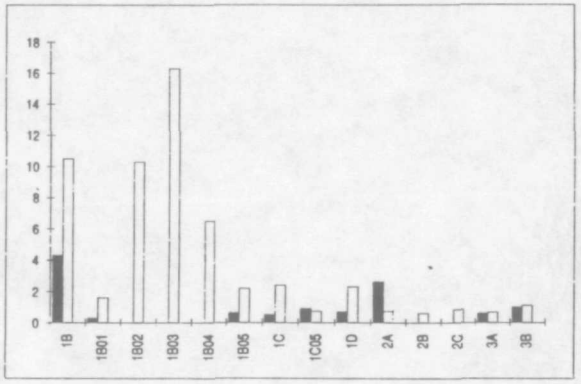
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 0.29 | 1.1 |
| 1B | 0.25 | 2.6 |
| 1C | | 0.59 |
| 1D | | 3.1 |
| 2A | 0.86 | 0.99 |
| 2B | 4.6 | 1.7 |
| 2C | 1.5 | 0.87 |
| 3A | 0.84 | 1.2 |
| 3B | 0.3 | 3.2 |
| 4A | | |




Selenium in Surface Soils

Bearing 090

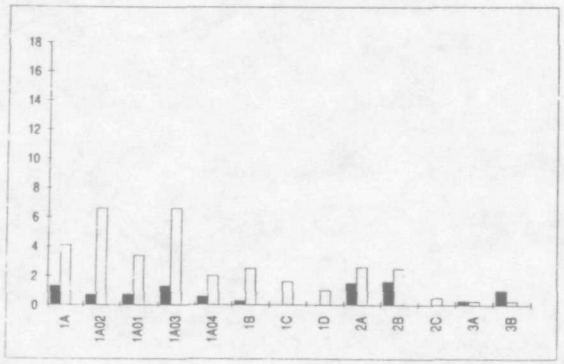
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 4.3 | 10.5 |
| 1B01 | 0.29 | 1.6 |
| 1B02 | | 10.3 |
| 1B03 | | 16.3 |
| 1B04 | | 6.5 |
| 1B05 | 0.62 | 2.2 |
| 1C | 0.5 | 2.4 |
| 1C05 | 0.89 | 0.73 |
| 1D | 0.68 | 2.3 |
| 2A | 2.6 | 0.73 |
| 2B | | 0.6 |
| 2C | | 0.84 |
| 3A | 0.6 | 0.67 |
| 3B | 0.98 | 1.1 |




Selenium in Surface Soils

Bearing 045

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 1.3 | 4.1 |
| 1A02 | 0.7 | 6.6 |
| 1A01 | 0.73 | 3.4 |
| 1A03 | 1.3 | 6.6 |
| 1A04 | 0.57 | 2 |
| 1B | 0.28 | 2.5 |
| 1C | | 1.6 |
| 1D | | 1 |
| 2A | 1.5 | 2.6 |
| 2B | 1.6 | 2.5 |
| 2C | | 0.5 |
| 3A | 0.29 | 0.27 |
| 3B | 1 | 0.26 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Selenium Versus Distance From EMF Facilities, NE Quadrant**

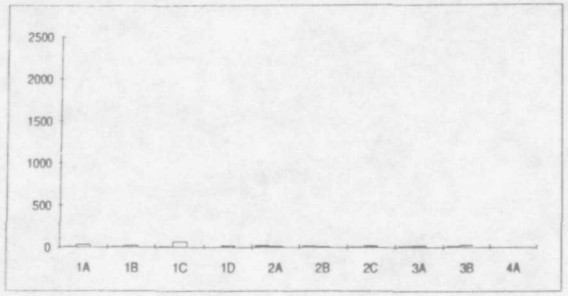
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-34 | |

93-14779.231
12-6-93 VK 1

Lead in Surface Soils

Bearing 000

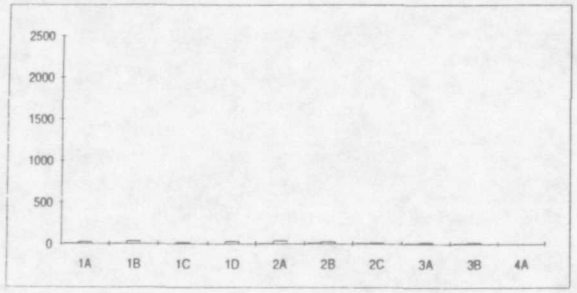
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 9.4 | 33.9 |
| 1B | 12.1 | 24.1 |
| 1C | 11.9 | 68.1 |
| 1D | | 20.8 |
| 2A | 29.3 | 17.2 |
| 2B | 20.5 | 12.3 |
| 2C | 9.8 | 21.5 |
| 3A | 17.2 | 21.6 |
| 3B | 16.6 | 26 |
| 4A | | |




Lead in Surface Soils

Bearing 023

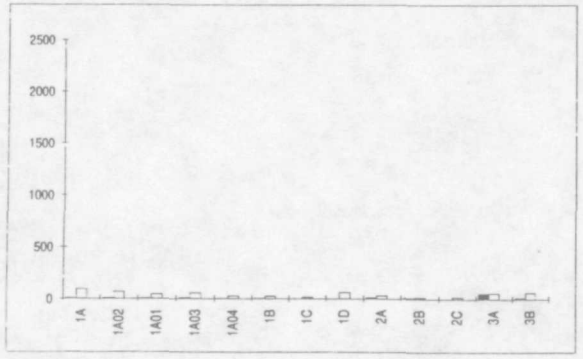
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 7.5 | 23.2 |
| 1B | 4.9 | 32.3 |
| 1C | | 19.3 |
| 1D | | 30.7 |
| 2A | 6.4 | 39.9 |
| 2B | 14.6 | 25.9 |
| 2C | 11.5 | 17.5 |
| 3A | 14.3 | 20.5 |
| 3B | 11 | 19.3 |
| 4A | | |




Lead in Surface Soils

Bearing 045

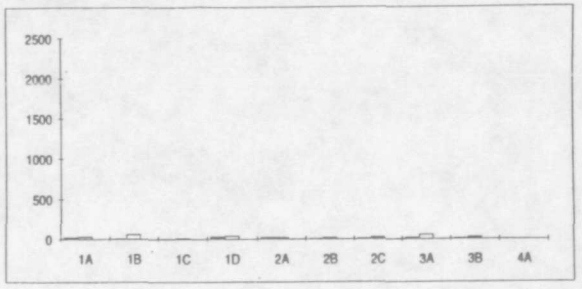
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 8.1 | 95 |
| 1A02 | 8.2 | 69.5 |
| 1A01 | 7.73 | 45.1 |
| 1A03 | 11.3 | 57.3 |
| 1A04 | 6.4 | 29.3 |
| 1B | 7.5 | 27.6 |
| 1C | | 17.1 |
| 1D | | 62.7 |
| 2A | 13.9 | 31.4 |
| 2B | 12.7 | 16.5 |
| 2C | | 20.2 |
| 3A | 55.1 | 59.5 |
| 3B | 14.8 | 64.4 |




Lead in Surface Soils

Bearing 068

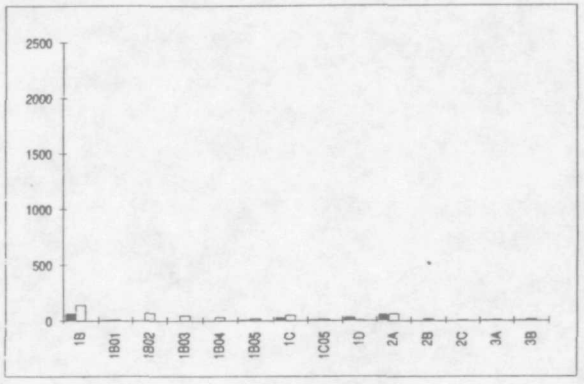
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 23.4 | 29.2 |
| 1B | 8.1 | 61.3 |
| 1C | 3.9 | 10.9 |
| 1D | 32.4 | 39.4 |
| 2A | 20.8 | 18.7 |
| 2B | 5 | 17.7 |
| 2C | 10.1 | 23.7 |
| 3A | 19.1 | 56.7 |
| 3B | 8.3 | 24.4 |
| 4A | | |




Lead in Surface Soils

Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 64.9 | 142 |
| 1B01 | 7.9 | 10.6 |
| 1B02 | | 69.3 |
| 1B03 | | 47.6 |
| 1B04 | | 31.4 |
| 1B05 | 7.8 | 19.1 |
| 1C | 29.1 | 50 |
| 1C05 | 9.6 | 12, |
| 1D | 30.6 | 5.7 |
| 2A | 53.9 | 63.3 |
| 2B | | 16.2 |
| 2C | | 8.5 |
| 3A | 5.1 | 9.6 |
| 3B | 5.3 | 15.2 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

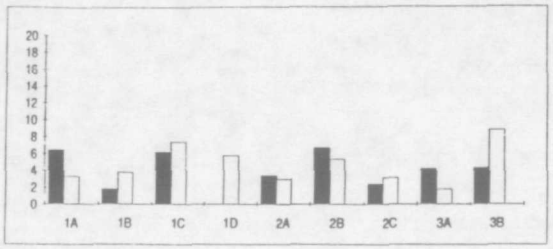
**Concentration of Lead Versus Distance From EMF Facilities, NE Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-35 | |

Arsenic in Surface Soils

Bearing 000

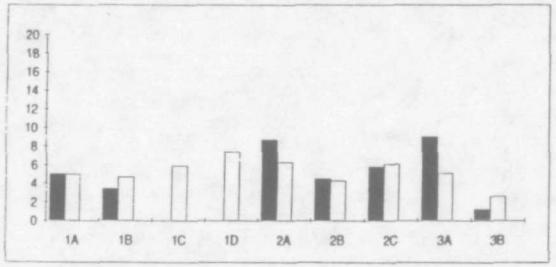
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 6.4 | 3.3 |
| 1B | 1.8 | 3.8 |
| 1C | 6.2 | 7.4 |
| 1D | | 5.8 |
| 2A | 3.4 | 3 |
| 2B | 6.7 | 5.4 |
| 2C | 2.4 | 3.2 |
| 3A | 4.2 | 1.8 |
| 3B | 4.3 | 8.8 |




Arsenic in Surface Soils

Bearing 023

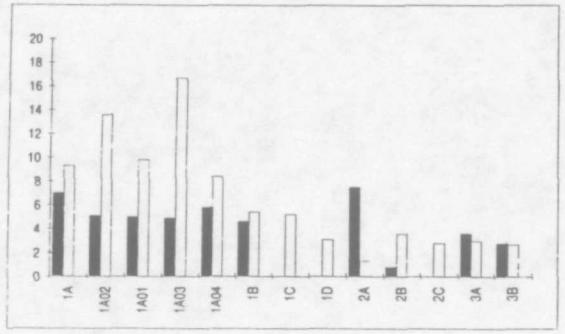
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 5 | 5 |
| 1B | 3.4 | 4.7 |
| 1C | | 5.9 |
| 1D | | 7.4 |
| 2A | 8.7 | 6.3 |
| 2B | 4.5 | 4.3 |
| 2C | 5.8 | 6.1 |
| 3A | 9 | 5.1 |
| 3B | 1.2 | 2.6 |




Arsenic in Surface Soils

Bearing 045

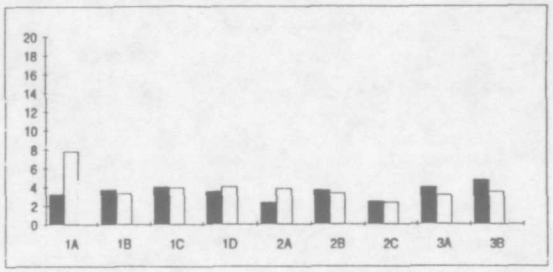
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 7 | 9.3 |
| 1A02 | 5.1 | 13.6 |
| 1A01 | 5 | 9.8 |
| 1A03 | 4.9 | 16.7 |
| 1A04 | 5.8 | 8.4 |
| 1B | 4.6 | 5.4 |
| 1C | | 5.2 |
| 1D | | 3.1 |
| 2A | 7.5 | 1.3 |
| 2B | 0.79 | 3.6 |
| 2C | | 2.8 |
| 3A | 3.6 | 3 |
| 3B | 2.8 | 2.7 |




Arsenic in Surface Soils

Bearing 068

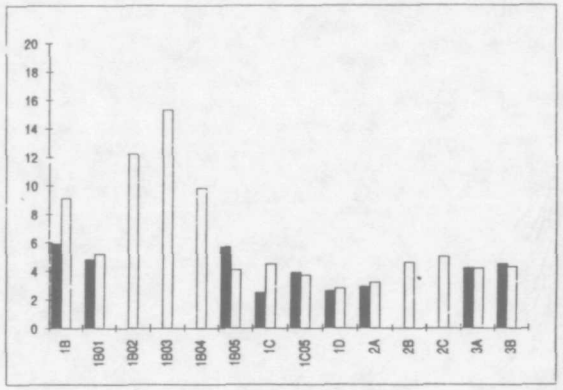
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 3.2 | 7.8 |
| 1B | 3.7 | 3.3 |
| 1C | 4 | 3.9 |
| 1D | 3.5 | 4 |
| 2A | 2.3 | 3.8 |
| 2B | 3.6 | 3.3 |
| 2C | 2.4 | 2.3 |
| 3A | 3.9 | 3.1 |
| 3B | 4.7 | 3.5 |




Arsenic in Surface Soils

Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 5.9 | 9.1 |
| 1B01 | 4.8 | 5.2 |
| 1B02 | | 12.2 |
| 1B03 | | 15.3 |
| 1B04 | | 9.8 |
| 1B05 | 5.7 | 4.1 |
| 1C | 2.5 | 4.5 |
| 1C05 | 3.9 | 3.7 |
| 1D | 2.6 | 2.8 |
| 2A | 2.9 | 3.2 |
| 2B | | 4.6 |
| 2C | | 5 |
| 3A | 4.2 | 4.2 |
| 3B | 4.5 | 4.3 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Arsenic Versus Distance From EMF Facilities, NE Quadrant**

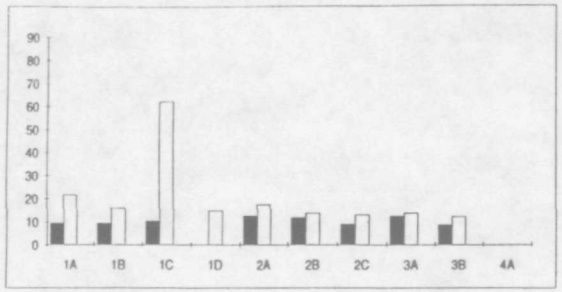
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-36 | |

93-1477b 233
12-6-93 NK 1

Copper in Surface Soils

Bearing 000

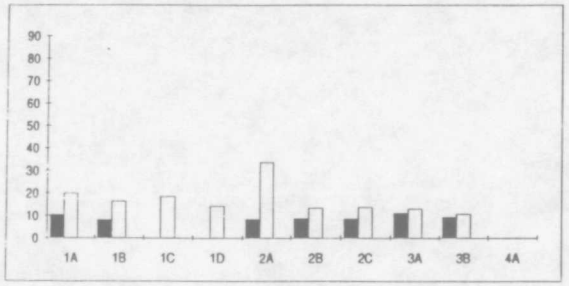
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 9.4 | 21.6 |
| 1B | 9.3 | 15.9 |
| 1C | 10.4 | 61.9 |
| 1D | | 14.8 |
| 2A | 12.6 | 17.5 |
| 2B | 11.8 | 13.9 |
| 2C | 9 | 13.2 |
| 3A | 12.5 | 13.9 |
| 3B | 8.7 | 12.3 |
| 4A | | |




Copper in Surface Soils

Bearing 023

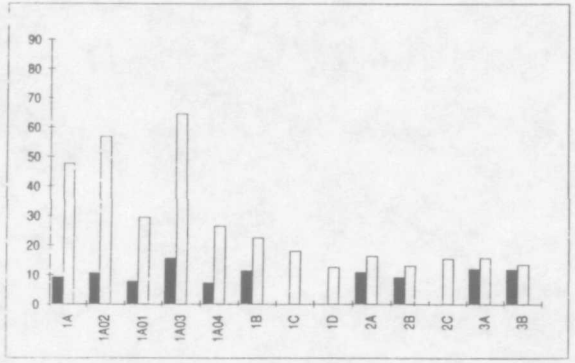
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 10.2 | 19.9 |
| 1B | 8.1 | 16.4 |
| 1C | | 18.5 |
| 1D | | 14.2 |
| 2A | 8.3 | 33.6 |
| 2B | 8.7 | 13.4 |
| 2C | 8.5 | 13.7 |
| 3A | 11 | 13 |
| 3B | 9.3 | 10.8 |
| 4A | | |




Copper in Surface Soils

Bearing 045

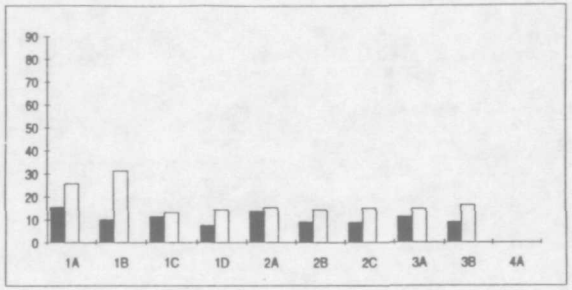
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 9.2 | 47.7 |
| 1A02 | 10.5 | 56.9 |
| 1A01 | 7.8 | 29.4 |
| 1A03 | 15.5 | 64.7 |
| 1A04 | 7.2 | 26.5 |
| 1B | 11.3 | 22.5 |
| 1C | | 17.9 |
| 1D | | 12.5 |
| 2A | 10.8 | 16.3 |
| 2B | 9.1 | 13.1 |
| 2C | | 15.5 |
| 3A | 12 | 15.7 |
| 3B | 11.8 | 13.5 |




Copper in Surface Soils

Bearing 068

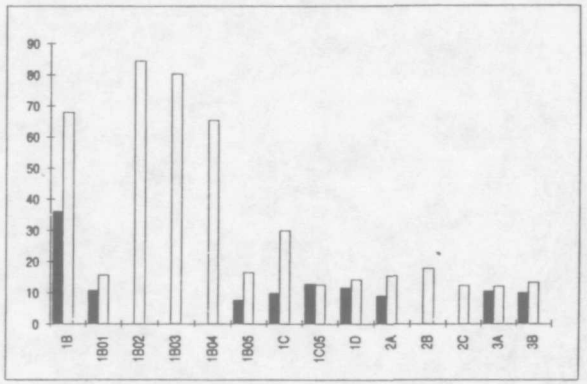
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 15.4 | 25.7 |
| 1B | 10 | 31.3 |
| 1C | 11.4 | 13.2 |
| 1D | 7.5 | 14.4 |
| 2A | 13.7 | 15.3 |
| 2B | 9 | 14.3 |
| 2C | 8.8 | 14.9 |
| 3A | 11.2 | 14.7 |
| 3B | 8.8 | 16.3 |
| 4A | | |




Copper in Surface Soils

Bearing 090

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1B | 36 | 67.9 |
| 1B01 | 10.7 | 15.7 |
| 1B02 | | 84.4 |
| 1B03 | | 80.2 |
| 1B04 | | 65.3 |
| 1B05 | 7.6 | 16.5 |
| 1C | 9.8 | 29.9 |
| 1C05 | 12.8 | 12.6 |
| 1D | 11.5 | 14.2 |
| 2A | 9 | 15.4 |
| 2B | | 17.8 |
| 2C | | 12.3 |
| 3A | 10.4 | 12.1 |
| 3B | 9.9 | 13.3 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Copper Versus Distance From EMF Facilities, NE Quadrant**

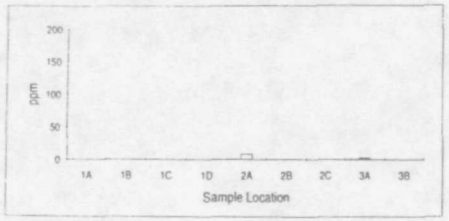
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-37 | |

93-1477b.234
12-6-93 VK 1

Cadmium in Surface Soils

Bearing 113

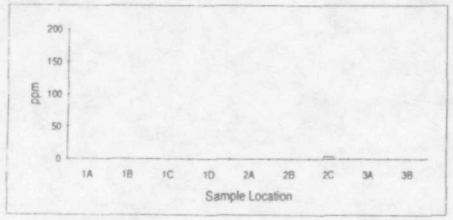
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 0.71 | 7.8 |
| 2B | | |
| 2C | | |
| 3A | 0.52 | 2.7 |
| 3B | | |




Cadmium in Surface Soils

Bearing 120

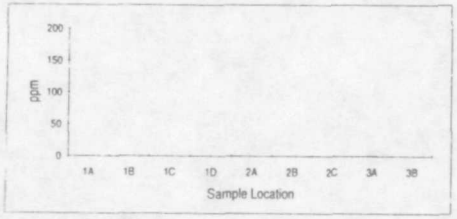
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 0.29 | 4.1 |
| 3A | | |
| 3B | | |




Cadmium in Surface Soils

Bearing 125

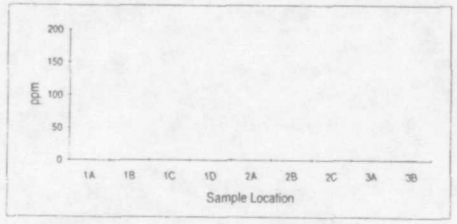
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.37 | 0.95 |
| 3B | | |




Cadmium in Surface Soils

Bearing130

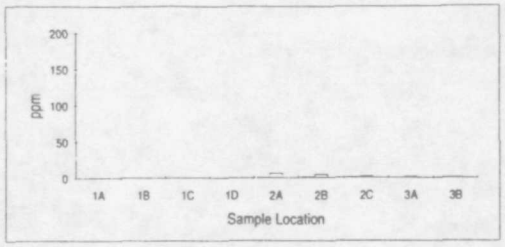
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 0.38 | 1 |




Cadmium in Surface Soils

Bearing 135

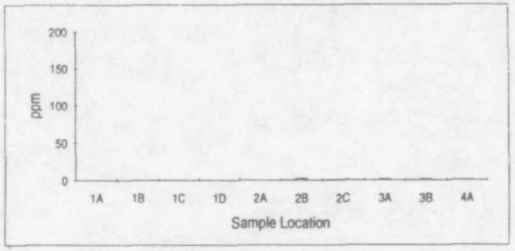
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 0.48 | 6.3 |
| 2B | 0.97 | 4.2 |
| 2C | 0.54 | 1.8 |
| 3A | | 1.3 |
| 3B | 0.45 | 1 |




Cadmium in Surface Soils

Bearing 158

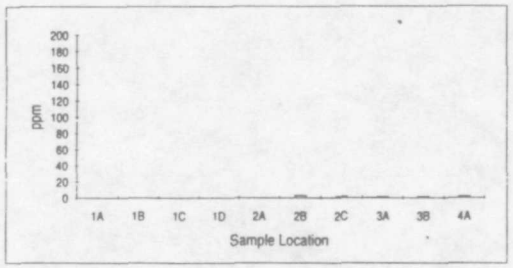
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 0.62 | 2.4 |
| 2C | 0.63 | 1.2 |
| 3A | | 1.5 |
| 3B | 0.49 | 1.5 |
| 4A | 0.37 | 0.54 |




Cadmium in Surface Soils

Bearing 180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 2.9 |
| 2C | | 1.8 |
| 3A | 0.57 | 1.7 |
| 3B | | 1.7 |
| 4A | | 1.9 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

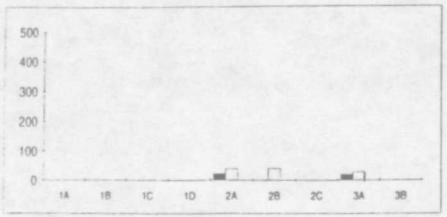
**Concentration of Cadmium Versus Distance From EMF Facilities, SE Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-38 | |

93-1477b-235
12-6-93 VK 1

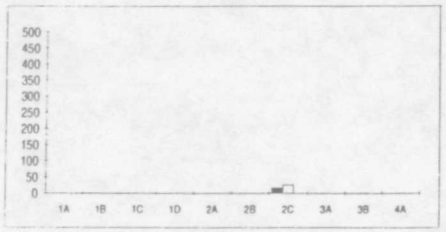
Chromium in Surface Soils
Bearing 113

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 22.1 | 39.4 |
| 2B | | 40 |
| 2C | | |
| 3A | 19.7 | 28.8 |
| 3B | | |



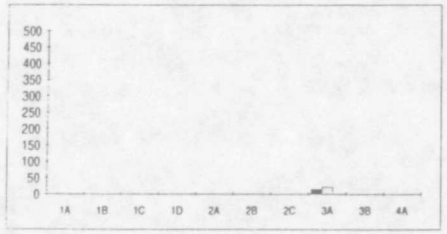

Chromium in Surface Soils
Bearing 120

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 16.9 | 26.3 |
| 3A | | |
| 3B | | |
| 4A | | |



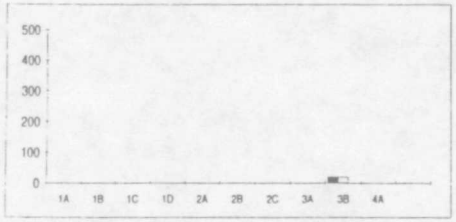

Chromium in Surface Soils
Bearing 125

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 15.3 | 21.9 |
| 3B | | |
| 4A | | |



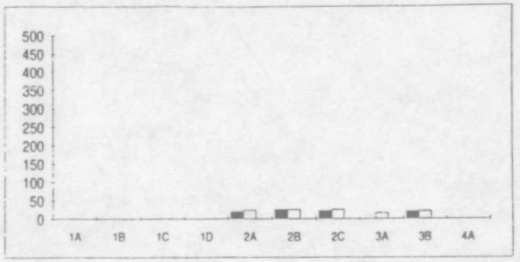

Chromium in Surface Soils
Bearing 130

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 19.7 | 19.3 |
| 4A | | |



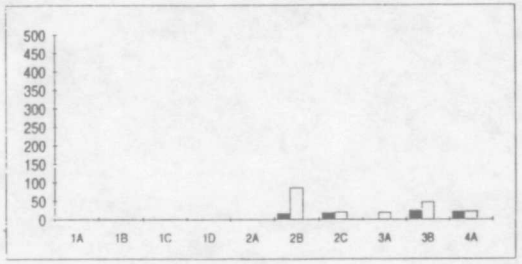

Chromium in Surface Soils
Bearing 135

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 19.1 | 23.6 |
| 2B | 25.4 | 25.3 |
| 2C | 21.3 | 25.1 |
| 3A | | 16.4 |
| 3B | 19.5 | 21.2 |
| 4A | | |



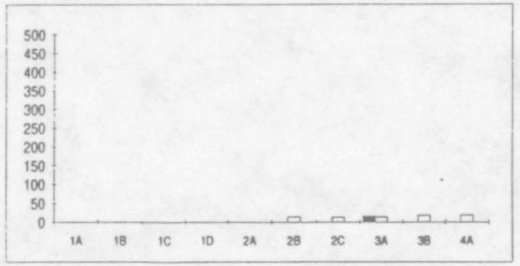

Chromium in Surface Soils
Bearing 158

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 16.3 | 86 |
| 2C | 17.5 | 19.9 |
| 3A | | 19.2 |
| 3B | 24.3 | 47.1 |
| 4A | 21.1 | 21.4 |




Chromium in Surface Soils
Bearing 180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 14.3 |
| 2C | | 13.1 |
| 3A | 15.9 | 14.2 |
| 3B | | 18.2 |
| 4A | | 19.2 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Chromium Versus Distance From EMF Facilities, SE Quadrant**

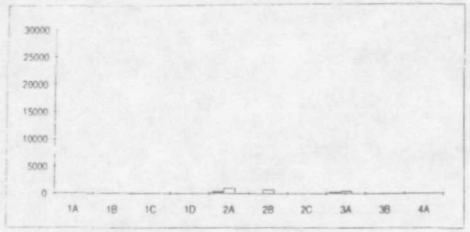
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-39 | |

93-1477b.238
12-6-93 NK 1

Fluoride in Surface Soil

Bearing 113

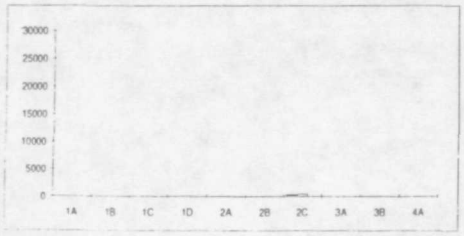
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 455 | 1020 |
| 2B | | 733 |
| 2C | | |
| 3A | 315 | 443 |
| 3B | | |
| 4A | | |




Fluoride in Surface Soil

Bearing 120

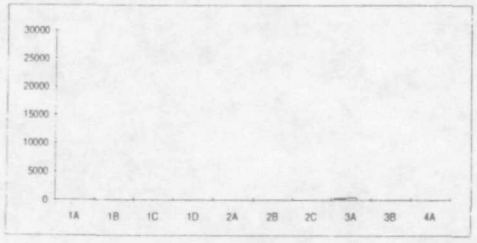
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 388 | 445 |
| 3A | | |
| 3B | | |
| 4A | | |




Fluoride in Surface Soil

Bearing125

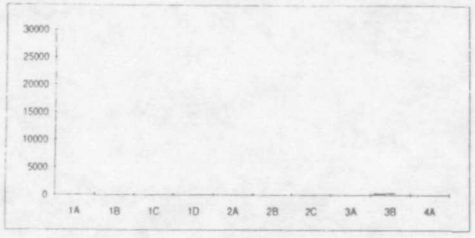
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 403 | 443 |
| 3B | | |
| 4A | | |




Fluoride in Surface Soil

Bearing 130

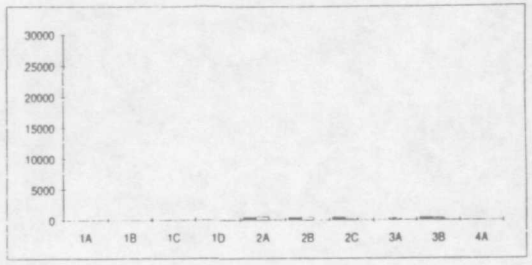
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 358 | 395 |
| 4A | | |




Fluoride in Surface Soil

Bearing 135

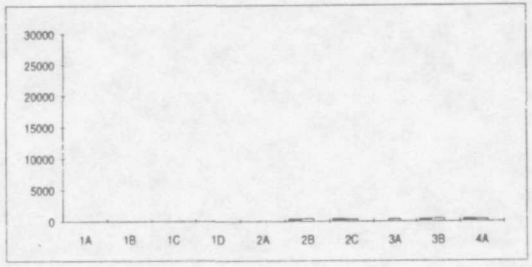
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 438 | 575 |
| 2B | 415 | 515 |
| 2C | 455 | 300 |
| 3A | | 288 |
| 3B | 445 | 355 |
| 4A | | |




Fluoride in Surface Soil

Bearing 158

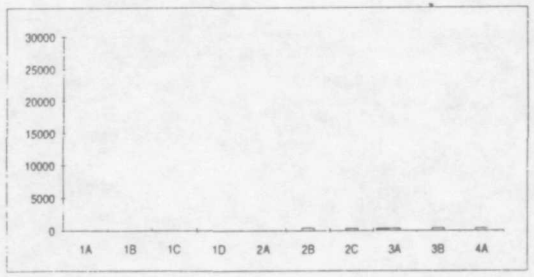
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 400 | 418 |
| 2C | 483 | 353 |
| 3A | | 360 |
| 3B | 398 | 450 |
| 4A | 443 | 378 |




Fluoride in Surface Soil

Bearing 180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 433 |
| 2C | | 348 |
| 3A | 423 | 345 |
| 3B | | 390 |
| 4A | | 380 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Fluoride Versus Distance From EMF Facilities, SE Quadrant**

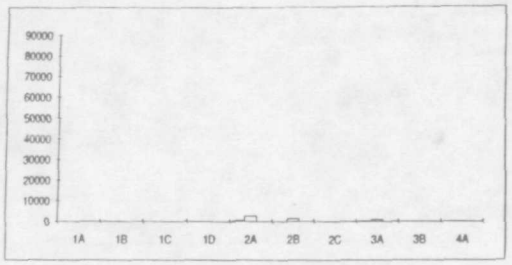
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-40 | |

93-14779-237
12-6-93 NK 1

Total Phosphorus in Surface Soil

Bearing 113

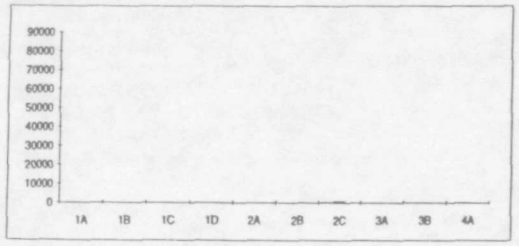
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 775 | 2690 |
| 2B | | 1350 |
| 2C | | |
| 3A | 442 | 937 |
| 3B | | |
| 4A | | |




Total Phosphorus in Surface Soil

Bearing 120

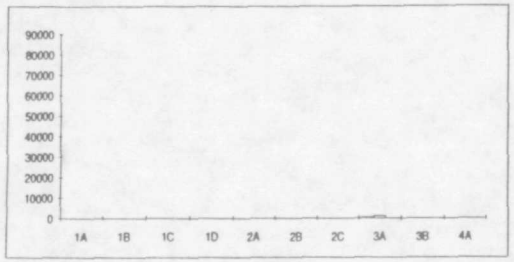
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 466 | 878 |
| 3A | | |
| 3B | | |
| 4A | | |




Total Phosphorus in Surface Soil

Bearing 125

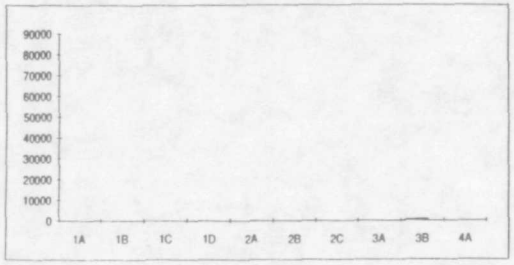
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 648 | 1230 |
| 3B | | |
| 4A | | |




Total Phosphorus in Surface Soil

Bearing 130

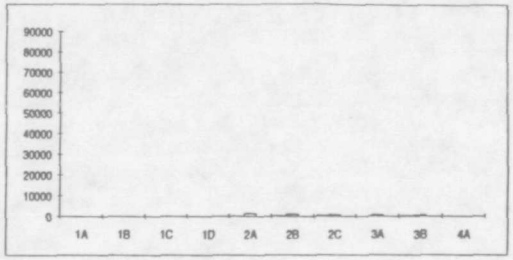
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 672 | 890 |
| 4A | | |




Total Phosphorus in Surface Soil

Bearing 135

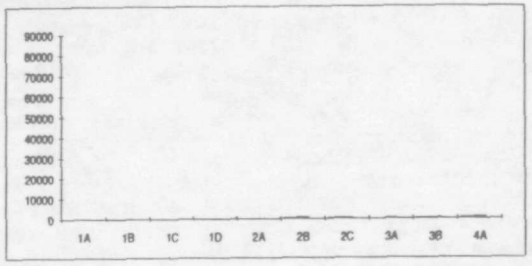
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 360 | 1430 |
| 2B | 527 | 1190 |
| 2C | 625 | 874 |
| 3A | | 772 |
| 3B | 501 | 695 |
| 4A | | |




Total Phosphorus in Surface Soil

Bearing158

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 447 | 820 |
| 2C | 573 | 507 |
| 3A | | 409 |
| 3B | 493 | 458 |
| 4A | 690 | 766 |

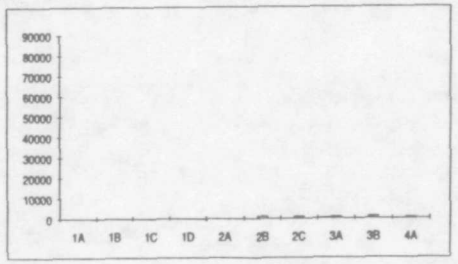



Total Phosphorus in Surface Soil

Bearing180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 1080 |
| 2C | | 954 |
| 3A | 490 | 901 |
| 3B | | 1070 |
| 4A | | 701 |

85000




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Total Phosphorus Versus Distance From EMF Facilities, SE Quadrant**

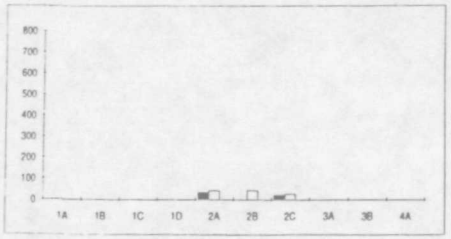
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-41 | |

13-1475.258
12-3-93 rk 0

Vanadium in Surface Soils

Bearing113

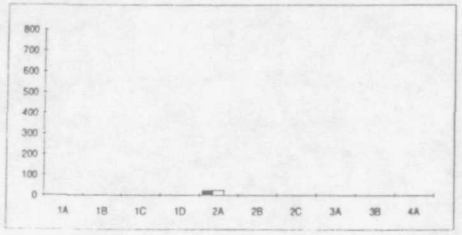
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 33.8 | 42.2 |
| 2B | | 43.6 |
| 2C | 22 | 27.2 |
| 3A | | |
| 3B | | |
| 4A | | |




Vanadium in Surface Soils

Bearing 120

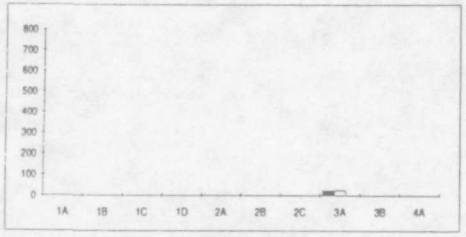
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 24.3 | 25.4 |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | | |
| 4A | | |




Vanadium in Surface Soils

Bearing 125

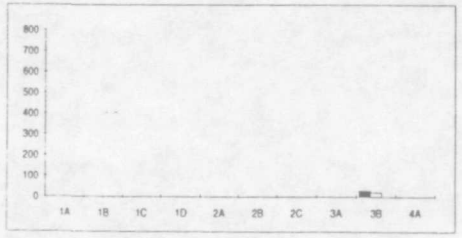
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 23.9 | 25.1 |
| 3B | | |
| 4A | | |




Vanadium in Surface Soils

Bearing130

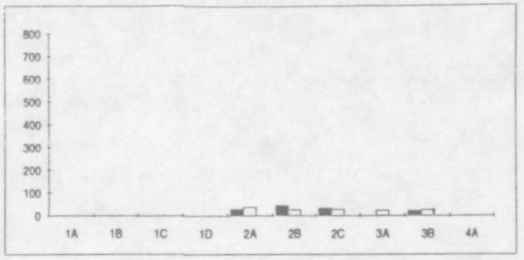
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 30.7 | 22 |
| 4A | | |




Vanadium in Surface Soils

Bearing 135

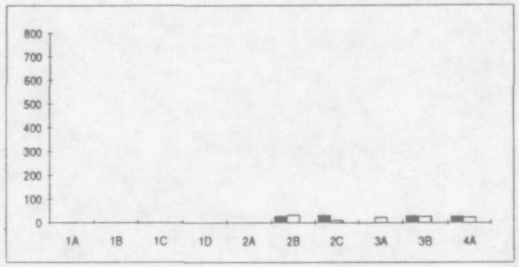
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 28.3 | 37.7 |
| 2B | 44.1 | 25.8 |
| 2C | 33.1 | 28.4 |
| 3A | | 22.8 |
| 3B | 22.2 | 26.2 |
| 4A | | |




Vanadium in Surface Soils

Bearing 158

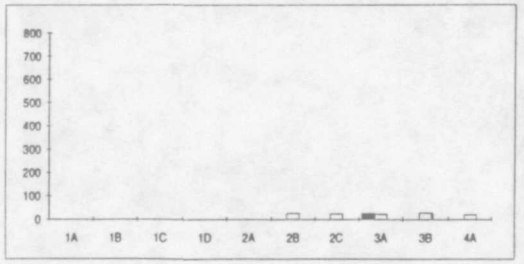
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 28.3 | 32.3 |
| 2C | 31.7 | 10.6 |
| 3A | | 22.6 |
| 3B | 29.5 | 26.1 |
| 4A | 27.4 | 22.9 |




Vanadium in Surface Soils

Bearing 180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 26.1 |
| 2C | | 24.3 |
| 3A | 26 | 23 |
| 3B | | 28.9 |
| 4A | | 20.8 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Vanadium Versus Distance From EMF Facilities, SE Quadrant**

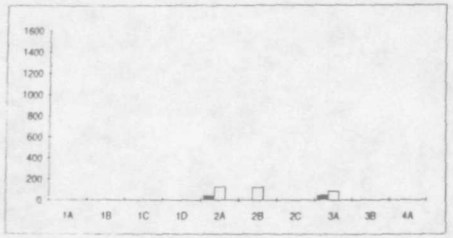
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-42 | |

33-14779-239
12-3-93 rvk 0

Zinc in Surface Soils

Bearing113

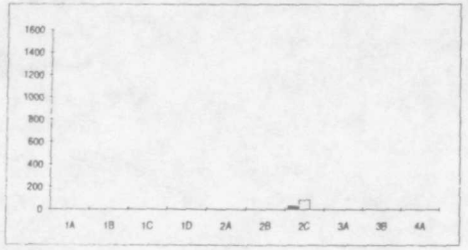
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 42.5 | 127 |
| 2B | | 123 |
| 2C | | |
| 3A | 49.8 | 84.8 |
| 3B | | |
| 4A | | |




Zinc in Surface Soils

Bearing 120

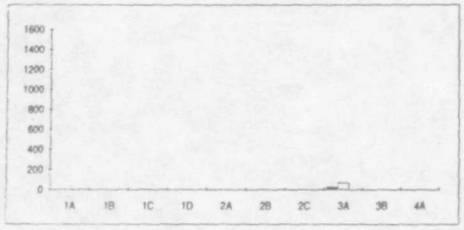
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 33.6 | 84.9 |
| 3A | | |
| 3B | | |
| 4A | | |




Zinc in Surface Soils

Bearing 125

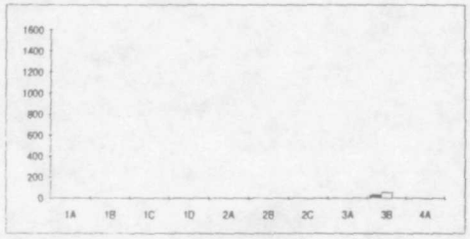
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 30.2 | 68.4 |
| 3B | | |
| 4A | | |




Zinc in Surface Soils

Bearing 130

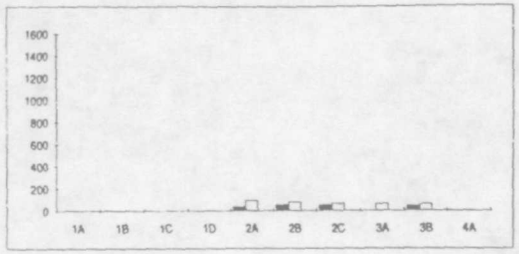
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 33.6 | 55.9 |
| 4A | | |




Zinc in Surface Soils

Bearing 135

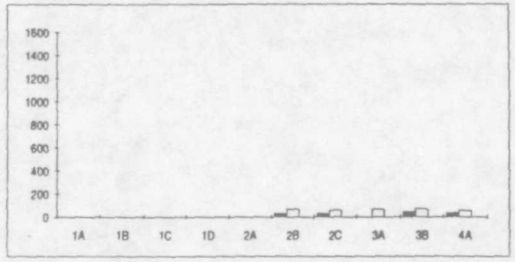
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 37.7 | 91.6 |
| 2B | 52.8 | 78 |
| 2C | 49.4 | 63.7 |
| 3A | | 61 |
| 3B | 41.7 | 60.2 |
| 4A | | |




Zinc in Surface Soils

Bearing 158

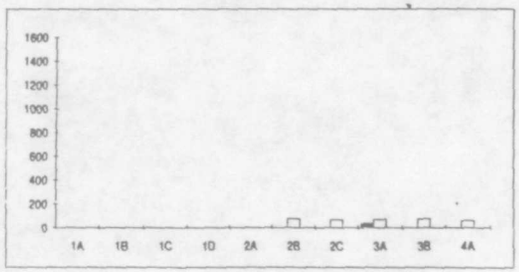
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 32 | 68.9 |
| 2C | 32.4 | 61.2 |
| 3A | | 67.6 |
| 3B | 47.5 | 71.3 |
| 4A | 36.5 | 58.5 |




Zinc in Surface Soils

Bearing 180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 75.8 |
| 2C | | 67.3 |
| 3A | 37.4 | 70.2 |
| 3B | | 75.8 |
| 4A | | 61.1 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Zinc Versus Distance From EMF Facilities, SE Quadrant**

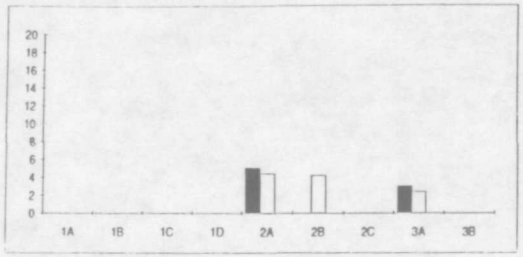
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-43 | |

43-14779-240
12-3-93 rw 0

Arsenic in Surface Soils

Bearing 113

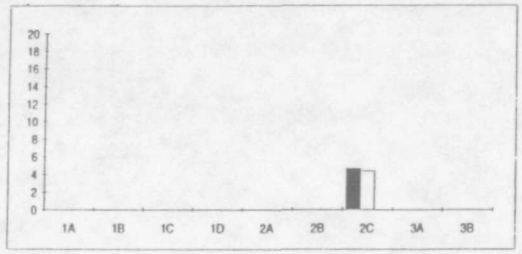
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 5 | 4.4 |
| 2B | | 4.2 |
| 2C | | |
| 3A | 3 | 2.4 |
| 3B | | |




Arsenic in Surface Soils

Bearing 120

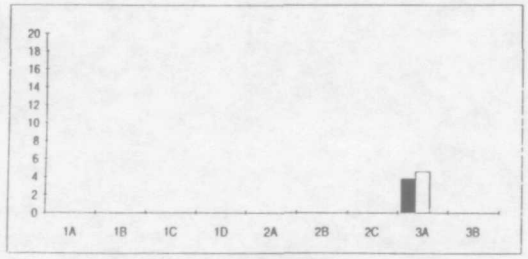
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 4.7 | 4.4 |
| 3A | | |
| 3B | | |




Arsenic in Surface Soils

Bearing 125

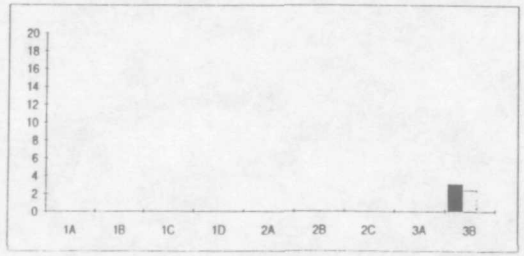
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 3.8 | 4.6 |
| 3B | | |




Arsenic in Surface Soils

Bearing 130

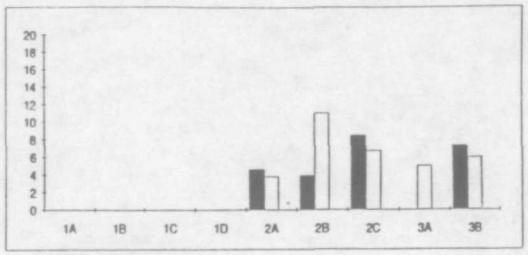
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 3.1 | 2.4 |




Arsenic in Surface Soils

Bearing 135

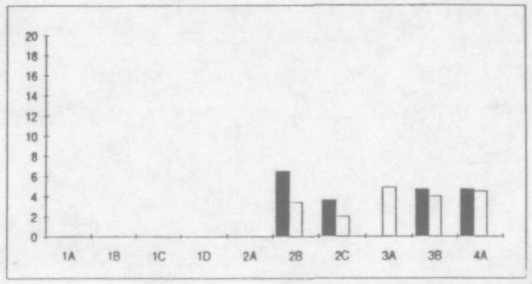
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 4.6 | 3.8 |
| 2B | 3.9 | 11 |
| 2C | 8.4 | 6.7 |
| 3A | | 5 |
| 3B | 7.3 | 6 |




Arsenic in Surface Soils

Bearing 158

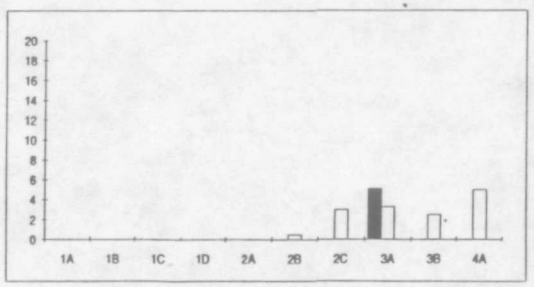
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 6.5 | 3.4 |
| 2C | 3.6 | 2 |
| 3A | | 4.9 |
| 3B | 4.7 | 4 |
| 4A | 4.7 | 4.5 |




Arsenic in Surface Soils

Bearing 180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 0.51 |
| 2C | | 3 |
| 3A | 5.1 | 3.3 |
| 3B | | 2.5 |
| 4A | | 5 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Arsenic Versus Distance From EMF Facilities, SE Quadrant**

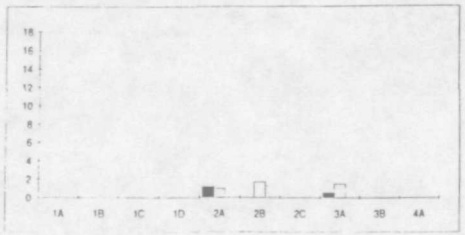
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-44 | |

13-1477b.241
12-3-93 VK: 3

Selenium in Surface Soils

Bearing 113

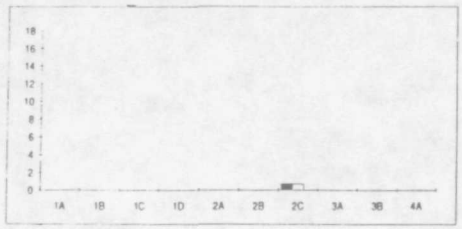
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 1.2 | 1 |
| 2B | | 1.7 |
| 2C | | |
| 3A | 0.53 | 1.5 |
| 3B | | |
| 4A | | |




Selenium in Surface Soils

Bearing120

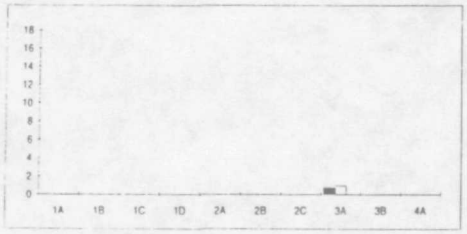
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 0.75 | 0.7 |
| 3A | | |
| 3B | | |
| 4A | | |




Selenium in Surface Soils

Bearing 125

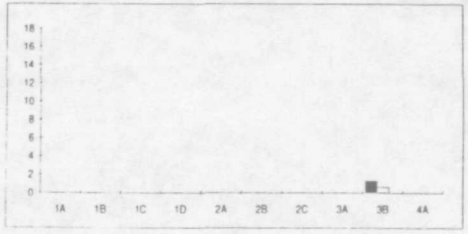
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.76 | 0.97 |
| 3B | | |
| 4A | | |




Selenium in Surface Soils

Bearing 130

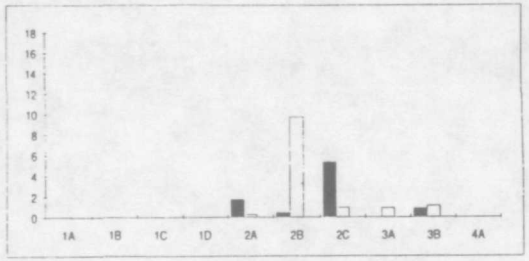
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 1.3 | 0.63 |
| 4A | | |




Selenium in Surface Soils

Bearing 135

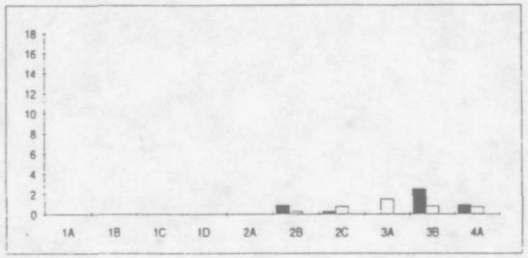
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 1.7 | 0.26 |
| 2B | 0.44 | 9.7 |
| 2C | 5.3 | 0.94 |
| 3A | | 0.9 |
| 3B | 0.84 | 1.1 |
| 4A | | |




Selenium in Surface Soils

Bearing 158

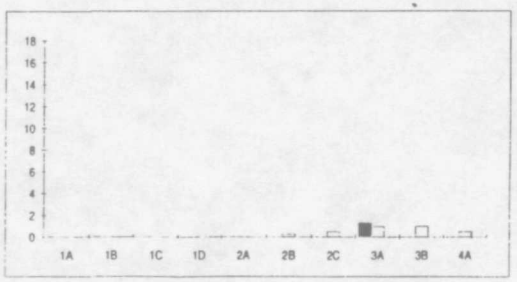
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 0.9 | 0.26 |
| 2C | 0.27 | 0.75 |
| 3A | | 1.5 |
| 3B | 2.5 | 0.8 |
| 4A | 0.92 | 0.73 |




Selenium in Surface Soils

Bearing 180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 0.26 |
| 2C | | 0.5 |
| 3A | 1.3 | 0.98 |
| 3B | | 0.99 |
| 4A | | 0.5 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Selenium Versus Distance From EMF Facilities, SE Quadrant**

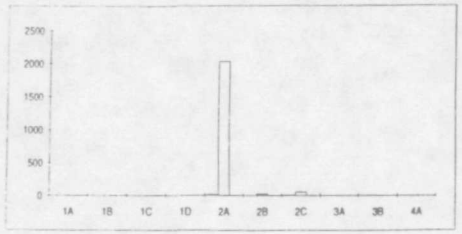
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-45 | |

13-1477b.242
12-3-93 VK 3

Lead in Surface Soils

Bearing 113

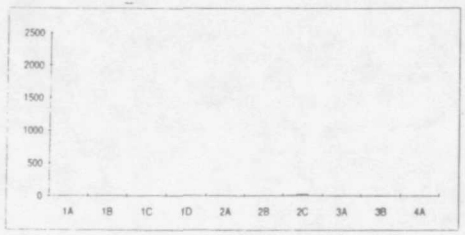
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 17.1 | 2030 |
| 2B | | 26.1 |
| 2C | 9.6 | 52.8 |
| 3A | | |
| 3B | | |
| 4A | | |




Lead in Surface Soils

Bearing120

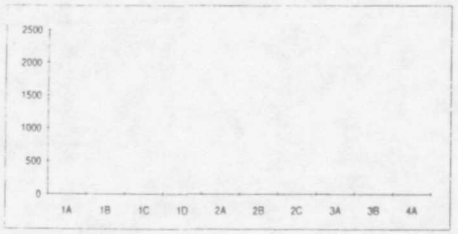
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 6.3 | 21.6 |
| 3A | | |
| 3B | | |
| 4A | | |




Lead in Surface Soils

Bearing 125

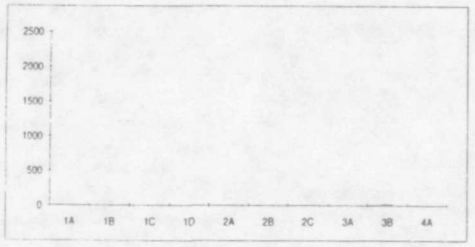
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 6.3 | 0.8 |
| 3B | | |
| 4A | | |




Lead in Surface Soils

Bearing 130

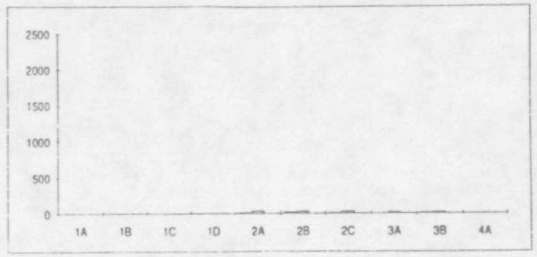
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 6.1 | 14.4 |
| 4A | | |




Lead in Surface Soils

Bearing 135

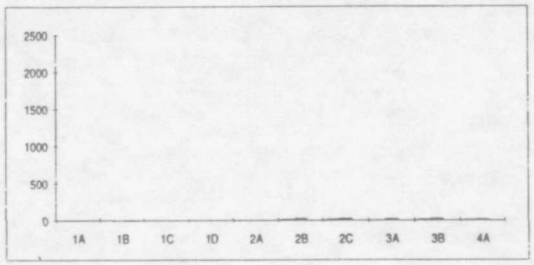
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 10.7 | 31.9 |
| 2B | 19.5 | 29.1 |
| 2C | 7.8 | 27.4 |
| 3A | | 15.3 |
| 3B | 9.4 | 16 |
| 4A | | |




Lead in Surface Soils

Bearing 158

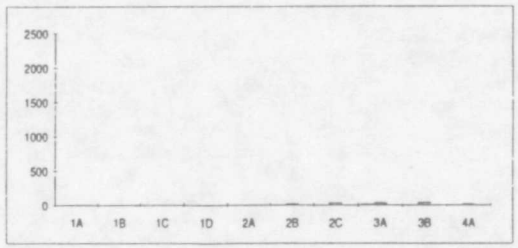
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 13 | 24.6 |
| 2C | 15.6 | 23.1 |
| 3A | | 18.3 |
| 3B | 12.7 | 21.5 |
| 4A | 5.9 | 14 |




Lead in Surface Soils

Bearing180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 21.1 |
| 2C | | 33 |
| 3A | 19.2 | 30.9 |
| 3B | | 38.2 |
| 4A | | 18.3 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Lead Versus Distance From EMF Facilities, SE Quadrant**

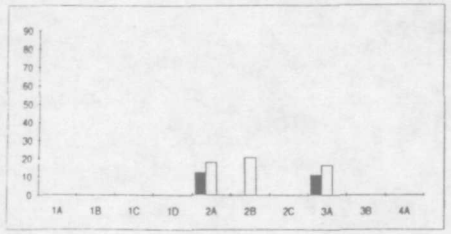
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-46 | |

13-1477b 243
12-3-93 KK 0

Copper in Surface Soils

Bearing 113

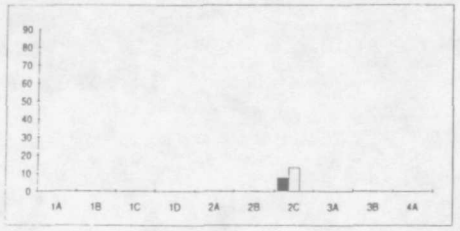
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 12.1 | 17.6 |
| 2B | | 20.2 |
| 2C | | |
| 3A | 10.9 | 16.2 |
| 3B | | |
| 4A | | |




Copper in Surface Soils

Bearing 120

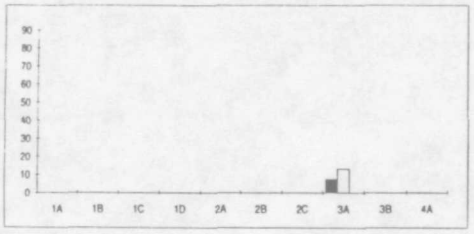
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 7.5 | 13.2 |
| 3A | | |
| 3B | | |
| 4A | | |




Copper in Surface Soils

Bearing 125

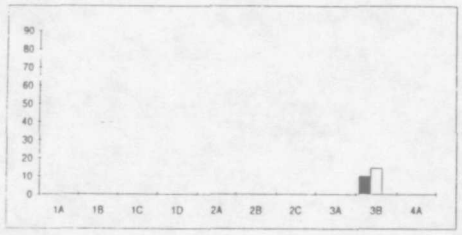
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 7.5 | 13.2 |
| 3B | | |
| 4A | | |




Copper in Surface Soils

Bearing 130

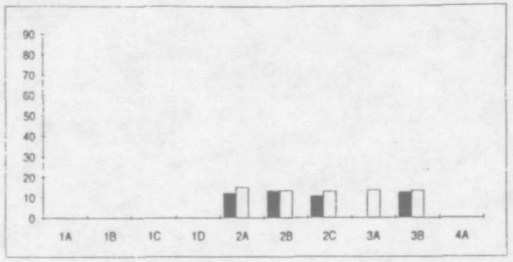
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 9.8 | 14.4 |
| 4A | | |




Copper in Surface Soils

Bearing 135

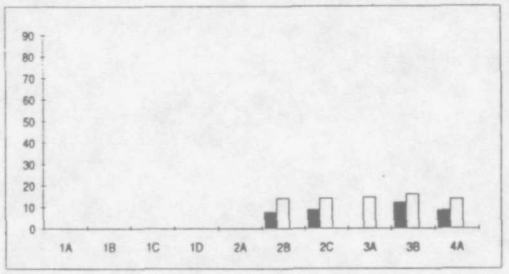
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 12 | 14.9 |
| 2B | 13.1 | 13.4 |
| 2C | 10.5 | 12.9 |
| 3A | | 13.5 |
| 3B | 12.4 | 13.3 |
| 4A | | |




Copper in Surface Soils

Bearing 158

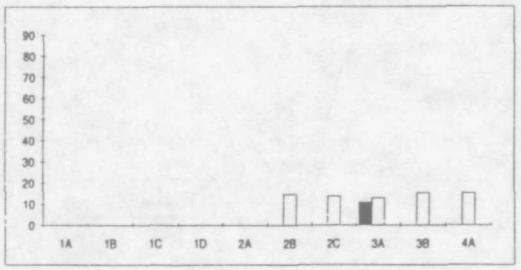
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | 7.6 | 14 |
| 2C | 8.7 | 14 |
| 3A | | 14.5 |
| 3B | 12 | 15.9 |
| 4A | 8.4 | 13.7 |




Copper in Surface Soils

Bearing 180

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | 14.7 |
| 2C | | 13.8 |
| 3A | 10.8 | 12.9 |
| 3B | | 15.4 |
| 4A | | 15.2 |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS -- below surface
SS -- surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Copper Versus Distance From EMF Facilities, SE Quadrant**

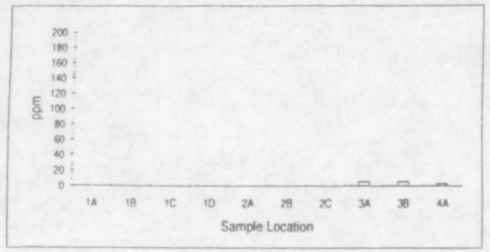
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-47 | |

13-1475-244
12-3-93 VK 0

Cadmium in Surface Soils

Bearing 203

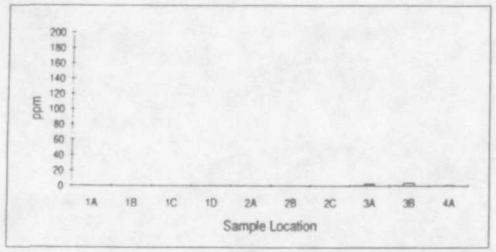
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.42 | 5.8 |
| 3B | 0.1 | 5.9 |
| 4A | 0.52 | 3.1 |




Cadmium in Surface Soils

Bearing 205

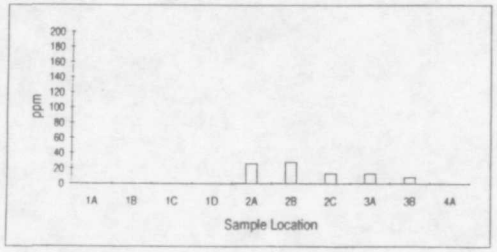
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.68 | 2.6 |
| 3B | 0.69 | 3.9 |
| 4A | 0.31 | 1 |




Cadmium in Surface Soils

Bearing 225

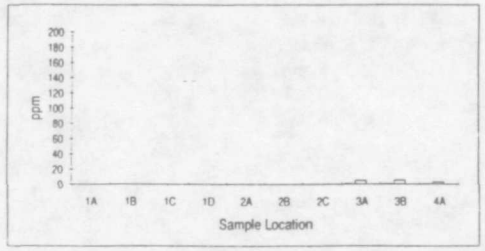
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 0.76 | 26.2 |
| 2B | 0.13 | 28.1 |
| 2C | 0.42 | 13.4 |
| 3A | 0.2 | 13.3 |
| 3B | 0.28 | 8.7 |
| 4A | | |




Cadmium in Surface Soils

Bearing 230

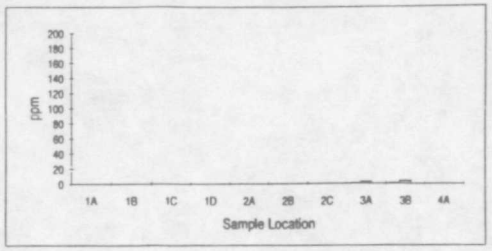
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.78 | 4.8 |
| 3B | 0.6 | 5.2 |
| 4A | 0.44 | 2.7 |




Cadmium in Surface Soils

Bearing 240

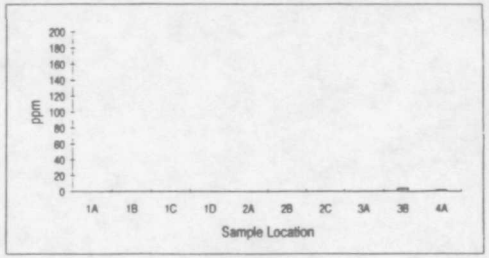
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.62 | 2.6 |
| 3B | 0.89 | 4 |
| 4A | | |




Cadmium in Surface Soils

Bearing 248

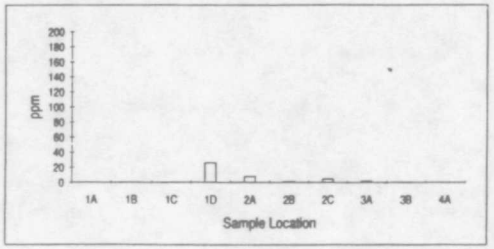
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 0.34 | 3.8 |
| 4A | 0.36 | 1.6 |




Cadmium in Surface Soils

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 0.48 | 26.1 |
| 2A | 0.46 | 8 |
| 2B | | 1.3 |
| 2C | | 4.6 |
| 3A | | 1.8 |
| 3B | 0.53 | 0.51 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Cadmium Versus Distance From EMF Facilities, SW Quadrant**

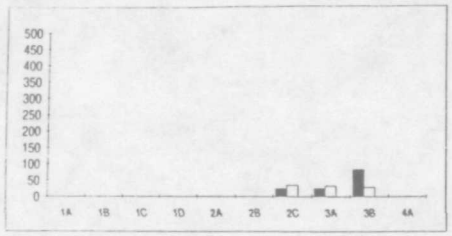
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-48 | |

93-1479-272
2-8-93 rk 3

Chromium in Surface Soils

Bearing 203

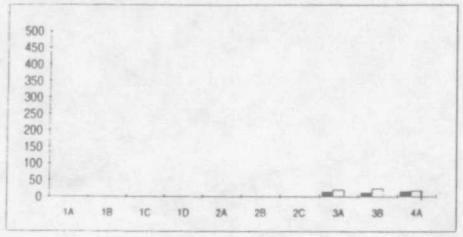
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | 23.8 | 34.4 |
| 3A | 24.4 | 32.2 |
| 3B | 81.7 | 28.8 |
| 4A | | |




Chromium in Surface Soils

Bearing 205

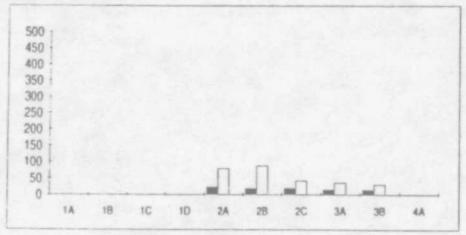
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 15.1 | 21.1 |
| 3B | 12.3 | 24.3 |
| 4A | 16.5 | 18 |




Chromium in Surface Soils

Bearing 225

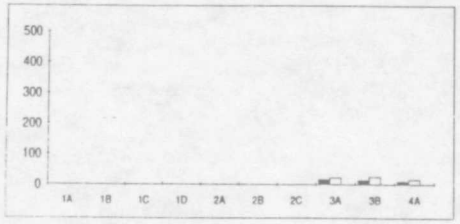
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 22.5 | 79.5 |
| 2B | 18.6 | 87.7 |
| 2C | 19.4 | 42.7 |
| 3A | 14.9 | 36.4 |
| 3B | 14.1 | 30.8 |
| 4A | | |




Chromium in Surface Soils

Bearing 230

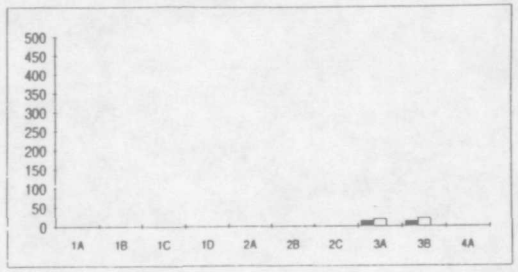
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 16.7 | 22.8 |
| 3B | 14.3 | 25.2 |
| 4A | 10.3 | 16.4 |




Chromium in Surface Soils

Bearing 240

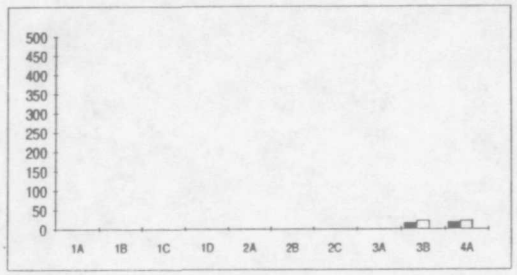
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 14.3 | 18.9 |
| 3B | 13.5 | 21 |
| 4A | | |




Chromium in Surface Soils

Bearing 248

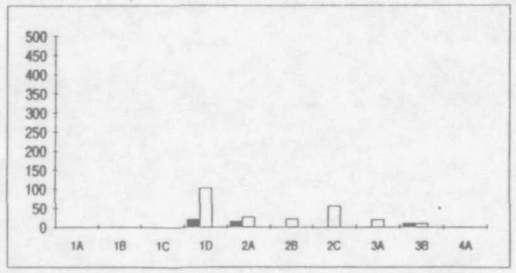
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 15.9 | 22 |
| 4A | 18 | 21.8 |




Chromium in Surface Soils

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 20.6 | 103 |
| 2A | 15.2 | 26.5 |
| 2B | | 21.9 |
| 2C | | 55.8 |
| 3A | | 19.6 |
| 3B | 10.4 | 9.3 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Chromium Versus Distance From EMF Facilities, SW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-49 | |

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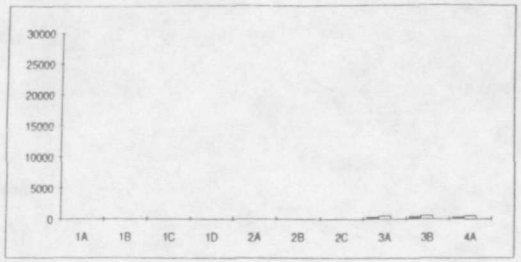
12-3-93 MK 3

Fluoride in Surface Soil

Bearing 203

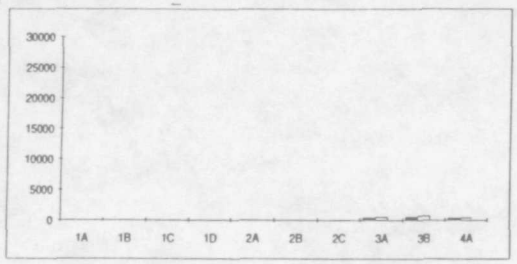
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 391 | 555 |
| 3B | 486 | 573 |
| 4A | 401 | 561 |




Fluoride in Surface Soil

Bearing 205

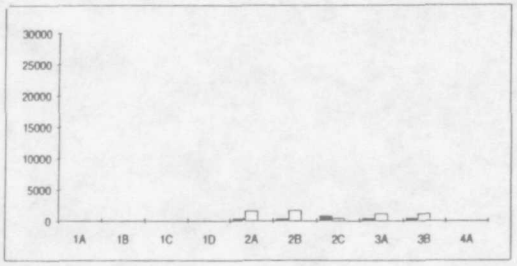
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 441 | 541 |
| 3B | 567 | 732 |
| 4A | 420 | 430 |




Fluoride in Surface Soil

Bearing 225

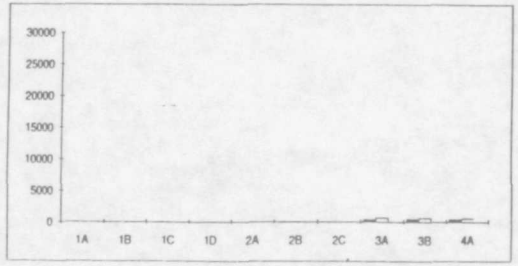
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 438 | 1590 |
| 2B | 383 | 1680 |
| 2C | 848 | 438 |
| 3A | 448 | 1160 |
| 3B | 458 | 1150 |
| 4A | | |




Fluoride in Surface Soil

Bearing 230

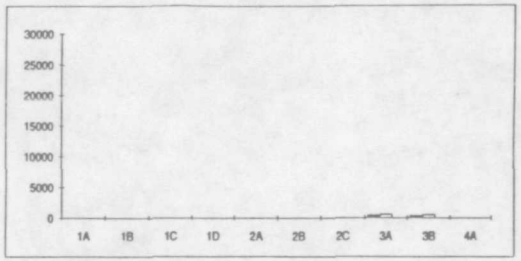
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 420 | 668 |
| 3B | 516 | 681 |
| 4A | 440 | 597 |




Fluoride in Surface Soil

Bearing 240

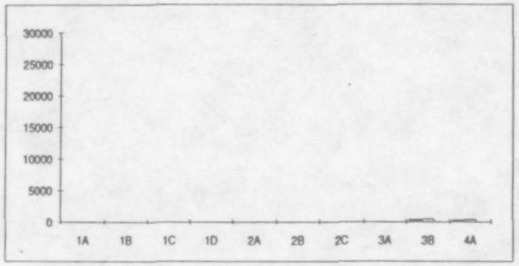
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 477 | 589 |
| 3B | 415 | 538 |
| 4A | | |




Fluoride in Surface Soil

Bearing 248

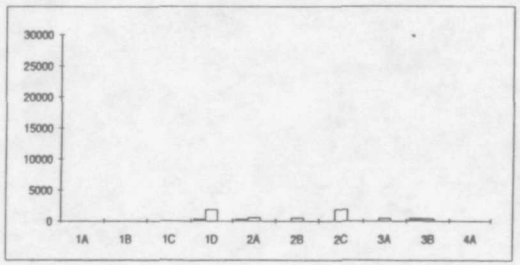
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 425 | 463 |
| 4A | 338 | 400 |




Fluoride in Surface Soil

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 398 | 1870 |
| 2A | 343 | 593 |
| 2B | | 530 |
| 2C | | 1900 |
| 3A | | 470 |
| 3B | 540 | 420 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Fluoride Versus Distance From EMF Facilities, SW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-50 | |

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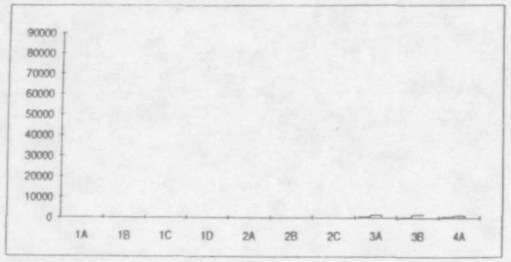
12-3-93 AK 3

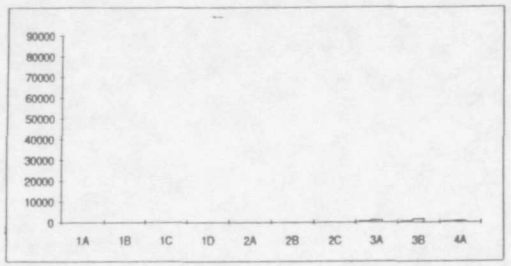
Total Phosphorus in Surface Soil
Bearing 203

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 647 | 1470 |
| 3B | 491 | 1640 |
| 4A | 842 | 1270 |



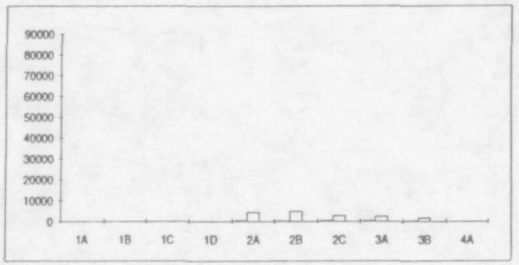

Total Phosphorus in Surface Soil
Bearing 205

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 671 | 1060 |
| 3B | 756 | 1520 |
| 4A | 528 | 719 |



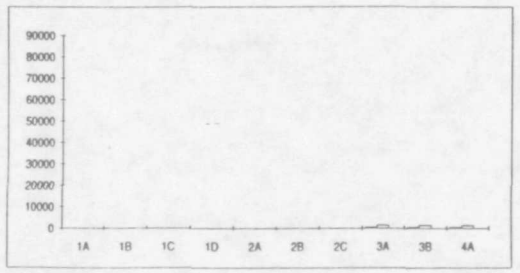

Total Phosphorus in Surface Soil
Bearing 225

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 658 | 4430 |
| 2B | 462 | 4860 |
| 2C | 560 | 2800 |
| 3A | 533 | 2520 |
| 3B | 448 | 1670 |
| 4A | | |



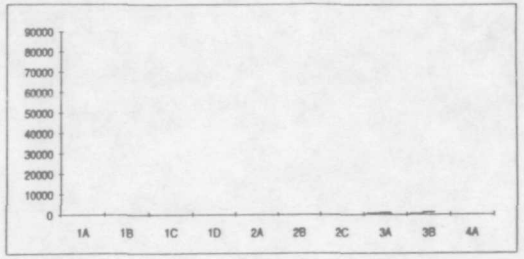

Total Phosphorus in Surface Soil
Bearing 230

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 700 | 1520 |
| 3B | 747 | 1560 |
| 4A | 695 | 1420 |



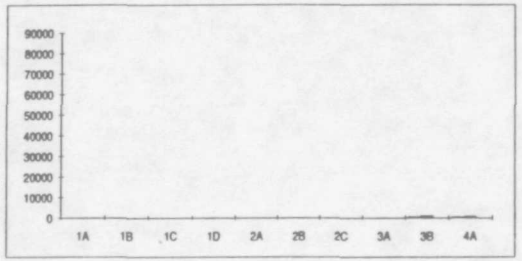

Total Phosphorus in Surface Soil
Bearing 240

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 770 | 1010 |
| 3B | 697 | 1230 |
| 4A | | |



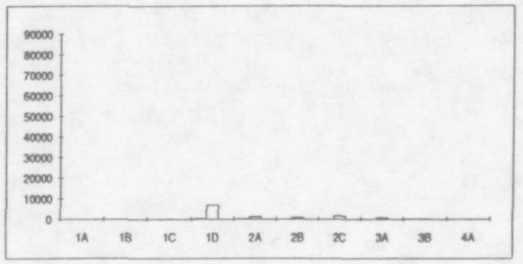

Total Phosphorus in Surface Soil
Bearing 248

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 675 | 994 |
| 4A | 613 | 874 |




Total Phosphorus in Surface Soil
Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 535 | 6910 |
| 2A | 395 | 1320 |
| 2B | | 899 |
| 2C | | 1610 |
| 3A | | 822 |
| 3B | 193 | 368 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Total Phosphorus Versus Distance From EMF Facilities, SW Quadrant**

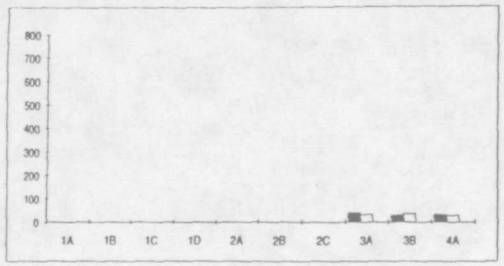
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-51 | |

13-1477b.247
12-3-93 /W 0

Vanadium in Surface Soils

Bearing 203

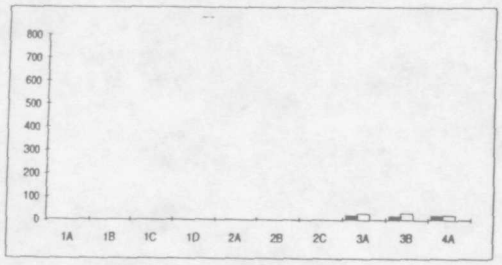
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 41.4 | 33 |
| 3B | 30.4 | 36.7 |
| 4A | 33.3 | 29.3 |




Vanadium in Surface Soils

Bearing 205

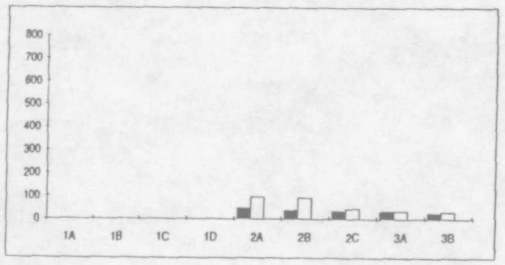
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 21 | 29.3 |
| 3B | 18.7 | 30.4 |
| 4A | 20.6 | 22 |




Vanadium in Surface Soils

Bearing 225

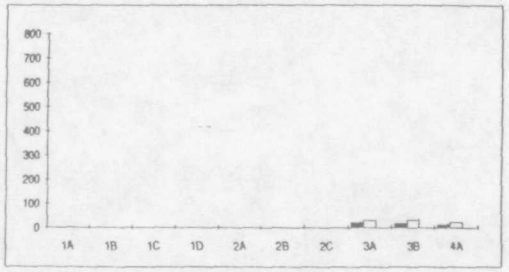
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 46.4 | 95.8 |
| 2B | 38.4 | 91.7 |
| 2C | 34.6 | 44.6 |
| 3A | 33.9 | 35.1 |
| 3B | 26.6 | 30.9 |
| 4A | | |




Vanadium in Surface Soils

Bearing 230

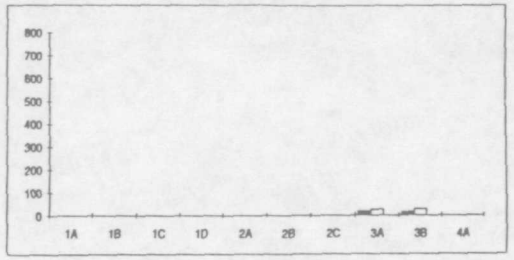
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 23.3 | 30.8 |
| 3B | 19 | 33.4 |
| 4A | 14.5 | 22.9 |




Vanadium in Surface Soils

Bearing 240

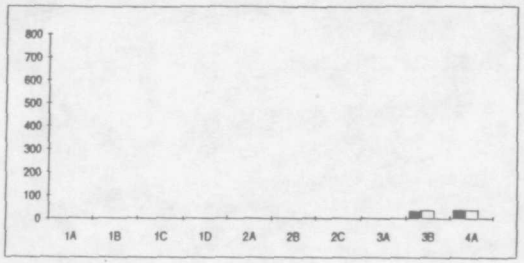
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 19.6 | 25.9 |
| 3B | 17.1 | 28.3 |
| 4A | | |




Vanadium in Surface Soils

Bearing 248

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 33.5 | 35.5 |
| 4A | 38.1 | 36.9 |




Vanadium in Surface Soils

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 42 | 133 |
| 2A | 21.9 | 36.5 |
| 2B | | 31.5 |
| 2C | | 60.3 |
| 3A | | 29.3 |
| 3B | 19.3 | 15.8 |
| 4A | | |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Vandium Versus Distance From EMF Facilities, SW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-52 | |

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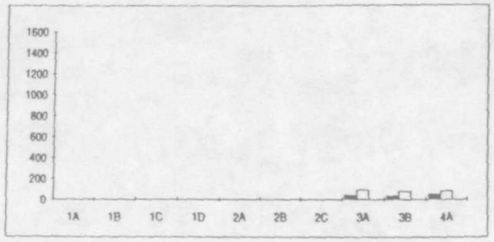
Zinc in Surface Soils

203

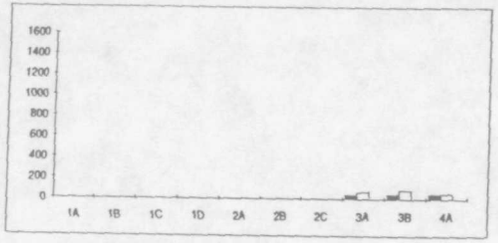
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 42.1 | 90.3 |
| 3B | 34.8 | 79.8 |
| 4A | 50.4 | 81.8 |




Zinc in Surface Soils

Bearing 205

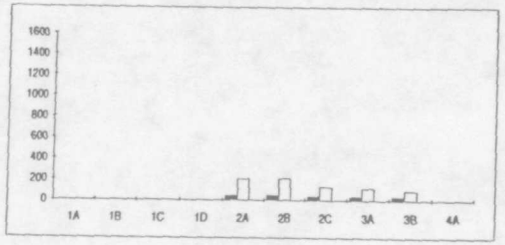
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 39.2 | 67.6 |
| 3B | 45.3 | 87.5 |
| 4A | 47.4 | 54.2 |




Zinc in Surface Soils

Bearing 225

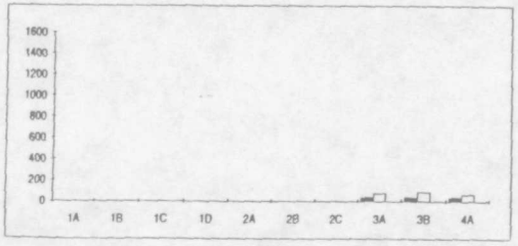
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 43.5 | 204 |
| 2B | 46.2 | 209 |
| 2C | 38.9 | 129 |
| 3A | 36.5 | 117 |
| 3B | 36.3 | 92.9 |
| 4A | | |




Zinc in Surface Soils

Bearing 230

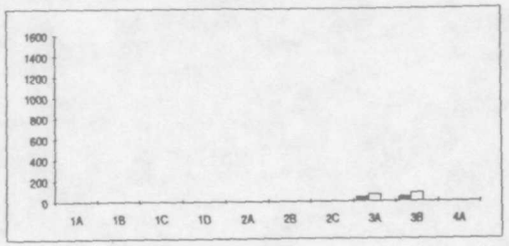
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 40 | 77.7 |
| 3B | 41.4 | 88.5 |
| 4A | 39.9 | 66.5 |




Zinc in Surface Soils

Bearing 240

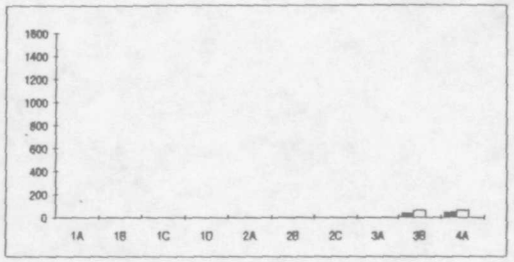
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 43.4 | 67.9 |
| 3B | 43.4 | 81.3 |
| 4A | | |




Zinc in Surface Soils

Bearing 248

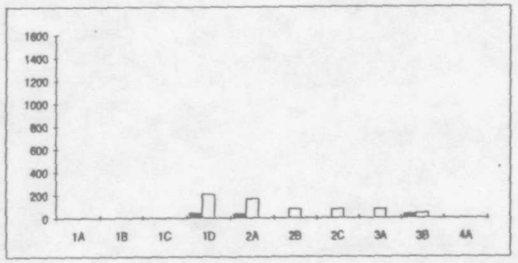
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 37.9 | 61.9 |
| 4A | 48.2 | 64.7 |




Zinc in Surface Soils

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 45 | 209 |
| 2A | 37.9 | 170 |
| 2B | | 79.9 |
| 2C | | 77 |
| 3A | | 74.7 |
| 3B | 35.8 | 43.7 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Zinc Versus Distance From EMF Facilities, SW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-53 | |

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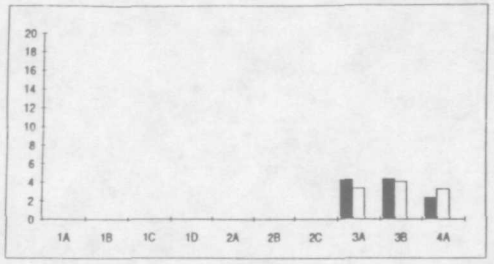
Arsenic in Surface Soils

Bearing 203

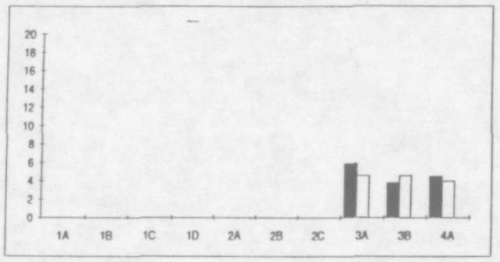
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 4.2 | 3.3 |
| 3B | 4.3 | 4 |
| 4A | 2.3 | 3.2 |




Arsenic in Surface Soils

Bearing 205

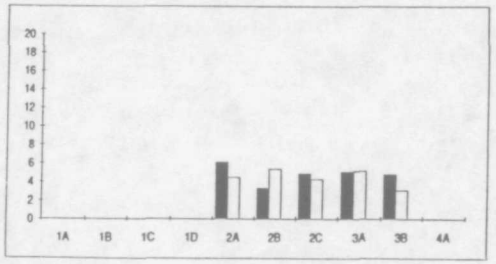
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 5.9 | 4.6 |
| 3B | 3.8 | 4.6 |
| 4A | 4.5 | 4 |




Arsenic in Surface Soils

Bearing 225

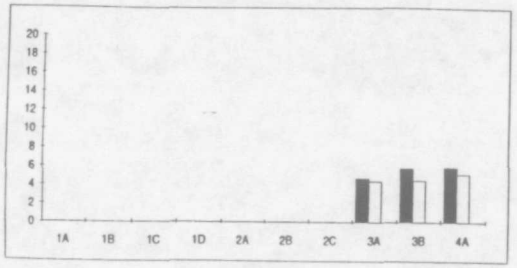
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 6.1 | 4.5 |
| 2B | 3.3 | 5.4 |
| 2C | 4.9 | 4.3 |
| 3A | 5.1 | 5.2 |
| 3B | 4.8 | 3.1 |
| 4A | | |




Arsenic in Surface Soils

Bearing 230

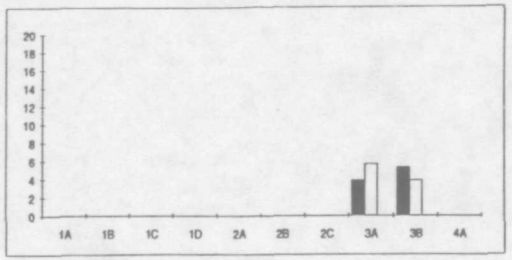
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 4.7 | 4.4 |
| 3B | 5.8 | 4.5 |
| 4A | 5.9 | 5.2 |




Arsenic in Surface Soils

Bearing 240

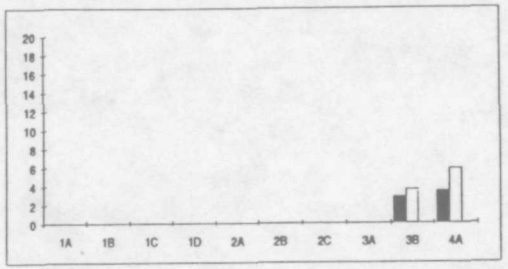
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 3.9 | 5.7 |
| 3B | 5.3 | 3.9 |
| 4A | | |




Arsenic in Surface Soils

Bearing 248

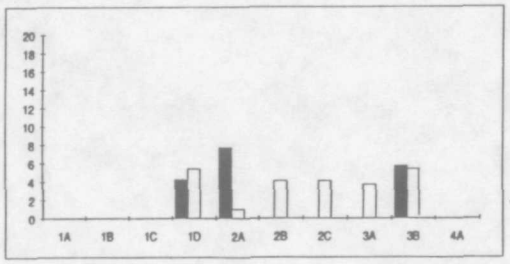
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 2.8 | 3.6 |
| 4A | 3.4 | 5.8 |




Arsenic in Surface Soils

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 4.2 | 5.4 |
| 2A | 7.7 | 1 |
| 2B | | 4.1 |
| 2C | | 4.1 |
| 3A | | 3.7 |
| 3B | 5.7 | 5.4 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Arsenic Versus Distance From EMF Facilities, SW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-54 | |

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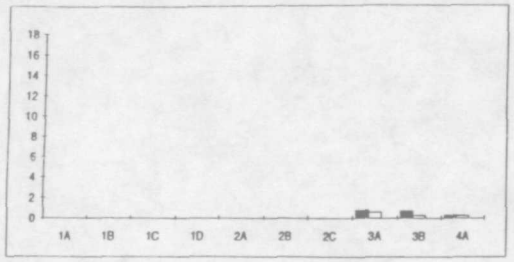
12-3-93 /vk 0

Selenium in Surface Soils

Bearing 203

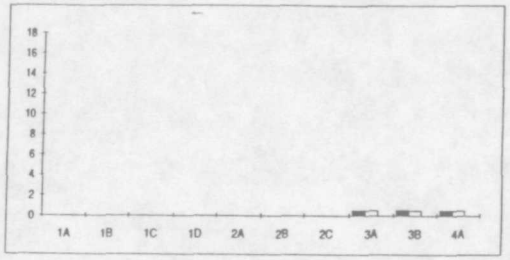
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.8 | 0.6 |
| 3B | 0.73 | 0.29 |
| 4A | 0.33 | 0.26 |




Selenium in Surface Soils

Bearing 205

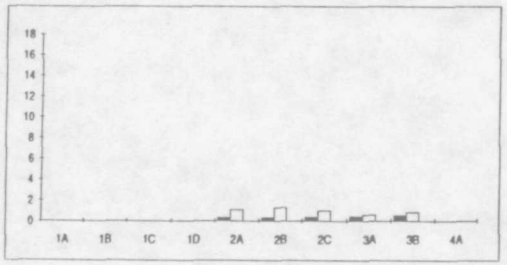
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.53 | 0.51 |
| 3B | 0.57 | 0.51 |
| 4A | 0.53 | 0.52 |




Selenium in Surface Soils

Bearing 225

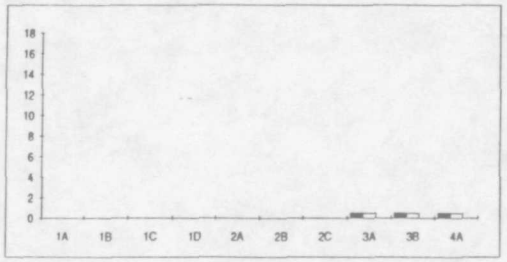
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 0.34 | 1.1 |
| 2B | 0.34 | 1.3 |
| 2C | 0.38 | 1 |
| 3A | 0.46 | 0.61 |
| 3B | 0.54 | 0.87 |
| 4A | | |




Selenium in Surface Soils

Bearing 230

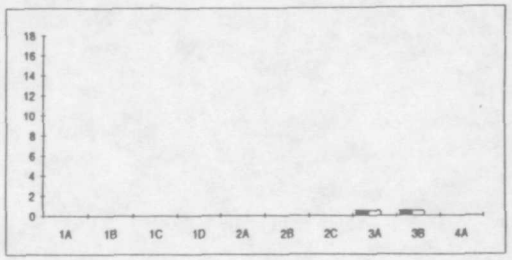
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.55 | 0.5 |
| 3B | 0.53 | 0.51 |
| 4A | 0.54 | 0.51 |




Selenium in Surface Soils

Bearing 240

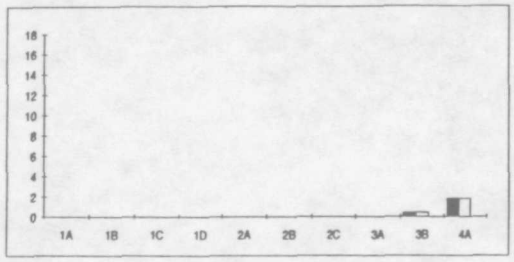
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 0.53 | 0.51 |
| 3B | 0.55 | 0.52 |
| 4A | | |




Selenium in Surface Soils

Bearing 248

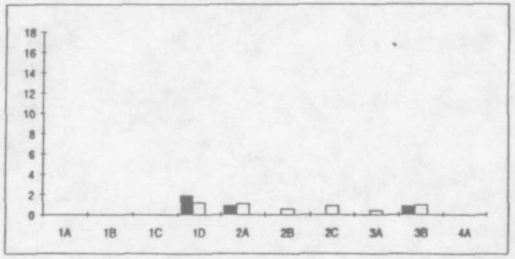
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 0.41 | 0.44 |
| 4A | 1.8 | 1.8 |




Selenium in Surface Soils

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 1.9 | 1.2 |
| 2A | 0.91 | 1.1 |
| 2B | | 0.59 |
| 2C | | 0.89 |
| 3A | | 0.41 |
| 3B | 0.87 | 0.97 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Selenium Versus Distance From EMF Facilities, SW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-55 | |

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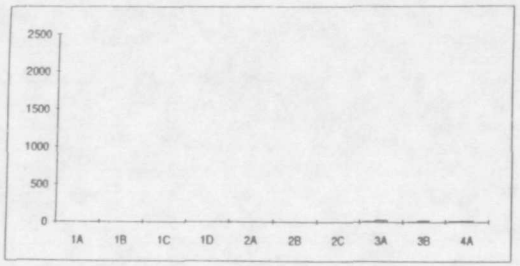
12-3-93 14:13

Lead in Surface Soils

Bearing 203

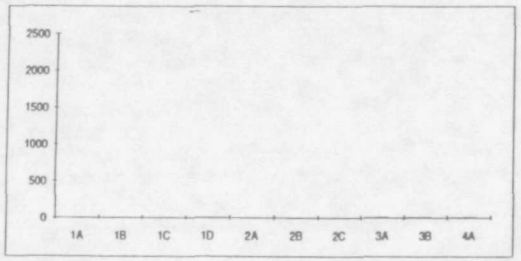
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 13.3 | 27.3 |
| 3B | 11.5 | 23.2 |
| 4A | 16.2 | 18.8 |




Lead in Surface Soils

Bearing 205

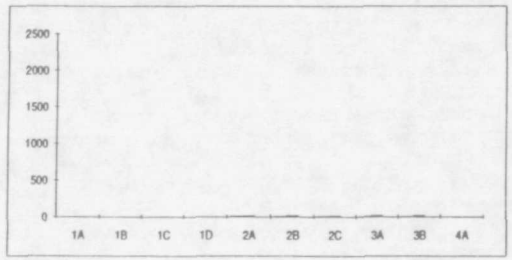
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 6.8 | 10.2 |
| 3B | 9 | 11.5 |
| 4A | 8.1 | 9.7 |




Lead in Surface Soils

Bearing 225

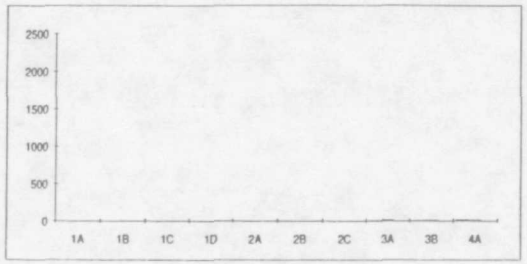
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 11.9 | 16.5 |
| 2B | 9.3 | 19.7 |
| 2C | 10.4 | 15.9 |
| 3A | 10 | 20.5 |
| 3B | 9.5 | 20.7 |
| 4A | | |




Lead in Surface Soils

Bearing 230

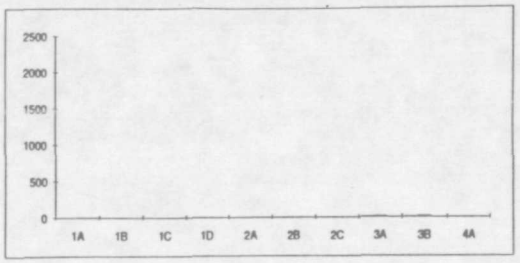
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 9.5 | 15.3 |
| 3B | 6.3 | 12.1 |
| 4A | 17.1 | 13.7 |




Lead in Surface Soils

Bearing 240

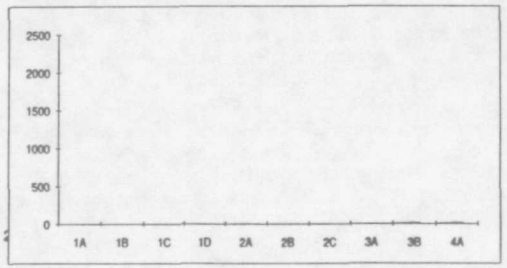
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 7.5 | 13.2 |
| 3B | 7.7 | 14.2 |
| 4A | | |




Lead in Surface Soils

Bearing 248

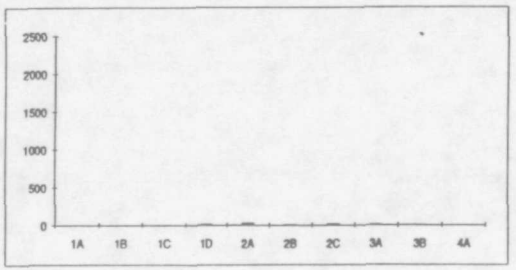
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 11.6 | 17.5 |
| 4A | 11.1 | 18.2 |




Lead in Surface Soils

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 6.7 | 16.8 |
| 2A | 5.3 | 27.9 |
| 2B | | 10.7 |
| 2C | | 18.7 |
| 3A | | 12.3 |
| 3B | 4.6 | 6.9 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Lead Versus Distance From EMF Facilities, SW Quadrant**

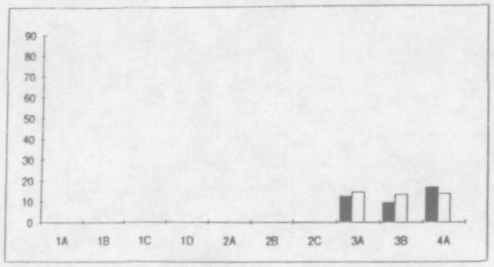
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-56 | |

93-1477b.252
12-3-93 VK 3

Copper in Surface Soils

Bearing 203

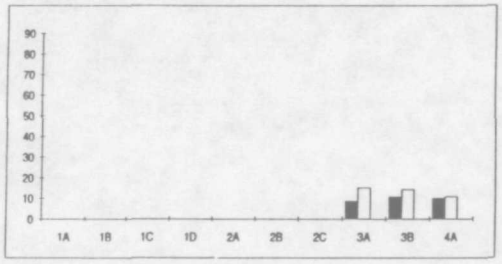
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 12.6 | 14.5 |
| 3B | 9.5 | 13.4 |
| 4A | 16.9 | 13.8 |




Copper in Surface Soils

Bearing 205

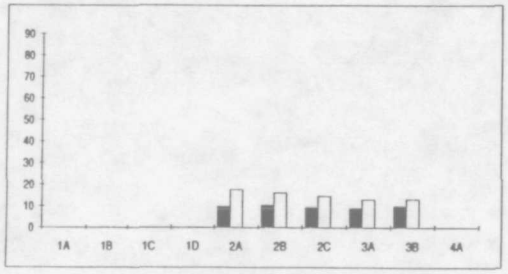
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 8.6 | 15.1 |
| 3B | 10.8 | 14.3 |
| 4A | 10.1 | 10.9 |




Copper in Surface Soils

Bearing 225

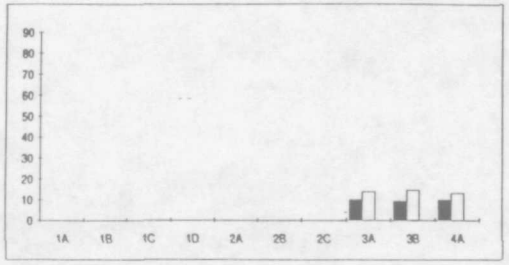
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | 9.7 | 17.7 |
| 2B | 10.4 | 16.2 |
| 2C | 9.5 | 14.7 |
| 3A | 9 | 13.1 |
| 3B | 10 | 13.2 |
| 4A | | |




Copper in Surface Soils

Bearing 230

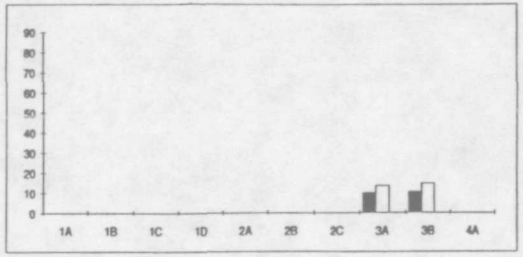
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 9.9 | 13.8 |
| 3B | 9.2 | 14.6 |
| 4A | 9.8 | 13.1 |




Copper in Surface Soils

Bearing 240

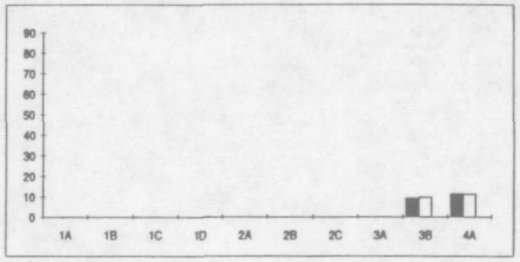
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | 9.8 | 13.4 |
| 3B | 10.4 | 14.6 |
| 4A | | |




Copper in Surface Soils

Bearing 248

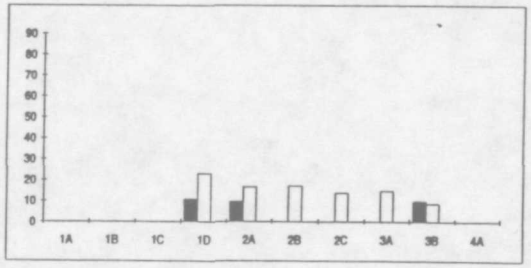
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | | |
| 2A | | |
| 2B | | |
| 2C | | |
| 3A | | |
| 3B | 9.2 | 9.7 |
| 4A | 11.4 | 11.2 |




Copper in Surface Soils

Bearing 270

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | | |
| 1B | | |
| 1C | | |
| 1D | 10.7 | 23 |
| 2A | 9.6 | 16.6 |
| 2B | | 17.1 |
| 2C | | 13.7 |
| 3A | | 14.7 |
| 3B | 9.7 | 8.7 |
| 4A | | |




**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Copper Versus Distance From EMF Facilities, SW Quadrant**

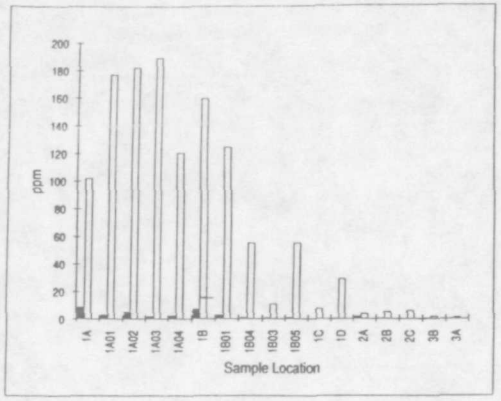
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-57 | |

13-1475.253
12-3-93 VK 0

Cadmium in Surface Soils

Bearing 293

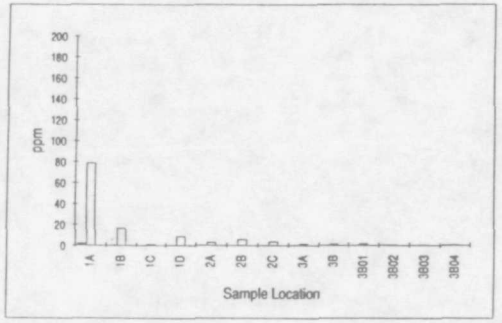
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 8.6 | 102 |
| 1A01 | 3 | 177 |
| 1A02 | 5 | 182 |
| 1A03 | 1.8 | 189 |
| 1A04 | 2.3 | 120 |
| 1B | 7 | 159 |
| 1B01 | 2.8 | 124 |
| 1B04 | 0.98 | 55.3 |
| 1B03 | 0.68 | 10.8 |
| 1B05 | 1 | 55.5 |
| 1C | 0.19 | 7.5 |
| 1D | 0.21 | 29.3 |
| 2A | 1.9 | 3.7 |
| 2B | 0.43 | 5.1 |
| 2C | 0.07 | 5.9 |
| 3B | 0.51 | 1.7 |
| 3A | | 1.1 |




Cadmium in Surface Soils

Bearing 315

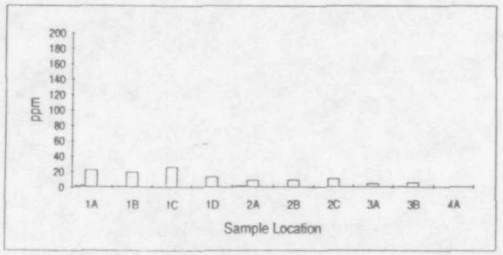
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 2.1 | 78.8 |
| 1B | 0.29 | 16.4 |
| 1C | | 1.1 |
| 1D | 0.26 | 8.8 |
| 2A | 0.34 | 3 |
| 2B | | 5.8 |
| 2C | 0.13 | 3.6 |
| 3A | 0.42 | 1.5 |
| 3B | 0.27 | 1.3 |
| 3B01 | 0.34 | 1.6 |
| 3B02 | 0.79 | 0.34 |
| 3B03 | 0.33 | 0.32 |
| 3B04 | 0.34 | 0.69 |

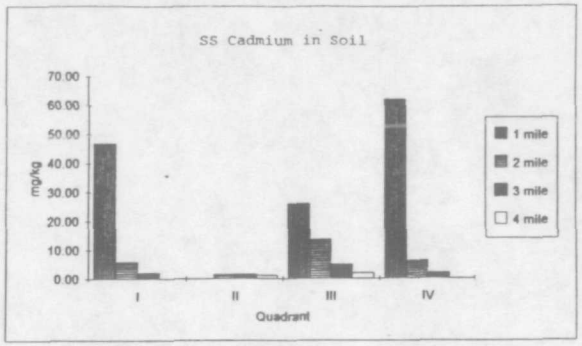



Cadmium in Surface Soils

Bearing 338

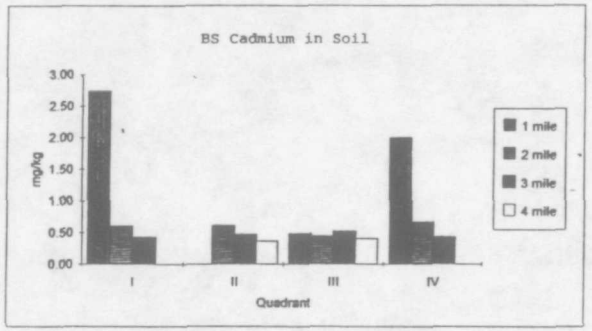
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 2.2 | 22 |
| 1B | 0.45 | 19.1 |
| 1C | | 25.8 |
| 1D | 0.16 | 13.1 |
| 2A | 1.7 | 8.7 |
| 2B | | 9 |
| 2C | 0.09 | 10.6 |
| 3A | 0.05 | 4.2 |
| 3B | 0.74 | 5.6 |
| 4A | | |




Cadmium, total
Surface Sample (SS)

| Distance \ Quadrant | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 46.72 | no data | 26.10 | 62.18 |
| 2 mile | 5.85 | 1.48 | 13.60 | 6.16 |
| 3 mile | 1.99 | 1.48 | 4.84 | 1.84 |
| 4 mile | no data | 1.22 | 2.10 | no data |




Cadmium, total
Below Surface Sample (BS)

| Distance \ Quadrant | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 2.74 | no data | 0.48 | 2.00 |
| 2 mile | 0.80 | 0.61 | 0.44 | 0.87 |
| 3 mile | 0.42 | 0.46 | 0.51 | 0.42 |
| 4 mile | no data | 0.37 | 0.41 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Cadmium Versus Distance From EMF Facilities, NW Quadrant**

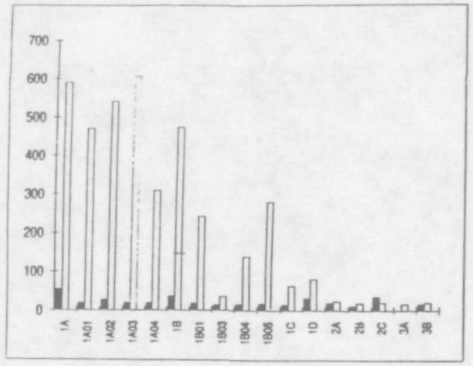
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-58 | |

03-1479-264
12-3-93 14:13

Chromium in Surface Soils

Bearing 293

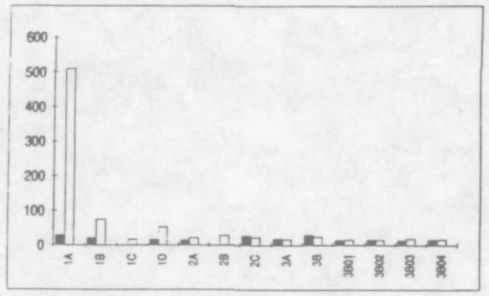
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 54.2 | 591 |
| 1A01 | 18.5 | 470 |
| 1A02 | 27.1 | 542 |
| 1A03 | 18.7 | 608 |
| 1A04 | 18.5 | 309 |
| 1B | 35.2 | 474 |
| 1B01 | 18.2 | 242 |
| 1B03 | 13.7 | 35.2 |
| 1B04 | 15.5 | 138 |
| 1B05 | 17.2 | 281 |
| 1C | 14.9 | 63.1 |
| 1D | 31 | 79.7 |
| 2A | 18.6 | 23.3 |
| 2B | 11 | 18.4 |
| 2C | 34.5 | 20.2 |
| 3A | | 16.3 |
| 3B | 16 | 20.2 |




Chromium in Surface Soils

Bearing 315

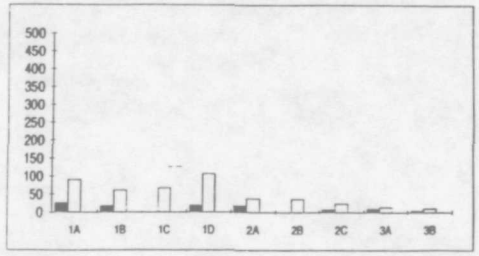
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 28.5 | 510 |
| 1B | 20.8 | 74.7 |
| 1C | | 16.9 |
| 1D | 16.1 | 52.6 |
| 2A | 14.4 | 21.5 |
| 2B | | 28.7 |
| 2C | 26.9 | 23.2 |
| 3A | 18.7 | 17.4 |
| 3B | 29.4 | 24.3 |
| 3B01 | 13.7 | 15.9 |
| 3B02 | 15.5 | 15.1 |
| 3B03 | 14.4 | 18.9 |
| 3B04 | 16.4 | 17.5 |

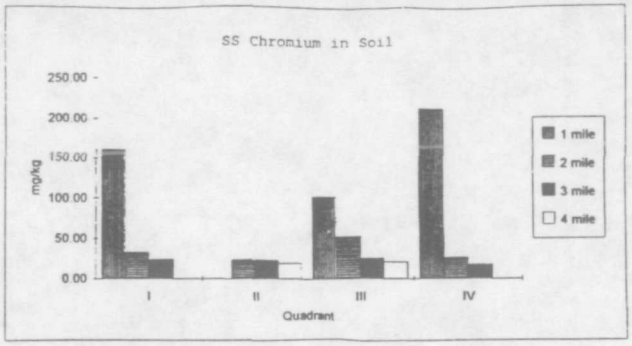



Chromium in Surface Soils

Bearing 338

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 25.4 | 90.7 |
| 1B | 17.6 | 61.4 |
| 1C | | 67 |
| 1D | 19 | 107 |
| 2A | 18.2 | 38.1 |
| 2B | | 36.6 |
| 2C | 8.5 | 24.3 |
| 3A | 10.2 | 14.4 |
| 3B | 4.9 | 10.7 |
| 4A | | |

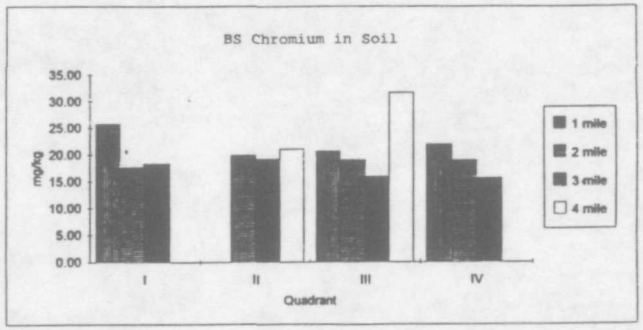



Chromium, total

Surface Sample (SS)

| Distance | Quadrant I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 160.70 | no data | 103.00 | 212.10 |
| 2 mile | 32.69 | 22.92 | 52.35 | 26.03 |
| 3 mile | 23.43 | 22.92 | 24.46 | 17.07 |
| 4 mile | no data | 20.30 | 21.25 | no data |




Chromium, total

Below Surface Sample (BS)

| Distance | Quadrant I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 25.67 | no data | 20.60 | 21.87 |
| 2 mile | 17.60 | 19.80 | 18.93 | 18.87 |
| 3 mile | 18.21 | 19.07 | 15.81 | 15.47 |
| 4 mile | no data | 21.10 | 31.63 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Chromium Versus Distance From EMF Facilities, NW Quadrant**

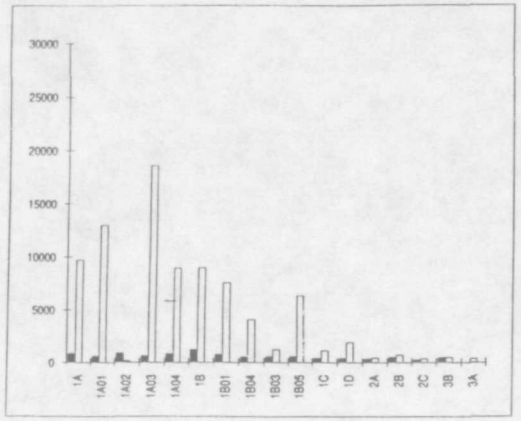
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-59 | |

93-1477b.255
12-6-93 Ak 0

## Fluoride in Surface Soil

Bearing 293

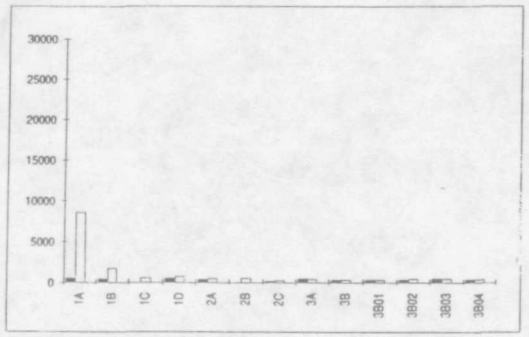
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 868 | 9700 |
| 1A01 | 618 | 13000 |
| 1A02 | 880 | 164 |
| 1A03 | 650 | 18600 |
| 1A04 | 848 | 8940 |
| 1B | 1210 | 8980 |
| 1B01 | 773 | 7540 |
| 1B04 | 555 | 4040 |
| 1B03 | 574 | 1230 |
| 1B05 | 589 | 6290 |
| 1C | 423 | 1130 |
| 1D | 433 | 1900 |
| 2A | 358 | 450 |
| 2B | 518 | 708 |
| 2C | 257 | 363 |
| 3B | 460 | 480 |
| 3A | | 370 |




## Fluoride in Surface Soil

Bearing 315

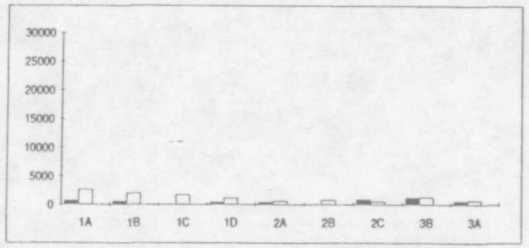
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 540 | 8600 |
| 1B | 458 | 1740 |
| 1C | | 568 |
| 1D | 523 | 745 |
| 2A | 395 | 513 |
| 2B | | 540 |
| 2C | 190 | 259 |
| 3A | 510 | 423 |
| 3B | 339 | 352 |
| 3B01 | 350 | 338 |
| 3B02 | 360 | 450 |
| 3B03 | 510 | 450 |
| 3B04 | 380 | 400 |

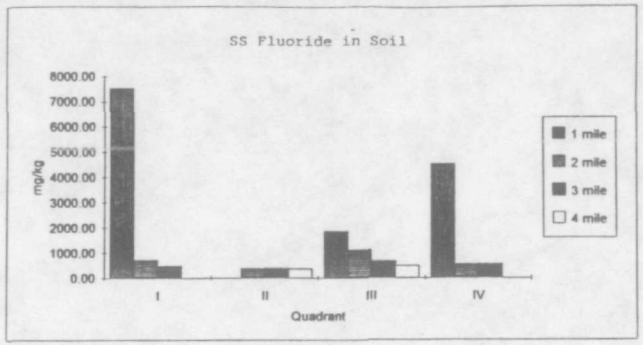



## Fluoride in Surface Soil

Bearing 338

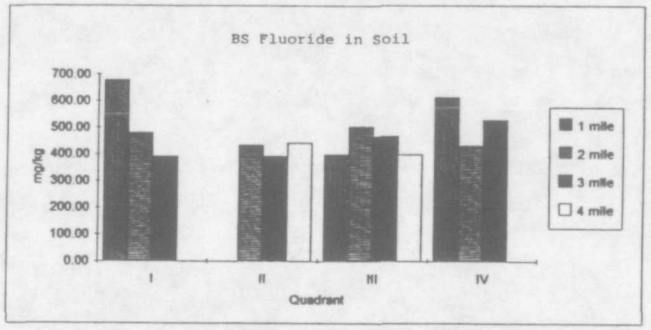
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 660 | 2600 |
| 1B | 605 | 2010 |
| 1C | | 1720 |
| 1D | 423 | 1150 |
| 2A | 420 | 653 |
| 2B | | 820 |
| 2C | 888 | 540 |
| 3B | 1230 | 1300 |
| 3A | 605 | 725 |




Fluoride
Surface Sample (SS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 7532.20 | no data | 1870.00 | 4536.13 |
| 2 mile | 722.12 | 385.44 | 1121.83 | 538.44 |
| 3 mile | 470.50 | 385.44 | 656.92 | 528.80 |
| 4 mile | no data | 379.00 | 497.00 | no data |




Fluoride
Below Surface Sample (BS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 678.72 | no data | 398.00 | 613.71 |
| 2 mile | 479.86 | 433.43 | 503.00 | 432.29 |
| 3 mile | 389.70 | 390.33 | 465.33 | 527.11 |
| 4 mile | no data | 443.00 | 399.75 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

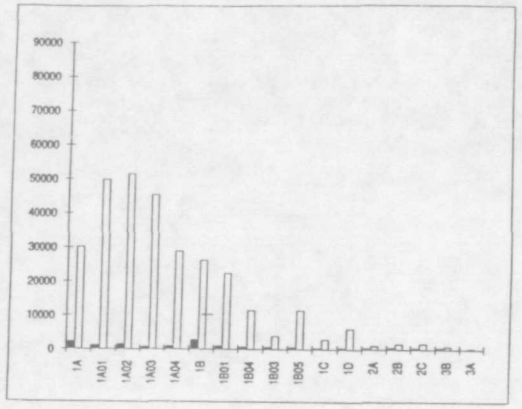
**Concentration of Fluoride Versus Distance From EMF Facilities, NW Quadrant**

| JOB No. | DRAWING No. | REV |
|---|---|---|
| 21372 | FIGURE 4.3-60 | |

Total Phosphorus in Surface Soil

Bearing 293

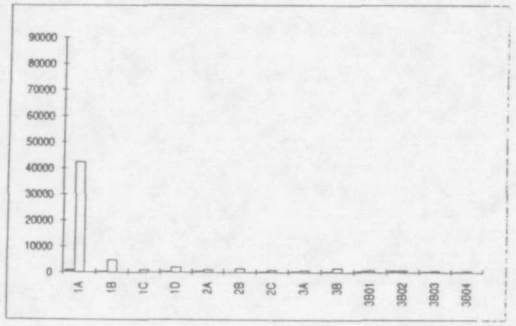
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 2310 | 30100 |
| 1A01 | 1150 | 49800 |
| 1A02 | 1520 | 51500 |
| 1A03 | 897 | 45400 |
| 1A04 | 903 | 28900 |
| 1B | 2770 | 26300 |
| 1B01 | 1100 | 22500 |
| 1B04 | 805 | 11500 |
| 1B03 | 737 | 3900 |
| 1B05 | 738 | 11500 |
| 1C | 427 | 2960 |
| 1D | 524 | 6070 |
| 2A | 478 | 1120 |
| 2B | 609 | 1660 |
| 2C | 532 | 1750 |
| 3B | 543 | 859 |
| 3A | | 300 |




Total Phosphorus in Surface Soil

Bearing 315

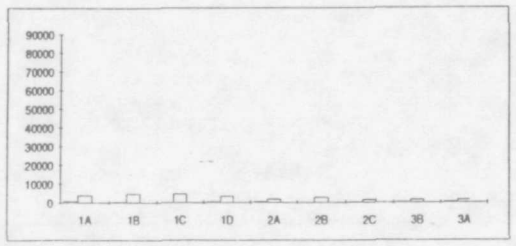
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 1090 | 42400 |
| 1B | 443 | 4850 |
| 1C | | 1050 |
| 1D | 451 | 1960 |
| 2A | 501 | 1070 |
| 2B | | 1450 |
| 2C | 396 | 899 |
| 3A | 583 | 842 |
| 3B | 512 | 1650 |
| 3B01 | 684 | 842 |
| 3B02 | 808 | 794 |
| 3B03 | 483 | 694 |
| 3B04 | 413 | 621 |

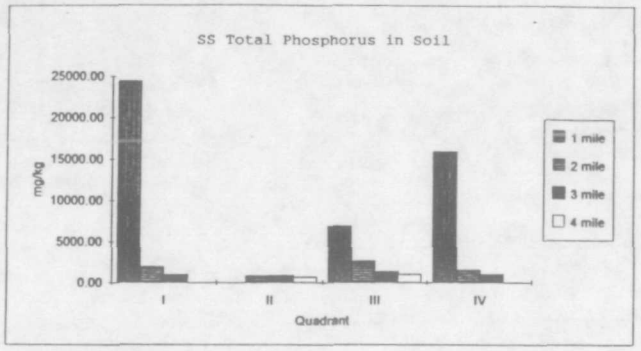



Total Phosphorus in Surface Soil

Bearing 338

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 805 | 3880 |
| 1B | 485 | 4690 |
| 1C | | 4670 |
| 1D | 637 | 3370 |
| 2A | 595 | 1920 |
| 2B | | 2820 |
| 2C | 332 | 1540 |
| 3B | 394 | 1530 |
| 3A | 543 | 1550 |

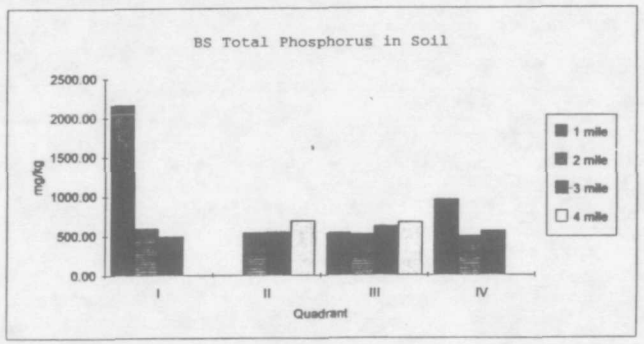



Phosphorus, total

Surface Sample (SS)

| Distance | Quadrant I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 24414.40 | no data | 6910.00 | 15939.17 |
| 2 mile | 1947.76 | 818.00 | 2653.17 | 1581.00 |
| 3 mile | 961.00 | 818.00 | 1337.23 | 968.20 |
| 4 mile | no data | 733.50 | 1070.75 | no data |




Phosphorus, total

Below Surface Sample (BS)

| Distance | Quadrant I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 2161.39 | no data | 535.00 | 954.05 |
| 2 mile | 589.57 | 539.00 | 518.75 | 491.86 |
| 3 mile | 483.90 | 541.00 | 610.67 | 551.44 |
| 4 mile | no data | 690.00 | 669.50 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Total Phosphorus Versus Distance From EMF Facilities, NW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-61 | |

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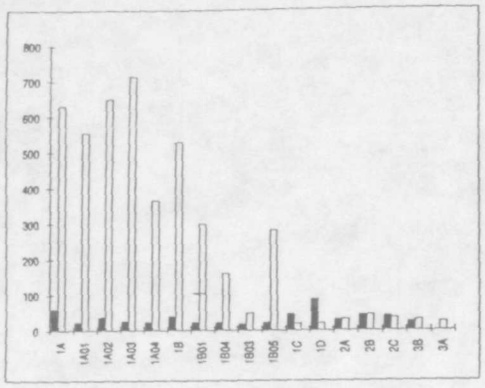
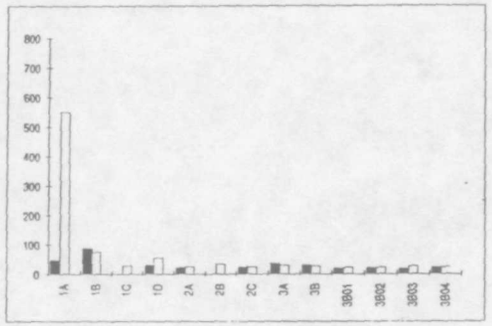
Vanadium in Surface Soils
Bearing 293

| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 59.3 | 630 |
| 1A01 | 23.2 | 555 |
| 1A02 | 36.8 | 649 |
| 1A03 | 25.9 | 713 |
| 1A04 | 23.6 | 364 |
| 1B | 38.7 | 527 |
| 1B01 | 22.7 | 298 |
| 1B04 | 21 | 160 |
| 1B03 | 17.9 | 48.8 |
| 1B05 | 22.1 | 281 |
| 1C | 45.4 | 20.4 |
| 1D | 87.8 | 19.7 |
| 2A | 29.6 | 31.9 |
| 2B | 43.8 | 44.1 |
| 2C | 40.2 | 36.3 |
| 3B | 24.7 | 30.3 |
| 3A | | 25.1 |



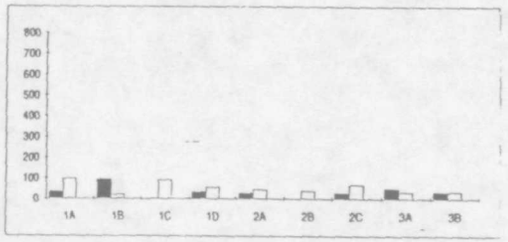

Vanadium in Surface Soils
Bearing 315

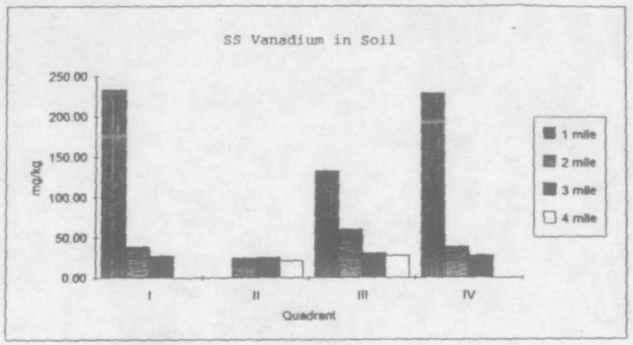
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 47.8 | 550 |
| 1B | 87.8 | 75.6 |
| 1C | | 28.5 |
| 1D | 29.9 | 55.2 |
| 2A | 22.7 | 25.9 |
| 2B | | 34.4 |
| 2C | 24.2 | 25 |
| 3A | 36.8 | 30.2 |
| 3B | 31.2 | 26.4 |
| 3B01 | 19.8 | 22.7 |
| 3B02 | 21.4 | 22.7 |
| 3B03 | 18.1 | 26.7 |
| 3B04 | 22.8 | 24.2 |




Vanadium in Surface Soils
Bearing 338

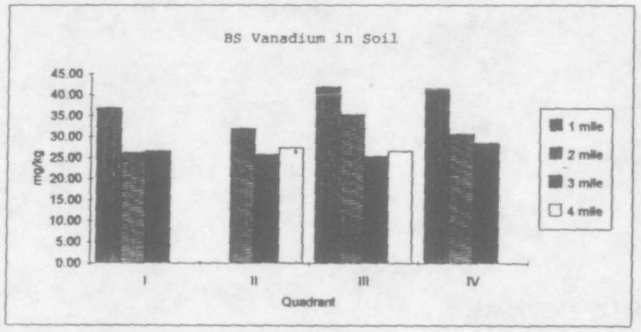
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 32.6 | 97 |
| 1B | 92.6 | 21.1 |
| 1C | | 90.6 |
| 1D | 32.9 | 55.1 |
| 2A | 27 | 44.1 |
| 2B | | 37.5 |
| 2C | 27.6 | 67.6 |
| 3A | 48.9 | 33.2 |
| 3B | 32.5 | 34.4 |




Vanadium, total
Surface Sample (SS)

| Distance | Quadrant I | Quadrant II | Quadrant III | Quadrant IV |
|---|---|---|---|---|
| 1 mile | 233.46 | no data | 133.00 | 230.09 |
| 2 mile | 38.81 | 24.88 | 60.07 | 38.53 |
| 3 mile | 27.30 | 24.88 | 30.34 | 27.59 |
| 4 mile | no data | 21.85 | 27.78 | no data |




Vanadium, total
Below Surface Sample (BS)

| Distance | Quadrant I | Quadrant II | Quadrant III | Quadrant IV |
|---|---|---|---|---|
| 1 mile | 36.92 | no data | 42.00 | 41.51 |
| 2 mile | 26.21 | 31.94 | 35.33 | 30.73 |
| 3 mile | 26.57 | 25.72 | 25.32 | 28.47 |
| 4 mile | no data | 27.40 | 26.63 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

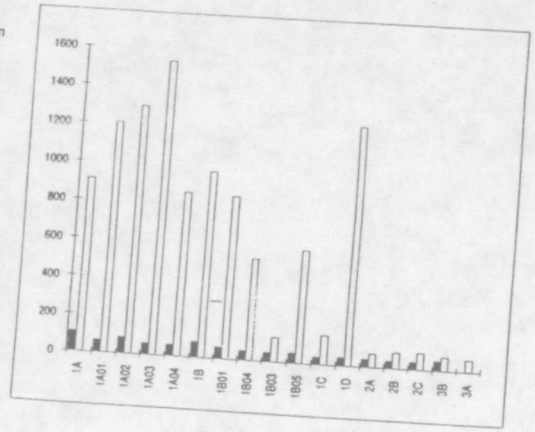
**Concentration of Vandium Versus Distance From EMF Facilities, NW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-62 | |

Zinc in Surface Soils

Bearing 293

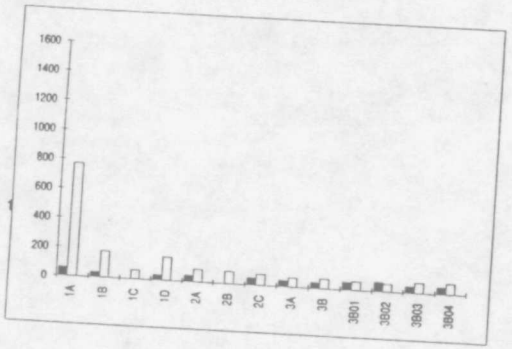
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 106 | 911 |
| 1A01 | 64.6 | 1210 |
| 1A02 | 84.5 | 1300 |
| 1A03 | 60.4 | 1540 |
| 1A04 | 59.1 | 861 |
| 1B | 81.1 | 977 |
| 1B01 | 62.1 | 854 |
| 1B04 | 49.8 | 534 |
| 1B03 | 47.6 | 128 |
| 1B05 | 53.1 | 593 |
| 1C | 40 | 153 |
| 1D | 44.8 | 1250 |
| 2A | 41.9 | 71.2 |
| 2B | 39 | 83.8 |
| 2C | 40.4 | 88.6 |
| 3B | 51.4 | 71.8 |
| 3A | | 63 |




Zinc in Surface Soils

Bearing 315

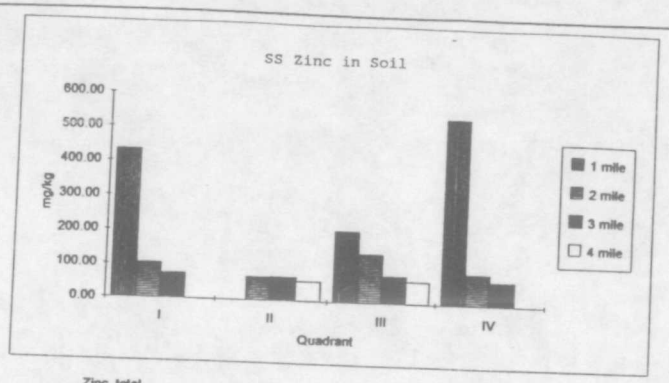
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 61.1 | 771 |
| 1B | 35.9 | 180 |
| 1C | | 60.8 |
| 1D | 35.2 | 158 |
| 2A | 42.7 | 86.8 |
| 2B | | 83.5 |
| 2C | 49.6 | 76 |
| 3A | 42.9 | 63.4 |
| 3B | 40.1 | 66.8 |
| 3B01 | 53.5 | 59.7 |
| 3B02 | 63.7 | 53.5 |
| 3B03 | 44.5 | 70.8 |
| 3B04 | 47.8 | 74.3 |




Zinc in Surface Soils

Bearing 338

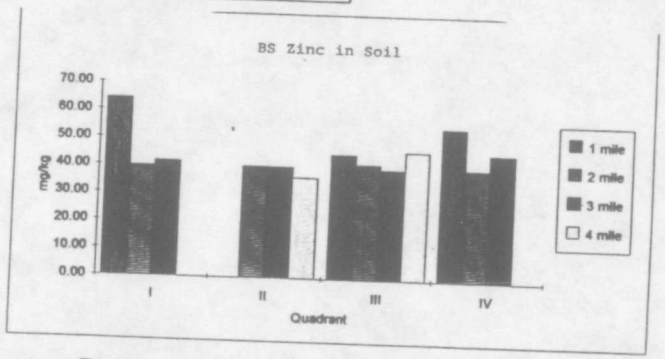
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 59.1 | 183 |
| 1B | 39.1 | 164 |
| 1C | | 215 |
| 1D | 37.6 | 126 |
| 2A | 39.3 | 94.9 |
| 2B | | 108 |
| 2C | 28.9 | 132 |
| 3A | 29 | 81.9 |
| 3B | 39.2 | 86.3 |
| 4A | | |




Zinc, total

Surface Sample (SS)

| Distance | Quadrant I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 433.79 | no data | 209.00 | 544.28 |
| 2 mile | 103.27 | 68.36 | 144.82 | 91.64 |
| 3 mile | 73.40 | 68.36 | 79.29 | 69.15 |
| 4 mile | no data | 59.80 | 66.80 | no data |




Zinc, total

Below Surface Sample (BS)

| Distance | Quadrant I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 64.16 | no data | 45.00 | 55.00 |
| 2 mile | 39.75 | 40.06 | 41.63 | 40.26 |
| 3 mile | 41.43 | 40.03 | 39.68 | 45.79 |
| 4 mile | no data | 36.50 | 46.48 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Zinc Versus Distance From EMF Facilities, NW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-63 | |

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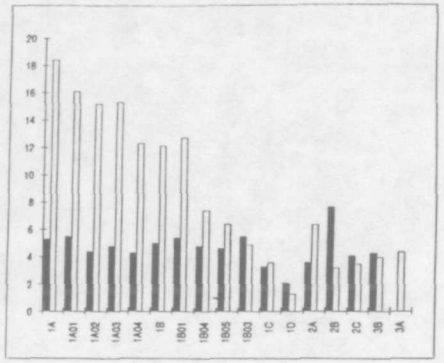
Arsenic in Surface Soils

Bearing 293

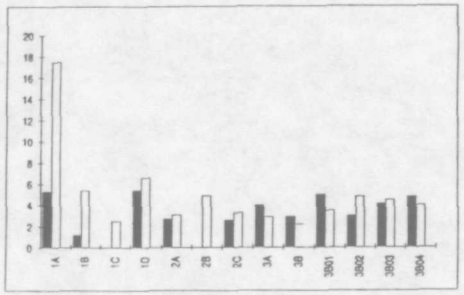
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 5.3 | 18.4 |
| 1A01 | 5.5 | 16.1 |
| 1A02 | 4.4 | 15.2 |
| 1A03 | 4.8 | 15.3 |
| 1A04 | 4.3 | 12.3 |
| 1B | 5 | 12.1 |
| 1B01 | 5.4 | 12.7 |
| 1B04 | 4.8 | 7.4 |
| 1B05 | 4.6 | 6.4 |
| 1B03 | 5.5 | 4.9 |
| 1C | 3.3 | 3.6 |
| 1D | 2.1 | 1.3 |
| 2A | 3.6 | 6.4 |
| 2B | 7.7 | 3.2 |
| 2C | 4.1 | 3.5 |
| 3B | 4.3 | 4 |
| 3A | | 4.4 |




Arsenic in Surface Soils

Bearing 315

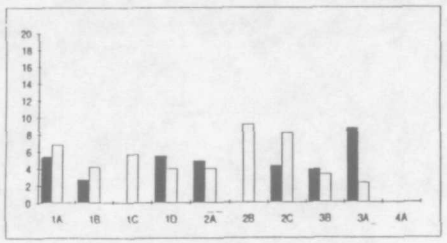
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 5.3 | 17.5 |
| 1B | 1.2 | 5.4 |
| 1C | | 2.5 |
| 1D | 5.4 | 6.6 |
| 2A | 2.7 | 3.1 |
| 2B | | 4.9 |
| 2C | 2.6 | 3.3 |
| 3A | 4 | 2.9 |
| 3B | 2.9 | 2.2 |
| 3B01 | 5 | 3.5 |
| 3B02 | 3 | 4.8 |
| 3B03 | 4.1 | 4.5 |
| 3B04 | 4.8 | 4 |

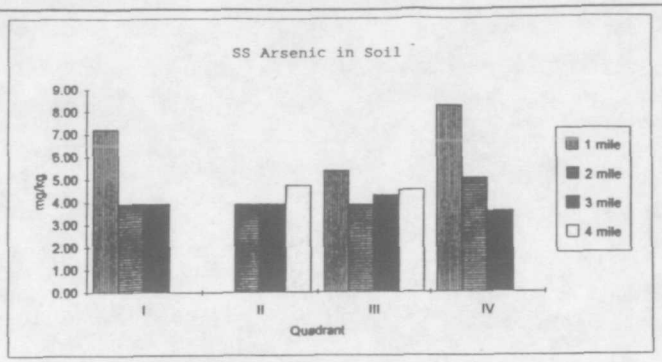



Arsenic in Surface Soils

Bearing 338

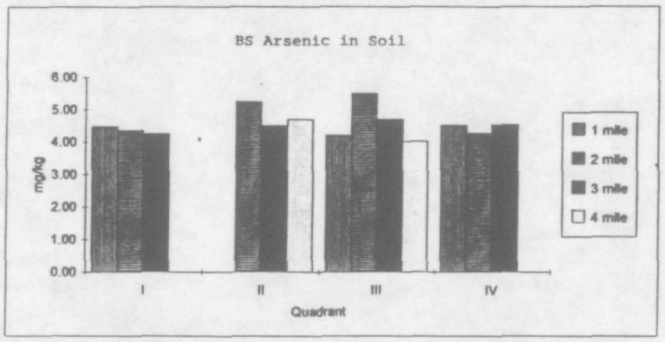
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 5.4 | 6.8 |
| 1B | 2.7 | 4.2 |
| 1C | | 5.7 |
| 1D | 5.5 | 4 |
| 2A | 4.9 | 4 |
| 2B | | 9.2 |
| 2C | 4.3 | 8.2 |
| 3B | 3.9 | 3.3 |
| 3A | 8.7 | 2.3 |
| 4A | | |




Arsenic, total
Surface Sample (SS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 7.21 | no data | 5.40 | 8.28 |
| 2 mile | 3.94 | 3.90 | 3.90 | 5.09 |
| 3 mile | 3.91 | 3.90 | 4.31 | 3.59 |
| 4 mile | no data | 4.75 | 4.55 | no data |




Arsenic, total
Below Surface Sample BS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 4.48 | no data | 4.20 | 4.52 |
| 2 mile | 4.36 | 5.24 | 5.50 | 4.27 |
| 3 mile | 4.24 | 4.50 | 4.89 | 4.52 |
| 4 mile | no data | 4.70 | 4.03 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Arsenic Versus Distance From EMF Facilities, NW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-64 | |

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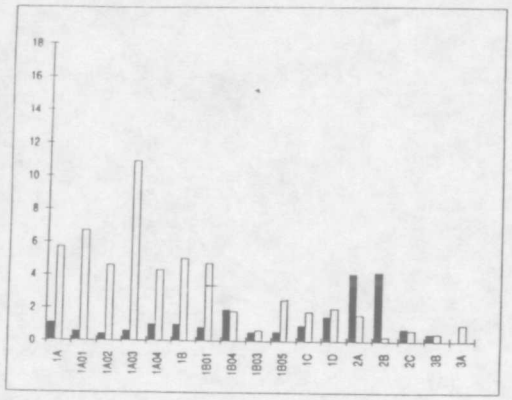
Selenium in Surface Soils

Bearing 293

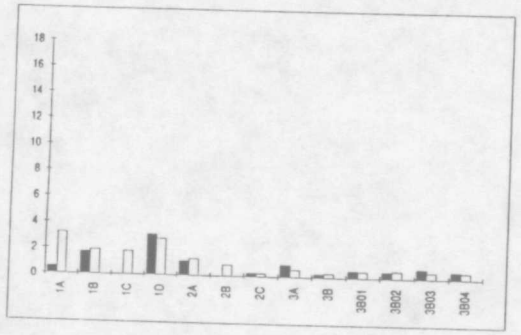
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 1.1 | 5.7 |
| 1A01 | 0.58 | 6.7 |
| 1A02 | 0.43 | 4.6 |
| 1A03 | 0.6 | 10.9 |
| 1A04 | 1 | 4.3 |
| 1B | 1 | 5 |
| 1B01 | 0.83 | 4.7 |
| 1B04 | 1.9 | 1.8 |
| 1B03 | 0.53 | 0.65 |
| 1B05 | 0.57 | 2.5 |
| 1C | 0.96 | 1.8 |
| 1D | 1.5 | 2 |
| 2A | 4.1 | 1.6 |
| 2B | 4.2 | 0.27 |
| 2C | 0.75 | 0.67 |
| 3B | 0.45 | 0.46 |
| 3A | | 1 |




Selenium in Surface Soils

Bearing 315

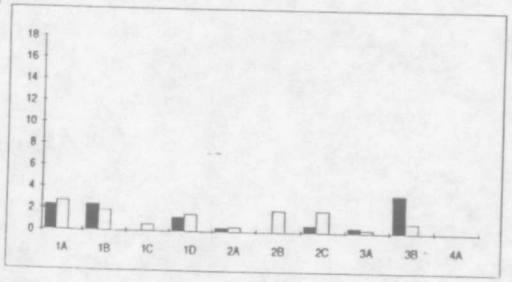
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 0.55 | 3.2 |
| 1B | 1.7 | 1.9 |
| 1C | | 1.8 |
| 1D | 3.1 | 2.8 |
| 2A | 1.1 | 1.3 |
| 2B | | 0.87 |
| 2C | 0.27 | 0.25 |
| 3A | 0.94 | 0.57 |
| 3B | 0.27 | 0.33 |
| 3B01 | 0.56 | 0.5 |
| 3B02 | 0.51 | 0.57 |
| 3B03 | 0.75 | 0.5 |
| 3B04 | 0.57 | 0.5 |

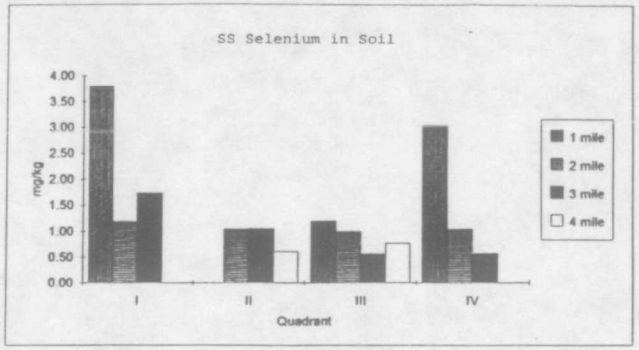



Selenium in Surface Soils

Bearing 338

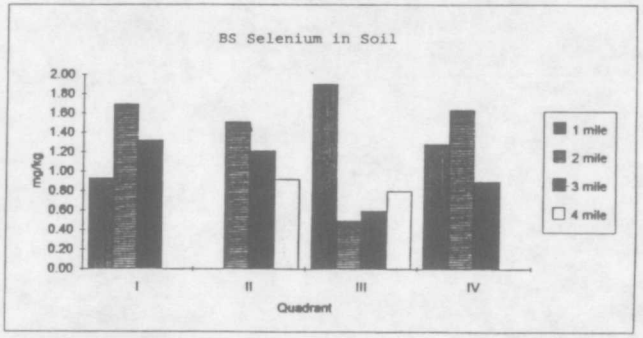
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 2.3 | 2.7 |
| 1B | 2.4 | 1.9 |
| 1C | | 0.62 |
| 1D | 1.3 | 1.6 |
| 2A | 0.37 | 0.43 |
| 2B | | 2 |
| 2C | 0.64 | 2 |
| 3A | 0.48 | 0.28 |
| 3B | 3.5 | 0.93 |
| 4A | | |




Selenium, total
Surface Sample (SS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 3.79 | no data | 1.20 | 3.04 |
| 2 mile | 1.19 | 1.04 | 1.00 | 1.04 |
| 3 mile | 1.73 | 1.04 | 0.56 | 0.56 |
| 4 mile | no data | 0.62 | 0.77 | no data |




Selenium, total
Below Surface Sample (BS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 0.93 | no data | 1.90 | 1.28 |
| 2 mile | 1.69 | 1.51 | 0.49 | 1.63 |
| 3 mile | 1.31 | 1.21 | 0.59 | 0.89 |
| 4 mile | no data | 0.92 | 0.80 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Concentration of Selenium Versus Distance From EMF Facilities, NW Quadrant**

| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-65 | |

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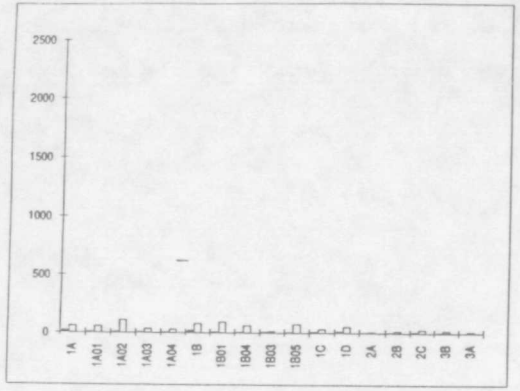
Lead in Surface Soils

Bearing 293

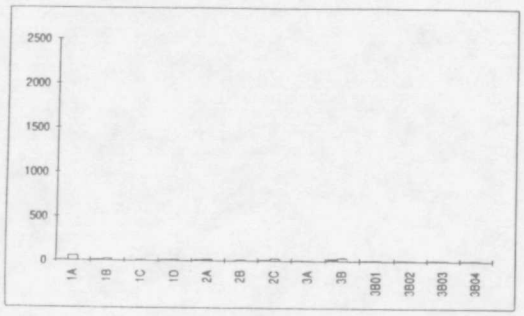
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 21.3 | 60.9 |
| 1A01 | 9 | 55.8 |
| 1A02 | 10.8 | 109 |
| 1A03 | 8.8 | 35.8 |
| 1A04 | 9.2 | 30.5 |
| 1B | 21.6 | 80.1 |
| 1B01 | 10.7 | 94.6 |
| 1B04 | 8.7 | 63.9 |
| 1B03 | 9.7 | 14.3 |
| 1B05 | 9.1 | 76.1 |
| 1C | 12.7 | 33.2 |
| 1D | 14.2 | 54.3 |
| 2A | 6.3 | 9.3 |
| 2B | 7.6 | 17.7 |
| 2C | 11.1 | 29.8 |
| 3B | 5 | 19 |
| 3A | | 12.3 |




Lead in Surface Soils

Bearing 315

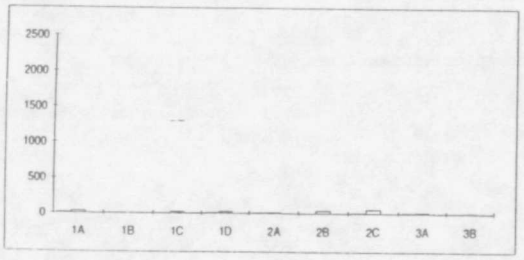
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 7.9 | 57.6 |
| 1B | 12.1 | 23.1 |
| 1C | | 12.6 |
| 1D | 13.7 | 15.7 |
| 2A | 15.6 | 19.9 |
| 2B | | 12.7 |
| 2C | 14.5 | 26.2 |
| 3A | 9.9 | 4.6 |
| 3B | 29.9 | 36.2 |
| 3B01 | 8.9 | 11.6 |
| 3B02 | 10.6 | 7.3 |
| 3B03 | 12.6 | 10.1 |
| 3B04 | 9.2 | 12.1 |

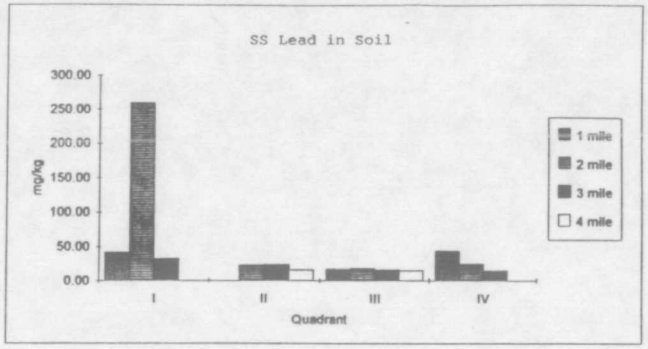



Lead in Surface Soils

Bearing 338

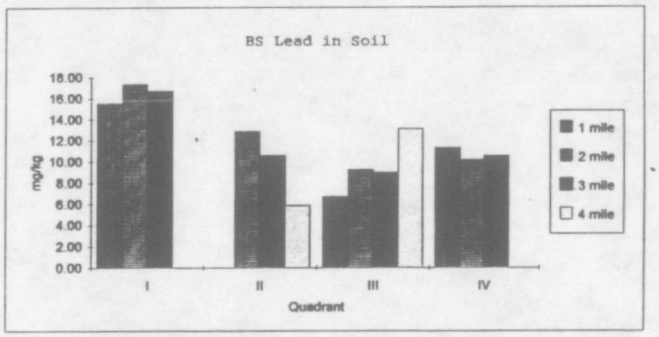
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 11.4 | 27.1 |
| 1B | 3 | 0.86 |
| 1C | | 20.3 |
| 1D | 10.1 | 26.6 |
| 2A | 6.9 | 13.2 |
| 2B | | 40.8 |
| 2C | 9 | 54.4 |
| 3A | 7 | 14.8 |
| 3B | 1.3 | 9.8 |




Lead, total
Surface Sample (SS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 41.50 | no data | 16.80 | 43.30 |
| 2 mile | 259.44 | 23.13 | 18.23 | 24.89 |
| 3 mile | 31.72 | 23.13 | 15.76 | 13.78 |
| 4 mile | no data | 16.15 | 15.10 | no data |




Lead, total
Below Surface Sample (BS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 15.52 | no data | 6.70 | 11.30 |
| 2 mile | 17.34 | 12.86 | 9.23 | 10.14 |
| 3 mile | 16.68 | 10.55 | 8.94 | 10.49 |
| 4 mile | no data | 5.90 | 13.13 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

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POCATELLO, IDAHO

**Concentration of Lead Versus Distance From EMF Facilities, NW Quadrant**

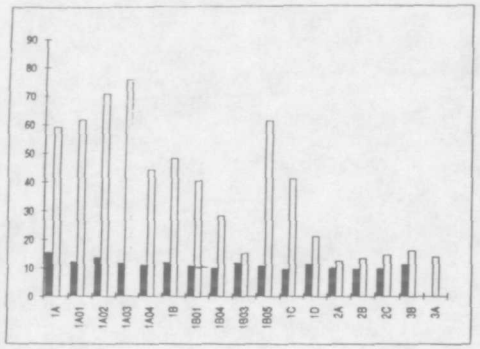
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-66 | |

33-1477b.271
12-8-93 VK 0

Copper in Surface Soils

Bearing 293

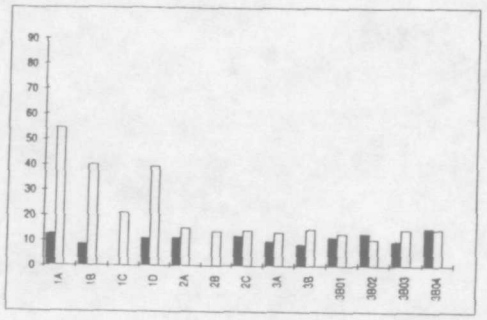
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 15.4 | 59.2 |
| 1A01 | 12 | 61.7 |
| 1A02 | 13.7 | 70.9 |
| 1A03 | 11.6 | 75.7 |
| 1A04 | 11 | 44.3 |
| 1B | 11.8 | 48.3 |
| 1B01 | 10.9 | 40.5 |
| 1B04 | 10 | 28.3 |
| 1B03 | 11.9 | 15.2 |
| 1B05 | 10.9 | 61.5 |
| 1C | 9.7 | 41.1 |
| 1D | 11.4 | 21.1 |
| 2A | 10 | 12.4 |
| 2B | 9.7 | 13.4 |
| 2C | 9.8 | 14.5 |
| 3B | 11.3 | 16.1 |
| 3A | | 13.9 |




Copper in Surface Soils

Bearing 315

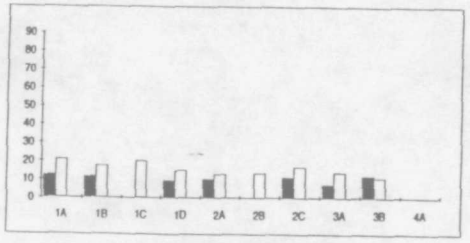
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 12.6 | 54.5 |
| 1B | 8.6 | 40 |
| 1C | | 21 |
| 1D | 10.9 | 39.3 |
| 2A | 11.2 | 14.9 |
| 2B | | 13.7 |
| 2C | 11.8 | 14 |
| 3A | 9.7 | 13.2 |
| 3B | 8.6 | 14.5 |
| 3B01 | 11.4 | 12.8 |
| 3B02 | 12.8 | 10.5 |
| 3B03 | 9.8 | 14.3 |
| 3B04 | 15 | 14.5 |

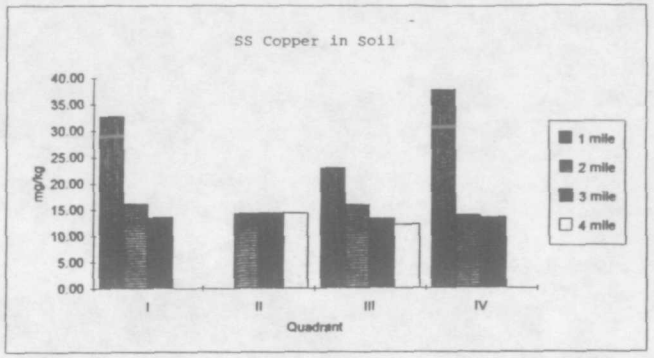



Copper in Surface Soils

Bearing 338

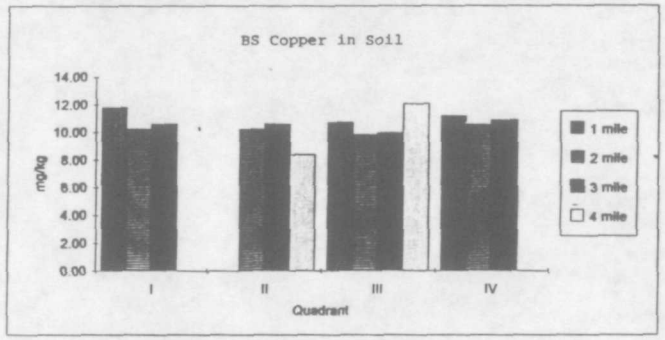
| Location | BS in ppm | SS in ppm |
|---|---|---|
| 1A | 12.2 | 20.7 |
| 1B | 11.3 | 17.3 |
| 1C | | 19.9 |
| 1D | 9.3 | 14.9 |
| 2A | 10.1 | 12.8 |
| 2B | | 13.4 |
| 2C | 11 | 16.8 |
| 3A | 7.2 | 13.8 |
| 3B | 11.8 | 10.9 |
| 4A | | |




Copper, total
Surface Sample (SS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 32.74 | no data | 23.00 | 37.90 |
| 2 mile | 16.20 | 14.37 | 16.00 | 13.99 |
| 3 mile | 13.56 | 14.37 | 13.32 | 13.45 |
| 4 mile | no data | 14.45 | 12.25 | no data |




Copper, total
Below Surface Sample (BS)
Quadrant

| Distance | I | II | III | IV |
|---|---|---|---|---|
| 1 mile | 11.81 | no data | 10.70 | 11.16 |
| 2 mile | 10.25 | 10.21 | 9.80 | 10.51 |
| 3 mile | 10.56 | 10.57 | 9.89 | 10.84 |
| 4 mile | no data | 8.40 | 12.05 | no data |

**Legend:**

Below surface concentration in ppm

Surface soil concentration in ppm

**Notes:**
BS – below surface
SS – surface soil

In the tables accompanying the bar charts, locations listed with no concentration given mean that the constituent was not analyzed at that location or that no sample was taken.

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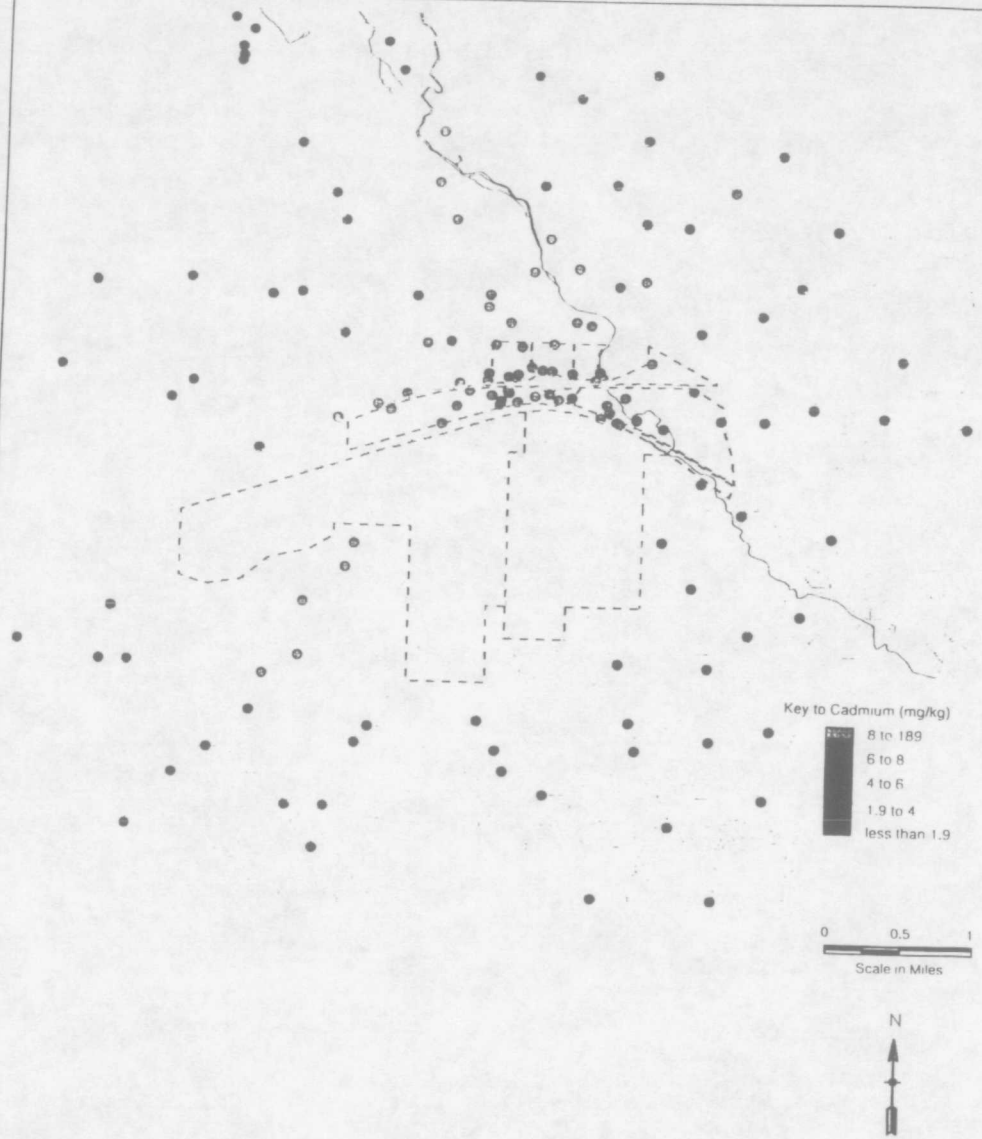
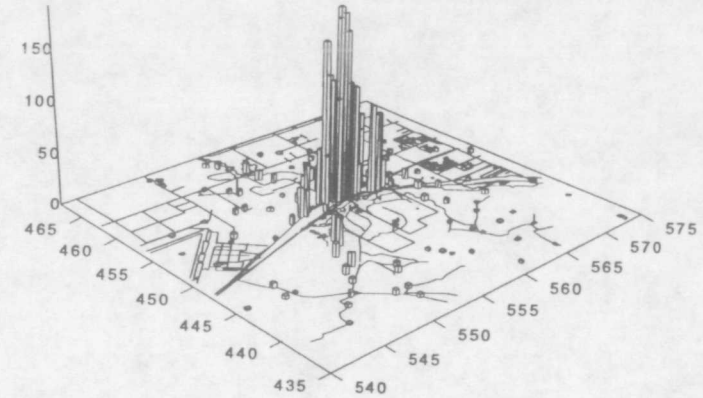
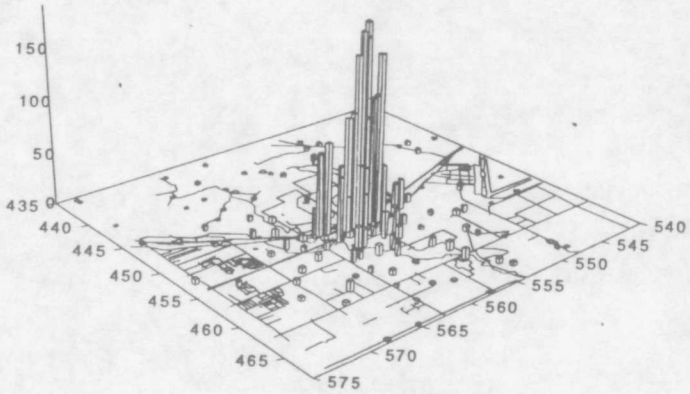
POCATELLO, IDAHO

**Concentration of Copper Versus Distance From EMF Facilities, NW Quadrant**

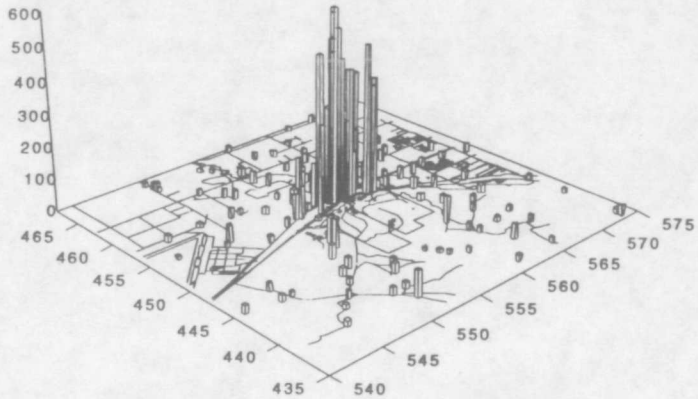
| JOB No. | DRAWING No. | REV. |
|---|---|---|
| 21372 | FIGURE 4.3-67 | |

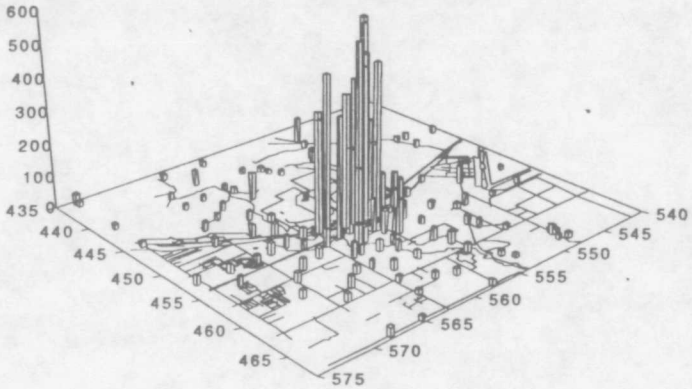


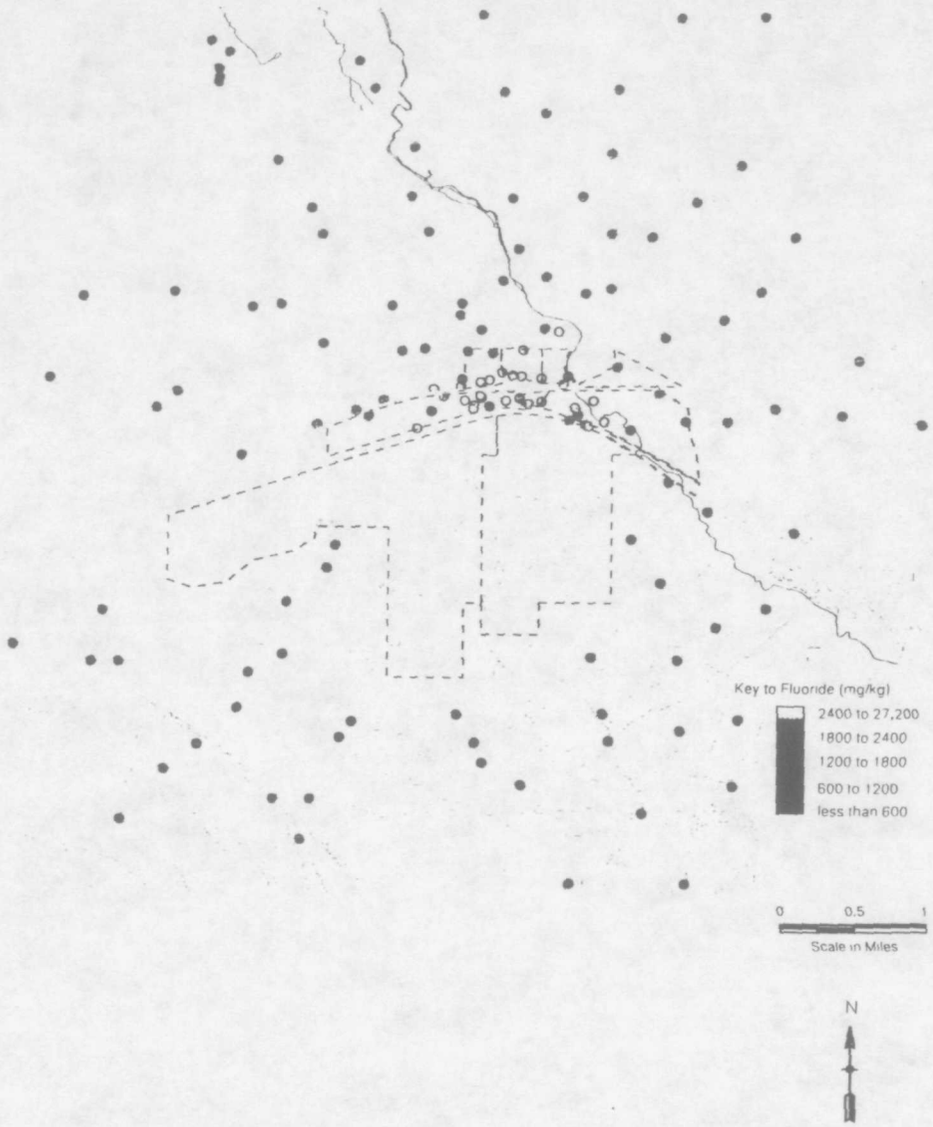



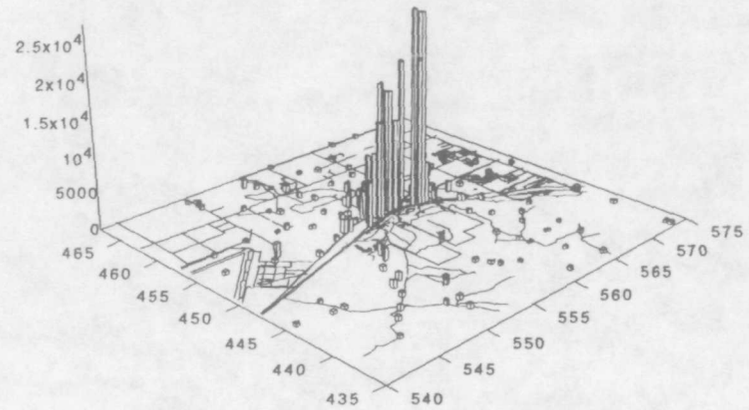

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| Relative Concentrations of Cadmium with Distance from EMF Facilities | | |
| Job Number | Drawing No. | Rev. |
| 21372 | FIGURE 4.3-68 | |

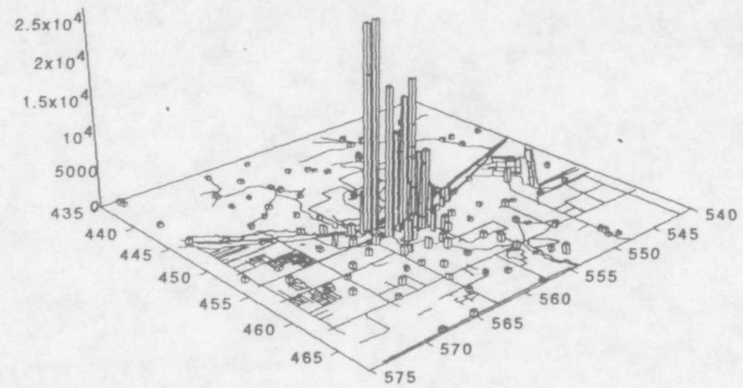


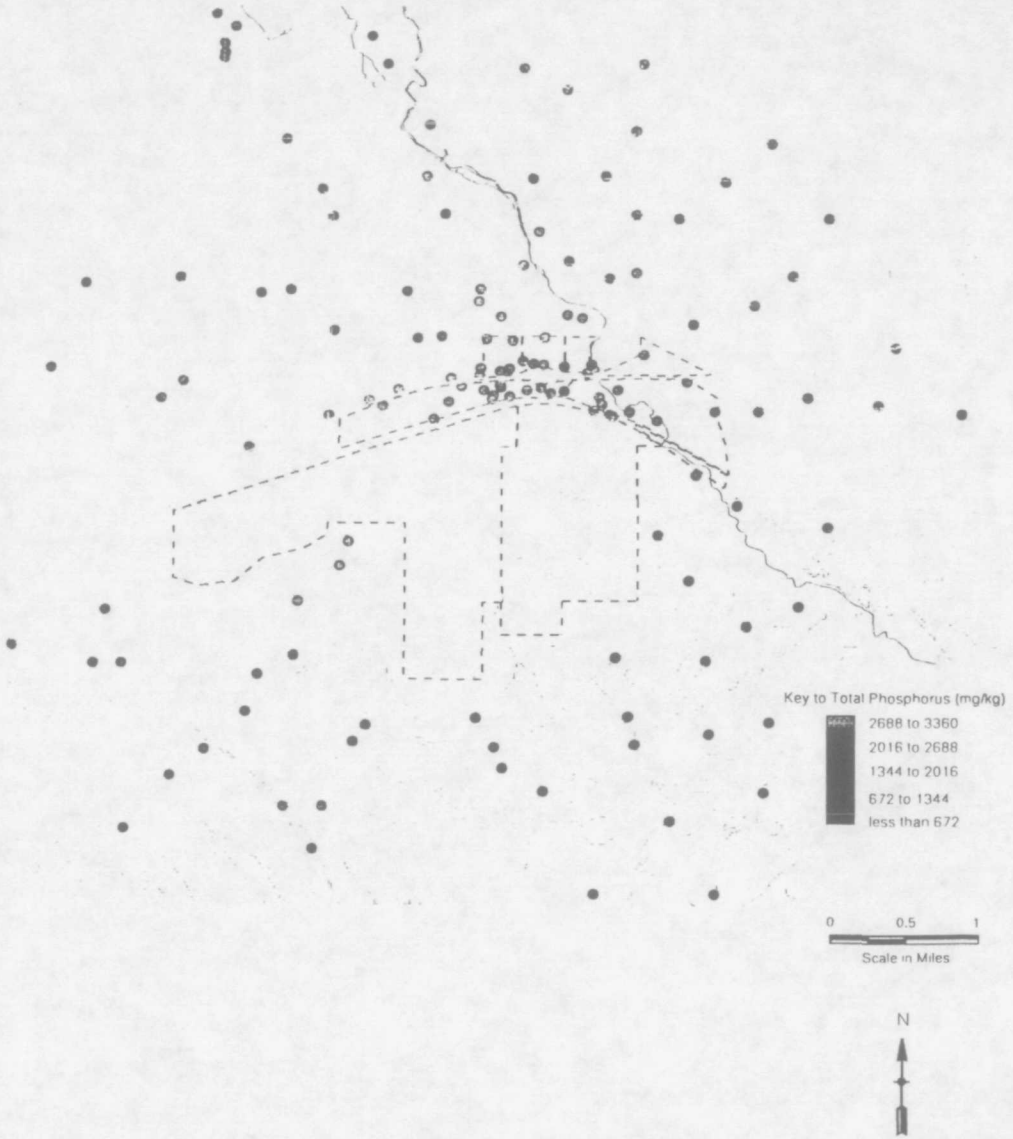

| | | | |
|---|---|---|---|
| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Relative Concentrations of Chromium with Distance from EMF Facilities | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.3-69 | |

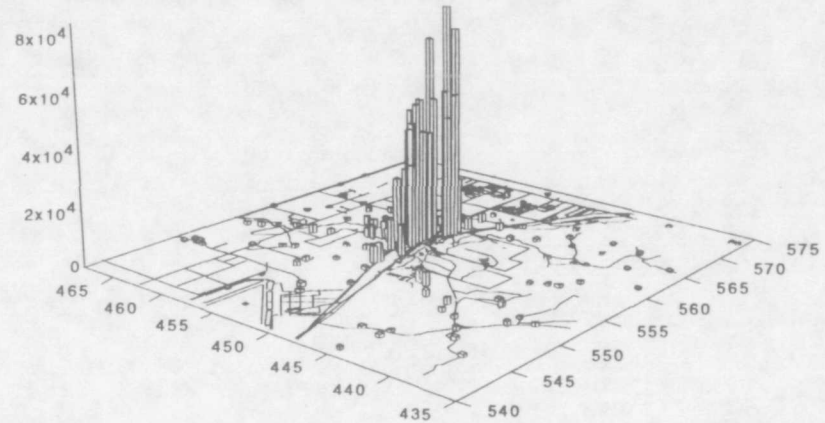


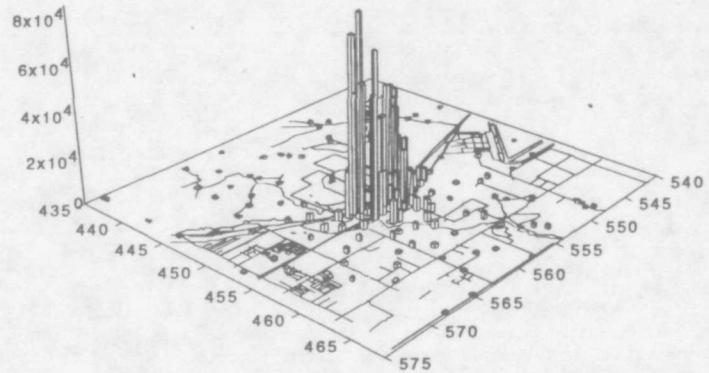



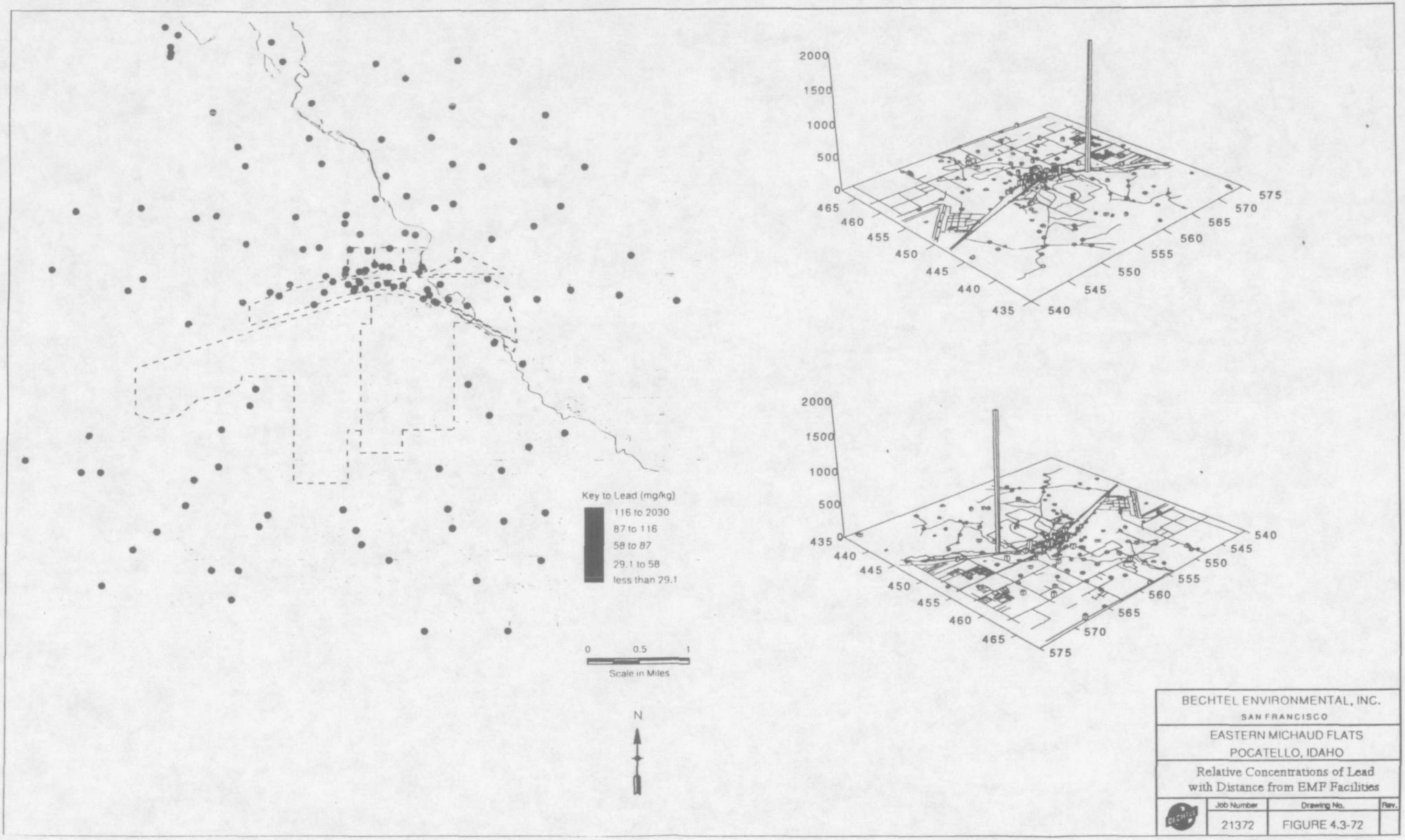

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Relative Concentrations of Fluoride with Distance from EMF Facilities | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.3-70 | |




| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Relative Concentrations of Total Phosphorus with Distance from EMF Facilities | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.3-71 | |

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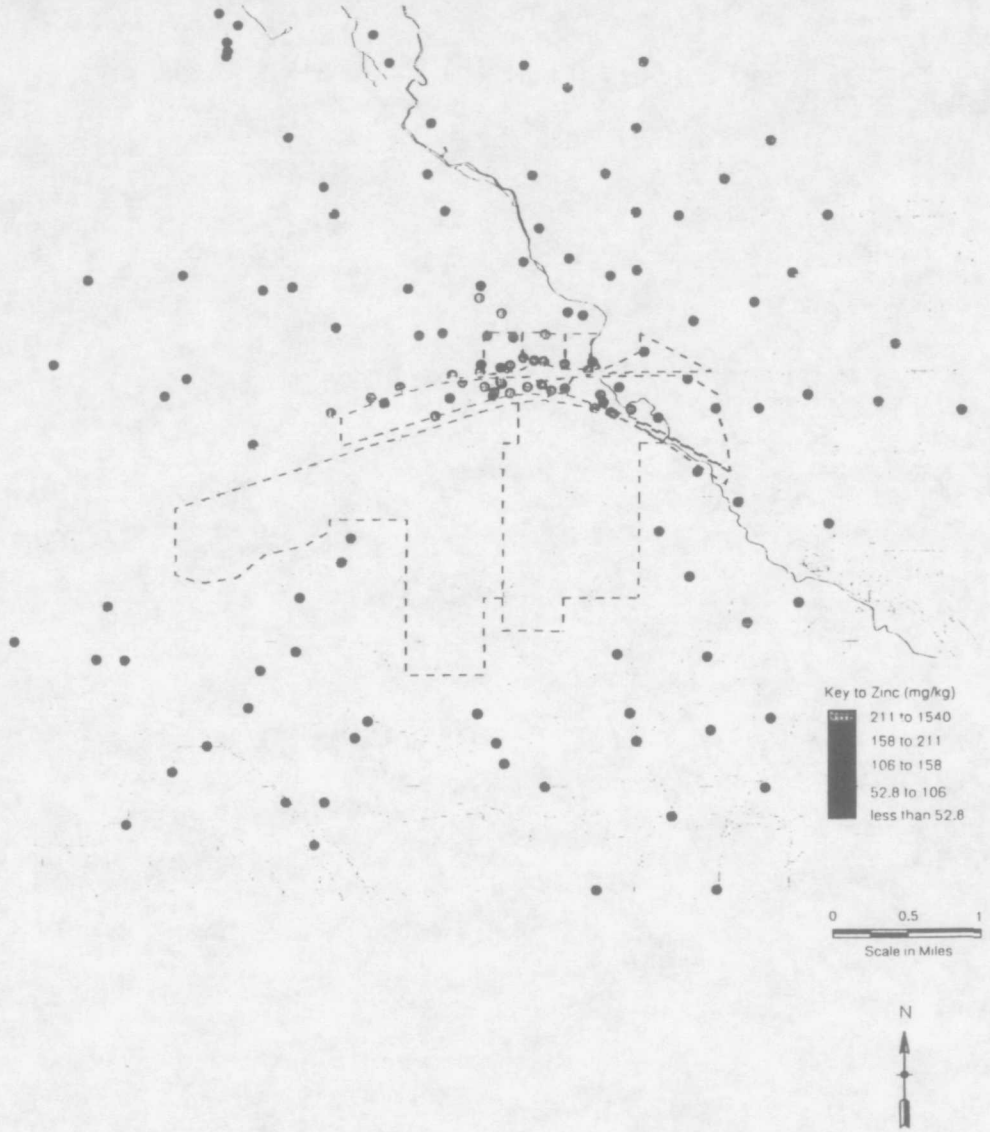
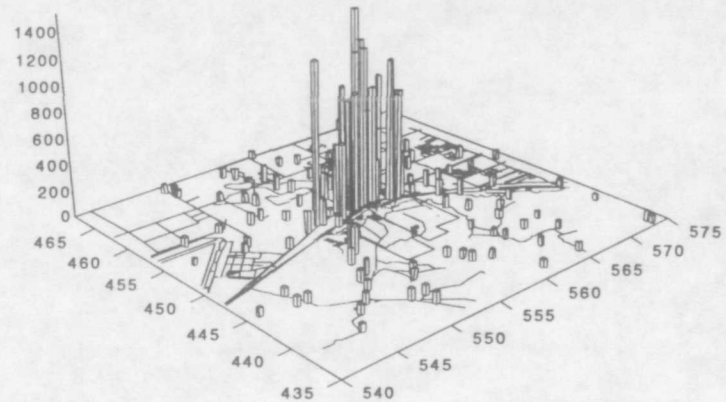
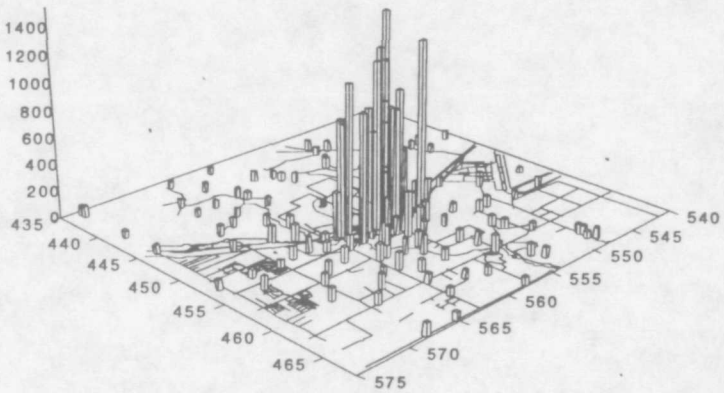
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Relative Concentrations of Lead with Distance from EMF Facilities

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.3-72 | |

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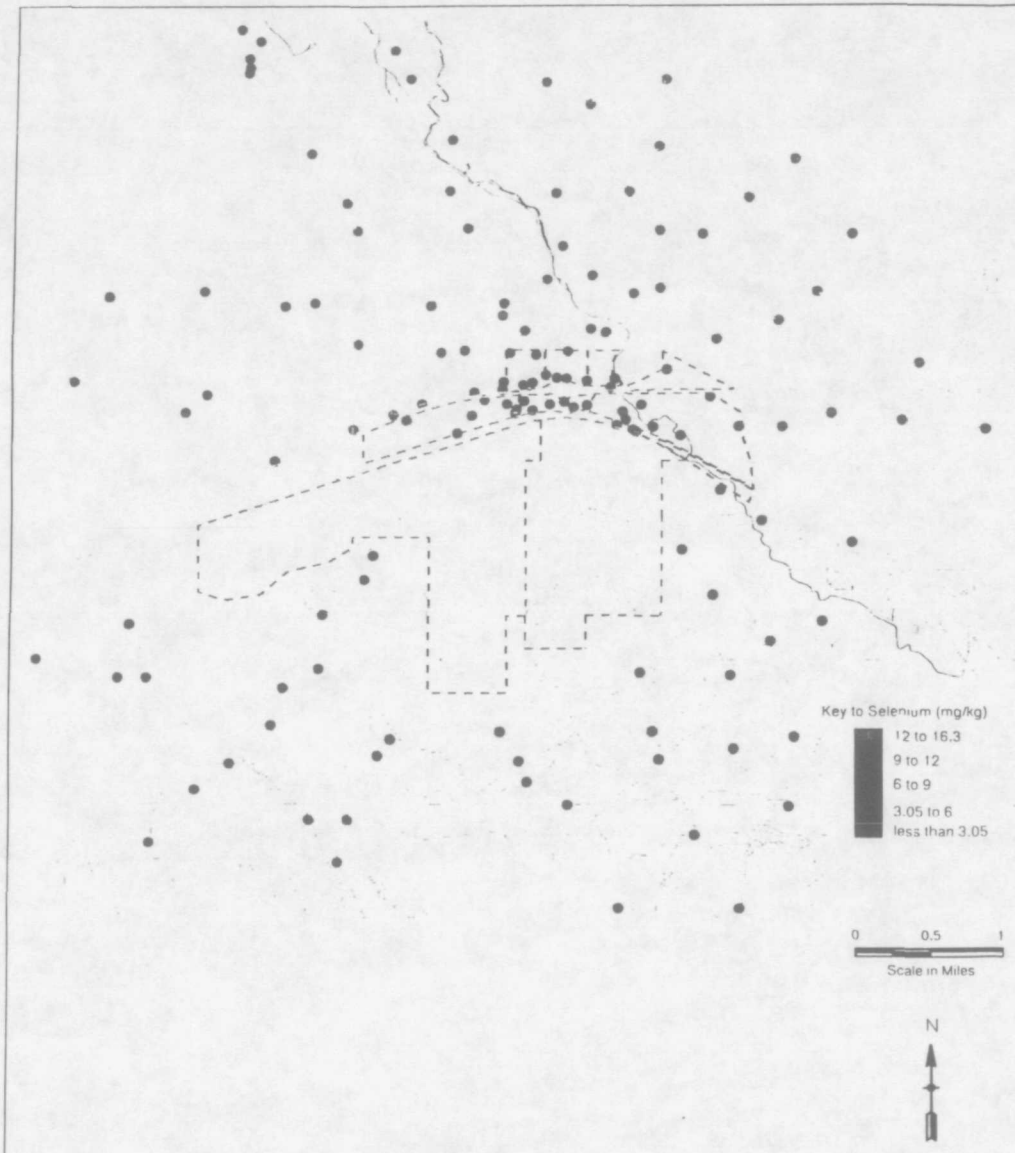
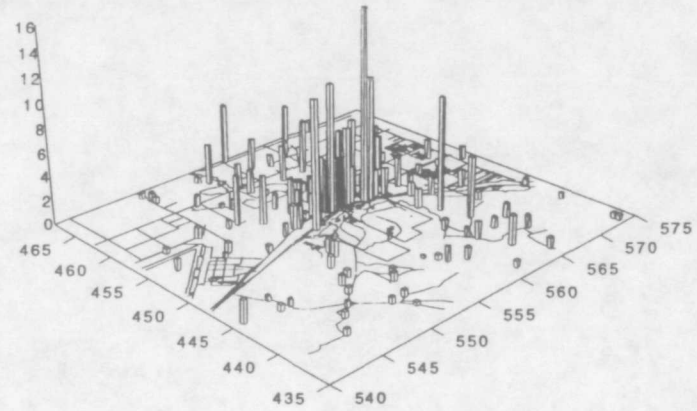
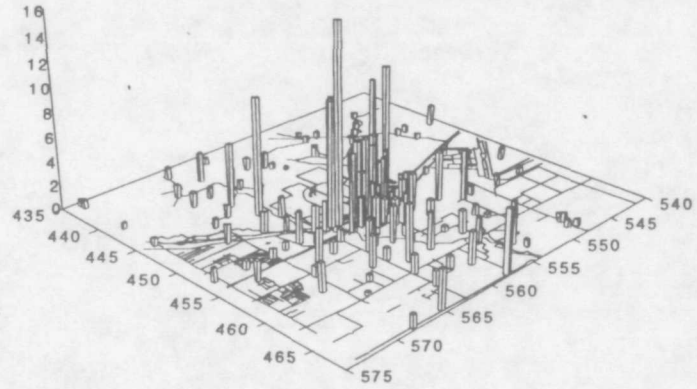
POCATELLO, IDAHO

Relative Concentrations of Zinc with Distance from EMF Facilities

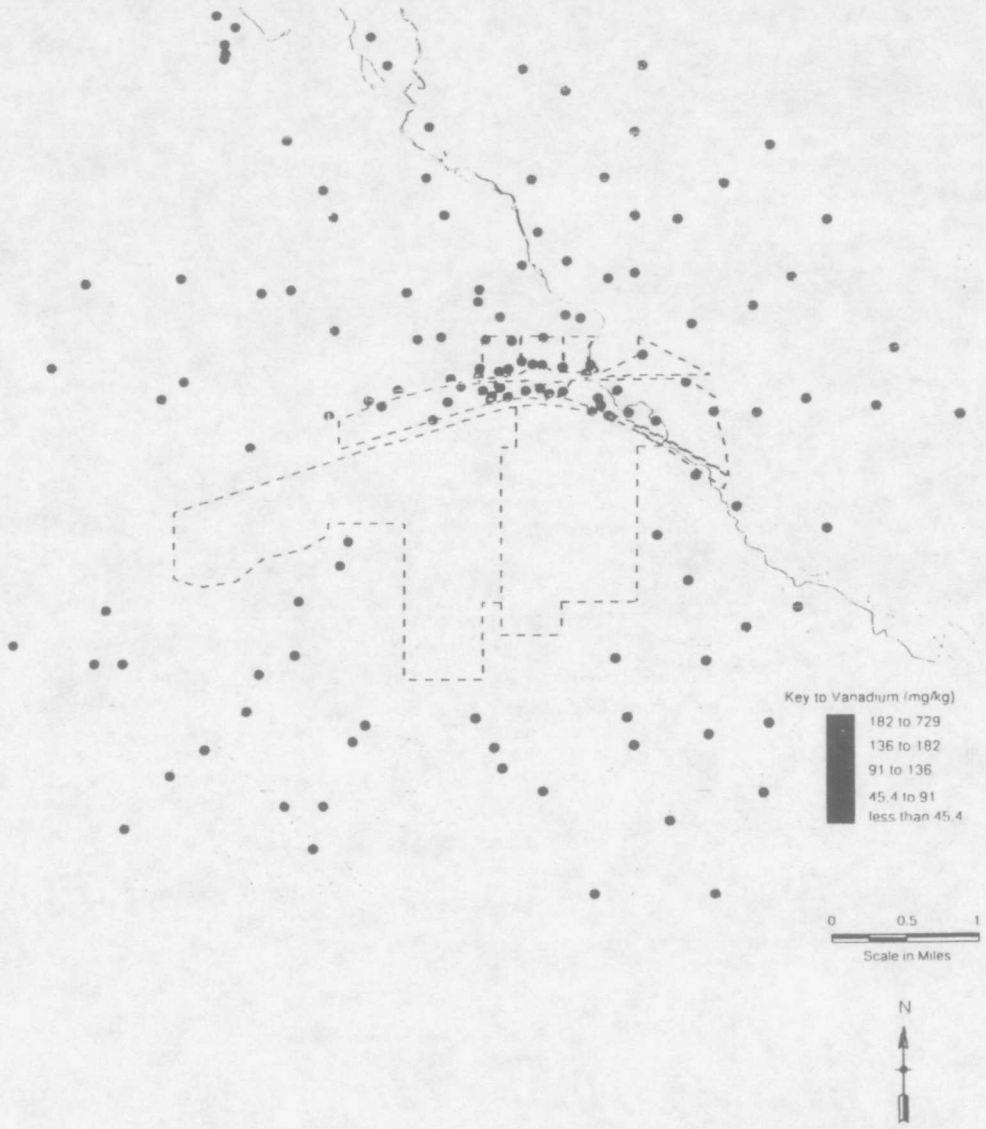
| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.3-73 | |

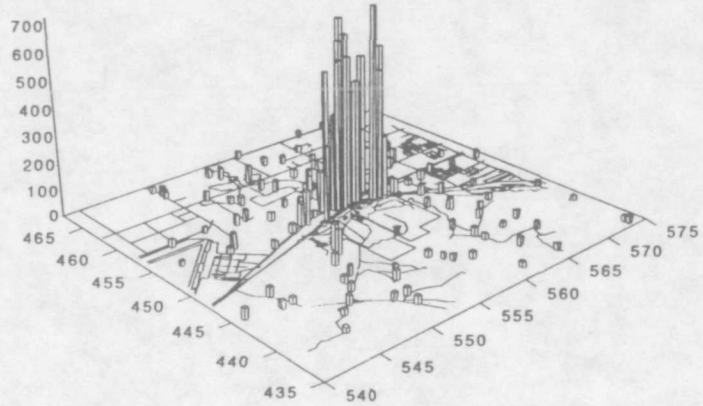


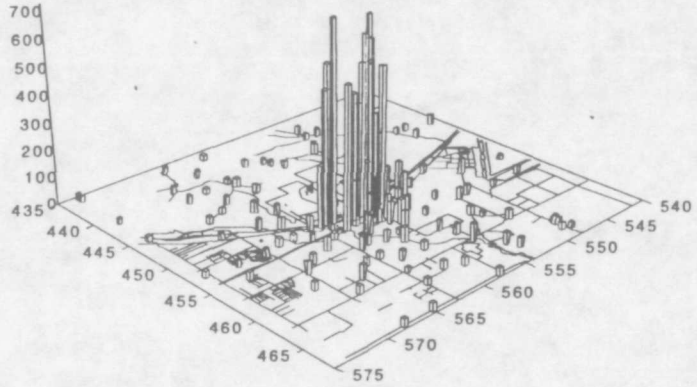




| | | |
|---|---|---|
| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| Relative Concentrations of Selenium with Distance from EMF Facilities | | |
| Job Number | Drawing No. | Rev. |
| 21372 | FIGURE 4.3-74 | |

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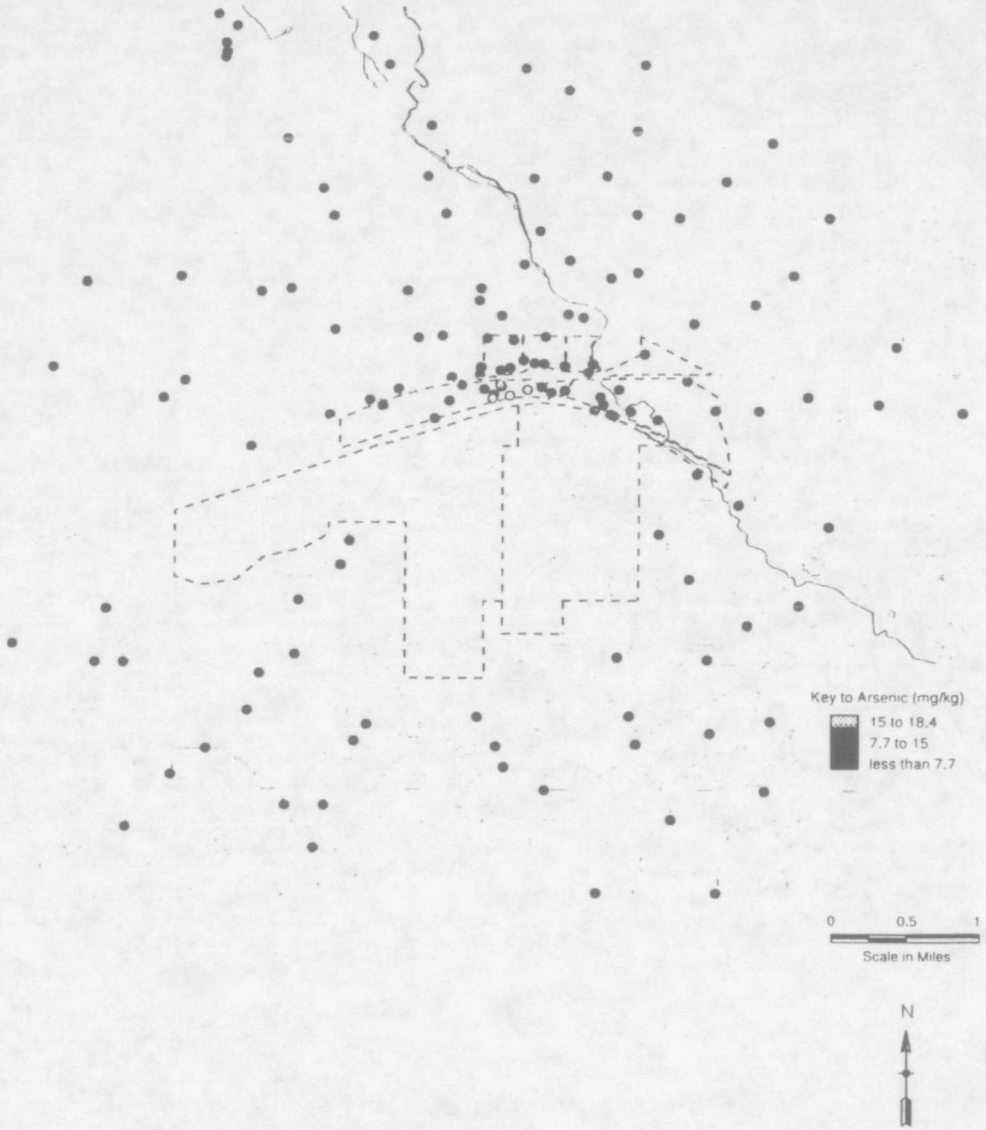
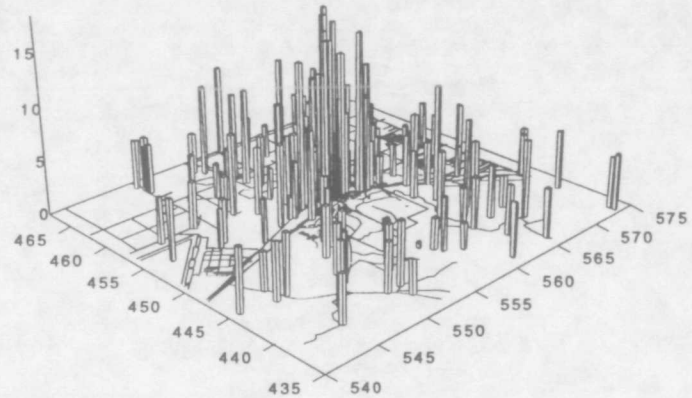
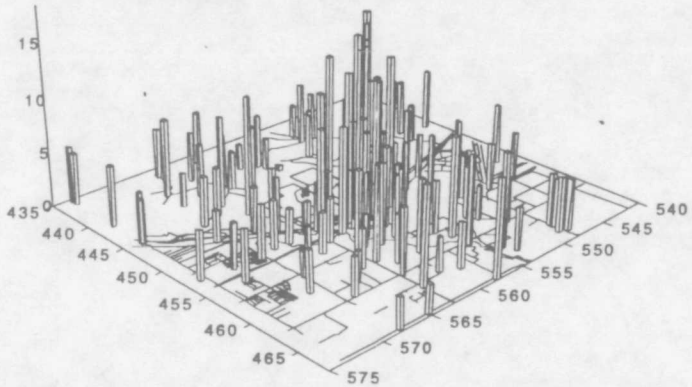
POCATELLO, IDAHO

Relative Concentrations of Vanadium with Distance from EMF Facilities

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.3-75 | |




BECHTEL ENVIRONMENTAL, INC.
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EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Relative Concentrations of Arsenic with Distance from EMF Facilities

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.3-76 | |

## 4.4 NATURE AND EXTENT – GROUNDWATER

This section provides an assessment of the nature and extent of EMF-related constituents in groundwater. Figure 4.4-1 is an overview of this section, including a summary of key findings. The objectives of this investigation were to characterize the nature of EMF-related influences on groundwater and to delineate these effects.

Section 4.4.1 describes the methodology used in the assessment and provides background information such as an explanation of the terms and conventions used in the remainder of this section. Section 4.4.2 is an overview of the nature and extent of constituents in groundwater. The nature and extent are described in detail in Sections 4.4.3 through 4.4.8. First, Section 4.4.3 describes representative, or background, groundwater quality, which must be characterized to assess impacted groundwater. Then, the remaining five sections describe the nature and extent beneath each of the following site areas:

- FMC facility (southwestern and central portions);
- Simplot facility (eastern portions);
- Joint fenceline area;
- Northern company properties (north of the FMC and Simplot facility fencelines and south of I-86); and
- The area north of I-86.

These five areas were delineated because the distribution of constituents in each area can be ascribed to distinct sources or influences from various sources (Figure 4.4-2).

The discussion in each of these sections is organized by constituent group, as follows:

- Common ions;
- Physical parameters;
- Nutrients and fluoride;
- Metals;
- Radiological parameters; and
- Organic compounds.

| | |
|---|---|
| REPRESENTATIVE GROUNDWATER QUALITY (SECTION 4.4.3): | • Seventeen wells characterize representative groundwater quality.<br>• Three hydrogeochemical regimes are present.<br>• Concentrations are typically low; pH is neutral to basic. |
| GROUNDWATER QUALITY AT SOURCE AREAS | FMC FACILITY *SECTION 4.4.4* / SIMPLOT FACILITY *SECTION 4.4.5* / JOINT FENCELINE AREA *SECTION 4.4.6*<br>• Groundwater has been impacted by releases from unlined waste management units at both facilities.<br>• Groundwater with elevated constituents at FMC was beneath and downgradient of closed unlined ponds 1E through 6E, 1S through 7S, 9S, and the slag pit. Constituents were also elevated downgradient of unlined Pond 8S, which was filled and dewatered in 1994.<br>• Groundwater with elevated constituents at Simplot was beneath and downgradient of the gypsum stack and former east overflow pond.<br>• Several potential sources contributed constituents within the joint fenceline area.<br>• Closures of unlined waste management units at both facilities have greatly reduced constituent releases; this has led to improved groundwater quality.<br>• Organic compounds were largely not detected.<br>• A few trace metals were detected above representative concentrations.<br>• Only arsenic and selenium were consistently above MCLs beneath limited portions of the site.<br>• Other constituents that were above primary and secondary MCLs were nitrate, fluoride, sulfate, chloride, manganese, and gross beta. |
| NORTHERN FMC/SIMPLOT PROPERTIES (SECTION 4.4.7): | • Except for nitrate, average constituent concentrations in this area did not exceed primary MCLs. |
| AREA NORTH OF I-86 (FMC OWNED BATISTE SPRING) (SECTION 4.4.8): | • EMF-related constituent concentrations were generally one to two orders of magnitude (i.e., 0.1 to 0.01) lower than their levels in upgradient source areas.<br>• EMF-related constituents in groundwater discharge to the Portneuf River at two springs (Batiste and Swanson Road) and through baseflow.<br>• Average concentrations of all constituents at these springs were below MCLs. |
| RADIOLOGICAL SPECIATION RESULTS (SECTION 4.4.9): | • Potassium-40 is EMF-related, whereas the alpha emitting radionuclides appear to be related to the silicic volcanic tuffs and rhyolite flows in the Bannock Range.<br>• Lead-210 was not detected. |

**FIGURE 4.4-1**
**OVERVIEW OF SECTION 4.4**

Section 4.4.9 is a presentation of radiological speciation results and a discussion of radioisotopes detected in groundwater.

### 4.4.1 Assessment Methodology and Background Information

This section outlines the methodology for assessing EMF-related influences on groundwater. Also, important background information is discussed to aid the reader in evaluating the presentation of data that follows. Section 2 of this report provides a description of the data collection methods and laboratory analyses.

#### *4.4.1.1 Definition of Terms and Conventions*

This section explains some of the key terms and conventions used throughout Section 4.4.

***Representative vs. Impacted Groundwater.*** To assess the effect on groundwater of EMF sources, the quality of unimpacted groundwater needs to be characterized. Characteristics of unimpacted groundwater are typically referred to as "background", which implies unimpacted, natural conditions. However, since the groundwater in the vicinity of the EMF facilities has been impacted by sources and anthropogenic activities outside the EMF site, the term "representative" instead of "background" will be used to distinguish it from groundwater affected by EMF sources.

***Hydrogeologic Areas vs. Hydrogeochemical Regimes***. As discussed in Section 3.3, there are three distinct hydrogeologic areas: the Michaud Flats, the Bannock Range, and the Portneuf River Valley. In general, each hydrogeologic area has a distinct hydrogeochemical regime, as identified using data from wells upgradient from the known EMF potential sources. However, the hydrogeochemical regimes are not necessarily restricted to a particular hydrogeologic area. For example, Bannock Range groundwater flows northward into the Michaud Flats hydrogeologic area and eventually can be traced to the Portneuf River Valley hydrogeologic area.

#### *4.4.1.2 Data Reduction*

To simplify the large database and to decrease the impacts of spurious analyses, the mean concentration or value for each parameter was calculated for each well. FMC conducted a time-series analysis as part of its RCRA groundwater reporting program (Bechtel, 1994n). The time-series analysis did not identify any statistically definable trends in constituent concentrations in

the impacted or unimpacted RCRA wells. These results support the averaging of concentrations for the 1992 to 1993 sampling period.

Simplot data were also reviewed to identify any significant temporal variations in constituent concentrations. The only well that had large temporal fluctuations was Well 318, located at the former east overflow pond.

Mean concentrations discussed in this report were calculated using the reported detection limit value where results were reported as "nondetect". This data treatment was agreed to by EPA and the Companies during a meeting on May 19, 1994.

Isoconcentration contour plots (Figures 4.4-5 through 4.4-24) were developed using the data treatment outlined by EPA in Comment #15 on the PSCS (Bechtel, 1994a). This data treatment method uses only one-half the reported detection limit where data are reported as nondetects. The outermost purple line is the lowermost representative (background) level on most figures. This lowermost level was not plotted for constituents that displayed a wide range of background concentrations (e.g., chloride and sulfate).

#### *4.4.1.3 Calculation of Representative Groundwater Concentrations*

Representative concentrations of each constituent were calculated for each hydrogeochemical regime. This was accomplished by calculating the 95% Upper Confidence Level (UCL) about the mean using the data from each representative well in the regime. Where the constituent was not detectable, the detection limit was used at the value for that sample. Representative well locations are shown on Figure 4.4-3. The representative concentrations for each constituent are provided in Table 4.4-1. Radiological parameters and organic compounds detected in the representative wells are summarized in Tables 4.4-2 and 4.4-3, respectively.

The method for calculating the representative concentrations was agreed to by the Companies and EPA Region 10 during a meeting in May 1994. Representative levels used in this report were presented to EPA in a letter from the Companies dated June 17, 1994.

### 4.4.2 Overview of Findings

The nature of EMF-related impacts to groundwater can be summarized as elevated (i.e., greater than the representative level) concentrations of common ions, decreased pH, elevated concentrations of nutrients such as ammonia, nitrate and orthophosphate, and metals such as

arsenic and manganese. Cobalt, fluoride, and selenium concentrations were elevated over a smaller area and at fewer sources, when compared to the extent of elevated major ion and nutrient concentrations (Figures 4.4-5 through 4.4-24). Gross alpha and gross beta activities were elevated in some of the monitoring wells. Gross beta activities correlated with potassium concentrations (i.e., gross beta activities were commensurate with expected activities of potassium-40, a beta emitter, given its natural abundance), whereas gross alpha activities were associated with the radioisotopes of uranium. No significant concentrations of organic compounds were detected. Only arsenic, nitrate, and selenium were consistently above MCLs beneath limited portions of the site. Other constituents that were above primary and secondary MCLs were sulfate, fluoride, and chloride.

The extent of EMF-related constituents is confined to areas within the facilities or on company property, with the highest concentrations of constituents within the facility boundaries. In the northern FMC/Simplot properties, the concentrations of all constituents decrease sharply to levels near the representative concentrations, and only a few constituents were above representative levels in groundwater north of I-86.

Constituent concentrations were typically much lower in the deeper aquifer. Upward vertical hydraulic gradients and/or the presence of confining strata appear to have effectively limited downward vertical migration of the dissolved constituents.

The closure of the former east overflow pond has had positive effects on groundwater quality. The closure of FMC's Pond 8S and lining of the railroad swale will produce positive effects on groundwater quality. Changes to slurry handling at the gypsum stack are likely to decrease the amount of water lost from the stack to the aquifer, further reducing potential future impacts. The effects of these activities are discussed in more detail in Section 5 of this report.

### FMC Southwestern and Central Areas

The southwest area of the FMC facility includes eleven former unlined ponds. Five former phossy waste ponds (Ponds 00S, 0S, 1S, 2S, and 3S) and the main plant facilities are located in the central area. These former unlined ponds were likely sources of constituents. There is no longer any head on these former sources; therefore, any residual amount currently in the groundwater will continue to diminish with time.

Groundwater in the southwestern area migrates north, transported by Bannock Range flow. This flow merges with more east-to-northeast-flowing Michaud Flats groundwater. The result is a mixing of the unimpacted, but more saline, Michaud Flats water with the impacted Bannock Range water. The converging flow pattern has the net effect of preventing impacted water from leaving the facility to the north (Figure 4.4-4).

Affected groundwater from the southwestern area commingles with affected groundwater in the central area and appears to migrate beyond the facility fenceline near Well 111, just north of the main plant area. This commingled groundwater continues northeast to east and likely explains the presence of the arsenic detected in samples collected from the Old Pilot House well. The concentrations of EMF-related constituents in Well 111 are considerably lower than those found near the old pond sources and show the effects of attenuation and advective mixing that occur within the facility boundary.

The groundwater flow direction through the central FMC area is east-northeast. Groundwater in the central area has the same constituents of interest as the southwestern area, except that trichloroethene was detected at very low concentrations in some wells. Another difference is that higher temperatures in the groundwater, caused by the heating of soils surrounding the slag pit operations, created a localized thermal plume in this area (Figure 4.4-12). The groundwater in the central FMC area appears to migrate beyond the facility boundary in the vicinity of Well 146.

**Eastern Simplot Area**

Two sources of EMF-related constituents to groundwater were identified at Simplot: the gypsum stacks and the former, unlined east overflow pond. The former east overflow pond was active during the period of investigation, and periodically received discharges of plant process water during plant upset conditions. During upset events, the effects of these discharges could be detected in downgradient monitoring Well 318. This unlined pond was replaced with a lined unit in August 1993.

Most of the constituents previously identified as EMF-related also occur in the groundwater in the eastern Simplot portion of the EMF site. The eastern extent of EMF-related constituents in shallow groundwater is delineated by Wells PEI-4, PEI-6, 305, and 328, which do not contain EMF-related constituents above representative levels. In the deeper groundwater, the eastern extent of EMF-related constituents is delineated by Wells 321 and 322.

Constituents detected above representative levels in Well 318, immediately downgradient of the former east overflow pond, that are characteristic of this source were beryllium, cadmium, total chromium, cobalt, copper, nickel, selenium, thallium, and zinc.

### Joint Fenceline Area

In the joint fenceline area, groundwater in the western part of the upper gypsum stack appears to flow in a northwesterly sweeping arc across the Simplot property boundary, in the general area of the FMC old calciner ponds and former kiln scrubber overflow pond, and then flow back toward the northeast (Figure 3.3-13; see Figures 1.1-1 and 1.2-1 for facility features). This "clockwise" flow appears to be paralleled to the north of the joint fenceline area by the flow pattern of the above-mentioned thermal plume originating beneath the FMC slag pit. The groundwater in the joint fenceline area appears to commingle with groundwater from the southwestern and central FMC areas, and then flows northeast.

As with the other areas previously discussed, major ions, nutrients, fluoride, and the metals arsenic, boron, lithium, manganese, and selenium were detected at elevated concentrations in groundwater beneath the joint fenceline area. In general, deeper monitoring wells 109, 329, and 330, located along the northern side of the joint fenceline area, delineate the extent of EMF-related constituents in the deeper aquifer, with the possible exception of minor levels of some common ions and nitrate. Wells 142 and 304 appear to delineate the lateral extent of arsenic and most other metals along the western portion of the gypsum stack, although these wells contain elevated concentrations of common ions and nutrients.

### Northern FMC/Simplot Properties South of I-86

EMF-related effects on groundwater beneath the affected portion of the northern FMC/Simplot properties were limited to slightly elevated concentrations of common ions, nutrients, and a limited suite of metals, low pH, and elevated TDS, and gross beta activities. The metals detected above representative levels include arsenic, manganese, and selenium. The extent of EMF-related constituents was delineated by Well 501 to the west, wells along I-86 to the north, and the Portneuf River to the east. Except for nitrate, average constituent concentrations in this area did not exceed primary MCLs. The ten deeper wells in this area did not contain elevated concentrations of EMF-related constituents. Therefore, the vertical extent of these constituents appeared to be limited to the shallow groundwater in the northern FMC/Simplot properties.

**Area North of I-86**

All EMF-affected groundwater passes beneath Interstate Highway I-86 through the shallow aquifer between some point east of Well 502 and the Portneuf River. This water discharges to the river at Batiste and Swanson Road Springs and as base flow between these springs. Average concentrations of EMF-related constituents were below MCLs in groundwater north of I-86; furthermore, most constituents were at or below representative levels in this area. There were no EMF-related effects in groundwater north of Batiste Spring, as evidenced by water quality in Wells 524 and 525, a well pair located about 150 feet north of the spring. All of this area is company-owned property, aside from the State-owned highway right-of-way along I-86.

Some EMF-related effects were observed at Batiste Spring, Swanson Road Spring, and Well 503. These were limited to elevated concentrations of sulfate, sodium, potassium, orthophosphate, total phosphorus, and lithium. Concentrations of ammonia, arsenic, nitrate, and selenium are very close to or below representative concentrations. The mean concentrations of arsenic and selenium at Batiste Spring were 0.015 mg/l and 0.0069 mg/l, respectively. The average concentration of all constituents at Batiste and Swanson Road Springs were below MCLs.

Overall levels of EMF-related constituents in Well 503, Batiste Spring, and Swanson Road Spring show a reduction of 10 to 100 times or greater when compared to concentrations observed in monitoring wells adjacent to the source areas.

### 4.4.3 REPRESENTATIVE GROUNDWATER CHEMISTRY

This section provides a discussion of the representative monitoring well network and the representative groundwater chemistry organized by constituent group.

#### *4.4.3.1 Selection of Representative Wells*

The following criteria were used to select representative wells:

- The group of wells must be representative of the three different hydrogeochemical regimes delineated in Section 3.3.
- The wells must be located upgradient or crossgradient from known or suspected EMF source areas, as defined by horizontal and/or vertical hydraulic gradients.

Seventeen wells representing the three hydrogeochemical regimes were selected (Figure 4.4-3).

- Michaud Flats: Wells 101, 102, TW-10S, 147, 514, 515
- Portneuf River Valley: Wells PEI-6, 510, 511, 512, 513
- Bannock Range: Wells 158, 106, Idaho Power, 301, PEI-1, 305

These wells comprise a representative cross-section of the different hydrogeologic and hydrogeochemical conditions that exist in the EMF study area (Figure 4.4-3).

***Michaud Flats.*** Wells 101, 102, and TW-10S are all hydraulically upgradient and furthest from the known extent of FMC's old ponds. There are no known potential sources located in areas upgradient from these wells. Well 147 is located along the far northwest boundary of FMC's facility, near Pond 16S. The data from this well were collected prior to operation of Pond 16S (a lined pond), eliminating the potential that groundwater samples from Well 147 were impacted by potential leaks in Pond 16S. Wells 514 and 515 are located north of I-86, hydraulically cross-gradient from the FMC facilities. There is a zone of converging groundwater flow located between the FMC old pond area and these wells. The groundwater flow patterns indicate that Wells 514 and 515 are located upgradient or crossgradient from all potential EMF sources.

***Portneuf River Valley.*** Wells PEI-6, 510, 511, 512, and 513 are located in the Portneuf River Valley area, and Wells 510, 511, 512, and 513 are located on the eastern side of the river, away from the EMF potential sources. Groundwater flow patterns indicate that these wells monitor groundwater flowing from the Pocatello area, east of the EMF site.

***Bannock Range.*** Wells 301, PEI-1, and 305 are close to existing or former waste management facilities. Because these wells are close to potential sources, the chemical and physical groundwater parameters of these wells were compared to other representative wells in the same hydrogeologic area. The comparison confirmed that these wells were unaffected by facility activities, and therefore they were retained in the representative well network. Wells 106, 158 and Idaho Power are located upgradient from any potential sources.

### 4.4.3.2 Common Ions in Representative Groundwater

The mean values of the common ion concentrations are presented in Table 4.4-1. In all three groundwaters calcium is the predominant cation. Chloride is the predominant anion in the Michaud Flats representative groundwater and bicarbonate is the dominant anion in the Bannock Range and Portneuf River groundwaters. Michaud Flats representative Wells TW-10S and 147 also have higher concentrations of sodium and potassium than representative wells to the east and south (e.g., Wells 101 and 102).

Well 514, located near I-86, has Bannock Range groundwater chemistry. Although this well is screened in the shallow aquifer, it may actually be monitoring deeper groundwater. In localized areas, the deeper aquifer may have a higher degree of hydraulic interconnection with the shallow aquifer zone due to thinning or pinching out of the intervening aquitard, which, in this case, is the American Falls Lake Beds. An alternate explanation for the different groundwater chemistry observed is that the shallow aquifer chemistry in the area may have been impacted by irrigation and agricultural activities (i.e., City of Pocatello STP sludge application to land), as indicated by the results from nearby Well 515. The impacts may not extend to the zone where Well 514 is located.

### 4.4.3.3 Physical Parameters in Representative Groundwater

The mean values of the physical parameters for the 17 representative wells are presented in Table 4.4-1. All of the groundwaters are generally neutral to slightly alkaline (mean pH ranges from 7.27 to 8.37). Other physical parameters show more variability among the three hydrogeochemical regimes.

Michaud Flats representative groundwater has higher specific conductance (460 to 1,229 μmhos/cm) and total dissolved solids (281 to 736 mg/l) and generally low mean temperatures compared with the Bannock Range groundwater (11.8°C for Michaud Flats and 16.7°C for Bannock Range groundwater). Redox ranges from 0 mV to 169, but mean redox values are on the order of 100 mV with Well TW-10S having a mean value of 0 mV. Higher specific conductance and total dissolved solids values are consistent with the overall higher ionic concentrations for groundwater in the Michaud Flats.

The Portneuf River groundwater is characterized by intermediate specific conductance (747 to 793 µmhos/cm) and total dissolved solids (440 to 527 mg/l), lower temperatures (12.7 to 13.3°C), and a narrower range of positive redox values (127 to 171 mV) than the other groundwaters.

Bannock Range representative groundwater is typified by slightly higher mean temperatures (14.5 to 16.6° C) and lower total dissolved solids (311 to 404 mg/l). The lower total dissolved solids correlates with lower concentrations of major ions, and lower specific conductance.

#### *4.4.3.4 Nutrients and Fluoride in Representative Groundwater*

The mean values of the nutrient and fluoride concentrations in representative groundwater are presented in Table 4.4-1. The nutrients and fluoride occur naturally to some degree in groundwaters but are also contributed by anthropogenic activities such as discharge to septic systems, livestock raising, and fertilizer application. These constituents were also identified in the EMF feedstock, by-product, and wastestreams.

The Michaud Flats regime generally had higher nutrient concentrations than the other two hydrogeochemical regimes; the Portneuf River regime generally had lower nutrient concentrations, with the exception of nitrate. The representative nitrate concentrations in the Portneuf River regime was 4.00 mg/l (Table 4.4-1). For some wells, none of the samples collected contained detectable concentrations of certain constituents (e.g., ammonia). Ammonia concentrations were negligible in the representative wells.

#### *4.4.3.5 Metals in Representative Groundwater*

The mean values of metal concentrations are presented in Table 4.4-1. The metals antimony, beryllium, cadmium, chromium, cobalt, lead, mercury, molybdenum, nickel, selenium, silver, thallium, and vanadium were detected sporadically if at all. These results yield a "highly censored" dataset for defining representative concentrations of these metals. In general, the 95% UCL for these metals is defined by the 95% UCL of the detection limit values. Defining the nature and extent of potentially EMF-related metals in groundwater using the 95% UCL for the highly-censored datasets was deemed acceptable since the representative levels are typically well below levels of concern.

Arsenic, barium, and boron were detected consistently in representative groundwater for all three hydrogeochemical regimes. Arsenic was detected in representative groundwater at mean concentrations from 0.0022 to 0.016 mg/l. Barium was found in representative groundwater at mean concentrations from 0.044 to 0.199 mg/l and boron was found at mean concentrations from 0.055 to 0.219 mg/l.

The presence of iron, copper, and zinc in representative groundwater was not consistent over time or among the three regimes. Iron was found in representative groundwater at mean concentrations up to 2.00 mg/l. Measurements over 1.0 mg/l were generally limited to initial rounds of sampling. Groundwater samples collected in 1994 were collected after field turbidity measurements were taken during well purging. The turbidity measurements have a high positive correlation with iron, indicating that the initial sampling of certain wells yielded higher turbidity samples.

Two anomalously high nondetect zinc values in Well 106 were initially used in calculating the 95% UCL for Bannock Range groundwater, but the resulting value of 0.971 mg/l was deemed unrealistically high. A revised value of 0.17 mg/l was calculated for the Bannock Range zinc representative concentration after removal of the two high nondetect values.

#### *4.4.3.6 Radiological Parameters in Representative Groundwater*

A summary of the activities for radiological parameters for the 17 representative wells is presented in Table 4.4-2.

Representative gross alpha activities ranged from not detectable to:

- 7.97 ± 1.37 pCi/l in the Michaud Flats regime;
- 5.72 ± 1.92 pCi/l for the Bannock Range groundwater; and
- 4.6 ± 2.3 pCi/l in the Portneuf River regime.

Gross alpha activities were detected more consistently and at slightly higher levels in the Michaud Flats representative groundwater and were detected less frequently and at slightly lower levels in the Portneuf River representative groundwater.

The gross beta activities were highest in the Michaud Flats regime, intermediate in the Bannock Range regime, and lowest in the Portneuf River regime. Representative gross beta activities in the three groundwaters ranged from:

- 2.93 ± 1.06 pCi/l to 45.8 ± 2.65 pCi/l (Table 4.4-2) for the Michaud Flats;
- ND to 11 ± 3.7 pCi/l for the Bannock Range; and
- ND to 9.3 ± 0.88 pCi/l for the Portneuf River.

Radium-226 was not detected in 9 of the 17 representative wells. In Wells 101, 102, 106, TW-10S, 147, 301, 305, and 511 activities ranged from 1.18 ± 0.19 to 6.35 ± 0.57 pCi/l.

Radium-228 was not detected in 7 of the 17 representative wells. In four of the remaining 12 representative wells, radium-228 was detected during only one sampling event. For these four wells, activities ranged from 1.20 ± 0.80 to 7.20 ± 1.00 pCi/l. Activity ranges in the other eight wells were 1.0 ± 0.8 pCi/l to 10.8 ± 1.1 pCi/l.

#### *4.4.3.7 Organic Compounds in Representative Groundwater*

Organic compound analyses were performed for samples from nine of the 17 representative wells. Concentrations of organic compounds detected in representative wells are presented in Table 4.4-3. Organic compounds were detected sporadically in the representative wells. Of the 11 volatile or semivolatile organic compounds reported in representative well samples, most or all may not actually have been present in groundwater. Several of the compounds are common laboratory contaminants, including methylene chloride, acetone, and plasticizers (phthalates). Compounds reported infrequently and at low concentrations, such as 2-butanone, may represent an aberration in the analytical methodology and may not actually have been present in the samples.

One compound, tetrachloroethene, was detected at low concentrations (0.001 to 0.003 mg/l) in all three rounds of samples from Well 511, but was not detected in any other representative well. The presence of this compound most likely represents a source along the Portneuf River upstream of the EMF facilities. Studies at the Union Pacific NPL site, located hydraulically upgradient of the EMF facilities, have documented the presence of chlorinated solvents in the groundwater.

### 4.4.4 NATURE AND EXTENT OF EMF-RELATED CONSTITUENTS IN GROUNDWATER AT FMC

The nature and extent of EMF-related constituents beneath the FMC facility focuses on the southwestern and central areas of the facility (Figure 4.4-2). Because constituents derived from sources in the eastern portion of the FMC facility may commingle with constituents originating at Simplot sources, the eastern FMC area is included in the discussion of the joint fenceline area in Section 4.4.6.

The following discussion pertains primarily to the extent of EMF-related constituents in the upper aquifer. Impacts to the deeper aquifer are limited in extent and of much lower average concentrations than the impacts observed in the shallow aquifer.

The potential sources identified in the southwest and central FMC portion of the EMF site are:

- Former Ponds 1E through 7E, 1S through 3S, 5S through 9S, including former unlined Pond 8S, which was operational during 1992 and 1993, in the southwestern area
- The slag pit adjacent to the furnace building and the railroad swale in the central FMC area

#### *4.4.4.1 Common Ions in FMC Area Groundwater*

Table 4.4-4 presents a summary of common ion concentrations and physical parameter measurements in the FMC monitoring wells. Impacted wells at the FMC facility had mean common ion concentrations above the upper representative limit for all common ions. These wells also had higher specific conductance and TDS.

In the former ponds area, the common ion with the highest concentrations relative to its representative concentration was potassium. The highest mean potassium concentration was 1,293 mg/l in Well 150, compared to representative concentrations of 12.7 and 10.5 mg/l. Other impacted wells in this portion of the site had potassium concentrations on the order of 2 to 4 times its representative concentration (Table 4.4-4 and Figure 4.4-5).

Figure 4.4-5 illustrates the extent of elevated potassium concentrations in the shallow aquifer at the EMF site. Immediately apparent from this map is that the potassium plume extends from the old pond area out to the northern fenceline of the FMC facilities and beyond. None of the following wells either associated with Pond 16S, or upgradient or crossgradient from the old

pond areas and the central area, contain elevated potassium concentrations: Lindley House, 106, 112, 158, 137, 124, 126, 128, 120, 147, 148, 149, 153, 154, Idaho Power, 101, and 501. Due to the presence of arsenic, orthophosphate, and nitrate in elevated concentrations in Wells 137 and 120, these wells do not completely delineate the lateral extent of impacted groundwater.

Sulfate concentrations were above the Michaud Flats representative levels (74.6 mg/l) in 24 monitoring wells. An additional five wells contained sulfate at levels ranging between the Bannock Range representative concentration (43.4 mg/l) and the Michaud Flats representative concentration. Sulfate concentrations were most elevated in Wells 139 and 140 at mean concentrations of 591 and 843 mg/l, respectively. For comparison, Wells 150 (former Pond 8S area) and Well 108 (central area) had mean sulfate concentrations of 253 and 242 mg/l, respectively (Table 4.4-4 and Figure 4.4-6).

Sulfate has a distribution similar to that of potassium in the upper aquifer in this portion of the EMF site, with some important differences (Figure 4.4-6). First, its distribution does not describe a unique source, nor does it correlate completely with the potassium concentrations within the area impacted by the FMC potential sources. Another important difference is the occurrence of elevated sulfate in the Lindley House well (177 mg/l), and in Wells 128, 127, 126, and 148 located north and cross-gradient from the old pond area. In general, sulfate concentrations provide a reasonable assessment of EMF-related impacts, as delineated by Wells 124, 101, 158, 106, 120, 119, and the wells located near Pond 16S.

Calcium was present at mean concentrations of up to 375 mg/l in Well 139, compared to representative concentrations of 97.7 to 68.75 mg/l in Michaud Flats and Bannock Range groundwater, respectively. Numerous wells contained mean calcium concentrations between the Bannock Range and Michaud Flats representative concentrations (Table 4.4-4 and Figure 4.4-7).

Chloride was present at mean concentrations up to 980 mg/l in Well 139; the representative concentrations were 192.9 mg/l and 52.4 mg/l for Michaud Flats and Bannock Range groundwater, respectively (Table 4.4-4 and Figure 4.4-8).

Magnesium was present at concentrations up to 137 mg/l in Well 139. Seventeen monitoring wells had mean magnesium concentrations greater than 33.6 mg/l, the representative concentration for Michaud Flats groundwater. Eleven wells had mean concentrations in excess

of the Bannock Range representative concentrations (19.2 mg/l) but below the Michaud Flats representative concentrations (Table 4.4-4 and Figure 4.4-9).

Sodium concentrations were elevated in 28 monitoring wells at mean concentrations up to 542 mg/l in Well 152. There are several wells with mean sodium concentrations in the relatively broad range between the Bannock Range representative concentrations (27.5 mg/l) and Michaud Flats representative concentrations (74.3 mg/l) (Table 4.4-4 and Figure 4.4-10).

In general, sodium, calcium, chloride, and magnesium concentrations have a pattern similar to sulfate in the upper aquifer, each with minor variations (Figures 4.4-6 through 4.4-10). For example, sodium exceeds representative concentrations in Well 148, as does sulfate and calcium, but this well is located upgradient from the identified FMC potential sources (recall that the data collected from Well 148 were collected prior to operation of Pond 16S). The Lindley House well, Wells 124, 126, 127, and 128 contain one or more of these common ions at a mean concentration above the representative levels.

#### *4.4.4.2 Physical Parameters in FMC Area Groundwater*

The mean values of the physical parameter measurements are presented in Table 4.4-4. The pH was typically lower in the impacted wells when compared to the representative levels (Figure 4.4-13). Reducing conditions were noted in Wells 150, 152, 131, 132, 141, 159, TW-5S, and 122. Wells 150 and 152, however, had much lower Eh values than the other wells, indicating stronger potential reducing conditions. For comparison, all the representative wells (except TW-10S) have oxidizing Eh conditions in the groundwater.

Elevated specific conductance and TDS are indicative of elevated major ion concentrations. Throughout this portion of the EMF site, these parameters are elevated with respect to the Michaud Flats and the Bannock Range representative levels (Table 4.4-4) in the impacted wells. Elevated groundwater temperatures (ranging up to 21 to 28°C, compared with the typical groundwater temperature of 13 to 18°C) were noted in several monitoring wells located downgradient from the slag pit (Wells 108, 122, and 146). These elevated temperatures were noted in shallow wells only, indicating the source is the heated soils around the slag pit, not geothermal groundwaters. Figure 4.4-12 illustrates the configuration of this plume, showing groundwater flow direction through the central FMC area to be east-northeast. The groundwater

cools as it flows from the area of the slag pit and as it commingles with groundwater from other areas.

#### *4.4.4.3 Nutrients and Fluoride in FMC Area Groundwater*

The mean values of the nutrient and fluoride concentrations are presented in Table 4.4-4. Ammonia, nitrate, orthophosphate, total phosphorus, and fluoride were detected in FMC monitoring wells at mean concentrations that exceeded the representative concentrations.

Ammonia was present at mean concentrations of 9.52 and 8.69 mg/l in Wells 150 and 152, immediately downgradient from former Pond 8S. Ammonia was also detected at elevated concentrations in Wells 104, 116, 132, 141, 151, and 159. In the central FMC area, only Well 122 had a mean ammonia concentration in excess of the representative concentrations (Figure 4.4-21).

Nitrate was present at mean concentrations in excess of the Bannock Range representative concentration of 1.60 mg/l in numerous shallow wells associated with the former ponds area. Mean nitrate concentrations in 14 wells also exceeded the Michaud Flats representative concentration. The highest nitrate concentrations were detected in Wells 130 and 139, associated with the old ponds in the southwest FMC area and in Wells TW-5S, 121, and 122 in the central FMC area (Figure 4.4-22).

The elevated nitrate concentrations are delineated by Wells 124, 126, 127, 101, 158, 106, and the wells located north and east of former Pond 8S (Figure 4.4-22). The ammonia plume map in Figure 4.4-21 and the nitrate plume map (Figure 4.4-22) point out an interesting relationship between ammonia and nitrate. It appears that the distribution of ammonia concentrations in the impacted wells is the inverse of the nitrate concentrations. For example, downgradient from former Pond 8S, several wells contained ammonia at elevated concentrations, with Wells 150 and 152 having the highest mean concentrations. However, none of these wells had mean nitrate concentrations in excess of the representative concentrations. Further downgradient, in the central FMC area, ammonia concentrations decreased while nitrate concentrations increased. It appears that the ammonia associated with the reducing groundwater conditions at former Pond 8S may be oxidized to nitrate further downgradient.

The two phosphate parameters were detected in nearly all the shallow monitoring wells in the former ponds area and the central FMC area. Orthophosphate and total phosphorus concentrations were highest in Wells 150 and 152 by a factor of 10 over all other impacted monitoring wells (Figure 4.4-23).

Fluoride was detected at above-representative concentrations in 17 shallow monitoring wells in the southwest and central FMC area (Table 4.4-4). Wells located in both the former ponds area and slag pit area contained elevated levels of fluoride, with the highest mean concentrations (up to 10.9 mg/l) detected in Wells 104, 150, and 152 (Figure 4.4-24). In the slag pit area, the mean concentrations ranged up to 2.88 mg/l in Well 108. The representative fluoride concentrations are 0.80 and 0.60 mg/l in Michaud Flats and Bannock Range groundwater, respectively.

#### *4.4.4.4 Metals in FMC Area Groundwater*

The mean values of metal concentrations are presented in Table 4.4-4. Because the mean concentrations of antimony, cadmium, mercury, silver, thallium, vanadium, and zinc did not exceed either the Bannock Range or Michaud Flats representative concentrations in any of the wells in this portion of the EMF site, they were eliminated from further consideration. Aluminum, beryllium, copper, lead, and possibly molybdenum were also eliminated as EMF-related constituents for this area, as discussed below.

Aluminum was detected at mean concentrations of 10.15 mg/l in Well 131 and 0.76 mg/l in Well 116, compared to 0.547 mg/l for the Bannock Range representative level. Aluminum was eliminated as an EMF-related constituent for potential sources in this portion of the EMF site due to the elevated turbidity encountered in Wells 131 and 116.

Copper was detected at mean concentrations of 0.023 mg/l in Well 116, compared to 0.011 mg/l in the Bannock Range. Copper was also be eliminated as a result of turbidity in Well 116 because there was a copper value of 0.245 mg/l reported from the October 1990 sampling event in conjunction with an elevated iron content (high iron content is also typically associated with elevated turbidity).

Chromium was above the representative level in Well 153, located upgradient from all known source areas at the EMF site, thereby indicating that the chromium level reported for this well is not due to EMF activities.

Beryllium and lead exceeded the Michaud Flats representative levels in several wells but were below the Bannock Range representative levels in all wells. Since there is commingling of these two groundwater types, and because most reported results for beryllium and lead were nondetects, these two constituents are not considered EMF-related. Additionally, the wells which contained these constituents at levels above the Michaud Flats representative concentrations were randomly located throughout this portion of the site, further indicating no unique source or "plume" of these constituents.

Molybdenum was detected in Wells 115, 122, 159, and TW-5S at concentrations that exceeded Michaud Flats and Bannock Range representative levels (Table 4.4-4). Molybdenum was also detected in three wells (Wells 103, 104, and 114) at levels above the Michaud Flats levels, but below the Bannock Range level. Given that the concentration in Well 115 exceeded the Bannock Range level, the molybdenum detections may indicate representative concentrations rather than EMF-related impacts. The above-representative molybdenum concentrations in Wells 122, 159, and TW-5S are due to high detection limits.

Nickel was detected at mean concentrations of 0.0203 to 0.0221 mg/l in Wells 104, 131, 132, 141, and 152. These concentrations compare to representative concentrations of 0.0200 mg/l. Nickel was eliminated as a EMF-related constituent in the southwest FMC area because the above-representative mean concentrations were estimated from nondetect data. Wells 104, 131, 132, 141, and 152 each have at least one very high nondetect value, which increases the mean concentrations.

Arsenic, barium, boron, cobalt, lithium, manganese, and selenium were detected above representative concentrations in groundwater beneath the potential FMC source areas listed above (Figures 4.4-14 through 4.4-20).

Mean arsenic concentrations ranged from 0.020 mg/l to 0.1878 mg/l in impacted shallow wells. The arsenic concentrations decrease with distance from the old pond area toward the central FMC area, and increase again within the central area as the groundwater underflows another source area. This is illustrated by the higher arsenic concentrations associated with shallow monitoring wells immediately downgradient from potential source areas (Figure 4.4-14). Wells 127 and 128 had mean arsenic concentrations of 0.021 and 0.023 mg/l, respectively (Table 4.4-4). Combined with the elevated major ion concentrations observed in these wells, it appears

that EMF-related impacts are present in these wells, but are delineated by Wells 124 and 125/126 to the west and north (Figure 4.4-14).

The arsenic concentrations are not elevated above the representative levels in wells along the northern fenceline of FMC up to Well 112. To the south, Wells 101/102, 106, TW-10S, and 158 all define arsenic concentrations of less than representative levels. This arsenic distribution is consistent with the groundwater flow patterns, and the known source areas relative to the these flow patterns.

Elevated arsenic concentrations were also present in the deeper aquifer in this area. Typically, arsenic concentrations in the deeper aquifer are localized and are much lower than those detected in the shallow aquifer. For example, at well pair 137/130 the mean arsenic concentrations in shallow Well 137 were 0.086 mg/l and 0.030 mg/l in deeper Well 130.

Barium was found in numerous wells at concentrations above the representative concentrations; however, its spatial distribution is not clearly associated with particular site sources. A key aspect of the barium distribution is that wells located in the westernmost portion of the EMF site (upgradient of known sources) often contain some of the highest concentrations of barium (Figure 4.4-15 and Table 4.4- 4; Wells 153, 154, 147, 148, and 149, 501 and TW-10S). Conversely, the lowest barium concentrations occur in wells known to be impacted by other EMF-related constituents, such as Wells 150 and 152, which are immediately downgradient from former Pond 8S.

Boron was detected at elevated concentrations in the shallow wells located near the old ponds in the southwest FMC area (Figure 4.4-16). The highest mean boron concentrations (14.49 mg/l and 17.10 mg/l) were detected in Wells 150 and 152, respectively, which are located immediately downgradient from former pond 8S. Well 127, which is farther downgradient of the ponds, had a mean boron concentration of 0.310 mg/l, slightly above the Michaud Flats and Bannock Range representative concentrations of 0.294 and 0.308 mg/l, indicating the mean concentration in this area is very close to the 95% UCL for the representative groundwater chemistry. Mean boron concentrations at other wells are between the representative level of 0.30 mg/l and 2.2 mg/l (Table 4.4-4). Wells 126, 124, 101, 158, 106 and 112, which have boron concentrations below the representative levels, define the extent of this constituent. There does not appear to be a significant increase in boron concentrations through the central FMC area, although elevated

concentrations persist up to and beyond the FMC's facility's fenceline at Wells TW-5S and 111 (Figure 4.4-16).

Cobalt was detected in 15 shallow wells at above-representative levels. The highest mean cobalt concentrations were detected in wells associated with the westernmost old ponds (Wells 114, 115, 139, and 159). Lower concentrations of cobalt were detected in Wells 128, 131, 132, 103, 134, and 140 (Figure 4.4-17). There may a secondary cobalt source in the central FMC area, as elevated concentrations were detected in Well 111, along the northern fenceline. However, only two wells in the central area had mean cobalt concentrations above either the Bannock Range or Michaud Flats representative levels (Figure 4.4-17). Cobalt concentrations below representative levels are defined by Wells 112 and 126 to the north, 124 and 101 to the west, 158, 120, 118, 119, 135, 121, and 108 along the southern margin of the plume (Figure 4.4-17).

Lithium was detected in 19 wells at mean concentrations above the Bannock Range and Michaud Flats representative levels, up to 0.19 mg/l (Well 152). Numerous other wells had lithium concentrations that were above the Bannock Range representative level (0.016 mg/l), but below the Michaud Flats representative level (0.061 mg/l). In general, lithium concentrations in impacted wells are between 0.061 mg/l and 0.19 mg/l, which are not significantly elevated with respect to the Michaud Flats representative levels (Table 4.4-4 and Figure 4.4-18). Lithium appears to be emanating from the old ponds located upgradient from Well 116. Elevated lithium concentrations are delineated by Wells 112, 126, 124, 128, 101, 113, 119, 158, 121, and 135. In general, the area encompassed by the elevated lithium concentrations is similar to the areas defined by elevated major ion concentrations (Figure 4.4-18).

Manganese was detected in numerous wells at mean concentrations that were greater than the Bannock Range representative level of 0.0201 mg/l. There were also three wells with manganese concentrations between the Bannock Range and Michaud Flats representative concentrations. The highest mean manganese concentrations were detected in Wells 141, 151, and 159, downgradient from the old ponds in the southwest FMC area and downgradient from the central FMC area. There appears to be manganese sources located in both areas (Table 4.4-4 and Figure 4.4-19). Manganese concentrations increase downgradient from the central area indicating an additional amount of this constituent is introduced into the aquifer in the central FMC area (Figure 4.4-19).

Selenium was detected in Wells 116, 139, 140, 108, 121, 135, and 146 at slightly elevated levels with respect to the Michaud Flats and Bannock Range representative concentrations (Figure 4.4-20). In the southwest FMC area, Wells 116, 139, and 140 had mean selenium concentrations ranging from 0.015 to 0.025 mg/l. In the central FMC area, the highest mean selenium concentration was 0.050 mg/l in Well 121 (Table 4.4-4). More typically, the mean selenium concentrations in impacted wells ranged from 0.006 to 0.008 mg/l, only slightly above the representative levels (0.0055 to 0.0057 mg/l). The extent of elevated selenium in groundwater is delineated by numerous wells with below-representative mean concentrations (Figure 4.4-20).

#### *4.4.4.5 Radiological Parameters in FMC Area Groundwater*

The mean values of the radiological parameters are presented in Table 4.4-5. Wells 150 and 152 in the former ponds area had elevated gross alpha activities for at least one sampling event.

Eight wells monitoring the former ponds area (150, 152, 104, 132, 111, 134, TW-5S, and 116) had gross beta activities above the upper range of representative activity of 45.8 pCi/l with a maximum value of 1,110 pCi/l at Well 150. In the central area, gross beta also exceeded representative activities in Well 121, Well 122, Well 108, and Well 146, with a maximum value of 186 pCi/l at Well 108. Mean gross beta activities are associated with mean potassium concentrations with a correlation coefficient of greater than 0.9, which indicates that potassium-40 is the primary beta-emitter in impacted groundwater at FMC.

Radium-226 and radium-228 were sporadically detected at very low levels in most monitoring wells, including those wells that are hydraulically upgradient from the identified potential sources. Typically, radium-226 and radium-228 activities were reported as ND or not detected for each well over several sampling events. This indicates there is no persistent, elevated presence of this radioisotopes at levels above the detection limit. Additionally, there does not appear to be any "source" of these radioisotopes where activities are persistently elevated above the representative level.

#### *4.4.4.6 Organic Compounds in FMC Area Groundwater*

Several volatile organic compounds (VOCs) were found in wells used to monitor the slag pit area in the central FMC area. As shown in Table 4.4-6, trichloroethene (TCE) was detected during three rounds of sampling at Well 121 at concentrations from 0.008 to 0.015 mg/l. TCE was also

detected in Wells 108 and 146, downgradient from Well 121, at concentrations of 0.002 to 0.003 mg/l. TCE was not detected in wells located upgradient from the central area or in the northern portion of the central area. These data suggest that TCE is present in groundwater in only a limited area.

### 4.4.5 NATURE AND EXTENT OF EMF-RELATED CONSTITUENTS IN GROUNDWATER AT SIMPLOT

This section discusses the groundwater quality beneath the eastern area of the Simplot facility. Potential sources in this area include the former east overflow pond, the lower gypsum stack, and the eastern two-thirds of the upper gypsum stack (Figure 4.4-2). Most of the Simplot production facilities are also in this area. Due to special circumstances at the former east overflow pond, Well 318 is discussed separately (Section 4.4.5.7).

Groundwater from the Portneuf River Valley and Bannock Range hydrogeochemical regimes underflows the eastern Simplot facilities. Michaud Flats groundwater does not flow under this area; therefore, constituent concentrations in Simplot monitoring wells will not be compared to the Michaud Flats representative constituent concentrations.

#### *4.4.5.1 Common Ions in Simplot Area Groundwater*

The mean values of the common ion concentrations are presented in Table 4.4-7 and illustrated in Figures 4.4-5 through 4.4-11. The common ions calcium, chloride, magnesium, potassium, sodium, bicarbonate, and sulfate were detected above representative levels in shallow monitoring wells and in some of the deeper monitoring wells within the eastern Simplot area. Wells PEI-4, PEI-6, 321, 322, and 328, which define the eastern limit of the effects of EMF-related constituents in groundwater, are not discussed further as all concentrations were near representative levels (Portneuf River hydrogeochemical regime).

Sulfate was the most elevated of the common ions when compared to representative concentrations. All wells in the eastern Simplot area exhibited sulfate concentrations above representative levels except deep Well 319. Figure 4.4-6 illustrates the distribution of sulfate in shallow groundwater, indicating that seepage from the gypsum stacks is the source of the elevated sulfate, as well as other common ions, in the eastern Simplot area. Wells located near the gypsum stacks contained mean sulfate concentrations near or above 2,000 mg/l (Wells

PEI-3, 300, 306, 316, 326, and 332). Wells located further downgradient contained sulfate concentrations ranging from 280 mg/l (Well 327) to 1,710 mg/l (Well 313).

Mean concentrations of sodium, calcium, magnesium, and chloride were above representative levels in all eastern Simplot area wells except Well 319. Potassium exceeded its representative level in all wells except PEI-3, PEI-5 and 319. Bicarbonate alkalinity concentrations exceeded the representative level in all wells except 318 and 319. The ranges exhibited for the above common ions were as follows: sodium, 38.5 mg/l (319) to 693 mg/l (300); calcium, 133 mg/l (327) to 564 mg/l (306); magnesium, 49.5 mg/l (327) to 297 mg/l (326); chloride, 68.3 mg/l (327) to 171 mg/l (313); potassium, 11.92 mg/l (327) to 38.95 mg/l (313); and bicarbonate alkalinity, 182 mg/l (PEI-5) to 1307 mg/l (326).

#### *4.4.5.2 Physical Parameters in Simplot Area Groundwater*

The mean values of the physical parameter measurements are presented in Table 4.4-7. Impacted wells in the Simplot area typically had over 1,000 mg/l TDS (up to 7,620 mg/l in Well 318) compared to the representative levels of 412 mg/l in Bannock Range groundwater and 580 mg/l in Portneuf River Valley groundwater. Wells located adjacent to the gypsum stack (PEI-3, 300, and 306) had mean TDS levels over 4,000 mg/l. Elevated specific conductance and TDS are indicative of elevated common ion concentrations. These elevated constituents (with respect to the Bannock Range and Portneuf River representative levels) were bounded on the east by Wells PEI-4, 321, 322, and 328. The pH in impacted wells was decreased compared to representative wells; most impacted wells had pH levels between 5.5 and 6.75. Eh results demonstrated oxidizing conditions beneath the Simplot facility in all wells; as was the case for representative wells. There were no elevated temperatures associated with the Simplot facility.

#### *4.4.5.3 Nutrients and Fluoride in Simplot Area Groundwater*

Nutrient and fluoride analytical results for Simplot monitoring wells with impacted water chemistry are summarized in Table 4.4-7. Total phosphorus, orthophosphate, nitrate, ammonia, and fluoride were present at elevated concentrations in groundwater beneath portions of the Simplot facility (Figures 4.4-21 through 4.4-24).

The phosphate parameters are characteristic EMF-related constituents in groundwater for the Simplot facility. Orthophosphate (Figure 4.4-23) and total phosphorus were found at elevated

concentrations in all impacted Simplot wells. Mean phosphate concentrations ranged from 6.36 mg/l to 183 mg/l (orthophosphate) and 6.45 to 179 mg/l (total phosphorus). For comparison, representative concentrations are 0.13 mg/l for orthophosphate and 0.31 mg/l for total phosphorus.

Elevated nitrate concentrations were detected in samples from 12 wells (PEI-3, PEI-5, 300, 306, 313, 315, 316, 320, 325, 326, 327, and 332); mean concentrations ranged from 1.92 to 74.3 mg/l (compared with the representative level of 4.00 mg/l in Portneuf River Valley groundwater and 1.60 mg/l in Bannock Range groundwater). Elevated ammonia concentrations were detected in samples from Wells 313, 318, 320, and 325; mean concentrations ranged from 2.90 mg/l to 37.4 mg/l. The distribution of nitrate and ammonia plumes indicate that there is a nitrogen compound source within the Simplot plant, the plume configurations do not indicate the gypsum stack is a source of nitrate or ammonia.

Of note is the occurrence of elevated ammonia in the same wells as elevated nitrate. Since all these wells had oxidizing conditions, it may be that the ammonia was oxidizing as it was transported along a flowpath.

Elevated mean fluoride concentrations were detected in Wells 319, 320, 327, and PEI-5; mean concentrations ranged from 1.26 mg/l in Well 319 to 4.15 mg/l in PEI-5. The distribution of fluoride in the shallow groundwater indicates there may be a secondary or weaker source of fluoride within the Simplot plant area, as the above-listed shallow wells are not directly downgradient from the former east overflow pond.

#### *4.4.5.4 Metals in Simplot Area Groundwater*

The mean values of metal concentrations are presented in Table 4.4-7. Isoconcentration contour plots were not developed for aluminum, beryllium, cadmium, chromium, copper, iron, lead, molybdenum, vanadium, thallium, or zinc because elevated concentrations of these constituents that were EMF-related were limited to Well 318 (and possibly Well 320). This distribution does not readily permit delineation of the area or extent of impact. The occurrence of constituents unique to Well 318 and the former east overflow pond will be discussed separately in Section 4.4.5.7.

Aluminum, antimony, barium, beryllium, cadmium, chromium, cobalt, iron, lead, mercury, molybdenum, silver, thallium, vanadium, and zinc were eliminated from further consideration as being EMF-related constituents in the eastern Simplot area. Although some of these metals were detected in Well 318, these constituents are unique to the former east overflow pond. They were not detected in any other well at levels in excess of representative concentrations, except in the following instances: aluminum in Well PEI-5; barium in Well 322; silver in Wells PEI-3 and 316; and vanadium and zinc in Well PEI-3.

Barium was detected in Well 322 at a mean concentration of 0.1900 mg/l, compared to the Portneuf River Valley representative concentration of 0.1735 mg/l. Wells located near Well 322 do not contain elevated levels of barium, indicating the barium detected in Well 322 is not derived from EMF-related sources. Barium levels also exceeded the representative level for the Bannock Range in Wells PEI-5 and 318.

Mean arsenic concentrations exceeded the Bannock Range representative level (0.0180 mg/l) in 14 wells in the eastern Simplot area (Table 4.4-7 and Figure 4.4-14). Arsenic was below its representative level only in deep Well 319. The distribution of arsenic is generally correlative with sulfate and other common ions, indicating that gypsum stack seepage is the source of arsenic in the eastern Simplot area.

Arsenic levels were highest within (Wells PEI-3, 300, and 306) or adjacent to (Wells 315, 316, 317, 326 and 332) the gypsum stacks. The highest mean concentration of arsenic was 0.609 mg/l at Well 300, which is located between the upper and lower gypsum stack.

Arsenic concentrations were typically lowest in wells furthest downgradient from the gypsum stacks. Mean arsenic concentrations in these downgradient wells ranged from 0.0292 mg/l at Well 327 to 0.068 mg/l at Well 320.

Boron was detected at mean concentrations greater than its representative level in Bannock Range groundwater (0.3078 mg/l) in 12 wells (PEI-3, 300, 306, 313, 315, 316, 317, 318, 320, 325, 326, and 332). Concentrations in these wells, other than Well 318, ranged from 0.37 mg/l in Well 325 to 0.74 mg/l in Well PEI-3. Figure 4.4-16 shows that boron was rather uniformly distributed throughout the affected area adjacent to and downgradient from the gypsum stacks, except at Well 318 immediately downgradient from the former East Overflow Pond.

Copper was detected in Wells PEI-5, PEI-3, 300, and 316 at mean concentrations from 0.0126 mg/l to 0.018 mg/l. The Bannock Range representative concentration is 0.0109 mg/l.

Lithium was detected at elevated mean concentrations in 16 wells in the eastern Simplot area. Mean concentrations range from 0.0378 mg/l to 0.359 mg/l compared to the Bannock Range representative concentration of 0.0165 mg/l. The Portneuf River Valley representative concentration was 0.040 mg/l, and the unimpacted monitoring wells 321, PEI-4, and 328 have mean lithium concentrations less than this level. Elevated lithium concentrations were limited to the east by Wells 305 and 328. Lithium appeared to be emanating from the former East Overflow Pond and the joint fenceline area. In general, the area encompassed by elevated lithium concentrations is similar to the areas defined by elevated common ion concentrations (Figure 4.4-18).

Manganese was detected in Wells 320 and PEI-5 at concentrations above the Bannock Range representative concentrations. The mean concentrations in these wells range from 0.4824 to 0.680 mg/l. The manganese in Well 320 may be associated with the former east overflow pond, as it was detected in Well 318 at a mean concentration of 7.07 mg/l (Table 4.4-7; Figure 4.4-19).

Average nickel concentrations exceeded the representative level (for Bannock Range groundwater) in Well PEI-5 (0.2315 mg/l) and Well 332 (0.0318 mg/l). Nickel was also detected above the representative level in Well 320, which may be within the downgradient flowpath from the former east overflow pond or the joint fenceline area. The elevated nickel detected in Well 318 may be migrating to Well 320.

Selenium concentrations were elevated with respect to representative concentrations in Wells PEI-3, 300, 313, 316, 320, 326, and 332 (Figure 4.4-20). The Bannock Range representative concentration was 0.0055 mg/l.

#### *4.4.5.5 Radiological Parameters in Simplot Area Groundwater*

Gross beta and gross alpha activities were determined to be EMF-related parameters for the Simplot area by a comparison of their levels to representative groundwater concentrations. The mean values of the radiological parameters are presented in Table 4.4-8.

Mean gross alpha activities ranged from a low of 2.34 pCi/l in Well PEI-4 to a high of 1690 pCi/l in Well 318. The upper limit of gross alpha in representative wells was 5.8 pCi/l. Wells 313, 315, 316, and 325, in the vicinity of the gypsum stacks, also had elevated gross alpha activities compared to representative wells. Detected gross beta activities (in discrete samples) ranged from a low of 4.09 pCi/l in Well 328 to a high of 1163 pCi/l in Well 318 (Table 4.4-8). Mean gross beta activities exceeded the representative level in Wells 317, 318, 320, 306, 313 and 315.

Neither of the radium isotopes (226 and 228) were detected at mean activities above the representative activities in any well, with the exception of radium-226 in Well 325. Well 325 is located in the Bannock Range hydrogeochemical regime, which has a representative radium-226 activity of 1.00 pCi/l. The mean radium-226 activity in Well 325 was 1.18 pCi/l, and likely is not indicative of a radium-226 source.

#### *4.4.5.6 Organic Compounds in Simplot Area Groundwater*

Several organic compounds were detected in Simplot monitoring wells. The mean values of the compound concentrations are presented in Table 4.4-9. However, the sporadic detection of these organic compounds indicates that they are not EMF-related constituents. Of the 15 volatile or semivolatile organic compounds reported, most or all may not actually be present in groundwater. Several compounds represent common laboratory solvents, including methylene chloride, acetone, and plasticizers (phthalates). Compounds reported infrequently and at low concentrations, such as 2-butanone, tetrachloroethene, 1,1,1-trichloro-ethane, ethyl benzene, trichloroethene, xylenes, benzoic acid, and tetrahydrofuran, may represent an aberration in the analytical methodology and may not actually be present in the samples.

#### *4.4.5.7 Constituents Detected in Groundwater at the Former East Overflow Pond*

The former east overflow pond is a relatively unique source at the EMF site because of the very low pH process fluids that were intermittently discharged to the pond. The very low pH conditions increased the solubilities of certain metals. Well 318 monitors the shallow groundwater adjacent to this former pond. Groundwater samples collected while the pond was still in operation had the lowest recorded pH (mean of 2.60) and the highest overall concentrations of the following metals: aluminum, cadmium, chromium, copper, iron, lead, lithium, manganese, molybdenum, nickel, vanadium, and zinc. Monitoring Well 320, which may

be downgradient from Well 318, contained nickel and manganese at levels that indicate the former east overflow pond may have impacted groundwater in that area (Table 4.4-7).

Well 318 also had the highest mean concentrations of calcium, fluoride, orthophosphate, total phosphorus, ammonia, sulfate, and TDS of any well within the eastern Simplot area.

Simplot closed the former east overflow pond in August 1993, replacing it with a lined pond. Data collected in June 1994 from Well 318 indicated that metal concentrations have decreased significantly, and pH rose to greater than 6 since closing the pond (Table 4.4-10). These results will be discussed in more detail in Section 5 of this report.

### 4.4.6 Nature and Extent of EMF-Related Constituents in Groundwater in the Joint Fenceline Area

The joint fenceline area is bounded by the FMC former kiln scrubber overflow ponds in the west and the Simplot gypsum stack in the east (Figure 4.4-2). The area includes the FMC former calciner ponds, calciner sediment storage area (south of the former calciner ponds), the FMC IWW ditch, the former kiln scrubber overflow pond, and the western third of the Simplot upper gypsum stack. The joint fenceline area is discussed separately because there is a commingling of impacted groundwater from various sources.

In general and as previously described in Section 4.4.5, gypsum stack seepage results in elevated common ion concentrations, notably sulfate, elevated arsenic and lithium, and depressed pH in shallow groundwater. These gypsum stack effects are also apparent in portions of the joint fenceline area. Other potential sources that may influence groundwater chemistry in the joint fenceline area include the former calciner ponds, calciner sediment storage area, the IWW basin and ditch, and the former kiln scrubber overflow pond. Constituents that may be contributed by one or more of these sources include chloride, potassium, ammonia, selenium, and arsenic.

This area is very complex geologically and hydrologically, with great variation in transmissivity, hydraulic conductivity and pH. All of these factors, in association with complex chemical reactions that are occurring in the subsurface (SII, 1994), and the dynamics of facility operations (i.e., pond heads, closures, gypsum stack construction, etc.) over the years, have contributed to the complexity of this area. For these reasons, statements in this section concerning sources in

this area should not be extrapolated to areas east or north of the gypsum stack, nor west or north of the FMC former kiln scrubber overflow ponds (Figure 4.4-2).

Portneuf River Valley and Michaud Flats groundwaters do not underflow this area. The groundwater underflowing the joint fenceline area originates in the Bannock Range recharge areas.

#### *4.4.6.1 Common Ions in Joint Fenceline Area Groundwater*

Table 4.4-11 summarizes the common ion concentrations detected in wells throughout the joint fenceline area, with a comparison to the Bannock Range representative levels. All common ions in shallow groundwater were elevated with respect to representative levels. Of particular note are potassium and sulfate.

Elevated potassium levels were detected in all shallow wells except Well 324. The highest potassium concentrations were detected in Wells 136, 145, and 309, and were, respectively, 122, 81, and 55 mg/l. Concentrations in other wells were less than 36 mg/l. These data indicate that potassium is primarily introduced into the groundwater from residuals associated with the old calciner ponds (Figure 4.4-5).

Sulfate was detected at elevated concentrations in all shallow wells throughout the joint fenceline area. Mean concentrations reported for shallow wells 307, 308, and 333 were 1,932, 1,958, and 2,200 mg/l, respectively. These wells contained the highest mean sulfate values and all three wells are located in close proximity to the gypsum stack (Figure 4.4-6). Deep wells 330, 109 and 329, located along the northern joint fenceline, which had the lowest mean sulfate concentrations, do not appear to be site-affected (Table 4.4-11).

#### *4.4.6.2 Physical Parameters in Joint Fenceline Area Groundwater*

The TDS and specific conductance were above measured representative levels in all the wells in the joint fenceline area, except for Wells 109, 329, and 330. The pH was below representative levels in all wells except for Wells 330 and 331. Temperature was elevated in Wells 123, 309, 310, 324, and 331. The mean values of the physical parameter measurements are presented in Table 4.4-11.

### 4.4.6.3 Nutrients and Fluoride in Joint Fenceline Area Groundwater

The mean nutrient and fluoride concentrations are presented in Table 4.4-11. Mean ammonia concentrations exceeded the Bannock Range representative level in eight monitoring wells, with the highest mean concentration reported for Well 145.

Mean nitrate concentrations exceeded the Bannock Range level of 1.60 mg/l in 17 wells. Only Wells 324, 109, and 330 had mean nitrate concentrations below the Bannock Range representative levels. The highest mean nitrate concentration was reported in Well 331, in the northeast corner of the joint fenceline area and is affected by a source east of the joint fenceline area within the Simplot plant (Figure 4.4-22).

Total phosphorus was elevated in 15 monitoring wells and orthophosphate was elevated with respect to the Bannock Range levels in 17 wells (Table 4.4-11). Total phosphorus and orthophosphate concentrations were highest in Wells 136, 307, 308, and 323. The deep monitoring wells (109, 329, and 330) along the northern joint fenceline area did not contain elevated concentrations of orthophosphate or total phosphorus and do not appear to be site-affected (Table 4.4-11).

Fluoride concentrations were slightly above the representative level in seven wells throughout the joint fenceline area. The highest concentrations were detected in Wells 308 and 136 (mean concentrations of 1.34 and 1.66 mg/l, respectively).

### 4.4.6.4 Metals in Joint Fenceline Area Groundwater

The mean values of the metals concentrations are presented in Table 4.4-11. Metals with mean concentrations below the Bannock Range representative levels in all joint fenceline area wells were: aluminum, antimony, beryllium, chromium, iron, lead, molybdenum, silver, thallium, and zinc, and are not discussed further. In addition, barium, cadmium, copper, cobalt, and mercury were not found to be EMF-related, as discussed below.

Barium was detected at a mean concentration of 0.246 mg/l in Well 142, compared to the Bannock Range representative level of 0.1204 mg/l. Well 142 is downgradient from the upper gypsum stack at Simplot; however, none of the shallow monitoring wells located immediately adjacent to the gypsum stack had mean barium concentrations in excess of the Bannock Range

representative level. This observation indicates that barium is not a EMF-related constituent in the joint fenceline area, since no potential source of this constituent has been identified upgradient from Well 142.

Cadmium was detected at a mean concentration of 0.0055 mg/l in Well 143. This value exceeds the Bannock Range representative level of 0.005 mg/l; however, several of the analytical results that exceeded 0.005 mg/l were J-qualified (meaning the detected concentrations are estimated). All unqualified data from this well were below 0.005 mg/l, suggesting that true mean concentrations are less than the representative level for cadmium.

Copper was detected in Well 136 at a mean concentration of 0.0135 mg/l, compared to the Bannock Range representative concentration 0.0109 mg/l. The historical copper concentrations in this well indicate total copper is typically less than 0.0109 mg/l, with three samples elevated with respect to this concentration while one sample of these was nondetect. It appears that copper is not a EMF-related constituent in the joint fenceline area.

Cobalt was detected at mean concentrations in excess of the representative level in Well 144. This well had a reported mean concentration 0.0144 mg/l compared to the Bannock Range level of 0.0108 mg/l. The cobalt detected in this well does not appear to be EMF-related because this well is a deeper well, and there is no upgradient potential source of cobalt, as evidenced by cobalt concentrations in upgradient wells 142, 304, 333, 136, and 143. In any case, the concentrations detected in Well 144 are not significantly elevated when compared to the representative levels.

Mercury was detected at levels exceeding the Bannock Range representative level of 0.00078 mg/l in Well 144 at a mean concentration of 0.00221 mg/l. Well 144 is a deep monitoring well paired with shallow Well 145. Mercury is below the representative level in Well 145, and in all other shallow wells located throughout the joint fenceline area, indicating that the mercury in Well 144 is not EMF-related. Further evidence of this is that mercury was not detected in samples collected during the August 1993 and December 1993 sampling events. These results indicate that the occurrence of mercury in this well is sporadic, if it is truly present and not an artifact of laboratory contamination or field sampling contamination.

Arsenic, boron, lithium, manganese, nickel, selenium, and vanadium were detected at concentrations above representative levels in groundwater beneath the joint fenceline area.

There are several key aspects regarding the distribution of these metals; selenium appears to be associated with FMC's old calciner ponds, while lithium appears to be associated with the Simplot upper gypsum stack (Figures 4.4-18 and 4.4-20). While neither of these constituent plumes represents a unique source for these constituents at the EMF site, their distribution does indicate a stronger source of selenium and lithium in the joint fenceline area.

Elevated arsenic concentrations were more prevalent in the central portion of the joint fenceline area, with less than representative levels in Wells 142, 304, and recently installed Well 161 in the southern portion of this area. The highest mean arsenic concentrations were detected in Well 323, at a mean concentration of 0.658 mg/l. Other wells with similar levels are 123 (0.5506 mg/l), 307 (0.5970 mg/l), and 308 (0.5521 mg/l). Deeper wells 329, 330, 109, and 144 do not contain elevated arsenic concentrations. Gypsum stack seepage results in elevated arsenic in shallow groundwater, and other potential sources include the former calciner ponds and calciner sediment storage area.

Boron was detected in 15 wells at elevated concentrations ranging up to 1.03 mg/l (in Well 143). No primary source of boron was identified, but potential sources include the gypsum stack, former calciner ponds, and calciner sediment storage area.

Lithium was elevated with respect to the representative Bannock Range concentrations in all wells throughout the joint fenceline area, including deeper Wells 109, 330, 329, and 144. The highest mean concentrations were detected in Wells 136, 145, 307, 308, and 333, up to 0.6073 mg/l in Well 307 (Table 4.4-11). Lithium appears to be primarily associated with the Simplot upper gypsum stack.

Manganese was detected in 12 wells at mean concentrations exceeding the Bannock Range representative concentration of 0.0201 mg/l. Mean manganese concentrations ranged up to 2.266 mg/l in Well 136 (Table 4.4-11; Figure 4.4-19). No primary source of manganese was identified, but potential sources include the IWW basin and ditch and former kiln scrubber overflow pond.

Nickel was detected in five wells (136, 143, 145, 308, and 312) at mean concentrations exceeding the Bannock Range representative levels of 0.002 mg/l (Table 4.4-11). The highest mean concentrations were detected in Wells 143 and 308 at levels of 0.0580 and 0.0527 mg/l, respectively.

Selenium was detected in 15 wells at mean concentrations in excess of the Bannock Range representative level (0.0055 mg/l). The highest mean concentration was detected in Well 123 (0.2896 mg/l), while most other wells had mean concentrations on the order of 0.010 to 0.100 mg/l (Table 4.4-11). Mean selenium concentrations in wells in this area (123, 143, 145, 312, and several other shallow wells) were the highest observed throughout the EMF site (Figure 4.4-20). Selenium appears to be primarily associated with FMC's old calciner ponds.

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Vanadium was detected at mean concentrations in excess of the Bannock Range representative level (0.100 mg/l) in Wells 123, 143, and 312. The highest mean concentration was detected in Well 123 (0.186 mg/l).

#### *4.4.6.5 Radiological Parameters in Joint Fenceline Area Groundwater*

The mean values of the radiological parameter measurements are presented in Table 4.4-12. Gross alpha and gross beta activities were both measured at above-representative levels in the joint fenceline area groundwater.

#### *4.4.6.6 Organic Compounds in Joint Fenceline Area Groundwater*

Wells 301, PEI-1, 304, and 312 had reported levels of organic compounds (Table 4.4-9). The occurrence of these compounds in representative Wells 301 and PEI-1 indicates these compounds may have been detected as a result of laboratory contamination.

### 4.4.7 NATURE AND EXTENT OF EMF-RELATED CONSTITUENTS IN GROUNDWATER WITHIN THE NORTHERN FMC/SIMPLOT PROPERTIES

The northern FMC/Simplot properties is defined as the properties owned by the Companies located north of the facilities' fencelines and south of I-86. As discussed above, EMF-related impacts to groundwater were delineated to the south, east, and west of the facilities. No EMF-related sources were identified in the northern FMC/Simplot properties. Therefore, most or all the constituents detected in northern area wells that exceeded representative levels were likely derived from either EMF sources within the facilities' fencelines, or from non-EMF sources.

The following subsections describe the distribution of these constituents in more detail.

#### *4.4.7.1 Common Ions in Northern FMC/Simplot Properties*

The mean values of the common ion concentrations are presented in Table 4.4-13. The highest concentrations of common ions detected in monitoring wells were about 10 to 100 times lower than the concentrations detected in monitoring wells located adjacent to potential sources (Figures 4.4-5 through 4.4-11). Mean sulfate concentrations were highest in Well TW-12S (316 mg/l).

Potassium concentrations in northern site area monitoring wells were highest in Well TW-9S (127 mg/l), the Old Pilot House well (106 mg/l), Well TW-12S (20.34 mg/l), and Well 517 (76.5 mg/l). These wells are located in an area downgradient from potential potassium sources in the southwest and central FMC area and sources in the joint fenceline area.

Alkalinity (bicarbonate), calcium, chloride, magnesium, and sodium concentrations were elevated with respect to representative concentrations in the impacted wells.

#### *4.4.7.2 Physical Parameters in Northern FMC/Simplot Properties Groundwater*

The mean values of the physical parameter measurements are presented in Table 4.4-13. Physical parameters were detected at levels above the representative levels (or were below the representative levels in the case of Eh and pH) in the northern FMC/Simplot properties.

#### *4.4.7.3 Nutrients and Fluoride in Northern FMC/Simplot Properties Groundwater*

The mean values of the nutrient and fluoride concentrations are presented in Table 4.4-13. Ammonia was detected at a mean concentration above representative levels in Well TW 12S.

EMF site-related constituents total phosphorus and orthophosphate also occur in the impacted northern site area wells (Figure 4.4-23), but the overall concentrations were significantly lower than the maximum concentrations detected in wells immediately adjacent to potential sources. Total phosphorus was detected at mean concentrations ranging from 1.07 mg/l (Well 517) to 29.63 mg/l (Well TW-12S), and orthophosphate was detected at mean concentrations ranging from 0.86 mg/l to 27.47 mg/l (Table 4.4-13).

Fluoride was also identified as an EMF site-related constituent in northern site area groundwater. Well TW-12S contained the most elevated mean fluoride concentration relative to representative concentrations (1.13 mg/l; Table 4.4-13) (Figure 4.4-24).

Nitrate was detected at concentrations exceeding representative levels in nine northern site area wells (Table 4.4-13; Figure 4.4-22). Mean nitrate concentrations in impacted wells ranged from 1.81 mg/l to 13.36 mg/l. The highest mean nitrate concentrations were detected in Wells TW-12S, Old Pilot House, TW-9S, and 517 (Table 4.4-13). Some of the nitrate in the impacted wells may be an oxidation product of ammonia. Nitrate detected in unimpacted wells occurs as a

result of non-EMF-related anthropogenic activities. Representative nitrate concentrations ranged up to 5.52 mg/l in the Michaud Flats hydrogeochemical regime.

#### *4.4.7.4 Metals in Northern FMC/Simplot Properties Groundwater*

The mean values of the metals concentrations in northern site area groundwater are presented in Table 4.4-13. The metals aluminum, antimony, beryllium, cadmium, chromium, copper, lead, mercury, molybdenum, silver, thallium, vanadium, and zinc were not detected at above-representative concentrations in northern FMC/Simplot area wells.

Groundwater from Wells TW-9S, Old Pilot House, and TW-12S contained the highest concentrations of arsenic for any of the northern FMC/Simplot area wells. Other wells with arsenic concentrations above the representative concentration included 517, 518, and the Frontier Well, with mean concentrations ranging from 0.0169 mg/l to 0.032 mg/l. The upper concentration value of arsenic in representative groundwater is 0.018 mg/l in Bannock Range groundwater and 0.0105 mg/l for the Portneuf River Valley groundwater (Table 4.4-13 and Figure 4.4-14).

Barium exceeded the representative level in the Old Pilot House well and Well 501. Well 501 is located hydraulically crossgradient or upgradient from EMF potential sources, therefore, the barium in this well is not considered EMF-related. This conclusion is further supported by the fact that groundwater from Well 501 does not contain other EMF-related constituents at levels in excess of the Michaud Flats representative levels. This exceedance of barium may be due to the higher barium content of Michaud Flats groundwater that converges and mixes with Bannock Range groundwater in the vicinity of the Old Pilot House well or it may be derived from EMF sources upgradient from this well (Figure 4.4-15).

Boron exceeded representative levels in four northern site area wells: Lindley, Old Pilot House, Well TW-9S, and Well 517. The maximum mean concentrations were 0.7046 mg/l, detected in the Old Pilot House well. The Old Pilot House well is closest to onsite potential sources, and the mean concentrations decrease from this well out to Wells TW-9S and 517. The Lindley Well appears to have only slightly elevated boron concentrations relative to the representative levels (0.3269 mg/l vs. 0.3078 mg/l for Bannock Range representative levels), indicating that the boron concentrations in the Lindley Well are not EMF-related. (The reader will recall that there will be

a certain number of wells which, while not impacted by EMF sources, contain a constituent in excess of the statistically-defined representative concentrations.)

Cobalt also exceeded representative concentrations in the Old Pilot House well (Table 4.4-13). The mean cobalt concentration in this well was 0.0154 mg/l compared to the Michaud Flats representative level of 0.0145 mg/l and the Bannock Range representative level of 0.0109 mg/l.

Iron exceeded representative levels in Wells TW-9S (1.3756 mg/l mean concentration). This well is mild steel cased, with stainless steel wire-wrapped well screens or perforated mild steel intakes. Given the well construction materials and the reduced Eh conditions observed in the TW-series wells, it appears that the mild steel may provide a source for the elevated iron content in the water sampled from these wells. An alternate explanation might be that these wells yield slightly more turbid samples due to the lack of filter pack.

Lithium occurs at mean concentrations above the Bannock Range representative concentration in Well 500, the New Pilot House well, 504, and 508 at levels slightly greater than 0.0400 mg/l (Figure 4.4-18). The representative lithium concentrations are 0.040 mg/l in Portneuf River Valley groundwater and 0.0165 mg/l in Bannock Range groundwater. These wells are not impacted by other EMF-related constituents. Additionally, none of the unimpacted wells listed above exceeded the Michaud Flats groundwater representative concentration (0.0610 mg/l). Therefore, lithium detected in these wells is likely to be within the representative range for groundwater, and the Bannock Range representative level may be underestimated.

Manganese was present at mean concentrations in excess of representative concentrations in the Old Pilot House well, Wells TW-9S, TW-12S, and Well 503. These maximum mean concentration was 1.1005 mg/l in TW-9S. The representative levels are 0.0201 mg/l in Bannock Range groundwater up to 0.1097 mg/l in the Portneuf River Valley groundwater.

Nickel exceeded the representative concentrations in Well TW-12S, where the mean concentration was 0.0606 mg/l compared to representative levels of 0.0200 mg/l. Mean nickel concentrations were not above this level in other northern site area wells.

Selenium was reported at maximum mean concentrations of 0.0112 mg/l and 0.0153 mg/l in Wells TW-12S and 517, respectively. These concentrations are 0.0057 to 0.008 mg/l higher than the representative concentrations.

#### *4.4.7.5 Radiological Parameters in Northern FMC/Simplot Properties Groundwater*

The mean values of the radiological parameters are presented in Table 4.4-14. The radiological parameter radium-228 was not detected at mean values above representative levels. Radium-226 was reported at a mean activity of 1.88 pCi/l in Well 508, located along the Portneuf River and unimpacted by EMF-related sources, as evidenced by common ion, nutrients, and metals concentrations in the well. Gross alpha was detected at a mean activity of 10.33 pCi/l in the Lindley well compared to background levels of 5.57 pCi/l. The gross alpha activity in this well does not appear to be EMF-related, because there no evidence of an upgradient source for the gross alpha in this well.

Gross beta was the only radiological parameter that was consistently detected at levels above representative in northern area wells. The gross beta activity in these wells correlated with the total potassium concentrations, indicating that potassium-40 is the beta-emitter present in these wells.

#### *4.4.7.6 Organic Compounds in Northern FMC/Simplot Properties Groundwater*

The mean values of the organic compound concentrations in northern area groundwater are presented in Table 4.4-15. No significant concentrations of organic compounds were detected.

### 4.4.8 NATURE AND EXTENT OF EMF-RELATED CONSTITUENTS IN GROUNDWATER NORTH OF I-86

All EMF-affected groundwater passes beneath I-86 through the shallow aquifer between some point east of Well 502 and the Portneuf River. This water discharges to the river at Batiste and Swanson Road Springs and as base flow between these springs. Average concentrations of EMF-related constituents were below MCLs in groundwater north of I-86. Furthermore, most constituents were at or below representative levels in this area (Tables 4.4-16 to 4.4-18). There were no EMF-related effects in groundwater north of Batiste Spring, as evidenced by water quality in Wells 524 and 525, a well pair located about 150 feet north of the spring.

EMF-related impacts were not detected in Wells 514, 515, 516, 519, 502, TW-11I, and TW-11S. The only points north of I-86 where EMF-related constituents were detected above representative values are Well 503, and Batiste and Swanson Road Springs. These springs are on

company-owned property, while Well 503 is on the county right-of-way. These impacts were limited to slightly elevated concentrations of major ions, nutrients, a limited suite of metals, low pH, and elevated TDS. The pattern in the extent of EMF-related constituents is generally consistent; Well 503 contained the highest levels of constituents, Swanson Road Spring and Batiste Spring contain elevated, but lower, concentrations, of certain constituents. Batiste Spring has groundwater chemistry similar to that of Bannock Range hydrogeochemical regime, and Well 503 and Swanson Road Spring have groundwater chemistry similar to that of the Portneuf River Valley hydrogeochemical regime.

Ammonia was detected in Well 503 and Batiste Spring at mean concentrations in excess of the representative concentrations (Figure 4.4-21). In Well 503, Batiste and Swanson Road Spring, mean sulfate concentrations ranged from 115 to 238 mg/l (Table 4.4-16), which exceed the representative levels. Orthophosphate and total phosphorus concentrations were also elevated with respect to representative levels. Mean potassium concentrations slightly exceeded representative levels in samples from Batiste Spring (10.61 mg/l) and Well 503 (8.27 mg/l). Fluoride was also elevated with respect to representative concentrations in Well 503 (Figure 4.4-24).

Mean concentrations of arsenic, lithium, iron, mercury, and selenium were found to exceed representative levels at one or more offsite monitoring locations; (Table 4.4-16); however, iron and mercury are not thought to be EMF-related, as discussed below.

Arsenic concentrations are elevated with respect to representative levels in Well 503 (Portneuf River regime), but not Batiste Spring (Bannock Range regime). Lithium concentrations were slightly above representative levels in Batiste Spring, Well TW-11I and Well TW-11S. Lithium in Wells TW-11I and TW-11S is not considered site related because all other site indicator parameter concentrations were below representative levels in these wells. Iron exceeded the representative level in Well TW-11I, however, this was found to be associated with the mild

steel well casing. The mean mercury concentration in samples from Well 516 exceeds the representative level, but this is because of one high value with a U qualifier (i.e., nondetect).

The mean concentration of selenium in Batiste Spring was 0.0069 mg/l, compared to representative levels of 0.0055 to 0.0060 mg/l. During one sampling event (December 1992), selenium was detected in Batiste Spring water at a concentration of 0.010 mg/l. If this value is not used in calculating the mean selenium concentrations, the mean concentration at Batiste Spring is less than the representative level. Under "average" conditions, selenium concentrations are not elevated with respect to unimpacted groundwater.

Groundwater from beneath the EMF site discharges to the Portneuf River at Batiste and Swanson Road Spring and as baseflow between these springs. Although a few EMF-related constituents have been detected at Batiste and Swanson Road Springs, concentrations were from one to two orders of magnitude less than concentrations in groundwater beneath source areas. Average concentrations in the groundwater north of I-86 were below MCLs.

### 4.4.9 Radiological Speciation Results

Groundwater samples collected from 12 wells in March 1994 were tested for alpha, beta, and gamma emitting radioisotopes associated with the phosphate ore processed at the facilities. These wells were selected because previous samples had higher detected gross alpha and/or gross beta activities compared with other wells and because these wells represent a cross section of the various potential sources and geologic areas. These data, presented in Table 4.4-19, were also reported to EPA in August 1994, in response to EPA's request for additional site characterization data to support the development of the baseline risk assessment.

Radionuclide-specific analyses were performed for the major radionuclides in the uranium-238 decay chain (i.e., uranium -238 and -234, thorium-230, radium-226, lead-210, and polonium-210). Radionuclide-specific analyses were also performed for thorium-232, radium-228, and potassium-40. Only radium-226, -228, uranium-234, uranium-238, and potassium-40 were detected. Lead-210, thorium-232 and -230, and polonium-210 were not detected above their minimum detectable activity (MDA) in any sample. Gross alpha and gross beta activities were

also measured in the water samples to evaluate total activities associated with the detected radioisotopes.

Section 4.4.9.1 discusses speciation data for beta-emitting radionuclides and Section 4.4.9.2 discusses speciation data for alpha-emitting radionuclides. These sections include a discussion of groundwater samples analyzed for gross alpha and beta, radium-226, and radium-228 in samples collected during the quarterly groundwater monitoring event during the period of investigation. Section 4.4.9.3 discusses potential relationships between radionuclides in soils and groundwater.

### *4.4.9.1 Beta-emitting Radionuclides*

Gross beta was detected among the samples collected in the representative monitoring well network during the quarterly monitoring program over the course of the remedial investigation (see Section 4.4.1) at a mean activity of 7.7 pCi/l; the minimum detected activity in this group of samples was below the MDA of 2 pCi/l and the maximum detected activity was 20.6 pCi/l. As discussed in this section, potassium-40 is the dominant beta-emitting radionuclide in most samples containing above-representative gross beta activities.

**Speciation Results from March 1994.** Table 4.4-20 presents a series of comparisons related to beta particle-emitting radionuclides detected in samples collected from 12 wells in March 1994. It lists the activity of potassium-40 that would be expected given the total potassium concentration detected in the sample. This activity was calculated using the naturally-occurring ratio of potassium-40 to total potassium (0.0118%), as noted in the table. It also lists the gross beta activity that would be expected if the detected beta-emitting radionuclides (potassium-40, radium-228, and radium-226) were the only beta-emitting radionuclides in the sample. This was calculated to evaluate the accuracy of the gross beta and radionuclide-specific analyses. The gross beta activity was calculated using the established beta-emission specific activities of potassium-40, radium-226 and radium-228 as noted in the table.

These comparisons show that the detected activities of beta-emitting radionuclides were consistent with the detected gross beta activities. Potassium-40 is the dominant beta-emitting

**TABLE 4.4-20**
**COMPARISON OF MEASURED AND PREDICTED BETA-EMITTING RADIONUCLIDES IN GROUNDWATER SAMPLES COLLECTED FROM 12 WELLS IN MARCH 1994**

| | DETECTED CONSTITUENT LEVELS | | | | | PREDICTED CONSTITUENT LEVELS | | | |
|---|---|---|---|---|---|---|---|---|---|
| Well Number[1] | Gross Beta[2] | Potassium-40[2] | Potassium[3] | Radium-228[2] | Radium-226[2] | Gross Beta[2,4] | Potassium-40[2,5] | Radium-228[7] | Radium-226[7] |
| 121 | 120 ±10.7 | 184 ± 82 | 169.6 | 4.7 ± 1 | <MDA of 1 | <175.1 | 142.1 | 75.5 | 41.0 |
| 123 | 27.3 ± 3.5 | <MDA[6] of 110 | 29.0 | <MDA of 1 | 2.1 ± 0.3 | <106.2 | 24.3 | 17.2 | 9.3 |
| 136 | 64.9 ± 17.3 | 126 ± 81.2 | NA[6] | 8.4 ± 1 | 1.4 ± 0.6 | 130.2 | ND[6] | 40.8 | 22.2 |
| 146 | 40.5 ± 2.4 | <MDA of 110 | NA | 1.7 ± 0.8 | <MDA of 1 | <104.1 | ND | 25.5 | 13.8 |
| 150 | 1,110 ± 22.9 | 1,310 ± 143 | 1,295 | <MDA of 1 | <MDA of 1 | <1177 | 1,085 | 698 | 379 |
| 152 | 849 ± 20.3 | 1,190 ± 133 | 1,188 | 4.5 ± 0.8 | <MDA of 1 | <1,073 | 995 | 534 | 290 |
| 306 | 60.3 ± 6.7 | <MDA of 110 | NA | <MDA of 1 | <MDA of 1 | <103 | ND | 37.9 | 20.6 |
| 309 | 90.9 ± 7.7 | <MDA of 110 | NA | <MDA of 1 | <MDA of 1 | <103 | ND | 57.2 | 31.0 |
| Batiste Spring | 10.4 ± 1.2 | <MDA of 110 | 13.8 | 1.3 ± 0.4 | 4.6 ± 0.4 | <115.8 | 11.6 | 6.5 | 3.5 |
| Lindley | 12.7 ± 1.7 | <MDA of 110 | NA | 4.2 ± 0.8 | 1.8 ± 0.6 | <110.5 | ND | 8.0 | 4.3 |
| New Pilot | 4.4 ± 0.8 | <MDA of 110 | NA | <MDA of 1 | NA | <103 | ND | 2.8 | 1.5 |
| Old Pilot | 85 ± 5.8 | 122 ± 61.5 | NA | <MDA of 1 | 1.6 ± 0.2 | <106.3 | ND | 53.5 | 29.0 |

[1] Samples collected in March, 1994
[2] Expressed in pCi/l
[3] Total potassium, in mg/l
[4] Gross beta activity attributable to detected Potassium-40, Ra-226, and Ra-228. Gross beta = (Potassium-40 x 0.895) + (Ra-228 x 1.59) + (Ra-226 x 2.93)(see Radiological Health Handbook, U.S. Department of Commerce, NTIS, 1970.)
[5] K-40 activity predicted from total potassium concentration in groundwater sample, based on following relationship (see Radiological Health Handbook, US Dept. Commerce, NTIS, 1970):
Specific activity Potassium-40 = 3.578 E5 Ci-yrs/g; Potassium-40 half-life = 1.26 E9 yrs; Atomic mass Potassium-40 = 40 amu; Potassium (mg/l) = Potassium-40 (mg/l)/0.000118
Potassium-40 (pCi/l) = Potassium-40 (mg/l) x (1g/1000 mg) x 7.1E6 pCi/g.
[6] NA = not analyzed ND = insufficient data to calculate MDA = minimum detectable activity
[7] Ra-228 and -226 activities each attributable to detected gross beta, assuming that Ra-228 or Ra-226 was the only beta-emitting radionuclide, where Ra-228 = beta / 1.59, and Ra-226 = gross beta / 2.93. (ibid.)

radionuclide in these groundwater samples. Its detected activities are also consistent with those predicted from the activity attributable to the total potassium concentrations.

Radium-226 and -228 activities were predicted from the gross beta activity using the assumption that radium-226 and -228 were the only beta-emitting radionuclides present. While Ra-226 itself decays by alpha particle emission, two of its daughters (Pb-214 and Bi-214) decay by beta particle emission. Therefore, if Ra-226 is present in a sample and in equilibrium with its daughters, both alpha and beta activities should be detected in the sample. The predicted radium-226 and -228 activities, shown in Table 4.4-20, are substantially greater than the measured radium-226 and -228 activities in any sample. This reinforces the interpretation that potassium-40 is the principal beta-emitting radionuclide.

**Site-wide Distribution.** These relationships can also be used to evaluate the site-wide distribution of gross beta and its association with site-related constituents in surface and subsurface soils and potential sources. Figure 4.4-25 displays isopleths of mean gross beta activity in groundwater within the study area. These data were obtained from analysis of samples collected during the quarterly groundwater sampling events during the remedial investigation.

Examination of Figure 4.4-25 shows that there were five areas in which gross beta activities exceeded the representative level: (1) wells 150 and 152 in the southwestern area of FMC; (2) Well 122 in the central FMC area; (3) Well 142 in the joint fenceline area; (4) Well 136 in the joint fenceline area; and (5) Well 318 in the eastern Simplot area.

The mean gross beta activity in Well 304 (71.9 pCi/l) was also elevated. Isopleths in Figure 4.4-25 were not extended south to Well 304 because this Bannock Range well is screened in an area where shallow and deeper aquifers are not differentiated.

Table 4.4-21 presents the observed mean total potassium concentrations and gross beta activities for these wells, along with the gross beta activities predicted from the observed mean total potassium concentrations and radium-226 and -228 activities. The observed gross beta activities

are consistent with the gross beta activities attributable to potassium-40 in each well, except wells 318 and 304. Comparison of Figure 4.4-25 with Figure 4.4-5, which displays isopleths of mean total potassium concentrations in groundwater within the study area, shows a similar pattern of elevated potassium levels in the shallow aquifer.

**TABLE 4.4-21**
**COMPARISONS OF BETA-EMITTING RADIONUCLIDES AND POTASSIUM IN SEVEN ONSITE WELLS**

| | DETECTED MEAN CONSTITUENT LEVELS | | | | PREDICTED | |
|---|---|---|---|---|---|---|
| **Well** | **Potassium[1]** | **Gross Beta[3]** | **Radium-228[3]** | **Radium-226** | **Potassium-40[2]** | **Gross Beta[4]** |
| 150 | 1294 | 778 | <MDA of 1 | <MDA of 1 | 1084 | <977 |
| 152 | 1087 | 544 | <1.7 | <MDA of 1 | 910 | <823 |
| 122 | 231 | 132.6 | 1.6 | <1.4 | 194 | <180 |
| 136 | 122 | <45.3 | <1.5 | 1.4 ± 0.6 | 102 | <100 |
| 142 | 18.2 | <17.9 | <1.0 | <1.4 | 15 | ≤20.7 |
| 304 | 16.9 | 71.9 | <4.4 | <1.2 | 14.2 | <23.2 |
| 318 | 242 | 790 | <3.3 | <MDA of 1 | 203 | <190 |
| 318 (12/93 – 12/94) | 38.2 | 40.8 | <MDA of 1 | <MDA of 1 | 32.0 | <33.1 |

[1] Mean concentration in samples collected between 6/92 and 7/93, in mg/l
[2] Mean activity (in pCi/l) predicted from observed total potassium concentration
[3] Where gross beta, radium-228 and radium-226 were not detected, mean was calculated using minimum detectable activities. Gross beta MDA = 2 pCi/l; Ra-228 and Ra-226 MDA each = 1 pCi/l)
[4] Mean activity predicted from observed total potassium, radium-228, and radium-226 where gross beta = (K-40 x 0.895) + (Ra-228 x 1.59) + (Ra-226 x 2.93)

*Well 318.* The observed mean gross beta activity for Well 318 (790 pCi/l) is greater than the predicted gross beta activity (<190 pCi/l). The predicted gross beta activity was computed from the beta activity attributable to the mean radium-226 and -228 activities (<MDA of 1 pCi/l and <3.3 pCi/l, respectively) plus the estimated mean activity of potassium-40 (203 pCi/l) attributable to the observed mean total potassium concentration (242 mg/l).

The radionuclide(s) that may have contributed to this excess gross beta activity in Well 318 was not detected in the samples. It is likely, however, that the acidic process wastes (pH approximately 0.6) delivered to the former east overflow pond contained dissolved uranium-238 and beta-emitting daughter products in sufficient activities to account for this excess gross beta. As

discussed in Section 4.4.9.2, the mean gross alpha activity in Well 318 (1,166 pCi/l ) and absence of radium-226 (<MDA of 1 pCi/l) indicate that uranium-238 and uranium-234 accounted for the detected gross alpha activity in samples from this well. Uranium-238 and uranium-234 would thus be expected to have been present in samples from Well 318 at mean activities of 583 and 583 pCi/l, respectively. Thorium-234 and protactinium-234, both short-lived, beta-emitting radionuclides of uranium-238, would likely account for this observed excess gross beta activity (600 pCi/l) in samples collected from Well 318.

However, as noted in Section 4.4.5.7, levels of site-related constituents have declined significantly in Well 318 following closure of the former east overflow pond at Simplot in August 1993. The mean gross beta activity at Well 318 during this latter period (40.8 ± 6.5 pCi/l) is similar to the predicted gross beta activity (<33.1 pCi/l) calculated from the observed mean total potassium concentration (38.2 mg/l) and radium-226 (<MDA of 1 pCi/l) and radium-228 (<MDA of 1 pCi/l) activities in samples collected from this well during this period.

*Well 304.* The mean gross beta activity in samples collected from Well 304 (71.9 pCi/l) is greater than the beta activity (<23.2 pCi/l) attributable to the potassium-40 activity (14.2) pCi/l) calculated from the mean total potassium concentration (16.9 mg/l) in these samples and the observed mean radium-226 (<1.2 pCi/l) and radium-228 (<4.4 pCi/l) activities. As discussed in Section 4.4.9.2, Well 304 also contained elevated gross alpha activity attributable to uranium-238 and uranium-234. The beta-emitting radionuclides associated with this excess gross beta activity may have been uranium-238 daughter products, such as thorium-234 and protactinium-234. Section 4.4.9.2 provides further discussion on the presence of uranium isotopes in samples collected from this well.

**Radium-226.** Eighty nine percent of the samples collected during the period of investigation did not contain radium-226 above the MDA (typically 1 pCi/l). The MCL for radium-226 (20 pCi/l) was not exceeded in any sample. Rather, radium-226 was detected sporadically in groundwater monitoring samples, including those collected from the representative monitoring well network. The results of radium-226 analyses in samples collected during the quarterly sampling events

during the investigation were presented earlier in Tables 4.4-2, 4.4-5, 4.4-8, 4.4-12, 4.4-14, and 4.4-17. Table 4.4-22 summarizes the frequency of radium-226 detection in samples collected from representative wells and wells within the five geographic subareas of the EMF site study area (described in Sections 4.4.4 through 4.4.8). It also presents the highest mean radium-226 activity within each group of wells, as well as the maximum single detected activity and the average activity among those samples with detectable levels of radium-226.

**TABLE 4.4-22**
**FREQUENCY AND RANGE OF DETECTION OF RADIUM-226 IN QUARTERLY MONITORING EVENTS**

| WELL GROUP | SAMPLES BELOW THE MINIMUM DETECTABLE ACTIVITY | | HIGHEST MEAN ACTIVITY IN A WELL (pCi/l) | MAXIMUM AND AVERAGE OF DETECTED ACTIVITIES (pCi/l) | |
|---|---|---|---|---|---|
| Representative | 67 of 76 | 90% | <2.6 | 6.4 | 3.5 |
| FMC | 115 of 139 | 83% | <2.6 (<2.3) | 7.1 (3.8) | 2.2 |
| Eastern Simplot | 54 of 55 | 98% | <1.2 | 1.5 | 1.5 |
| Joint Fenceline | 57 of 66 | 86% | <1.9 | 3.8 | 2.1 |
| Northern Properties | 55 of 58 | 95% | <2.1 | 5.4 | 2.9 |
| North of I-86 | 33 of 34 | 97% | <1 | 1.1 | 1.1 |

The frequency with which radium-226 was reported to be below the MDA was similar among the groups of wells. The lowest frequency (83%) occurred in FMC-area wells and the highest (98%) among wells within the eastern Simplot area. The maximum detected activity in any sample was 7.1 pCi/l in Well 128; this result is biased high, however, because the gross alpha activity in this sample was below the MDA (2 pCi/l). The gross alpha activity in a sample containing radium-226 at 7.1 pCi/l would be expected to be approximately 28 pCi/l. The following three quarterly samples collected from Well 128 contained radium-226 activities at 1.01 and 1.40 pCi/l, and <MDA. The next highest single radium-226 activity within the FMC group of wells was 3.83 pCi/l in Well 109, which is within the range of radium-226 in representative wells (maximum activity of 6.4 pCi/l). The next highest mean radium-226 activity among wells within the FMC area was <2.6 pCi/l for Well 148.

Radium-226 is not a site-related constituent. With the exception of the single biased-high result for Well 128; it was detected within the range of activities observed in representative wells. Additionally, the mean activities within study area wells are comparable to, or less than, the mean activities in representative network wells. This finding, as well as the sporadic and random detections of radium-226, indicate that an attempt to display radium-226 activities as isopleths would not be meaningful.

**Radium 228**. Seventy nine percent of the samples collected during the period of investigation did not contain radium-228 above the MDA (typically 1 pCi/l). The MCL for radium-228 (20 pCi/l) was not exceeded in any sample. Like radium-226, radium-228 was detected sporadically in groundwater monitoring samples, including those collected from the representative monitoring well network. The results of radium-228 analyses in samples collected during the quarterly sampling events during the investigation were presented earlier in Tables 4.4-2, 4.4-5, 4.4-8, 4.4-12, 4.4-14, and 4.4-17. Table 4.4-23 summarizes the frequency of radium-228 detection in samples collected from representative wells and wells within the five geographic subareas of the EMF site study area (described in Sections 4.4.4 through 4.4.8). It also presents the highest mean radium-228 activity within each group of wells, as well as the maximum single detected activity and the average activity among those samples with detectable levels of radium-228.

**TABLE 4.4-23**
**FREQUENCY AND RANGE OF DETECTION OF RADIUM-228 IN QUARTERLY MONITORING EVENTS**

| WELL GROUP | SAMPLES BELOW THE MINIMUM DETECTABLE ACTIVITY | | HIGHEST MEAN ACTIVITY (pCi/l) | MAXIMUM AND AVERAGE OF DETECTED ACTIVITIES (pCi/l) | |
|---|---|---|---|---|---|
| Representative | 57 of 76 | 75% | <3.2 | 10.8 | 3.9 |
| FMC | 114 of 139 | 82% | <3.4 | 10.7 | 4.1 |
| Eastern Simplot | 44 of 55 | 80% | <4.2 | 7.8 | 3.4 |
| Joint Fenceline | 51 of 66 | 77% | <4.4 | 13.8 | 4.4 |
| Northern Properties | 46 of 58 | 79% | <3.6 | 8.3 | 3.6 |
| North of I-86 | 26 of 34 | 76% | <3.3 | 9.0 | 4.7 |

The frequency with which radium-228 was reported to be below the MDA was similar among the groups of wells. The lowest frequency (75%) occurred in representative network wells and the

highest (82%) among FMC area wells. The maximum detected activity in any sample was 13.8 pCi/l in Well 304, slightly above the maximum detected activity (10.8 pCi/l) among representative network samples. Further discussion of radiological constituents in samples from Well 304 is presented in Section 4.4.9.3, where it is concluded that acidic seepage from the gypstack has dissolved native uranium and thorium from volcanic rocks within the saturated zone.

Radium-228 does not appear to be a site-related constituent. With the exception of Well 304, it was detected within the range of activities observed in representative wells. This finding, as well as the sporadic and random detections of radium-228, indicate that an attempt to display radium-228 activities as isopleths would not be meaningful.

**Summary of Beta-emitting Radionuclides.** The detected gross beta activities in the shallow aquifer attributable to releases from EMF sources are related to potassium-40, which is a naturally-occurring isotope of potassium. Potassium-40 activities can be ascertained from the concentration of total potassium, which is a site-related constituent. Radium-228 is not a site-related constituent; its activities were in the range of samples collected from reference wells, with the exception of Well 304. As discussed in Section 4.4.9.2, the presence of radium-228 in Well 304 is likely attributable to dissolution of native volcanic rocks. Radium-226 activities did not exceed the average activity of samples collected from representative wells, which the exception of a biased-high result from Well 128. Radium-226 is not a site-related constituent in groundwater. One or more additional radionuclides, likely thorium-234 and protactinium-234, may have been present in samples collected from Well 318 prior to (but not after) closure of the east overflow pond at Simplot.

### *4.4.9.2 Alpha-emitting Radionuclides*

Gross alpha activity was measured in groundwater samples collected during the quarterly monitoring events during the investigation. Gross alpha was detected in samples collected from the representative well network at an average activity of 3.5 pCi/l. The maximum activity detected in

these representative samples was 8.0 pCi/l and the minimum was below the MDA of 2 pCi/l. Uranium-238 and uranium-234 were the dominant alpha-emitting radionuclides in samples with gross alpha activities above representative levels. The mean activity of radium-226, another alpha-emitting radionuclide, did not exceed the average activity observed in representative groundwater.

**Speciation Results from March 1994.** Table 4.4-24 presents the activities of alpha particle-emitting radionuclides detected in groundwater samples collected in March 1994. It also lists the activities of gross alpha, uranium-238, uranium-234, and radium-226 that would be predicted in these samples if each of these radionuclides were the only alpha-emitting radionuclide present in the sample. These were calculated to evaluate the accuracy of the gross alpha and radionuclide-specific analyses. The gross alpha activity was calculated using the established alpha-emission specific activities of uranium-238 and -234 and radium-226, as noted in the table.

As listed in Table 4.4-24, gross alpha was elevated above representative levels in Well 306 (28.3 ± 5.0 pCi/l), Well 309 (77.5 ± 8.3 pCi/l), and the Lindley well (12.9 ± 1.8 pCi/l). In wells 306 and 309, uranium-238 (11.2 ± 1.6 and 7.2 ± 1.1 pCi/l, respectively) and uranium-234 (29.4 ± 3.6 and 20.7 ± 2.6 pCi/l, respectively) appear to account for this gross alpha activity. Radium-226 was below the MDA of 1 pCi/l in samples from each well. In the Lindley well, the detected gross alpha activity is related to uranium-238 (3.7 ± 0.7 pCi/l), uranium-234 (7.5 ± 1.1 pCi/l), and radium-226 (1.8 ± 0.6 pCi/l).

The detected activities of radium-226 in Well 123 (2.1 ± 0.3 pCi/l), Well 136 (1.4 ± 0.6 pCi/l), and the Old Pilot House Well (1.6 ± 0.2 pCi/l) are not consistent with the reported gross alpha activities for each well (below MDA of 2 pCi/l). One pCi/l of radium-226 would correlate to a gross alpha activity of 4 pCi/l. This suggests that either the detected radium-226 activities are biased high or that the gross alpha activities are biased low. Despite these inconsistencies, these detected radium-226 activities are each below the average activity of radium-226 (2.6 pCi/l) in samples collected from the representative well network. Hence, further evaluation of these results is not considered to be necessary.

**TABLE 4.4-24**
**COMPARISON OF MEASURED AND PREDICTED ALPHA-EMITTING RADIONUCLIDES IN GROUNDWATER SAMPLES COLLECTED FROM 12 WELLS IN MARCH 1994**

| | DETECTED ACTIVITIES (pCi/l) | | | | PREDICTED ACTIVITIES (pCi/l) | | | |
|---|---|---|---|---|---|---|---|---|
| Well Number[1] | Gross Alpha[2] | Uranium-238[2] | Uranium-234[2] | Radium-226[2] | Gross Alpha[2,4] | Uranium-238[5] | Uranium-234[5] | Radium-226[5] |
| 121 | <MDA of 2 | <MDA of 500 | ND[3] | <MDA of 1 | <MDA of 500 | <2 | <2 | <0.5 |
| 123 | <MDA of 2 | <MDA of 500 | ND | 2.1 ± 0.3 | <MDA of 500 | <2 | <2 | <0.5 |
| 136 | <MDA of 2 | <MDA of 500 | ND | 1.4 ± 0.6 | <MDA of 500 | <2 | <2 | <0.5 |
| 146 | <MDA of 2 | <MDA of 500 | ND | <MDA of 1 | <MDA of 500 | <2 | <2 | <0.5 |
| 150 | <MDA of 2 | <MDA of 500 | ND | <MDA of 1 | <MDA of 500 | <2 | <2 | <0.5 |
| 152 | <MDA of 2 | 1.6 ± 0.4 | <MDA of 1 | <MDA of 1 | <6.6 ± 0.4 | <2 | <2 | <0.5 |
| 306 | 28.3 ± 5.0 | 11.2 ± 1.6 | 29.4 ± 3.6 | <MDA of 1 | <44.6 ± 5.2 | 14.2 | 14.2 | 7.1 ± 1.3 |
| 309 | 77.5 ± 8.3 | 7.2 ± 1.1 | 20.7 ± 2.6 | <MDA of 1 | <31.9 ± 3.7 | 38.8 | 38.8 | 19.4 ± 2.1 |
| Batiste Spring | <MDA of 2 | 1.1 ± 0.4 | 1.5 ± 0.5 | 4.6 ± 0.4 | 21 ± 2.5 | <2 | <2 | <0.5 |
| Lindley | 12.9 ± 1.8 | 3.7 ± 0.7 | 7.5 ± 1.1 | 1.8 ± 0.6 | 18.4 ± 4.2 | 6.5 | 6.5 | 3.2 |
| New Pilot | 3.1 ± 0.7 | <MDA of 1 | 2.0 ± 0.5 | NA | <7 ± 0.5 | 1.6 | 1.6 | 0.8 |
| Old Pilot | <MDA of 2 | <MDA of 1 | <MDA of 1 | 1.6 ± 0.2 | <8.4 ± 0.8 | <2 | <2 | <0.5 |

[1] Samples collected in March, 1994
[2] Expressed in pCi/l
[3] Not detected in gamma spec analysis
[4] Gross alpha activity attributable to detected alpha-emitting radionuclides. Gross alpha = (uranium-238 x 1) + (uranium-234 x 1) + (radium-226 x 4), in pCi/l (see Radiological Health handbook, US Dept. Commerce, NTIS, 1970)
[5] Activity predicted assuming that detected gross alpha activity was attributable to these radionuclides. Due to secular equilibrium and similar chemical properties, uranium-238 and uranium-234 were assumed to be present at equal activities. (Ibid.)

The detected gross alpha activity (below the MDA of 2 pCi/l) in the sample collected at Batiste Spring is less than the activity that would be expected (18.4 ± 1.6 pCi/l) given the reported activity of radium-226 (4.6 ± 0.4 pCi/l) in this sample. The detected activities of uranium-238 (1.1 ± 0.4 pCi/l) and uranium-234 (1.5 ± 0.5 pCi/l) in this sample are consistent with the reported gross alpha activity. This suggests that the reported radium-226 activity in this sample is biased high. The detected gross alpha activity in Well 309 (77.5 ± 8.3 pCi/l) is greater than the activity that would be expected (i.e., <31.9 ± 3.7 pCi/l) given the detected activities of uranium-238 (7.2 ± 1.1 pCi/l), uranium-234 (20.7 ± 2.6 pCi/l), and radium-226 (below MDA of 1 pCi/l) in this sample. This indicates that either the detected gross alpha activity is biased high; one or more of the radionuclide-specific activities are biased low; or that an additional alpha-emitting radionuclide was present.

With the exceptions noted for wells 123, 136, and 309, Batiste Spring and the Old Pilot House Well, the detected gross alpha activities are consistent with the detected activities of the naturally-occurring alpha-emitting radionuclides uranium-238, uranium-234, and radium-226.

**Site-wide Distribution.** Isopleths of mean gross alpha activities in the shallow aquifer are shown in Figure 4.4-26. Four areas of elevated activity can be seen: (1) the Lindley well, where the mean activity was 10.3 pCi/l; (2) Well 318, where the mean activity was 1166 pCi/l; (3) Well 142, where the mean activity was ≤24.8 pCi/l; and (4) wells 306, 313, and 325, where the mean activity was 43.6, 14.8, and 10.0 pCi/l, respectively. The mean gross alpha activity (192 pCi/l) was also elevated in samples collected from Well 304. Isopleths in Figure 4.4-26 were not extended south to Well 304 because this Bannock Range well is screened in an area where the shallow and deeper aquifers are not differentiated. Table 4.4-25 presents the gross alpha activities and detected alpha-emitting radionuclides in samples collected from these wells.

*Lindley Well.* Radium-226 was not detected in samples collected from the Lindley well during this period (MDA of 1 pCi/l). Both uranium-238 and uranium-234 were detected in the March 1994 sample from this well. Thus it is likely that the gross alpha activity in the Lindley well

(10.3 pCi/l) was attributable to uranium-238 and uranium-234, each possibly present at a mean activity of 5.2 pCi/l. However, the Lindley well was not downgradient from potential source areas within the FMC or Simplot facilities during the period of investigation. Thus the presence of elevated gross alpha activity in this well is not believed to be associated with releases to groundwater from these sources.

*Well 318.* The mean gross alpha activity for Well 318 in samples collected in 1992 and the first half of 1993 (1166 pCi/l) is greater than the predicted gross alpha activity (<4 pCi/l) attributable to radium-226, which was the only alpha-emitting radionuclide analyzed in samples from this well during this period. This indicates that one or more additional alpha-emitting radionuclides were present in these samples. The evaluation of gross beta activities in samples collected from this well (see Section 4.4.9.1) suggested that thorium-234 and protactinium-234, both short-lived beta-emitting radionuclides derived from decay of uranium-238, were present in these samples, and that uranium-238 had been released to groundwater through acidic dissolution from the potential source material. The excess gross alpha activity detected in these samples is likely attributable to uranium-238 and uranium-234.

However, as noted in Section 4.4.5.7, levels of site-related constituents have declined significantly in Well 318 following closure of the former east overflow pond at Simplot in August 1993. The mean gross alpha activity detected at Well 318 during this latter period was ≤9.8 pCi/l. Radium-226 was not detected in these samples, at an MDA of 1 pCi/l. The alpha activity in these samples might be attributable to uranium-238 and uranium-234, each potentially present at a mean activity of 5 pCi/l.

*Wells 306, 313, and 142 Association with Volcanic Lithology.* The mean gross alpha activity (43.6 pCi/l) in Well 306 exceeded the representative level. Radium-226 was not detected above the MDA of 1 pCi/l in samples collected from this well. Uranium-238 (11.2 ± 1.6 pCi/l) and uranium-234 (28.4 ± 3.6 pCi/l) were detected in the March 1994 sample from Well 306. It is likely that the observed gross alpha activity in other samples collected from this well is attributable to uranium-238 and uranium-234.

The mean gross alpha activity of samples collected from Well 313 (14.8 pCi/l) and the absence of radium-226 (less than MDA of 1 pCi/l) suggest that uranium-238 and uranium-234 also accounted for the detected gross alpha activity. The potential mean activities of uranium-238 and uranium-234 that would correspond to the detected mean gross alpha activity in the well are 7.4 pCi/l and 7.4 pCi/l, respectively.

Radium-226 in Well 142 was detected at a mean activity of less than 1.4 pCi/l, which is less than the activity of radium-226 (≤6.2 pCi/l) that would be necessary to account for the mean gross alpha activity detected in this well (≤24.8 pCi/l) if radium-226 were the only alpha-emitting radionuclide. Samples from Well 142 were not analyzed for other alpha-emitting radionuclides. The gross alpha activity in Well 142 is likely attributable to uranium-238 and uranium-234, with each potentially present at a mean activity of ≤12.4 pCi/l, comparable with the activities detected at Well 306.

The presence of uranium isotopes in samples from wells 306, 313, and 142 are related to the lithology of the screened interval of these wells, rather than to seepage from the gypstack. Well 306 is screened in a welded tuff of the Starlight Formation. Well 313 is screened in a sandy gravel stratum of the Sunbeam Formation; these gravels contain volcanic tuff granules derived from the underlying Starlight Formation. Well 142 is a deep well screened in the Sunbeam Formation; the screened interval is placed in sediments derived from rhyolitic volcanic rocks of the Starlight Formation. (See Appendix B of Part II for geologic drilling log for wells and borings). Gamma logging was performed in these and other well borings (see Appendix D of Part II). Gamma logging in boreholes measures gamma radiation emitted from the decay of radionuclides in the uranium-238 series and potassium-40, which are naturally present in igneous rocks and fine-grained (shale and clay) sediments. Relatively high gamma counts may indicate clays, acidic to intermediate igneous rocks, or deposits derived from these igneous rocks, and any micaceous or orthoclase-rich material.

**TABLE 4.4-25**
**RADIONUCLIDES DETECTED OR PREDICTED IN GROUNDWATER WITH ELEVATED GROSS ALPHA ACTIVITIES**

| | DETECTED MEAN ACTIVITIES (pCi/l) | | | | PREDICTED ACTIVITIES[2] (pCi/l) | | | |
|---|---|---|---|---|---|---|---|---|
| **Well** | **Gross Alpha** | **Uranium-238** | **Uranium-234** | **Radium-226** | **Gross Alpha** | **Uranium-238** | **Uranium-234** | **Radium-226** |
| Lindley | 10.3 | 3.7 ± 0.7[1] | 7.5 ± 1.1[1] | <MDA of 1 | 15.2 ± 1.8 | 5.2 | 5.2 | 2.6 |
| 142 | ≤24.8 | NA[3] | NA | <1.4 | ≥5.6 | ≤12.4 | ≤12.4 | ≤6.2 |
| 304 | 192 | NA | NA | <1.2 | ≥4.7 | 96 | 96 | 48 |
| 306 | 43.6 | 11.2 ± 1.6[1] | 29.4 ± 3.6[1] | <MDA of 1 | <44.6 ± 5.2 | 21.8 | 21.8 | 10.9 |
| 313 | 14.8 | NA | NA | <MDA of 1 | ≥4 | 7.4 | 7.4 | 3.7 |
| 325 | 10.0 | NA | NA | <1.2 | ≥4.8 | 5 | 5 | 2.5 |
| 318 | 1166 | NA | NA | <MDA of 1 | ≥4 | 583 | 583 | 291 |
| 318 (12/93 - 12/94) | ≤9.8 | NA | NA | <MDA of 1 | ≥4 | ≤5 | ≤5 | ≤2.5 |

[1] Lindley and 306 sampled for U-238 and U-233/234 in March 1994
[2] Activities predicted from mean gross alpha activities assuming that (U-238 + U-234) or Ra-226 were the only alpha-emitting radionuclides present, using: gross alpha/2 = U-238; gross alpha/2 = U-234; gross alpha/4 = Ra-226
[3] NA - not analyzed

Intervals of comparatively high and constant gamma counts (approximately 200 cps, as described in Appendix D) correlate very closely with rhyolite or hard rhyolitic welded tuff of the Starlight Formation in wells 142, 144, and 313. An underlying deposit of softer volcanic ash in Well 142 also correlates with an interval of constant, but lower, gamma counts (approximately 100 cps). Strata of the Sunbeam Formation containing gravels and sands derived from the volcanic rocks of the Starlight Formation also show a high gamma count in wells 300, 301, 305, 306, 307, 308, 309, and 313 (approximately 100 to 200 cps). In contrast, the non-volcanic, quartzitic Michaud Gravel typically has a low uniform gamma signature (Wells 107, 109, 319, 321, and most of the 500-series wells) of approximately 50 to 100 cps.

These relationships suggest that the gross alpha activities detected in wells 306, 313, and 142 are associated with naturally-occurring radionuclides in the Starlight and Sunbeam Formations.

*Further Associations with Volcanic Lithologies.* The association of elevated gross alpha activities observed in samples from wells 142, 306, and 313 with volcanic lithologies in the saturated zone is further supported by examination of data for well pairs 315/316, 309/310, and 143/144. Table 4.4-26 presents the mean gross alpha activities for these latter wells and a description of the lithology of their screened intervals. Gross alpha activities in the deeper wells ranged between 13.1 to 20.6 pCi/l, whereas gross alpha activities in the shallower wells ranged between 4.2 to 9.7 pCi/l. Uranium-238 (7.2 ± 1.1 pCi/l) and uranium-234 (20.7 ± 2.6 pCi/l) were detected in the March 1994 sample collected from Well 309. These wells are either screened within the volcanic rocks of the Starlight Formation (rhyolite, tuff, or basalt) or in gravels of the Sunbeam Formation composed of 50 to 90% of volcanic rock fragments derived from the Starlight Formation.

Representative wells in the Bannock Range are not screened in the Starlight Formation. Nor are these wells screened in strata that contain volcanic rock fragments in proportions as high as those encountered in the previously-listed wells. The screened interval of representative Well 106

encountered the highest reported proportion (30%) of volcanic lithologies among the representative wells in the Bannock Range. Consequently, the gross alpha activity detected in samples collected from the representative well network may understate the natural activity of alpha-emitting radionuclides in groundwater.

**TABLE 4.4-26**
**RELATIONSHIP BETWEEN LITHOLOGY AND GROSS ALPHA ACTIVITY IN SEVEN WELLS**

| WELL PAIRS | SCREENED INTERVAL[1] | LITHOLOGY[2] | GROSS ALPHA (pCi/l) |
|---|---|---|---|
| 315 (deep) | 120-140 | gravel containing andesite, basalt , and pumiceous tuff granules | 20.6 |
| 316 (shallow) | 82-87 | gravel containing 80% andesitic granules | 9.7 |
| 309 (deep) | 148-168 | gravel containing up to 70% andesitic granules | 19.2 |
| 310 (shallow) | 82-87 | gravel containing up to 90% andesitic granules and weathered tuff | 6.5 |
| 144 (deep) | 189-219 | weathered rhyolite and rhyolite | 13.1 |
| 143 (shallow) | 112.2-116.4 | gravel containing rhyolite and andesite | 4.2 |

[1] In feet below ground surface. See Appendix B, attachment B-6 (100-series wells) and B-7 (300-series wells) of Part II for further information on well construction.
[2] See Appendix B for detailed well boring logs.

*Well 304*. The mean gross alpha activity in Well 304 (192 pCi/l) exceeded the representative level. Radium-226 was detected at a mean activity of <1.2 pCi/l, which is less than the activity (48 pCi/l) necessary to account for the observed mean gross alpha activity if radium-226 were the only alpha-emitting radionuclide present in these groundwater samples. The observed gross alpha activity could have been attributable to uranium-238 and uranium-234, if each had been present at a mean activity of 96 pCi/l.

The screened interval of Well 304 (between 275.5 and 290.2 feet below ground surface) encompasses weathered basalt of the Starlight Formation and a sandy gravel of the Sunbeam Formation containing basalt and tuff fragments. The screened interval encountered a greater proportion of mafic volcanic rocks compared with other wells screened in volcanic lithologies, such as wells 306 and 315. The gamma activity in the screened interval of Well 304 (approximately 60 to 100 cps) is less than the gamma activity recorded in well borings containing a greater proportion of acidic to intermediate rocks. Mafic rocks, such as basalt, generally contain a lower proportion of radionuclides in the uranium-238 and thorium-232 decay series, compared with acidic to intermediate rocks, such as rhyolite and andesite. Consequently, the lower gamma activity in the Well 304 boring is consistent with the observed higher proportion of basalt in the screened interval of Well 304, compared with other wells screened in volcanic lithologies.

The mean gross alpha activity in Well 304 was, however, approximately 4 and 9 times greater than that detected in wells 306 and 315, respectively. The mean concentrations of the site-related constituents sulfate (737 mg/l) and total phosphorus (11.5 mg/l) were also elevated in samples from Well 304, suggesting that the elevated gross alpha activity may be related to seepage from the gypstack. However, other geochemical data indicate that the gross alpha activity in samples from this well might not be directly related to migration of alpha-emitting radionuclides from the gypstack. As discussed in Section 5.3.2.1, the mean arsenic concentration in Well 304 was 1% of the concentration expected if arsenic were a non-attenuated constituent. It was suggested that this lower-than-expected arsenic concentration might be associated with the lower permeability region of the Bannock Range in which Well 304 is screened. The longer residence time of groundwater within this lower permeability region might have reduced arsenic concentrations through a rate-limited attenuation mechanism. It is also possible that a relatively longer residence time could increase the gross alpha activity of groundwater. The reduced pH seepage from the gypstack, if given a longer contact period with

igneous rocks, would dissolve more alpha-emitting radionuclides from these rocks, compared with potential reactions in higher permeability regions. Thus the elevated gross alpha activity might reflect an indirect site-related effect—dissolution from native materials—rather than a direct site-related effect—migration of alpha-emitting radionuclides.

*Well 325.* The mean gross alpha activities in Well 325 (10.0 pCi/l) exceeded the representative level. Radium-226 was detected at a mean activity of <1.2 pCi/l, which is less than the mean activity (2.5 pCi/l) needed to account for the observed gross alpha activity. It is likely that the gross alpha activity was attributable to uranium-238 and uranium-234, each at a mean activity of 5 pCi/l.

Well 325 is screened in sand and gravel containing predominantly quartzite, and the elevation of gross alpha above the representative level appears to be site-related. It is possible, however, that groundwater containing naturally elevated gross alpha was introduced into this well due to the positive vertical gradient from the lower aquifer observed in this area (see Figures 3.3-10A through 3.3-10I). Given the relationship previously noted in the shallow/deep well pairs, gross alpha activity in groundwater from this lower aquifer should be higher than the activity in the shallow zone within which Well 325 is screened.

**Summary of Alpha-emitting Radionuclides.** With several exceptions, the elevated gross alpha activities do not appear to be associated with releases from EMF sources. Rather, they are attributable to natural radioactive constituents in volcanic rocks of the Starlight Formation and sediments of the Sunbeam Formation containing materials derived from the Starlight Formation. Representative wells are not screened in volcanic rocks of the Starlight Formation, nor in strata containing a high proportion of detrital material derived from this formation. Consequently, the average and maximum gross alpha activity (3.5 and 8 pCi/l, respectively) in samples collected from the representative well network are likely less than the naturally-occurring gross alpha activity in wells that are more closely associated with the Starlight Formation, such as wells 142,

143/144, 306, 309/310, 313, and 315/316. Based on these observations, the natural gross alpha activity in wells screened within the volcanic rocks of the Starlight Formation and in gravels of the Sunbeam Formation derived from the Starlight Formation ranges between approximately 13 to 20 pCi/l.

Above-representative gross alpha activities in Well 318 is attributable to an EMF source. An unknown radionuclide(s), probably uranium-238 and uranium-234, may have been present in samples collected from Well 318 prior to closure of the east overflow pond at Simplot. Gross alpha activities in Well 318 have declined nearly to representative levels since closure of this pond.

The elevated gross alpha activity in samples from Wells 304 may also have been attributable to uranium isotopes, because radium-226 was not detected at a sufficient activity in these wells to account for the observed gross alpha activity. Well 304 is downgradient from the gypstack at Simplot. It is more likely, however, that the gross alpha activity in Well 304 is related to the dissolution of uranium from rocks and gravels in the saturated zone due to a longer residence time of acidic seepage within this lower permeability region, rather than to migration of uranium isotopes from the gypstack.

The above-representative gross alpha activity in Well 325 may be related to upward migration of naturally-elevated groundwater from the lower aquifer. The cause of elevated mean gross alpha activity at the Lindley well is unknown but is not associated with groundwater releases from EMF potential source areas.

#### *4.4.9.3 Relationship with Surface Soils*

As reported in Section 4.2, soil samples were collected within the industrial operations area of the EMF facilities beneath potential sources of groundwater impact (e.g., former unlined ponds, material stockpiles, areas containing waste materials used as fill). Evaluation of these data

indicated that exceedences of the representative levels of gross alpha and gross beta were confined to the fill materials and certain source materials within former ponds. As noted in Section 4.2.2.2 (Simplot area) and 4.2.3.2 (FMC area), there was no evidence of radionuclide migration into native soils from unlined sources that lacked a current or previous sustained hydraulic head.

Unlined sources within the industrial operations area that had a current or previous sustained hydraulic head were found to have affected groundwater. As reported in Section 4.4.9.1, gross beta activities in groundwater above representative levels was predominantly attributable to the release of potassium-40 from these sources in all but one case. In samples collected from Well 318 prior to closure of the east overflow pond, the activity of gross beta above representative level may have been attributable to thorium-234 and protactinium-234. As reported in Section 4.4.9.2, gross alpha activities in groundwater were found to be attributable to either naturally-occurring uranium-238 and uranium-234 derived from volcanic rocks, or to the release of these constituents from the former east overflow pond before its closure.

To assess the relationship between radionuclides in groundwater and soil samples that had been collected outside of the industrial operations areas of the facilities, the distribution of gross alpha and gross beta activities in groundwater were compared with the activities of alpha- and beta-emitting radionuclides in surface soils. This was done to evaluate whether radionuclides deposited onto these soils through fallout from air emissions had leached to groundwater.

Lead-210, polonium-210, and uranium-238 were analyzed in surface soil samples collected along 16 radials originating at the northern fenceline of the operations area of the EMF facilities. Discussion of the nature and extent of site-related constituents in surface soils is presented in Section 4.3, and isopleths of the activities of these radionuclides in surface soils are presented in Figures 4.3-25 through 4.3-27. As discussed in Section 4.3, surface soils were found to have been affected by fallout of wind blown dusts from ore handling operations. This effect was identified to have occurred predominantly within the area between the northern fenceline of the

industrial operations area and Interstate 86. The distribution of uranium-238 in surface soils was primarily attributable to these fugitive dust emissions. In addition, an overprinting of lead-210 and polonium-210 on surface soils above activities attributable to secular equilibrium with their parent, uranium-238, was noted both within this area and along several radials within a mile beyond the Interstate.

As discussed in Sections 4.4.9.1 and 4.4.9.2, lead-210 and polonium-210 were not detected in samples analyzed from 12 wells that routinely contained elevated gross alpha or beta activities. Rather, the activities of gross alpha and gross beta in all but a few wells were found to be attributable to uranium-234 and uranium-238 (alpha) and potassium-40 (beta). It was speculated, however, that uranium isotopes and beta-emitting radionuclides such as protactinium-234 in the uranium-238 decay series might have been present in groundwater samples collected from Well 318 prior to closure of the former east overflow pond at Simplot. Gross alpha and beta activities in this well have nearly returned to their representative levels since closure of this pond. Consequently, there is no relationship between lead-210 and polonium-210 in surface soils and groundwater.

The distribution of uranium-234 and uranium-238 in groundwater (as reflected by the distribution of gross alpha activities) is attributable to their natural presence in volcanic rocks of the Starlight Formation and sediments derived from this formation, releases from the gypstack, or past releases from the former east overflow pond. This can be further illustrated by examination of Figure 4.4-27, which displays uranium-238 activities in surface soils and gross alpha activities in groundwater. If gross alpha activities in groundwater were related to uranium-238 activities in surface soils, one would expect to observe a correlation between the spatial distributions of uranium-238 in soils and gross alpha in groundwater.

Figure 4.4-27 shows there to be no spatial correlation between uranium-238 activities in surface soils and gross alpha activities in groundwater. Several observations can be made by

examination of this figure. First, uranium-238 is elevated above its reference level (3.88 pCi/g) in several surface soil samples collected on the east side of the Portneuf River. However, gross alpha activities in this area (as reflected in samples from Well 509) were not above the representative level. Second, uranium-238 activities are elevated (ranging from greater than 14 to 3.9 pCi/g) in surface soils collected in the area between the northern fenceline of the Simplot operations area and the Portneuf River to the north and east of the operations area. Gross alpha activities in wells within this area were below representative levels. Third, uranium-238 was elevated (ranging from greater than 14 to less than 7 pCi/g) in soil samples collected along the northern side of Interstate 86. Gross alpha activities in ground water samples collected within this area did not exceed the average activity in representative wells.

In summary, the distributions of lead-210, polonium-210, and uranium-238 in surface soils show no relationship with the distribution of alpha- and beta-emitting radionuclides in groundwater.

# Surface and Subsurface Characterizations Tables for Section 4.4

**Table 4.4-1**
**Representative Groundwater Chemistry**

| ANALYTE (a) | CALCIUM-CHLORIDE WATER CHEMISTRY | | | | | | | CALCIUM-BICARBONATE WATER CHEMISTRY | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Michaud Hydrogeochemical Regime | | | | | | | Bannock Hydrogeochemical Regime | | | | | | | | | | | | |
| | Well TW-10S Mean (b) | Well 101 Mean (b) | Well 102 Mean (b) | Well 147 Mean (b) | Well 514 Mean (b) | Well 515 Mean (b) | Michaud 95% UCL (c) | Idaho Power Mean (b) | Well PEI-1 Mean (b) | Well 106 Mean (b) | Well 158 Mean (b) | Well 301 Mean (b) | Well 305 Mean (b) | Bannock 95% UCL (c) | Well PEI-6 Mean (b) | Well 510 Mean (b) | Well 511 Mean (b) | Well 512 Mean (b) | Well 513 Mean (b) | Portneuf 95% UCL (c) |
| **COMMON IONS (mg/l)** | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, bicarbonate | 142 | 143 | 148 | 171 | 132 | 190 | 198 | 165 | 159 | 151 | 169 | 120 | 137 | 171 | 293 | 284 | 291 | 280 | 280 | 307 |
| Calcium | 79.11 | 85.68 | 75.97 | 85.41 | 44.79 | 93.46 | 97.71 | 45.54 | 58.65 | 59.71 | 64.62 | 50.37 | 53.69 | 68.75 | 79.57 | 79.36 | 83.48 | 61.93 | 59.54 | 91.93 |
| Chloride | 168.85 | 131.23 | 111.38 | 147.89 | 29.00 | 187.50 | 192.90 | 45.09 | 39.28 | 47.81 | 66.50 | 42.02 | 45.78 | 52.42 | 60.98 | 57.35 | 55.55 | 34.37 | 21.72 | 67.87 |
| Magnesium | 25.66 | 31.76 | 27.34 | 25.55 | 14.56 | 32.63 | 33.59 | 16.85 | 15.40 | 16.70 | 22.41 | 10.93 | 13.16 | 19.20 | 32.24 | 30.49 | 29.95 | 26.72 | 30.16 | 35.92 |
| Potassium | 9.39 | 8.54 | 7.96 | 10.57 | 4.45 | 9.21 | 12.72 | 8.19 | 6.22 | 9.79 | 9.08 | 8.15 | 6.54 | 10.52 | 6.56 | 6.40 | 6.32 | 6.19 | 6.58 | 7.34 |
| Sodium | 52.35 | 32.60 | 28.93 | 55.79 | 21.43 | 86.35 | 74.28 | 25.03 | 13.95 | 22.93 | 23.53 | 25.56 | 18.30 | 27.53 | 40.47 | 39.58 | 36.42 | 49.85 | 37.02 | 53.21 |
| Sulfate | 33.73 | 63.71 | 48.34 | 56.53 | 44.00 | 113.50 | 72.57 | 23.00 | 16.17 | 37.61 | 46.50 | 13.67 | 35.33 | 43.40 | 52.85 | 51.87 | 48.13 | 50.45 | 69.13 | 70.68 |
| **PHYSICAL PARAMETERS** | | | | | | | | | | | | | | | | | | | | |
| Spec Conductivity (umhos/cm) | 833 | 841 | 747 | 1229 | 460 | 1229 | 1136 | 574 | 410 | 529 | 554 | 422 | 496 | 569 | 789 | 780 | 793 | 747 | 761 | 871 |
| pH | 7.39 | 7.52 | 7.46 | 7.29 | 7.70 | 7.54 | (d) | 7.60 | 8.37 | 7.50 | 7.62 | 7.44 | 7.37 | (d) | 7.43 | 7.52 | 7.50 | 7.27 | 7.29 | (d) |
| Temperature (degrees Celcius) | 14.7 | 13.4 | 13.8 | 16.7 | 11.8 | 14.0 | (d) | 15.7 | 16.5 | 16.5 | 16.6 | 14.5 | 16.4 | (d) | 13.0 | 13.1 | 13.2 | 13.3 | 12.7 | (d) |
| Total Dissolved Solids (mg/l) | 563 | 542 | 485 | 668 | 281 | 736 | 867 | 326 | 324 | 344 | 404 | 311 | 374 | 412 | 527 | 509 | 505 | 445 | 440 | 580 |
| Redox (mV) | 0 | 112 | 110 | 70 | 157 | 169 | (d) | 69 | (e) | 99 | 44 | 105 | 122 | (d) | 167 | 171 | 170 | 127 | 133 | (d) |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.16 | 0.20 | 0.25 | 0.33 | 0.50 | 0.50 | 0.50 | 0.35 | 0.10 | 0.35 | 0.50 | 0.35 | 0.65 | 0.50 | 0.31 | 0.35 | 0.33 | 0.35 | 0.35 | 0.50 |
| Nitrate (NO3 as N) | 4.45 | 1.76 | 1.69 | 2.29 | 0.65 | 2.02 | 5.52 | 1.45 | 0.81 | 1.02 | 1.03 | 0.66 | 1.03 | 1.60 | 1.97 | 2.98 | 2.31 | 3.49 | 3.19 | 4.00 |
| Orthophosphate (PO4 as P) | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 0.06 | 0.03 | 0.11 | 0.04 | 0.03 | 0.05 | 0.04 | 0.13 | 0.16 | 0.04 | 0.04 | 0.04 | 0.05 | 0.27 |
| Phosphorous | 0.04 | 0.27 | 0.32 | 0.03 | 0.02 | 0.02 | 0.33 | 0.05 | 0.05 | 0.10 | 0.23 | 0.06 | 0.04 | 0.31 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.15 |
| Fluoride | 0.43 | 0.35 | 0.39 | 0.69 | 0.60 | 0.70 | 0.80 | 0.42 | 0.35 | 0.46 | 0.50 | 0.52 | 0.48 | 0.60 | 0.24 | 0.19 | 0.20 | 0.20 | 0.39 | 0.41 |
| **METALS (mg/l)** | | | | | | | | | | | | | | | | | | | | |
| Aluminum | 0.0134 | 0.0167 | 0.0329 | 0.0901 | 0.0226 | 0.0226 | 0.0977 | 0.0310 | 0.1400 | 0.1230 | 0.5130 | 0.3660 | 0.0420 | 0.5472 | 0.4592 | 0.0437 | 0.1522 | 0.1776 | 0.0688 | 0.9475 |
| Antimony | 0.0631 | 0.0336 | 0.0352 | 0.0725 | 0.0482 | 0.0482 | 0.1000 | 0.0747 | 0.0800 | 0.0831 | 0.0482 | 0.0747 | 0.0777 | 0.1340 | 0.0324 | 0.0278 | 0.0278 | 0.0278 | 0.0278 | 0.1000 |
| Arsenic | 0.0044 | 0.0130 | 0.0126 | 0.0049 | 0.0062 | 0.0041 | 0.0149 | 0.0160 | 0.0050 | 0.0040 | 0.0150 | 0.0080 | 0.0080 | 0.0180 | 0.0022 | 0.0045 | 0.0037 | 0.0064 | 0.0054 | 0.0104 |
| Barium | 0.1657 | 0.1532 | 0.1024 | 0.1991 | 0.0559 | 0.1081 | 0.2297 | 0.0440 | 0.0680 | 0.1170 | 0.0730 | 0.0640 | 0.0740 | 0.1204 | 0.1379 | 0.1497 | 0.1320 | 0.1221 | 0.0731 | 0.1735 |
| Beryllium | 0.0005 | 0.0006 | 0.0006 | 0.0010 | 0.0007 | 0.0007 | 0.0020 | 0.0010 | 0.0060 | 0.0020 | 0.0007 | 0.0010 | 0.0020 | 0.0040 | 0.0008 | 0.0011 | 0.0012 | 0.0017 | 0.0012 | 0.0026 |
| Boron | 0.0653 | 0.0600 | 0.0554 | 0.1675 | 0.0622 | 0.1166 | 0.2935 | 0.0790 | 0.2190 | 0.0660 | 0.1260 | 0.1690 | 0.1120 | 0.3078 | 0.1860 | 0.1355 | 0.1563 | 0.1419 | 0.1400 | 0.2500 |
| Cadmium | 0.0024 | 0.0031 | 0.0032 | 0.0014 | 0.0006 | 0.0006 | 0.0050 | 0.0020 | 0.0001 | 0.0030 | 0.0006 | 0.0020 | 0.0010 | 0.0050 | 0.0008 | 0.0012 | 0.0012 | 0.0014 | 0.0014 | 0.0050 |
| Chromium | 0.0053 | 0.0054 | 0.0058 | 0.0059 | 0.0030 | 0.0023 | 0.0114 | 0.0040 | 0.0008 | 0.0050 | 0.0027 | 0.0070 | 0.0030 | 0.0110 | 0.0026 | 0.0036 | 0.0027 | 0.0038 | 0.0029 | 0.0100 |
| Cobalt | 0.0033 | 0.0040 | 0.0036 | 0.0050 | 0.0027 | 0.0027 | 0.0145 | 0.0050 | 0.0100 | 0.0090 | 0.0030 | 0.0070 | 0.0060 | 0.0108 | 0.0031 | 0.0066 | 0.0076 | 0.0052 | 0.0064 | 0.0163 |
| Copper | 0.0037 | 0.0057 | 0.0039 | 0.0042 | 0.0037 | 0.0017 | 0.0085 | 0.0050 | 0.0073 | 0.0050 | 0.0040 | 0.0040 | 0.0050 | 0.0109 | 0.0078 | 0.0053 | 0.0044 | 0.0048 | 0.0049 | 0.0130 |
| Iron | 0.2521 | 0.1716 | 0.1183 | 0.0891 | 0.0620 | 0.0620 | 0.7690 | 0.1330 | 0.0670 | 0.1090 | 0.4440 | 0.2850 | 0.0470 | 0.8402 | 0.2691 | 0.0629 | 0.1420 | 0.3627 | 0.0659 | 1.0740 |
| Lead | 0.0015 | 0.0013 | 0.0011 | 0.0012 | 0.0028 | 0.0008 | 0.0020 | 0.0020 | 0.0050 | 0.0010 | 0.0020 | 0.0013 | 0.0010 | 0.0068 | 0.0013 | 0.0013 | 0.0013 | 0.0016 | 0.0013 | 0.0024 |
| Lithium | 0.0187 | 0.0097 | 0.0097 | 0.0508 | 0.0364 | 0.0533 | 0.0610 | 0.0120 | 0.0070 | 0.0160 | 0.0160 | 0.0070 | 0.0100 | 0.0165 | 0.0334 | 0.0299 | 0.0278 | 0.0292 | 0.0273 | 0.0400 |
| Manganese | 0.0079 | 0.0077 | 0.0096 | 0.0085 | 0.0028 | 0.0018 | 0.0518 | 0.0030 | 0.0060 | 0.0080 | 0.0021 | 0.0050 | 0.0070 | 0.0201 | 0.0254 | 0.0025 | 0.0047 | 0.0717 | 0.0037 | 0.1097 |
| Mercury | 0.00015 | 0.00016 | 0.00011 | 0.00027 | 0.00064 | 0.00048 | 0.00074 | 0.00030 | 0.00030 | 0.00040 | 0.00020 | 0.00020 | 0.00040 | 0.00078 | 0.00026 | 0.00024 | 0.00018 | 0.00020 | 0.00019 | 0.00054 |
| Molybdenum | 0.0084 | 0.0114 | 0.0078 | 0.0135 | 0.0138 | 0.0113 | 0.0245 | 0.0220 | 0.0250 | 0.0150 | 0.0110 | 0.0280 | 0.0190 | 0.0330 | 0.0086 | 0.0143 | 0.0164 | 0.0164 | 0.0231 | 0.0300 |
| Nickel | 0.0058 | 0.0064 | 0.0066 | 0.0104 | 0.0124 | 0.0124 | 0.0200 | 0.0130 | 0.0090 | 0.0120 | 0.0124 | 0.0120 | 0.0120 | 0.0200 | 0.0101 | 0.0160 | 0.0133 | 0.0148 | 0.0151 | 0.0247 |
| Selenium | 0.0032 | 0.0030 | 0.0031 | 0.0034 | 0.0024 | 0.0019 | 0.0057 | 0.0020 | 0.0040 | 0.0020 | 0.0020 | 0.0030 | 0.0030 | 0.0055 | 0.0013 | 0.0029 | 0.0027 | 0.0028 | 0.0028 | 0.0060 |
| Silver | 0.0032 | 0.0034 | 0.0035 | 0.0026 | 0.0039 | 0.0039 | 0.0050 | 0.0030 | 0.0020 | 0.0040 | 0.0040 | 0.0030 | 0.0050 | 0.0052 | 0.0020 | 0.0030 | 0.0031 | 0.0031 | 0.0034 | 0.0040 |
| Thallium | 0.0008 | 0.0009 | 0.0009 | 0.0100 | 0.0009 | 0.0009 | 0.0040 | 0.0020 | 0.0200 | 0.0020 | 0.0009 | 0.0080 | 0.0080 | 0.0400 | 0.0049 | 0.0024 | 0.0017 | 0.0017 | 0.0017 | 0.0045 |
| Vanadium | 0.0148 | 0.0185 | 0.0167 | 0.0144 | 0.0024 | 0.0022 | 0.0745 | 0.0200 | 0.0800 | 0.0160 | 0.0060 | 0.0080 | 0.0290 | 0.1000 | 0.0827 | 0.0076 | 0.0074 | 0.0087 | 0.0077 | 0.1987 |
| Zinc | 0.0113 | 0.0133 | 0.0122 | 0.0152 | 0.0054 | 0.0047 | 0.0501 | 0.0009 | 0.0095 | 0.0026 | 0.0060 | 0.2250 | 0.0060 | 0.1700 | 0.0782 | 0.0107 | 0.0102 | 0.0101 | 0.0105 | 0.1615 |

Notes:
(a) Chemical concentrations shown on this table are mean values and 95% upper confidence levels (95% UCL) and were calculated from analytical data for groundwater samples collected prior to 1994.
(b) Mean concentrations are shown for each parameter in each well in order to simplify presentation and analysis of data. Instrument detection limits were used for non-detect results in the calculation of mean concentrations.
(c) The 95% UCLs are based on the total population of analytical results for representative groundwater.
(d) 95% UCLs for pH, temperature, and redox were not calculated
(e) Redox was not analyzed in wells PEI-1, PEI-3, PEI-5, 153, and 372.

**Table 4.4-2**
**Activities of Radiological Parameters in Representative EMF Groundwater**

| Radiological Parameter (pCi/l) | CALCIUM-CHLORIDE WATER CHEMISTRY | | | | | | CALCIUM-BICARBONATE WATER CHEMISTRY | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Michaud Flats Hydrogeochemical Regime | | | | | | Bannock Range Hydrogeochemical Regime | | | | | | Portneuf River Hydrogeochemical Regime | | | | |
| | Well 101 | Well 102 | TW-10S | Well 147 | Well 514 | Well 515 | Well 158 | Idaho Power | Well 106 | Well 301 | PEI-1 | Well 305 | PEI-6 | Well 510 | Well 511 | Well 512 | Well 513 |
| Gross alpha | | | | | | | | | | | | | | | | | |
| Jun-92 | 2.6±1.9 | ND | 3.4±3 | ND | NS | NS | NS | ND | ND | RS | 2.4±1.3 | RS | 4.6±2.3 | RS | RS | RS | RS |
| Sep-92 | 4.4±2.45 | 2.28±1.87 | 3.45±0.36 | 2.66±0.4 | NS | NS | NS | 2.65±0.58 | 4.59±1.95 | 4.57±0.89 | 2.78±0.41 | 3.08±0.45 | 3.39±0.35 | ND | ND | 2.21±0.64 | 2.07±0.73 |
| Dec-92 | 7.34±2.38 | 4.5±1.72 | 5.36±2.52 | 5.18±1.14 | NS | NS | NS | 3.31±0.99 | 3.76±0.96 | 2.66±0.55 | NS | 2.98±1.02 | 2.31±0.59 | ND | ND | ND | ND |
| Mar-93 | 2.94±1.6 | 3.94±1.24 | 5.82±2.07 | 4.39±1.05 | NS | NS | NS | 4.78±1.48 | ND | 4.94±1.06 | NS | 3.93±1.37 | 3.56±1.48 | 2.88±0.85 | 2.24±0.93 | 2.59±1.33 | 3.48±1.44 |
| Jul-93 | 3.54±0.78 | 2.54±0.57 | 7.97±1.37 | 3.97±0.95 | ND | 5.26±1.31 | 3.8±0.98 | 3.83±1.29 | 2.23±0.78 | 2.5±0.80 | NS | 2.3±0.70 | ND | ND | ND | ND | 2.95±1.09 |
| Dec-93 | 4.06±1.43 | 3.0±1.26 | 2.77±1.32 | 3.21±1.45 | ND | 6.25±1.62 | 2.05±1.41 | 5.72±1.92 | 3.52±1.5 | 2.35±0.50 | NS | 4.01±0.66 | ND | 2.47±1.46 | ND | 2.18±1.15 | 2.06±0.86 |
| Gross beta | | | | | | | | | | | | | | | | | |
| Jun-92 | 4.1±2.9 | 6.5±3 | 6.1±3.4 | 20.6±3.5 | NS | NS | NS | 14±3.1 | ND | RS | 11±3.7 | RS | 9.1±2.9 | RS | RS | RS | RS |
| Sep-92 | 8.11±1.81 | 6.97±1.74 | 8.27±0.39 | 14.3±0.48 | NS | NS | NS | 10.9±0.91 | 9.04±1.82 | 6.29±0.82 | 7.95±0.49 | 6.89±0.52 | 4.44±0.46 | 6.11±0.7 | ND | 7.64±0.73 | 9.3±0.88 |
| Dec-92 | 9.77±1.35 | 9.53±1.46 | 10.1±1.49 | 10.8±0.94 | NS | NS | NS | 7.17±0.88 | 8.43±0.757 | 5.87±0.72 | NS | 5.57±0.95 | 4.04±0.56 | ND | ND | ND | ND |
| Mar-93 | 45.8±2.65 | 7.61±0.98 | 7.05±0.96 | 9.85±1.01 | NS | NS | NS | ND | 7.18±1.15 | ND | NS | 6.67±1.23 | ND | 7.44±1.45 | 7.47±1.42 | ND | ND |
| Jul-93 | 7.14±0.79 | 5.42±0.73 | 9.58±0.89 | 8.91±0.9 | 2.93±1.06 | 6.35±1.34 | 8.03±0.96 | 5.78±1.24 | 5.28±1.03 | 10.8±1.1 | NS | 9.3±1.1 | 4.1±0.8 | 5.19±1.15 | 4.1±1.12 | 5.31±1.17 | 4.5±1.07 |
| Dec-93 | 6.29±1.38 | 5.91±1.45 | 6.55±1.53 | 11.6±2.08 | 3.76±1.43 | 12.3±2.03 | 10.2±2.05 | 6.82±1.73 | 8.75±1.98 | 5.69±0.84 | NS | 7.83±0.91 | 6.07±1.72 | 6.78±1.8 | 7.73±1.86 | ND | 7.03±1.17 |
| Radium-226 | | | | | | | | | | | | | | | | | |
| Jun-92 | NA | NA | NA | NA | NS | NS | NS | NA | NA | RS | NH | RS | NA | RS | RS | RS | RS |
| Sep-92 | ND | ND | 6.35±0.57 | ND | NS | NS | NS | ND | ND | 1.65±0.53 | ND | ND | ND | ND | ND | ND | ND |
| Dec-92 | ND | ND | ND | ND | NS | NS | NS | ND | ND | ND | NS | 3.41±0.29 | ND | ND | ND | ND | ND |
| Mar-93 | ND | ND | ND | 1.82±0.26 | NS | NS | NS | ND | ND | ND | NS | ND | ND | ND | ND | ND | ND |
| Jul-93 | 1.57±0.34 | 1.84±0.23 | ND | ND | ND | ND | ND | ND | ND | ND | NS | ND | ND | ND | 1.18±0.19 | ND | ND |
| Dec-93 | ND | ND | 3.83±0.32 | ND | ND | ND | ND | ND | 1.31±0.24 | ND | NS | ND | ND | ND | ND | ND | ND |
| Radium-228 | | | | | | | | | | | | | | | | | |
| Jun-92 | ND | ND | ND | ND | NS | NS | NS | ND | ND | RS | NH | RS | ND | RS | RS | RS | RS |
| Sep-92 | 1.2±0.8 | 1.8±0.9 | 4.2±1 | ND | NS | NS | NS | 1.2±0.7 | 1±0.8 | 2.7±1 | ND | ND | ND | ND | ND | ND | 2.1±0.5 |
| Dec-92 | ND | 6.5±1.2 | ND | ND | NS | NS | NS | ND | ND | 1±0.6 | NS | 2±1 | ND | ND | ND | ND | ND |
| Mar-93 | ND | ND | ND | ND | NS | NS | NS | ND | ND | 1±0.7 | NS | ND | 5.4±1 | ND | 7.2±1 | ND | ND |
| Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1±0.6 | NS | ND | 5.3±0.80 | ND | ND | ND | ND |
| Dec-93 | ND | ND | ND | ND | ND | ND | ND | ND | 9.6±1 | ND | NS | 1.5±0.6 | 1±0.6 | ND | ND | ND | 10.8±1.1 |

Notes:
NA - Not analyzed.
ND - Not detected.
NS - Not sampled.
RS - Rejected sample.

**TABLE 4.4-3**
**ORGANIC COMPOUNDS REPORTED IN GROUNDWATER FROM REPRESENTATIVE WELLS (mg/l)**

| | | CALCIUM-CHLORIDE WATER CHEMISTRY | | | CALCIUM-BICARBONATE WATER CHEMISTRY | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Michaud Flats Hydrogeochemical Regime | | | Bannock Range Hydrogeochemical Regime, Low-Chloride Subgroup | | | Portneuf River Hydrogeochemical Regime | | |
| **Parameter** | **Sample Event** | **Well 101** | **Well 102** | **TW-10S** | **Well 106** | **Well 301** | **PEI-1** | **PEI-6** | **Well 511** | **Well 513** |
| 2-Butanone | Sep-92 | | | | | | 0.003J | | | 0.004J |
| | Mar-93 | | | | | | | | | |
| Acetone | Sep-92 | | | | | 0.361J | 0.524J | | 0.044 | 0.1J |
| | Dec-92 | | | | | 0.12 | | | | |
| Bis(2-ethylhexyl) | Sep-92 | | | | | | | 0.001J | 0.017 | |
| -phthalate | Dec-92 | 0.004J | 0.002J | 0.004J | 0.005J | 0.026 | | 0.013 | 0.013 | 0.003J |
| | Dec-92 | | | | | | | | | 0.001J |
| | Mar-93 | | | | | 0.054 | | 0.025 | 0.012 | |
| Carbon disulfide | Sep-92 | | | | | | | | 0.027J | 0.033J |
| Chlorobenzene | Sep-92 | 0.001J | | | | | | | | |
| Di-n-butyl phthalate | Mar-93 | | | | | 0.001J | | | 0.002 | |
| Ethyl benzene | Sep-92 | | | | | 0.001 | | | | |
| Methylene chloride | Sep-92 | | | | | | | | | |
| Tetrachloroethene | Sep-92 | | | | | | | | 0.003J | |
| | Dec-92 | | | | | | | | 0.001J | |
| | Mar-93 | | | | | | | | 0.003 | |
| Trichloroethene | Sep-92 | | | | | | | 0.005 | | |
| Xylenes, total | Sep-92 | | | | | 0.008 | 0.006 | | | |
| | Mar-93 | | | 0.001J | | | | | | |

J = Validation qualifier indicating estimated quantity.

TABLE 4.4-4
FMC GROUNDWATER CHEMISTRY - COMMON IONS, METALS, PHYSICAL PARAMETERS, NUTRIENTS, AND FLUORIDE

| ANALYTE (a) | SOUTHWEST FMC AREA | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 95% UCL FOR REPRESENTATIVE GROUNDWATER (c) | MICHAUD WELLS | | | | | UNDETERMINED WELL | 95% UCL FOR REPRESENTATIVE GROUNDWATER (c) | BANNOCK WELLS | | | | | | | | | |
| | MICHAUD | Well 112 Mean (b) | Well 124 Mean (b) | Well 126 Mean (b) | Well 127 Mean (b) | Well 128 Mean (b) | Well 116 Mean (b) | BANNOCK | Well 103 Mean (b) | Well 104 Mean (b) | Well 113 Mean (b) | Well 114 Mean (b) | Well 115 Mean (b) | Well 117 Mean (b) | Well 118 Mean (b) | Well 119 Mean (b) | Well 120 Mean (b) | Well 125 Mean (b) |
| **COMMON IONS (mg/l)** | | | | | | | | | | | | | | | | | | |
| Alkalinity, bicarbonate | 198 | 196 | 207 | 180 | 189 | 227 | 493 | 171 | 304 | 931 | 273 | 534 | 518 | 296 | 395 | 194 | 211 | 187 |
| Calcium | 97.71 | 93 | 73 | 93 | 138 | 92 | 192 | 68.75 | 105 | 74 | 83 | 50 | 51 | 121 | 121 | 77 | 68 | 46 |
| Chloride | 192.90 | 142 | 112 | 143 | 275 | 182 | 629 | 52.42 | 122 | 232 | 142 | 142 | 136 | 59 | 173 | 119 | 82 | 33 |
| Magnesium | 33.59 | 31.3 | 22.8 | 26.8 | 41.3 | 33.2 | 86.0 | 19.20 | 44.6 | 60.4 | 37.0 | 25.5 | 22.0 | 45.5 | 48.9 | 28.5 | 27.3 | 12.9 |
| Potassium | 12.72 | 8.8 | 11.2 | 10.2 | 15.2 | 15.1 | 167.9 | 10.52 | 13.2 | 431.2 | 37.9 | 10.7 | 8.7 | 15.4 | 29.5 | 10.4 | 8.7 | 8.7 |
| Sodium | 74.28 | 72 | 76 | 67 | 116 | 117 | 320 | 27.53 | 63 | 308 | 101 | 346 | 326 | 41 | 123 | 41 | 45 | 52 |
| Sulfate | 72.57 | 102 | 68 | 90 | 155 | 111 | 259 | 43.40 | 108 | 276 | 109 | 129 | 134 | 232 | 124 | 54 | 49 | 43 |
| **PHYSICAL PARAMETERS (d)** | | | | | | | | | | | | | | | | | | |
| Spec. Conductivity (umhos/cm) | 1136 | 1060 | 890 | 995 | 1549 | 1281 | 3351 | 569 | 1112 | 3132 | 1168 | 1618 | 1514 | 1086 | 1482 | 742 | 748 | 538 |
| pH | 7.29 to 7.70 | 7.22 | 7.33 | 7.34 | 7.18 | 7.21 | 6.79 | 7.37 to 8.37 | 7.07 | 7.05 | 7.18 | 7.06 | 7.37 | 6.91 | 6.71 | 7.21 | 7.14 | 7.46 |
| Temperature (degrees Celcius) | 11.8 to 16.7 | 12.8 | 13.6 | 16.0 | 13.8 | 12.3 | 14.7 | 14.5 to 16.6 | 14.1 | 13.3 | 11.4 | 10.7 | 11.0 | 18.2 | 15.9 | 16.1 | 15.5 | 17.9 |
| Total Dissolved Solids (mg/l) | 867 | 655 | 518 | 578 | 855 | 745 | 2285 | 412 | 734 | 2023 | 752 | 1046 | 1073 | 767 | 964 | 506 | 474 | 339 |
| Redox (mV) | 0 to 169 | 159 | 184 | 161 | 200 | 164 | 109 | 44 to 122 | 209 | 151 | 72 | -52 | 23 | 132 | 42 | 67 | 80 | 91 |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.50 | 0.35 | 0.37 | 0.37 | 0.37 | 0.37 | 0.81 | 0.50 | 0.43 | 5.93 | 0.37 | 0.47 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 |
| Nitrate (NO3 as N) | 5.52 | 4.67 | 1.94 | 1.21 | 2.39 | 4.14 | 6.59 | 1.60 | 0.82 | 11.9 | 6.11 | 2.63 | 3.89 | 0.61 | 0.34 | 1.46 | 1.40 | 0.63 |
| Orthophosphate (PO4 as P) | 0.06 | 0.19 | 0.16 | 0.06 | 0.18 | 0.36 | 1.51 | 0.13 | 1.13 | 16.8 | 0.29 | 4.22 | 3.37 | 0.06 | 14.6 | 1.55 | 2.48 | 0.03 |
| Phosphorous | 0.33 | 0.24 | 0.22 | 0.08 | 0.22 | 0.43 | 2.80 | 0.31 | 1.89 | 18.7 | 0.84 | 21.3 | 11.4 | 0.07 | 40.3 | 2.04 | 3.30 | 0.08 |
| Fluoride | 0.80 | 0.56 | 0.81 | 0.89 | 0.32 | 0.29 | 0.90 | 0.60 | 0.18 | 10.9 | 0.86 | 0.85 | 0.18 | 0.35 | 0.18 | 0.20 | 0.20 | 1.16 |
| **METALS - Not EMF-Related (mg/l)** | | | | | | | | | | | | | | | | | | |
| Aluminum | 0.0977 | 0.0517 | 0.0360 | 0.0402 | 0.0502 | 0.0397 | 0.7595 | 0.5472 | 0.0346 | 0.0548 | 0.0352 | 0.0520 | 0.0366 | 0.0455 | 0.0368 | 0.0295 | 0.0375 | 0.0350 |
| Antimony | 0.1000 | 0.0631 | 0.0673 | 0.0711 | 0.0596 | 0.0769 | 0.0596 | 0.1340 | 0.0596 | 0.0596 | 0.0596 | 0.0639U | 0.0625 | 0.0596 | 0.0596 | 0.0596 | 0.0596 | 0.0725 |
| Beryllium | 0.0020 | 0.0017 | 0.0012 | 0.0010 | 0.0014 | 0.0012 | 0.0014 | 0.0040 | 0.0010 | 0.0013 | 0.0010 | 0.0010U | 0.0010 | 0.0013 | 0.0013 | 0.0013 | 0.0012 | 0.0013 |
| Cadmium | 0.0050 | 0.0016 | 0.0035 | 0.0034 | 0.0035 | 0.0035 | 0.0027 | 0.0050 | 0.0027 | 0.0026 | 0.0038 | 0.0025U | 0.0025 | 0.0031 | 0.0032 | 0.0025 | 0.0031 | 0.0035 |
| Chromium | 0.0114 | 0.0036 | 0.0057 | 0.0043 | 0.0050 | 0.0048 | 0.0063 | 0.0110 | 0.0039 | 0.0038 | 0.0053 | 0.0044U | 0.0043 | 0.0040 | 0.0039 | 0.0042 | 0.0041 | 0.0048 |
| Copper | 0.0085 | 0.0036 | 0.0060 | 0.0037 | 0.0049 | 0.0035 | 0.0230 | 0.0109 | 0.0044 | 0.0056 | 0.0037 | 0.0042 | 0.0047 | 0.0041 | 0.0056 | 0.0061 | 0.0058 | 0.0038 |
| Iron | 0.7690 | 0.0483 | 0.0461 | 0.0417 | 0.0416 | 0.0386 | 0.7687 | 0.8402 | 0.2692 | 0.0654 | 0.0544 | 0.1503 | 0.1041 | 0.1043 | 0.0844 | 0.1464 | 0.1055 | 0.0397 |
| Lead | 0.0020 | 0.0013 | 0.0012 | 0.0012 | 0.0012 | 0.0013 | 0.0044 | 0.0068 | 0.0014 | 0.0011 | 0.0012 | 0.0011U | 0.0011 | 0.0018 | 0.0019 | 0.0014 | 0.0015 | 0.0012 |
| Mercury | 0.00074 | 0.00025 | 0.00023 | 0.00033 | 0.00029 | 0.00024 | 0.00026 | 0.00078 | 0.00031 | 0.00024 | 0.00025 | 0.00031U | 0.00040 | 0.00028 | 0.00035 | 0.00026 | 0.00026 | 0.00026 |
| Molybdenum | 0.0245 | 0.0143 | 0.0141 | 0.0141 | 0.0192 | 0.0141 | 0.0222 | 0.0330 | 0.0310 | 0.0290 | 0.0159 | 0.0274 | 0.0366 | 0.0141 | 0.0169 | 0.0141 | 0.0144 | 0.0145 |
| Nickel | 0.0200 | 0.0120 | 0.0120 | 0.0120 | 0.0134 | 0.0120 | 0.0120 | 0.0200 | 0.0129 | 0.0208 | 0.0120 | 0.0142 | 0.0129 | 0.0120 | 0.0134 | 0.0120 | 0.0120 | 0.0120 |
| Silver | 0.0050 | 0.0026 | 0.0044 | 0.0033 | 0.0039 | 0.0028 | 0.0039 | 0.0052 | 0.0038 | 0.0039 | 0.0038 | 0.0039U | 0.0038 | 0.0037 | 0.0038 | 0.0037 | 0.0037 | 0.0037 |
| Thallium | 0.0040 | 0.0018 | 0.0016 | 0.0016 | 0.0016 | 0.0017 | 0.0017 | 0.0400 | 0.0018 | 0.0017 | 0.0016 | 0.0016U | 0.0016 | 0.0016 | 0.0016 | 0.0017 | 0.0016 | 0.0016 |
| Vanadium | 0.0745 | 0.0083 | 0.0119 | 0.0698 | 0.0101 | 0.0209 | 0.0149 | 0.1000 | 0.0128 | 0.0251 | 0.0203 | 0.0198 | 0.0229 | 0.0071 | 0.0071 | 0.0081 | 0.0118 | 0.0151 |
| Zinc | 0.0501 | 0.0074 | 0.0164 | 0.0170 | 0.0148 | 0.0138 | 0.0194 | 0.1700 | 0.0143 | 0.0103 | 0.0131 | 0.0123U | 0.0119 | 0.0083 | 0.0149 | 0.0076 | 0.0084 | 0.0137 |
| **METALS - EMF-Related (mg/l)** | | | | | | | | | | | | | | | | | | |
| Arsenic | 0.0149 | 0.0067 | 0.0134 | 0.0099 | 0.0210 | 0.0230 | 0.0729 | 0.0180 | 0.0351 | 0.1325 | 0.0344 | 0.1849 | 0.1855 | 0.0124 | 0.0320 | 0.0152 | 0.0195 | 0.0062 |
| Barium | 0.2297 | 0.1177 | 0.0702 | 0.1655 | 0.0952 | 0.0694 | 0.1452 | 0.1204 | 0.1248 | 0.3214 | 0.0578 | 0.1814 | 0.1012 | 0.1138 | 0.2119 | 0.1251 | 0.0856 | 0.0915 |
| Boron | 0.2935 | 0.1553 | 0.2206 | 0.1655 | 0.3098 | 0.5190 | 1.4509 | 0.3078 | 1.2311 | 1.9317 | 0.6927 | 1.8465 | 2.139 | 0.1039 | 0.7009 | 0.1643 | 0.2119 | 0.1607 |
| Cobalt | 0.0145 | 0.0053 | 0.0076 | 0.0053 | 0.0114 | 0.0113 | 0.0090 | 0.0108 | 0.1059 | 0.0329 | 0.0086 | 0.0381 | 0.0357 | 0.0053 | 0.0052 | 0.0051 | 0.0051 | 0.0076 |
| Lithium | 0.0610 | 0.0518 | 0.0546 | 0.0536 | 0.0708 | 0.0554 | 0.1838 | 0.0165 | 0.0304 | 0.1868 | 0.0441 | 0.1415 | 0.0353 | 0.0384 | 0.0671 | 0.0232 | 0.0241 | 0.0476 |
| Manganese | 0.0518 | 0.0024 | 0.0130 | 0.0029 | 0.0034 | 0.0031 | 0.226 | 0.0201 | 1.324 | 4.493 | 0.0088 | 1.830 | 0.509 | 0.0045 | 1.650 | 0.0101 | 0.0308 | 0.0038 |
| Selenium | 0.0057 | 0.0010 | 0.0024 | 0.0026 | 0.0055 | 0.0045 | 0.0150 | 0.0055 | 0.0028 | 0.0023 | 0.0042 | 0.0039 | 0.0049 | 0.0025 | 0.0033 | 0.0032 | 0.0031 | 0.0018 |

Notes: (a) Chemical concentrations shown on this table are mean values and 95% upper confidence levels (95% UCL) and were calculated from analytical data for groundwater samples collected prior to 1994.
(b) Mean concentrations are shown for each parameter in each well in order to simplify presentation and analysis of data. Instrument detection limits were used for non-detect results in the calculation of mean concentrations.
(c) The 95% UCLs are based on the total population of analytical results for representative groundwater.
(d) 95% UCLs for pH, temperature, and redox were not calculated. Ranges of these parameters are used for representative groundwater
(e) Redox was not analyzed in wells PEI-1, PEI-3, PEI-5, 153, and 322

TABLE 4.4-4

TABLE 4.4-4 *(continued)*
FMC GROUNDWATER CHEMISTRY - COMMON IONS, METALS, PHYSICAL PARAMETERS, NUTRIENTS, AND FLUORIDE

| ANALYTE (a) | SOUTHWEST FMC AREA | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 95% UCL FOR REPRESENTATIVE GROUNDWATER (c) MICHAUD | MICHAUD WELLS | | | | | | | 95% UCL FOR REPRESENTATIVE GROUNDWATER (c) BANNOCK | BANNOCK WELLS | | | | | | | | |
| | | Well 131 Mean (b) | Well 132 Mean (b) | Well 137 Mean (b) | Well 139 Mean (b) | Well 140 Mean (b) | Well 141 Mean (b) | Well 148 Mean (b) | | Well 129 Mean (b) | Well 130 Mean (b) | Well 149 Mean (b) | Well 150 Mean (b) | Well 151 Mean (b) | Well 152 Mean (b) | Well 153 Mean (b) | Well 154 Mean (b) | Well 159 Mean (b) |
| **COMMON IONS (mg/l)** | | | | | | | | | | | | | | | | | | | |
| Alkalinity, bicarbonate | 198 | 461 | 820 | 236 | 196 | 336 | 547 | 208 | 171 | 229 | 206 | 200 | 1490 | 333 | 1415 | 188 | 195 | 802 |
| Calcium | 97.71 | 175 | 56 | 69 | 376 | 234 | 150 | 86 | 68.75 | 85 | 79 | 58 | 31 | 88 | 59 | 64 | 66 | 179 |
| Chloride | 192.90 | 146 | 261 | 156 | 980 | 276 | 258 | 155 | 52.42 | 106 | 87 | 91 | 409 | 120 | 371 | 70 | 125 | 312 |
| Magnesium | 33.59 | 64.1 | 64.5 | 28.0 | 137.0 | 93.4 | 68.7 | 27.8 | 19.20 | 34.6 | 31.9 | 17.4 | 97.4 | 40.4 | 95.4 | 15.6 | 19.1 | 95.6 |
| Potassium | 12.72 | 14.0 | 251.9 | 8.3 | 33.1 | 38.2 | 27.1 | 11.9 | 10.52 | 11.3 | 10.0 | 10.3 | 1293.6 | 21.7 | 1087.0 | 14.2 | 11.0 | 27.9 |
| Sodium | 74.28 | 149 | 370 | 123 | 213 | 406 | 237 | 81 | 27.53 | 50 | 26 | 70 | 536 | 133 | 542 | 75 | 63 | 352 |
| Sulfate | 72.57 | 151 | 246 | 113 | 592 | 843 | 211 | 89 | 43.40 | 83 | 61 | 50 | 253 | 94 | 226 | 42 | 42 | 238 |
| **PHYSICAL PARAMETERS (d)** | | | | | | | | | | | | | | | | | | | |
| Spec. Conductivity (umhos/cm) | 1136 | 1581 | 2794 | 1228 | 4091 | 2828 | 2179 | 1069 | 569 | 914 | 773 | 774 | 6105 | 1256 | 5246 | 726 | 791 | 3080 |
| pH | 7.29 to 7.70 | 6.95 | 6.74 | 7.54 | 6.93 | 6.90 | 6.78 | 7.30 | 7.37 to 8.37 | 7.31 | 7.25 | 7.40 | 7.02 | 6.90 | 6.92 | 8.99 | 7.37 | 6.63 |
| Temperature (degrees Celcius) | 11.8 to 16.7 | 13.3 | 14.3 | 11.6 | 13.5 | 16.7 | 17.1 | 15.8 | 14.5 to 16.6 | 12.9 | 14.1 | 15.8 | 15.0 | 16.9 | 15.1 | 17.2 | 17.0 | 17.0 |
| Total Dissolved Solids(mg/l) | 867 | 1111 | 1736 | 747 | 2863 | 2145 | 1487 | 655 | 412 | 559 | 497 | 484 | 5271 | 882 | 4580 | 440 | 565 | 2145 |
| Redox (mV) | 0 to 169 | -113 | -15 | 191 | 265 | 154 | -17 | 82 | 44 to 122 | 188 | 216 | 69 | -239 | 18 | -238 | (e) | 99 | -119 |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.50 | 0.39 | 4.75 | 0.37 | 0.35 | 0.35 | 0.82 | 0.37 | 0.50 | 0.35 | 0.39 | 0.37 | 9.52 | 0.69 | 8.69 | 0.05 | 0.44 | 1.62 |
| Nitrate (NO3 as N) | 5.52 | 3.24 | 0.26 | 6.08 | 32.5 | 8.31 | 0.06 | 2.57 | 1.60 | 2.49 | 37.55 | 1.18 | 0.05 | 0.05 | 0.05 | 0.96 | 1.14 | 0.05 |
| Orthophosphate (PO4 as P) | 0.06 | 4.47 | 7.21 | 2.67 | 0.09 | 1.04 | 18.8 | 0.10 | 0.13 | 0.37 | 0.58 | 0.11 | 387 | 11.0 | 271 | 0.02 | 0.03 | 8.70 |
| Phosphorous | 0.33 | 32.2 | 27.5 | 3.79 | 0.11 | 5.13 | 52.6 | 0.15 | 0.31 | 0.61 | 0.73 | 0.16 | 665 | 55.4 | 489 | 0.06 | 0.02 | 192 |
| Fluoride | 0.80 | 0.33 | 1.19 | 0.16 | 1.13 | 2.98 | 0.14 | 0.79 | 0.60 | 0.30 | 0.28 | 1.05 | 8.65 | 0.14 | 8.58 | 1.17 | 1.12 | 0.20 |
| **METALS - Not EMF-Related (mg/l)** | | | | | | | | | | | | | | | | | | | |
| Aluminum | 0.0977 | 10.1454 | 0.0351 | 0.0349 | 0.0374 | 0.1496 | 0.0470 | 0.0359 | 0.5472 | 0.0341 | 0.0429 | 0.0283 | 0.0344 | 0.0290 | 0.0373 | 0.0700 | 0.0325 | 0.0255 |
| Antimony | 0.1000 | 0.0596 | 0.0596 | 0.0596 | 0.0847 | 0.0631 | 0.0764 | 0.0711 | 0.1340 | 0.0631 | 0.0596 | 0.0696 | 0.0596 | 0.0631 | 0.0890 | 0.1000 | 0.0515 | 0.0482 |
| Beryllium | 0.0020 | 0.0014 | 0.0012 | 0.0015 | 0.0017 | 0.0011 | 0.0011 | 0.0010 | 0.0040 | 0.0011 | 0.0012 | 0.0010 | 0.0013 | 0.0011 | 0.0012 | 0.0030 | 0.0009 | 0.0007 |
| Cadmium | 0.0050 | 0.0026 | 0.0027 | 0.0038 | 0.0014 | 0.0014 | 0.0014 | 0.0013 | 0.0050 | 0.0027 | 0.0026 | 0.0013 | 0.0013 | 0.0015 | 0.0019 | 0.0010 | 0.0016 | 0.0006 |
| Chromium | 0.0114 | 0.0052 | 0.0039 | 0.0039 | 0.0072 | 0.0056 | 0.0024 | 0.0064 | 0.0110 | 0.0045 | 0.0041 | 0.0047 | 0.0038 | 0.0024 | 0.0029 | 0.0160 | 0.0045 | 0.0007 |
| Copper | 0.0085 | 0.0091 | 0.0096 | 0.0037 | 0.0068 | 0.0048 | 0.0045 | 0.0037 | 0.0109 | 0.0045 | 0.0048 | 0.0036 | 0.0065 | 0.0041 | 0.0056 | 0.0030 | 0.0037 | 0.0037 |
| Iron | 0.7690 | 4.9496 | 0.2474 | 0.0418 | 0.0956 | 0.0983 | 0.0529 | 0.0398 | 0.8402 | 0.1531 | 0.0934 | 0.0341 | 0.7739 | 0.0356 | 0.5201 | 0.0230 | 0.0417 | 1.3509 |
| Lead | 0.0020 | 0.0040 | 0.0029 | 0.0012 | 0.0013 | 0.0013 | 0.0027 | 0.0012 | 0.0068 | 0.0011 | 0.0011 | 0.0012 | 0.0015 | 0.0013 | 0.0012 | 0.0020 | 0.0012 | 0.0008 |
| Mercury | 0.00074 | 0.00032 | 0.00022 | 0.00030 | 0.00051 | 0.00043 | 0.00031 | 0.00027 | 0.00078 | 0.00031 | 0.00024 | 0.00025 | 0.00023 | 0.00029 | 0.00021 | 0.00020 | 0.00015 | 0.00008 |
| Molybdenum | 0.0245 | 0.0152 | 0.0259 | 0.0178 | 0.0181 | 0.0153 | 0.0242 | 0.0147 | 0.0330 | 0.0148 | 0.0151 | 0.0175 | 0.0319 | 0.0168 | 0.0322 | 0.0200 | 0.0149 | 0.0430 |
| Nickel | 0.0200 | 0.0209 | 0.0221 | 0.0120 | 0.0120 | 0.0120 | 0.0209 | 0.0120 | 0.0200 | 0.0133 | 0.0121 | 0.0120 | 0.0195 | 0.0169 | 0.0203 | 0.0100 | 0.0134 | 0.0124 |
| Silver | 0.0050 | 0.0038 | 0.0039 | 0.0027 | 0.0036 | 0.0026 | 0.0032 | 0.0029 | 0.0052 | 0.0038 | 0.0038 | 0.0033 | 0.0031 | 0.0032 | 0.0033 | 0.0032 | 0.0037 | 0.0039 |
| Thallium | 0.0040 | 0.0017 | 0.0017 | 0.0017 | 0.0017 | 0.0017 | 0.0017 | 0.0016 | 0.0400 | 0.0018 | 0.0017 | 0.0016 | 0.0016 | 0.0017 | 0.0018 | 0.0400 | 0.0019 | 0.0009 |
| Vanadium | 0.0745 | 0.0187 | 0.0077 | 0.0176 | 0.0310 | 0.0142 | 0.0285 | 0.0229 | 0.1000 | 0.0143 | 0.0152 | 0.0234 | 0.0069 | 0.0185 | 0.0076 | 0.0200 | 0.0040 | 0.0022 |
| Zinc | 0.0501 | 0.0270 | 0.0215 | 0.0071 | 0.0168 | 0.0071 | 0.0171 | 0.0149 | 0.1700 | 0.0202 | 0.0086 | 0.0144 | 0.0088 | 0.0065 | 0.0078 | 0.0128 | 0.0080 | 0.0026 |
| **METALS - EMF-Related (mg/l)** | | | | | | | | | | | | | | | | | | | |
| Arsenic | 0.0149 | 0.0451 | 0.1467 | 0.0862 | 0.0113 | 0.0350 | 0.0820 | 0.0085 | 0.0180 | 0.0241 | 0.0305 | 0.0148 | 0.1878 | 0.0543 | 0.1506 | 0.0030 | 0.0061 | 0.0795 |
| Barium | 0.2297 | 0.1286 | 0.0873 | 0.0583 | 0.0880 | 0.0559 | 0.3494 | 0.1324 | 0.1204 | 0.0620 | 0.0714 | 0.0834 | 0.0117 | 0.2165 | 0.0313 | 0.1280 | 0.2317 | 0.4096 |
| Boron | 0.2935 | 2.0177 | 2.0991 | 0.5847 | 0.7867 | 1.1107 | 1.4865 | 0.3204 | 0.3078 | 0.3919 | 0.2472 | 0.1635 | 14.4936 | 0.9757 | 17.1035 | 0.1670 | 0.1223 | 2.2939 |
| Cobalt | 0.0145 | 0.0214 | 0.0243 | 0.0110 | 0.0422 | 0.0143 | 0.0190 | 0.0083 | 0.0108 | 0.0278 | 0.0235 | 0.0051 | 0.0323 | 0.0063 | 0.0150 | 0.0100 | 0.0033 | 0.0442 |
| Lithium | 0.0610 | 0.0547 | 0.1475 | 0.0683 | 0.1147 | 0.1347 | 0.0728 | 0.0546 | 0.0165 | 0.0239 | 0.0207 | 0.0551 | 0.1699 | 0.0522 | 0.1919 | 0.0440 | 0.0596 | 0.0916 |
| Manganese | 0.0518 | 0.4675 | 1.3213 | 0.1103 | 0.0089 | 0.2618 | 22.7002 | 0.0076 | 0.0201 | 0.0212 | 0.0052 | 0.0028 | 1.8572 | 5.3680 | 1.5421 | 0.0050 | 0.0030 | 10.8648 |
| Selenium | 0.0057 | 0.0043 | 0.0025 | 0.0046 | 0.0166 | 0.0248 | 0.0044 | 0.0046 | 0.0055 | 0.0042 | 0.0040 | 0.0037 | 0.0025 | 0.0021 | 0.0062 | 0.0035 | 0.0018 | 0.0016 |

Notes: (a) Chemical concentrations shown on this table are mean values and 95% upper confidence levels (95% UCL) and were calculated from analytical data for groundwater samples collected prior to 1994.
(b) Mean concentrations are shown for each parameter in each well in order to simplify presentation and analysis of data. Instrument detection limits were used for non-detect results in the calculation of mean concentrations.
(c) The 95% UCLs are based on the total population of analytical results for representative groundwater.
(d) 95% UCLs for pH, temperature, and redox were not calculated. Ranges of these parameters are used for representative groundwater.
(e) Redox was not analyzed in wells PEI-1, PEI-3, PEI-5, 153, and 322.

TABLE 4.4-4 (*continued*)

TABLE 4.4-4

FMC GROUNDWATER CHEMISTRY - COMMON IONS, METALS, PHYSICAL PARAMETERS, NUTRIENTS, AND FLUORIDE

| ANALYTE (a) | CENTRAL FMC AREA | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 95% UCL FOR REPRESENTATIVE GROUNDWATER (c) | MICHAUD WELLS | | | | | 95% UCL FOR REPRESENTATIVE GROUNDWATER (c) | BANNOCK WELLS | | | | |
| | Michaud | Well TW-5S Mean (b) | Well 108 Mean (b) | Well 111 Mean (b) | Well 122 Mean (b) | Well 146 Mean (b) | Bannock | Well 107 Mean (b) | Well 121 Mean (b) | Well 133 Mean (b) | Well 134 Mean (b) | Well 135 Mean (b) |
| **COMMON IONS (mg/l)** | | | | | | | | | | | | |
| Alkalinity, bicarbonate | 198 | 329 | 356 | 353 | 284 | 244 | 171 | 177 | 271 | 210 | 538 | 233 |
| Calcium | 97.71 | 90.20 | 99.06 | 96.0 | 64.62 | 82.35 | 68.75 | 69.84 | 113 | 83.41 | 112 | 145 |
| Chloride | 192.90 | 291 | 173 | 298 | 225 | 110 | 52.42 | 46.08 | 200 | 51.23 | 311 | 247 |
| Magnesium | 33.59 | 46.51 | 36.97 | 61.90 | 37.33 | 29.05 | 19.20 | 21.45 | 41.11 | 27.88 | 74.43 | 54.91 |
| Potassium | 12.72 | 208 | 180 | 139 | 231 | 68.95 | 10.52 | 8.42 | 160 | 13.31 | 197 | 20.26 |
| Sodium | 74.28 | 129 | 125 | 165 | 102 | 74.09 | 27.53 | 30.72 | 93.01 | 40.51 | 228 | 86.94 |
| Sulfate | 72.57 | 137 | 242 | 203 | 118 | 135 | 43.40 | 66.45 | 215 | 129.8 | 245 | 95.05 |
| **PHYSICAL PARAMETERS** | | | | | | | | | | | | |
| Spec. Conductivity (umhos/cm) | 1136 | 2093 | 1888 | 2064 | 1830 | 1141 | 569 | 634 | 1853 | 788 | 2263 | 1507 |
| pH | (d) | 6.95 | 7.05 | 6.84 | 7.02 | 7.05 | (d) | 7.39 | 6.94 | 7.31 | 6.73 | 6.92 |
| Temperature (degrees Celcius) | (d) | 19.6 | 30.4 | 16.0 | 21.8 | 22.8 | (d) | 19.5 | 19.2 | 18.5 | 17.8 | 16.1 |
| Total Dissolved Solids (mg/l) | 867 | 1257 | 1163 | 1350 | 1106 | 707 | 412 | 411 | 1179 | 534 | 1533 | 1036 |
| Redox (mV) | (d) | -79 | -27 | 160 | -19 | 134 | (d) | 59 | 175 | 106 | 90 | 86 |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.50 | 0.44 | 0.37 | 0.35 | 1.23 | 0.35 | 0.50 | 0.37 | 0.37 | 0.35 | 0.35 | 0.35 |
| Nitrate (NO3 as N) | 5.52 | 24.70 | 11.96 | 17.16 | 19.08 | 5.37 | 1.60 | <0.86 | 23.36 | 10.13 | 4.32 | 19.93 |
| Orthophosphate (PO4 as P) | 0.06 | 7.12 | 0.45 | 10.63 | 8.95 | 0.23 | 0.13 | 0.11 | 0.63 | 14.09 | 32.93 | 6.94 |
| Phosphorous | 0.33 | 8.02 | 0.72 | 15.05 | 8.08 | 0.29 | 0.31 | 0.08 | 0.61 | 0.24 | 34.25 | 5.24 |
| Fluoride | 0.80 | 0.13 | 2.88 | 0.14 | 0.27 | 0.76 | 0.60 | 0.60 | 2.41 | 0.52 | 0.17 | 0.22 |
| **METALS - Not EMF-Related (mg/l)** | | | | | | | | | | | | |
| Aluminum | 0.0977 | 0.0230 | 0.0571 | 0.0494 | 0.0372 | 0.0357 | 0.5472 | 0.0397 | 0.0460 | 0.0374 | 0.0307 | 0.0324 |
| Antimony | 0.1000 | 0.0631 | 0.0596 | 0.0631 | 0.0596 | 0.0631 | 0.1340 | 0.0617 | 0.0596 | 0.0631 | 0.0631 | 0.0631 |
| Beryllium | 0.0020 | 0.0011 | 0.0015 | 0.0013 | 0.0012 | 0.0014 | 0.0040 | 0.0017 | 0.0012 | 0.0011 | 0.0011 | 0.0011 |
| Cadmium | 0.0050 | 0.0017 | 0.0026 | 0.0014 | 0.0015 | 0.0014 | 0.0050 | 0.0025 | 0.0013 | 0.0028 | 0.0029 | 0.0016 |
| Chromium | 0.0114 | 0.0025 | 0.0062 | 0.0023 | 0.0023 | 0.0028 | 0.0110 | 0.0041 | 0.0029 | 0.0043 | 0.0041 | 0.0033 |
| Cobalt | 0.0145 | 0.0100 | 0.0074 | 0.0195 | 0.0089 | 0.0081 | 0.0108 | 0.0051 | 0.0057 | 0.0052 | 0.0161 | 0.0052 |
| Copper | 0.0085 | 0.0045 | 0.0052 | 0.0050 | 0.0043 | 0.0040 | 0.0109 | 0.0040 | 0.0050 | 0.0051 | 0.0105 | 0.0053 |
| Iron | 0.7690 | 0.3034 | 0.0878 | 0.0555 | 0.0352 | 0.0390 | 0.8402 | 0.2455 | 0.0484 | 0.0458 | 0.0478 | 0.0395 |
| Lead | 0.0020 | 0.0013 | 0.0022 | 0.0016 | 0.0013 | 0.0013 | 0.0068 | 0.0014 | 0.0012 | 0.0017 | 0.0030 | 0.0013 |
| Mercury | 0.00074 | 0.00073 | 0.00022 | 0.00026 | 0.00018 | 0.00027 | 0.00078 | 0.00017 | 0.00020 | 0.00036 | 0.00031 | 0.00057 |
| Molybdenum | 0.0245 | 0.0453 | 0.0159 | 0.0295 | 0.0478 | 0.0162 | 0.0330 | 0.0141 | 0.0159 | 0.0143 | 0.0158 | 0.0143 |
| Nickel | 0.0200 | 0.0136 | 0.0130 | 0.0165 | 0.0145 | 0.0127 | 0.0200 | 0.0120 | 0.0120 | 0.0149 | 0.0183 | 0.0120 |
| Silver | 0.0050 | 0.0029 | 0.0037 | 0.0026 | 0.0029 | 0.0034 | 0.0052 | 0.0037 | 0.0030 | 0.0039 | 0.0040 | 0.0026 |
| Thallium | 0.0040 | 0.0018 | 0.0016 | 0.0017 | 0.0016 | 0.0018 | 0.0400 | 0.0016 | 0.0022 | 0.0017 | 0.0017 | 0.0024 |
| Vanadium | 0.0745 | 0.0116 | 0.0184 | 0.0110 | 0.0105 | 0.0137 | 0.1000 | 0.0077 | 0.0090 | 0.0071 | 0.0229 | 0.0099 |
| Zinc | 0.0501 | 0.0110 | 0.0226 | 0.0078 | 0.0062 | 0.0074 | 0.1700 | 0.0072 | 0.0110 | 0.0084 | 0.0124 | 0.0076 |
| **METALS - EMF-Related (mg/l)** | | | | | | | | | | | | |
| Arsenic | 0.0149 | 0.0558 | 0.0350 | 0.0501 | 0.0595 | 0.0213 | 0.0180 | 0.0059 | 0.0171 | 0.0100 | 0.1244 | 0.0465 |
| Barium | 0.2297 | 0.1949 | 0.1115 | 0.2188 | 0.1206 | 0.0899 | 0.1204 | 0.1075 | 0.0791 | 0.1539 | 0.1481 | 0.1649 |
| Boron | 0.2935 | 0.5519 | 0.6669 | 0.9510 | 0.4886 | 0.3917 | 0.3078 | 0.0938 | 0.5538 | 0.1067 | 1.3679 | 0.3396 |
| Lithium | 0.0610 | 0.0871 | 0.0737 | 0.0917 | 0.0945 | 0.0688 | 0.0165 | 0.0403 | 0.0552 | 0.0332 | 0.0948 | 0.0375 |
| Manganese | 0.0518 | 0.4245 | 0.5087 | 1.1368 | 0.6300 | 0.4614 | 0.0201 | 0.0207 | 0.0542 | 0.0028 | 3.3961 | 0.0032 |
| Selenium | 0.0057 | 0.0034 | 0.0079 | 0.0028 | 0.0027 | 0.0063 | 0.0055 | 0.0022 | 0.0500 | 0.0017 | 0.0041 | 0.0067 |
| **RADIOLOGICAL PARAMETERS (pCi/l)** | | | | | | | | | | | | |
| Gross Alpha | 5.57 | -1.26 | 6.87 | 6.32 | 4.11 | 4.60 | 4.80 | 2.85 | 2.96 | 4.26 | 3.52 | -1.13 |
| Gross Beta | 17.14 | 138.10 | 144.75 | 79.92 | 132.59 | 53.25 | 14.10 | 14.28 | 92.21 | 14.62 | 137.40 | 6.38 |
| Radium-226 | 1.83 | 0.88 | 1.00 | 1.08 | 0.97 | 1.32 | 1.66 | 1.35 | 1.26 | 1.00 | 1.00 | 1.30 |
| Radium-228 | 2.88 | 0.90 | 2.28 | 1.00 | 1.60 | 2.36 | 2.25 | 1.74 | 1.64 | 1.60 | 1.62 | 3.43 |

Notes: (a) Chemical concentrations shown on this table are mean values and 95% upper confidence levels (95% UCL) and were calculated from analytical data for groundwater samples collected prior to 1994.
(b) Mean concentrations are shown for each parameter in each well in order to simplify presentation and analysis of data. Instrument detection limits were used for non-detect results in the calculation of mean concentrations.
(c) The 95% UCLs are based on the total population of analytical results for representative groundwater.
(d) 95% UCLs for pH, temperature, and redox were not calculated. Ranges of these parameters are used for representative groundwater.
(e) Redox was not analyzed in wells PEI-1, PEI-3, PEI-5, 153, and 322.

**Table 4.4-5**
**Activities of Radiological Parameters in Groundwater at FMC (pCi/l)**

| | | Michaud Flats Region | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sampling | Representative Wells | | | | | | | | | | | |
| Parameter | Event | 101 | 102 | 147 | TW-10S | 112 | 126 | 127 | 128 | 139 | 148 |
| Gross alpha | Jun-92 | 2.6 ±1.9 | ND | ND | 3.4 ±3.0 | ND | ND | ND | ND | ND | ND |
| Gross alpha | Jul-92 | | | | | | | | | | |
| Gross alpha | Sep-92 | 4.40 ±2.45 | 2.28 ±1.87 | 2.66 ±0.40 | 3.45 ±0.36 | 2.2 ±1.6 | 2.4 ±0.35 | ND | ND | 2.65 ±0.56 | 4.23 ±2.79 |
| Gross alpha | Dec-92 | 7.34 ±2.38 | 4.50 ±1.72 | 5.18 ±1.14 | 5.36 ±2.52 | 2.95 ±0.40 | ND | 2.19 ±1.16 | ND | ND | 6.57 ±1.04 |
| Gross alpha | Mar-93 | 2.94 ±1.60 | 3.94 ±1.24 | 4.39 ±1.05 | 5.82 ±2.07 | ND | ND | ND | ND | 2.27 ±2.95 | 3.31 ±1.00 |
| Gross alpha | Jul-93 | 3.54 ±0.78 | 2.54 ±0.57 | 3.97 ±0.95 | 7.97 ±1.37 | ND | ND | ND | ND | ND | 5.58 ±1.06 |
| Gross beta | Jun-92 | 4.1 ±2.9 | 6.5 ±3.0 | 20.6 ±3.50 | 6.1 ±3.40 | ND | 11.8 ±3.30 | 8.3 ±3.00 | 15.9 ±3.4 | 22.1 ±4.0 | 5.8 ±3.4 |
| Gross beta | Jul-92 | | | | | | | | | | |
| Gross beta | Sep-92 | 8.11 ±1.81 | 6.97 ±1.74 | 14.3 ±0.48 | 8.27 ±0.39 | 8.40 ±1.80 | 10.2 ±0.41 | 15 ±0.72 | 14.0 ±0.51 | 36.6 ±1.74 | 10.8 ±1.93 |
| Gross beta | Dec-92 | 9.77 ±1.35 | 9.51 ±1.46 | 10.8 ±0.94 | 10.1 ±1.49 | 6.59 ±0.42 | 9.74 ±1.66 | 7.57 ±1.27 | 9.02 ±0.46 | 41.4 ±1.68 | 9.87 ±0.91 |
| Gross beta | Mar-93 | 45.8 ±2.65 | 7.61 ±0.98 | 9.85 ±1.01 | 7.05 ±0.96 | 5.77 ±1.16 | ND | 10.1 ±1.61 | 12.4 ±1.89 | 37.4 ±5.24 | 9.77 ±1.03 |
| Gross beta | Jul-93 | 7.14 ±0.79 | 5.42 ±0.73 | 8.91 ±0.90 | 9.58 ±0.89 | ND | ND | ND | ND | ND | 10.4 ±0.88 |
| Radium-226 | Sep-92 | ND | ND | ND | 6.35 ±0.57 | 1.57 ±0.44 | 2.28 ±0.53 | ND | 7.09 ±0.82 | ND | 3.19 ±0.50 |
| Radium-226 | Dec-92 | ND | ND | ND | ND | ND | ND | ND | 1.01 ±0.20 | ND | ND |
| Radium-226 | Mar-93 | ND | ND | 1.82 ±0.26 | ND | 2.3 ±0.23 | ND | ND | 1.40 ±0.23 | ND | ND |
| Radium-226 | Jul-93 | 1.57 ±0.34 | 1.84 ±0.23 | ND | ND | ND | ND | ND | ND | ND | 3.81 ±0.51 |
| Radium-228 | Sep-92 | 1.2 ±0.8 | 1.8 ±0.9 | ND | 4.2 ±1.0 | ND | ND | ND | 1.3 ±0.8 | ND | ND |
| Radium-228 | Dec-92 | ND | 6.5 ±1.2 | ND | ND | ND | 1.4 ±0.9 | 7.8 ±1.4 | 1.1 ±0.9 | ND | ND |
| Radium-228 | Mar-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Radium-228 | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

| | | Representative Well | | | Bannock Range Region | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Sampling Event | 106 | 120 | 130 | 107 | 109 | 119 | 124 | 125 | 129 | 149 | 153 | 154 | FMC-6 | TW-3D | TW-5D | TW-5I |
| Gross alpha | Jun-92 | ND | ND | 3.7 ±2.4 | ND | 12.2 ±2.7 | ND | ND | 3.7 ±2.3 | ND | ND | 3.4 ±2.0 | NS | NS | ND | ND | ND |
| Gross alpha | Jul-92 | | | | | | | | | | | | | 2.8 ±1.8 | | | |
| Gross alpha | Sep-92 | 4.59 ±1.95 | ND | ND | 2.92 ±0.74 | 5.12 ±1.21 | ND | ND | ND | 2 ±1.60 | ND | NS | NS | NS | 2.8 ±1.40 | ND | ND |
| Gross alpha | Dec-92 | 3.76 ±0.96 | ND | 3.74 ±1.94 | 3.14 ±0.91 | 3.20 ±0.60 | ND | 3.12 ±1.83 | 3.48 ±1.47 | ND | ND | NS | 2.92 ±1.50 | NS | 5.92 ±1.51 | 2.8 ±0.89 | ND |
| Gross alpha | Mar-93 | ND | 3.5 ±3.89 | 3.14 ±1.08 | 4.69 ±1.20 | 2.59 ±1.05 | ND | ND | ND | ND | 2.46 ±1.54 | NS | 4.20 ±1.60 | NS | 5.94 ±1.56 | 2.8 ±1.05 | ND |
| Gross alpha | Jul-93 | ND | ND | ND | ND | 2.27 ±0.57 | ND | ND | ND | ND | 2.13 ±0.70 | NS | 5.10 ±1.13 | NS | 3.43 ±0.60 | ND | ND |
| Gross beta | Jun-92 | ND | 3.8 ±3.5 | 7.6 ±3.5 | 6.7 ±3.6 | 22.9 ±3.8 | 6.3 ±3.6 | 10.4 ±3.2 | 10.2 ±3.2 | 7.2 ±3.5 | 9.4 ±3.6 | 11.7 ±3.0 | NS | NS | ND | ND | ND |
| Gross beta | Jul-92 | | | | | | | | | | | | | 8.0 ±1.7 | | | |
| Gross beta | Sep-92 | 9.04 ±1.82 | 9.53 ±1.75 | 8.9 ±1.80 | 6.70 ±1.19 | 6.36 ±1.23 | 11.1 ±1.81 | 14 ±0.49 | 5.85 ±1.69 | ND | 7.90 ±0.37 | NS | NS | NS | 9.5 ±1.8 | 10.5 ±1.8 | 7.1 ±1.3 |
| Gross beta | Dec-92 | 8.43 ±0.76 | 5.22 ±0.41 | 7.66 ±1.37 | ND | 5.9 ±0.71 | 9.48 ±0.47 | 11.5 ±1.40 | 6.69 ±1.27 | 24.5 ±1.95 | 9.08 ±1.36 | NS | 9.01 ±1.30 | NS | 8.23 ±1.31 | 7.78 ±1.05 | 5.75 ±0.85 |
| Gross beta | Mar-93 | 7.18 ±1.15 | 30 ±5.12 | 7.3 ±1.72 | 7.83 ±1.77 | 5.37 ±1.03 | 11.6 ±1.86 | 8.26 ±1.17 | 7.10 ±1.20 | 6.24 ±1.76 | 8.26 ±1.01 | NS | 8.24 ±1.00 | NS | 9.06 ±1.27 | 4.63 ±1.82 | ND |
| Gross beta | Jul-93 | ND | ND | ND | ND | 4.33 ±0.65 | ND | ND | ND | ND | 8.40 ±0.81 | NS | 8.10 ±0.88 | NS | 6.67 ±0.70 | ND | ND |
| Radium-226 | Sep-92 | ND | 1.55 ±0.42 | ND | ND | ND | ND | ND | ND | ND | ND | NS | NS | NS | ND | ND | ND |
| Radium-226 | Dec-92 | ND | ND | ND | ND | ND | ND | ND | ND | 1.35 ±0.21 | ND | NS | 1.83 ±0.30 | NS | ND | ND | ND |
| Radium-226 | Mar-93 | ND | ND | ND | 2.24 ±0.27 | ND | ND | ND | ND | ND | ND | NS | ND | NS | ND | 2.21 ±0.27 | ND |
| Radium-226 | Jul-93 | ND | ND | ND | ND | 3.83 ±0.50 | ND | ND | ND | ND | 1.15 ±0.34 | NS | 1.06 ±0.30 | NS | ND | ND | ND |
| Radium-228 | Sep-92 | 1.0 ±0.8 | ND | ND | ND | ND | 10.7 ±1.1 | ND | ND | ND | ND | NS | NS | NS | ND | ND | ND |
| Radium-228 | Dec-92 | ND | 1.3 ±0.7 | ND | ND | 3.0 ±1.0 | ND | ND | ND | ND | ND | NS | 5.6 ±1.3 | NS | 7.2 ±1.3 | ND | ND |
| Radium-228 | Mar-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | NS | ND | NS | ND | ND | ND |
| Radium-228 | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.8 ±1.2 | NS | 1.0 ±0.9 | NS | ND | ND | ND |

Table 4.4-5

**Table 4.4-5 (continued)**
**Activities of Radiological Parameters in Groundwater at FMC (pCi/l) (continued)**

| | | Former Ponds/RS Area (Includes Southwestern Area former Ponds 1E-6E, 5S-7S, and 10S and Central Area former Ponds 1S-3S) | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Michaud Flats Regime | | | | | | Bannock Range Regime | | | | | | | | | | | | | | | | | | Undeterminded |
| Parameter | Sampling Event | 111 | 122 | 135 | 137 | 140 | TW-5S | 103 | 104 | 113 | 114 | 115 | 117 | 118 | 131 | 132 | 133 | 134 | 141 | 150 | 151 | 152 | 116 |
| Gross alpha | Jun-92 | 25.9 ±6.1 | 16.8 ±7.6 | ND | ND | 11.5 ±6.9 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 11.5 ±8.00 | ND | 10.1 ±7.90 | ND | 33.1 ±11.0 | ND | 2.5 ±2.00 | ND |
| Gross alpha | Jul-92 | | | | | | | | | | | | | | | | | | | | | | |
| Gross alpha | Sep-92 | ND | ND | ND | ND | 6.05 ±0.90 | ND | 3.39 ±0.38 | 7.22 ±1.69 | ND | 2.84 ±0.61 | 2.12 ±0.34 | 5.96 ±2.11 | ND | 4.64 ±0.61 | ND | 2.1 ±1.47 | ND | ND | ND | ND | 2.48 ±1.52 | ND |
| Gross alpha | Dec-92 | ND | ND | ND | 2.06 ±1.47 | 6.54 ±1.50 | ND | 3.05 ±0.30 | 2.19 ±1.23 | 4.78 ±0.53 | ND | 2.27 ±0.23 | 8.05 ±0.62 | ND | 6.09 ±0.56 | 4.63 ±1.04 | 8.76 ±1.29 | ND | ND | 11.2 ±6.95 | ND | 41.2 ±11.90 | ND |
| Gross alpha | Mar-93 | ND | ND | ND | ND | 4.52 ±2.23 | ND | 4.65 ±1.28 | 2.87 ±2.22 | ND | ND | 2.19 ±2.15 | 10.1 ±2.10 | ND | 3.38 ±1.66 | ND | 5.14 ±1.43 | ND | ND | ND | ND | ND | ND |
| Gross alpha | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 5 ±1.76 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Gross beta | Jun-92 | 108.1 ±6.5 | 155.1 ±8.2 | ND | 7.8 ±2.90 | 24.9 ±4.2 | 119.4 ±7.9 | 7.1 ±3.5 | 260.9 ±10.0 | 26.9 ±3.9 | ND | ND | 13 ±3.9 | 18.8 ±4.2 | 14.4 ±3.8 | 148.6 ±8.00 | 15.9 ±3.90 | 120 ±7.30 | 19.7 ±3.90 | 407.8 ±12.7 | ND | 355.2 ±11.2 | 92.4 |
| Gross beta | Jul-92 | | | | | | | | | | | | | | | | | | | | | | |
| Gross beta | Sep-92 | 80.8 ±1.41 | 171 ±4.67 | 14 ±1.95 | 7.89 ±0.56 | 38 ±1.22 | 167 ±2.52 | 12.8 ±0.52 | 384 ±5.11 | 29.8 ±0.71 | 7.83 ±0.88 | 10.8 ±1.37 | 18.5 ±2.10 | 27.8 ±1.35 | 15.4 ±0.81 | 240 ±4.23 | 10.1 ±1.79 | 181 ±2.46 | 21 ±1.59 | 1110 ±11.1 | 16.3 ±2.0 | 508 ±6.36 | 145 |
| Gross beta | Dec-92 | 96.0 ±3.73 | 158 ±3.21 | 12 ±0.93 | 4.48 ±1.21 | 26.5 ±1.73 | 163 ±3.57 | 18.7 ±0.60 | 325 ±3.99 | 27.9 ±0.66 | 8.7 ±2.54 | ND | 14.6 ±0.58 | 22.1 ±0.99 | ND | 196 ±3.26 | 21.3 ±1.03 | 144 ±4.33 | 19.8 ±0.98 | 334 ±11.3 | 18.4 ±1.7 | 80.6 ±8.17 | 125 |
| Gross beta | Mar-93 | 115 ±5.35 | 162 ±4.76 | 12.3 ±1.94 | 5.66 ±1.70 | 21.4 ±3.38 | 174 ±6.26 | 11.0 ±1.72 | 300 ±11.0 | 23.7 ±1.51 | 7.63 ±1.69 | 11.0 ±3.42 | 15.6 ±1.84 | 21.4 ±3.06 | 8.35 ±2.78 | 176 ±9.17 | 16.2 ±1.98 | 139 ±5.61 | 15.7 ±1.64 | 1100 ±27.3 | 19.2 ±2.0 | 991 ±27.3 | 300 |
| Gross beta | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | 14.9 ±1.65 | 6.57 ±1.24 | 6.67 ±1.34 | ND | ND | ND | ND | ND | ND | ND | 938 ±19.9 | ND | 783 ±18.0 | ND |
| Radium-226 | Sep-92 | 2.50 ±0.50 | 2.76 ±0.57 | ND | ND | ND | ND | ND | ND | 2.39 ±0.37 | ND | ND | ND | 3.27 ±0.42 | ND | ND | ND | ND | ND | 1.94 ±0.35 | 1.09 ±0.35 | ND | ND |
| Radium-226 | Dec-92 | ND | ND | ND | 1.53 ±0.20 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Radium-226 | Mar-93 | ND | ND | 3.77 ±0.36 | ND | ND | ND | ND | 1.15 ±0.18 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Radium-226 | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | 2.2 ±0.42 | ND | 1.96 ±0.43 | ND | ND | ND | ND | ND | ND | ND | 1.32 ±0.36 | ND | ND | ND |
| Radium-228 | Sep-92 | ND | 6.2 ±1.3 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 2.7 ±0.90 | ND | ND | ND | 1.6 ±0.90 | 1.1 ±0.70 | ND | ND | ND | 1.7 ±0.8 | ND |
| Radium-228 | Dec-92 | ND | ND | 5.1 ±1.3 | ND | ND | 1.1 ±0.9 | 3.1 ±0.8 | 4.3 ±1.0 | 1.3 ±0.8 | ND | 2.0 ±0.8 | ND | ND | 1.6 ±0.8 | ND | ND | ND | ND | ND | ND | ND | ND |
| Radium-228 | Mar-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 3.0 ±1.0 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Radium-228 | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | 1.6 ±0.8 | 1.5 ±1.0 | 6.0 ±1.2 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

| | | Slag Pit Area (includes railroad swale) | | |
|---|---|---|---|---|
| | | Michaud Flats Regime | Bannock Range Regime | |
| Parameter | Sampling Event | 121 | 108 | 146 |
| Gross alpha | Jun-92 | ND | 11.2 ±8.3 | 17.6 ±3.8 |
| Gross alpha | Jul-92 | | | |
| Gross alpha | Sep-92 | ND | 2.12 ±0.82 | ND |
| Gross alpha | Dec-92 | ND | 3.94 ±2.93 | ND |
| Gross alpha | Mar-93 | 7.88 ±2.25 | 4.15 ±1.60 | ND |
| Gross alpha | Jul-93 | ND | ND | ND |
| Gross beta | Jun-92 | 89.2 ±6.6 | 105.5 ±7.0 | 66.4 ±5.4 |
| Gross beta | Jul-92 | | | |
| Gross beta | Sep-92 | 119 ±1.73 | 186 ±2.22 | 55.1 ±2.53 |
| Gross beta | Dec-92 | 99.8 ±2.57 | 156 ±4.92 | 41.7 ±1.67 |
| Gross beta | Mar-93 | 3.27 ±1.60 | 145 ±5.21 | 52.6 ±2.58 |
| Gross beta | Jul-93 | ND | ND | ND |
| Radium-226 | Sep-92 | ND | ND | ND |
| Radium-226 | Dec-92 | ND | ND | ND |
| Radium-226 | Mar-93 | ND | ND | 1.79 ±0.28 |
| Radium-226 | Jul-93 | ND | ND | ND |
| Radium-228 | Sep-92 | 2.8 ±1.3 | ND | 7.2 ±1.3 |
| Radium-228 | Dec-92 | ND | ND | ND |
| Radium-228 | Mar-93 | ND | ND | ND |
| Radium-228 | Jul-93 | ND | ND | ND |

NS = Not sampled

**Table 4.4-6**
**Organic Compounds Detected in Groundwater at FMC (mg/l)**

| Parameter | Sampling Event | Representative Concentrations/ Unimpacted Areas | | | | | Former Ponds/8S Area (Includes Southwestern Area former Ponds 1E-6E, 5S-7S, and Central Area former Ponds 1S-3S) | | | | | | | | | Slag Pit Area (Includes Railroad Swale) | | | Practical Quantitation Limits (mg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Representative Wells | | | | | | | | | | | | | | | | | |
| | | 101 | 102 | 106 | TW-10S | 112 | 104 | 111 | 134 | 135 | 139 | 140 | 141 | 150 | TW-5S | 108 | 121 | 146 | |
| ***VOLATILE ORGANIC COMPOUNDS*** | | | | | | | | | | | | | | | | | | | |
| 2-Butanone | Jun-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.007 | ND | ND | ND | ND | ND | ND | ND | 0.1 |
| 2-Butanone | Mar-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.01 | ND | ND | |
| Chlorobenzene | Jun-92 | 0.001 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.005 |
| Chloroform | Jun-92 | ND | ND | ND | ND | ND | ND | 0.001 | ND | ND | ND | ND | ND | ND | ND | ND | 0.001 | ND | 0.005 |
| Ethyl benzene | Jun-92 | ND | ND | ND | ND | ND | ND | ND | ND | 0.001 | ND | ND | ND | ND | ND | ND | ND | 0.002 | 0.005 |
| Tetrachloroethene | Jun-92 | ND | ND | ND | ND | ND | ND | 0.035 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.005 |
| Toluene | Jun-92 | ND | ND | ND | ND | ND | 0.001 | ND | ND | ND | ND | 0.002 | ND | ND | ND | ND | 0.002 | ND | 0.005 |
| Toluene | Sep-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.004 | 0.001 | ND | |
| Trichloroethene | Jun-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.003 | 0.015 | 0.003 | 0.005 |
| Trichloroethene | Sep-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.002 | 0.01 | 0.002 | |
| Trichloroethene | Dec-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.008 | ND | |
| Xylenes, total | Jun-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.005 |
| Xylenes, total | Sep-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.002 | ND | |
| Xylenes, total | Dec-92 | ND | ND | ND | 0.001 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | |
| ***SEMIVOLATILE ORGANIC COMPOUNDS*** | | | | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | Jun-92 | ND | ND | ND | ND | 0.003 | 0.003 | ND | ND | ND | ND | ND | ND | ND | ND | 0.005 | 0.002 | ND | 0.01 |
| Bis(2-ethylhexyl)phthalate | Sep-92 | 0.004 | 0.002 | 0.005 | 0.004 | 0.003 | ND | 0.006 | 0.006 | 0.006 | 0.003 | 0.005 | 0.004 | ND | 0.012 | 0.015 | 0.008 | 0.003 | |
| Bis(2-ethylhexyl)phthalate | Dec-92 | ND | ND | ND | ND | ND | ND | ND | 0.039 | ND | ND | ND | ND | ND | ND | 0.019 | 0.017 | ND | |
| Di-n-butyl phthalate | Dec-92 | ND | ND | ND | ND | 0.001 | ND | ND | ND | ND | ND | 0.001 | ND | 0.002 | ND | ND | ND | ND | 0.01 |
| Dimethyl phthalate | Dec-92 | ND | ND | ND | ND | ND | 0.024 | ND | 0.053 | 0.067 | ND | ND | ND | 0.054 | 0.005 | ND | 0.088 | ND | 0.01 |

ND = Below detection limit/not detected.

TABLE 4.4-7
SIMPLOT GROUNDWATER CHEMISTRY - COMMON IONS, METALS, PHYSICAL PARAMETERS, NUTRIENTS, AND FLUORIDE

| ANALYTE (a) | EASTERN SIMPLOT AREA | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BANNOCK WELLS | | | | | | | | | | | | | | | | PORTNEUF WELLS | | | | |
| | 95% UCL FOR REPRESENTATIVE GROUNDWATER (c) | Well PEI-3 Mean (b) | Well PEI-5 Mean (b) | Well 300 Mean (b) | Well 306 Mean (b) | Well 313 Mean (b) | Well 315 Mean (b) | Well 316 Mean (b) | Well 317 Mean (b) | Well 318 Mean (b) | Well 319 Mean (b) | Well 320 Mean (b) | Well 325 Mean (b) | Well 326 Mean (b) | Well 327 Mean (b) | Well 332 Mean (b) | 95% UCL FOR REPRESENTATIVE GROUNDWATER (c) | Well PEI-4 Mean (b) | Well 321 Mean (b) | Well 322 Mean (b) | Well 328 Mean (b) |
| **COMMON IONS (mg/l)** | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, bicarbonate | 171 | 607 | 182 | 411 | 1285 | 854 | 1199 | 1286 | 1204 | 151 | 164 | 511 | 732 | 1307 | 352 | 1090 | 307 | 297 | 266 | 279 | 293 |
| Calcium | 68.75 | 357 | 160 | 410 | 564 | 548 | 483 | 473 | 365 | 657 | 48 | 342 | 421 | 440 | 133 | 501 | 91.93 | 77 | 80 | 49 | 87 |
| Chloride | 52.42 | 103 | 75.6 | 94.8 | 118 | 171 | 126 | 125 | 113 | 141 | 26.8 | 97.3 | 118 | 122 | 68.3 | 119 | 67.87 | 61.1 | 57.9 | 52.6 | 62.2 |
| Magnesium | 19.20 | 126 | 64.2 | 87.7 | 174 | 170 | 206 | 268 | 217 | 216 | 15.4 | 119 | 124 | 297 | 49.5 | 209 | 35.92 | 33.2 | 29.8 | 28.6 | 32.0 |
| Potassium | 10.52 | 10.83 | 3.67 | 15.32 | 29.94 | 38.95 | 28.26 | 32.60 | 19.44 | 242 | 4.99 | 29.36 | 33.38 | 23.49 | 11.92 | 35.9 | 7.34 | 6.39 | 6.29 | 6.10 | 6.31 |
| Sodium | 27.53 | 565 | 102 | 693 | 299 | 296 | 326 | 519 | 517 | 310 | 38.5 | 263 | 235 | 574 | 85.9 | 451 | 53.21 | 40.3 | 36.6 | 20.9 | 40.9 |
| Sulfate | 43.40 | 2108 | 679 | 2500 | 1898 | 1710 | 1598 | 2070 | 1820 | 2506 | 55 | 1069 | 1191 | 2305 | 280 | 2130 | 70.68 | 54 | 48 | 46 | 47 |
| **PHYSICAL PARAMETERS (d)** | | | | | | | | | | | | | | | | | | | | | |
| Spec Conductivity (umhos/cm) | 569 | 4080 | 1553 | 4910 | 3976 | 4576 | 4239 | 4852 | 4663 | 7620 | 520 | 3492 | 3422 | 5412 | 1379 | 4836 | 871 | 782 | 797 | 798 | 873 |
| pH | 7.37 to 8.37 | 6.85 | 6.12 | 5.76 | 6.37 | 6.25 | 6.36 | 6.24 | 6.06 | 2.60 | 7.50 | 6.16 | 6.39 | 6.25 | 6.53 | 6.18 | 7.27 to 7.52 | 7.48 | 7.31 | 8.33 | 7.14 |
| Temperature (degrees Celcius) | 14.5 to 16.6 | 16.5 | 16.1 | 16.6 | 18.1 | 16.5 | 18.2 | 16.7 | 16.5 | 18.8 | 14.5 | 19.8 | 17.5 | 16.4 | 14.0 | 15.9 | 12.7 to 13.3 | 13.1 | 13.1 | 15.1 | 13.1 |
| Total Dissolved Solids (mg/l) | 412 | 4072 | 1532 | 4598 | 3834 | 4082 | 3872 | 4678 | 4168 | 10892 | 360 | 2570 | 2890 | 4554 | 913 | 4500 | 580 | 483 | 416 | 390 | 483 |
| Redox (mV) | 44 to 122 | (e) | (e) | 117 | 103 | 126 | 125 | 110 | 104 | 162 | 125 | 147 | 128 | 129 | 99 | 128 | 127 to 171 | 141 | 141 | (e) | 131 |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | | | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.50 | 0.36 | 0.15 | 0.38 | 0.38 | 6.00 | 0.38 | 0.35 | 0.38 | 19.36 | 0.35 | 37.4 | 2.90 | 0.43 | 0.21 | 0.50 | 0.50 | 0.12 | 0.19 | 0.10 | 0.40 |
| Nitrate (NO3 as N) | 1.60 | 3.44 | 2.24 | 2.15 | 2.01 | 62.0 | 7.63 | 12.63 | 0.99 | 1.06 | 0.97 | 74.3 | 34.4 | 15.6 | 2.43 | 5.19 | 4.00 | 1.92 | 2.85 | 36.0 | 2.09 |
| Orthophosphate (PO4 as P) | 0.13 | 59.9 | 43.7 | 183 | 27.5 | 22.6 | 33.4 | 58.9 | 102 | 2304 | 0.08 | 40.0 | 8.24 | 116.7 | 6.36 | 35.3 | 0.27 | 0.45 | 0.02 | 0.01 | 0.04 |
| Phosphorous | 0.31 | 107 | 147 | 179 | 25.5 | 21.8 | 33.5 | 55.6 | 96.9 | 1916 | 0.07 | 38.8 | 7.80 | 95.4 | 6.45 | 40.1 | 0.15 | 0.07 | 0.03 | 0.02 | 0.05 |
| Fluoride | 0.60 | 0.17 | 4.15 | 0.14 | 0.16 | 0.38 | 0.18 | 0.13 | 0.16 | 1061 | 1.26 | 5.18 | 0.15 | 0.15 | 1.13 | 0.30 | 0.41 | 0.26 | 0.14 | 0.20 | 0.23 |
| **METALS - Not EMF-Related (mg/l)** | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | 0.5472 | 0.1397 | 2.7138 | 0.0472 | 0.0752 | 0.0401 | 0.1156 | 0.5329 | 0.0347 | 360.1069 | 0.0327 | 0.1083 | 0.0885 | 0.0266 | 0.0133 | 0.0226 | 0.9475 | 0.2829 | 0.0406 | 0.1200 | 0.0280 |
| Antimony | 0.1340 | 0.0900 | 0.0800 | 0.0657 | 0.0557 | 0.0557 | 0.0557 | 0.0731 | 0.0577 | 0.0731 | 0.0747 | 0.0803 | 0.0545 | 0.0546 | 0.0348 | 0.0482 | 0.1000 | 0.0560 | 0.0475 | 0.0500 | 0.0557 |
| Barium | 0.1204 | 0.0357 | 0.1360 | 0.0155 | 0.1138 | 0.0850 | 0.0758 | 0.1049 | 0.1012 | 0.2346 | 0.0665 | 0.0421 | 0.0653 | 0.0380 | 0.1007 | 0.0383 | 0.1735 | 0.1329 | 0.1541 | 0.1900 | 0.1271 |
| Beryllium | 0.0040 | 0.0020 | 0.0107 | 0.0013 | 0.0009 | 0.0010 | 0.0009 | 0.0011 | 0.0009 | 0.0462 | 0.0014 | 0.0012 | 0.0009 | 0.0010 | 0.0004 | 0.0007 | 0.0026 | 0.0008 | 0.0007 | 0.0005 | 0.0010 |
| Cadmium | 0.0050 | 0.0006 | 0.0057 | 0.0016 | 0.0015 | 0.0015 | 0.0015 | 0.0019 | 0.0014 | 2.6175 | 0.0014 | 0.0151 | 0.0018 | 0.0018 | 0.0026 | 0.0048 | 0.0050 | 0.0007 | 0.0007 | 0.0001 | 0.0023 |
| Chromium | 0.0110 | 0.0027 | 0.0074 | 0.0032 | 0.0032 | 0.0041 | 0.0065 | 0.0093 | 0.0031 | 3.8110 | 0.0046 | 0.0043 | 0.0039 | 0.0037 | 0.0018 | 0.0013 | 0.0100 | 0.0018 | 0.0021 | 0.0006 | 0.0042 |
| Cobalt | 0.0108 | 0.0095 | 0.0095 | 0.0053 | 0.0071 | 0.0073 | 0.0071 | 0.0084 | 0.0043 | 0.0719 | 0.0052 | 0.0053 | 0.0031 | 0.0031 | 0.0016 | 0.0030 | 0.0163 | 0.0028 | 0.0027 | 0.0070 | 0.0033 |
| Iron | 0.8402 | 0.1602 | 0.1363 | 0.0380 | 0.0406 | 0.0413 | 0.0745 | 0.1038 | 0.0364 | 98.8849 | 0.0367 | 0.0946 | 0.1347 | 0.0365 | 0.0198 | 0.0620 | 1.0740 | 0.2730 | 0.0215 | 0.0385 | 0.0303 |
| Lead | 0.0068 | 0.0027 | 0.0020 | 0.0011 | 0.0011 | 0.0011 | 0.0011 | 0.0017 | 0.0011 | 0.0087 | 0.0016 | 0.0016 | 0.0011 | 0.0011 | 0.0006 | 0.0008 | 0.0024 | 0.0037 | 0.0006 | 0.0014 | 0.0013 |
| Mercury | 0.00078 | 0.00030 | 0.00060 | 0.00021 | 0.00033 | 0.00023 | 0.00021 | 0.00040 | 0.00031 | 0.00039 | 0.00022 | 0.00020 | 0.00020 | 0.00017 | 0.00009 | 0.00011 | 0.00054 | 0.00073 | 0.00010 | 0.00012 | 0.00019 |
| Molybdenum | 0.0330 | 0.0300 | 0.0300 | 0.0205 | 0.0337 | 0.0131 | 0.0277 | 0.0148 | 0.0239 | 0.1067 | 0.0181 | 0.0198 | 0.0122 | 0.0122 | 0.0061 | 0.0113 | 0.0300 | 0.0073 | 0.0066 | 0.0085 | 0.0130 |
| Silver | 0.0052 | 0.0073 | 0.0033 | 0.0031 | 0.0033 | 0.0032 | 0.0037 | 0.0062 | 0.0031 | 0.0032 | 0.0029 | 0.0044 | 0.0042 | 0.0036 | 0.0017 | 0.0039 | 0.0040 | 0.0016 | 0.0016 | 0.0010 | 0.0033 |
| Thallium | 0.0400 | 0.0203 | 0.0203 | 0.0024 | 0.0018 | 0.0020 | 0.0018 | 0.0018 | 0.0019 | 0.0327 | 0.0082 | 0.0082 | 0.0022 | 0.0023 | 0.0011 | 0.0010 | 0.0045 | 0.0048 | 0.0009 | 0.0003 | 0.0027 |
| Vanadium | 0.1000 | 0.3765 | 0.2028 | 0.0253 | 0.0206 | 0.0087 | 0.0138 | 0.0375 | 0.0541 | 14.9893 | 0.0174 | 0.0426 | 0.0080 | 0.0114 | 0.0034 | 0.0108 | 0.1987 | 0.0917 | 0.0139 | 0.0700 | 0.0023 |
| Zinc | 0.1700 | 0.7830 | 0.2470 | 0.0067 | 0.0055 | 0.0111 | 0.0234 | 0.0196 | 0.0040 | 19.3397 | 0.0102 | 0.0586 | 0.0083 | 0.0051 | 0.0177 | 0.0076 | 0.1615 | 0.0218 | 0.0032 | 0.0225 | 0.0064 |
| **METALS - EMF-Related (mg/l)** | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | 0.0180 | 0.2837 | 0.0434 | 0.6090 | 0.2747 | 0.2476 | 0.2305 | 0.3427 | 0.3799 | 0.3459 | 0.0129 | 0.0885 | 0.1096 | 0.4620 | 0.0292 | 0.2429 | 0.0104 | 0.0029 | 0.0027 | 0.0043 | 0.0036 |
| Boron | 0.3078 | 0.7404 | 0.2292 | 0.5548 | 0.4635 | 0.4837 | 0.5025 | 0.6216 | 0.5961 | 2.8229 | 0.1726 | 0.4012 | 0.3724 | 0.6273 | 0.1488 | 0.5541 | 0.2500 | 0.1902 | 0.0873 | 0.0700 | 0.1289 |
| Copper | 0.0109 | 0.0180 | 0.0157 | 0.0126 | 0.0070 | 0.0058 | 0.0067 | 0.0131 | 0.0082 | 0.8031 | 0.0033 | 0.0051 | 0.0054 | 0.0045 | 0.0023 | 0.0037 | 0.0130 | 0.0042 | 0.0024 | 0.0015 | 0.0037 |
| Lithium | 0.0165 | 0.1323 | 0.1573 | 0.0378 | 0.1079 | 0.1937 | 0.1769 | 0.3590 | 0.2522 | 0.4868 | 0.0424 | 0.1524 | 0.1379 | 0.3518 | 0.0427 | 0.2464 | 0.0400 | 0.0262 | 0.0194 | 0.0145 | 0.0331 |
| Manganese | 0.0201 | 0.0380 | 0.6800 | 0.0033 | 0.0021 | 0.0592 | 0.0031 | 0.0194 | 0.0021 | 7.0779 | 0.0025 | 0.5555 | 0.0604 | 0.0068 | 0.0014 | 0.0391 | 0.1097 | 0.0165 | 0.0010 | 0.0020 | 0.0014 |
| Nickel | 0.0200 | 0.0120 | 0.2315 | 0.0138 | 0.0124 | 0.0124 | 0.0124 | 0.0161 | 0.0130 | 2.3781 | 0.0120 | 0.1212 | 0.0137 | 0.0142 | 0.0088 | 0.0318 | 0.0247 | 0.0076 | 0.0088 | 0.0035 | 0.0137 |
| Selenium | 0.0055 | 0.0113 | 0.0054 | 0.0099 | 0.0081 | 0.0235 | 0.0090 | 0.0308 | 0.0054 | 0.0254 | 0.0034 | 0.0154 | 0.0049 | 0.0208 | 0.0039 | 0.0202 | 0.0060 | 0.0013 | 0.0023 | 0.0018 | 0.0030 |

Notes: (a) Chemical concentrations shown on this table are mean values and 95% upper confidence levels (95% UCL) and were calculated from analytical data for groundwater samples collected prior to 1994.
(b) Mean concentrations are shown for each parameter in each well in order to simplify presentation and analysis of data. Instrument detection limits were used for non-detect results in the calculation of mean concentrations.
(c) The 95% UCLs are based on the total population of analytical results for representative groundwater.
(d) 95% UCLs for pH, temperature, and redox were not calculated. Ranges of these parameters are used for representative groundwater.
(e) Redox was not analyzed in wells PEI-1, PEI-3, PEI-5, 153, and 322.

## Table 4.4-8
## Activities of Radiological Parameters in Groundwater - Eastern Simplot Area (pCi/l)

| Parameter | Sampling Event | Wells in Vicinity of Gypsum Stacks | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 300 | 306 | 313 | 315 | 316 | 325 | 326 | 332 | PEI-3 | PEI-5 |
| *Gross alpha* | Jun-92 | ND | ND | 8.3 ±6.60 | ND | ND | | | | ND | ND |
| | Sep-92 | ND | 27.3 ±3.39 | 11.7 ±2.50 | 20.8 ±1.89 | 17.6 ±3.08 | | | | ND | 7.97 ±0.03 |
| | Dec-92 | ND | 46.5 ±8.65 | 20.9 ±4.76 | 30.4 ±8.18 | ND | 8.69 ±4.97 | ND | | | |
| | Mar-93 | ND | 43.3 ±9.50 | 25.6 ±7.37 | 25.1 ±8.51 | 9.23 ±6.63 | 16.3 ±5.63 | 8.18 ±6.43 | | | |
| | Jul-93 | ND | 52.7 ±8.80 | 7.35 ±3.73 | 12.8 ±5.60 | ND | 5.08 ±2.91 | 5.33 ±3.44 | ND | | |
| *Gross beta* | Jun-92 | 28.4 ±4.4 | 27.5 ±4.2 | 32.5 ±4.40 | 25.1 ±10.2 | 28.7 ±19.40 | | | | 14.70 ±3.20 | ND |
| | Sep-92 | 11.1 ±2.57 | 38 ±1.88 | 31 ±1.90 | 25.7 ±2.07 | 50.7 ±2.04 | | | | ND | 11.7 ±1.8 |
| | Dec-92 | 9.91 ±5.90 | 33.4 ±4.75 | 36.2 ±6.83 | 31.7 ±5.14 | 18.9 ±5.74 | 26 ±5.89 | 26.8 ±6.04 | | | |
| | Mar-93 | 42 ±9.92 | 38.1 ±7.80 | 27.4 ±10.90 | 49.5 ±11.00 | 30.3 ±9.47 | 36.2 ±8.75 | 33.2 ±8.74 | | | |
| | Jul-93 | ND | 45.7 ±8.40 | 35.6 ±4.57 | 49.7 ±8.40 | 12.2 ±7.20 | 20.1 ±4.59 | 14 ±7.14 | 27.10 ±4.34 | | |
| *Radium-226* | Sep-92 | ND | ND | ND | ND | ND | | | | | |
| | Dec-92 | ND | ND | ND | ND | ND | 1.53 ±0.20 | ND | | ND | ND |
| | Mar-93 | ND | ND | ND | ND | ND | ND | ND | | | |
| | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | | |
| *Radium-228* | Sep-92 | ND | ND | ND | ND | ND | | | | | |
| | Dec-92 | ND | ND | 1.7 ±1.00 | ND | ND | 1.3 ±0.9 | ND | | ND | ND |
| | Mar-93 | 1.1 ±1.00 | 3.1 ±1.20 | ND | 1.6 ±0.80 | 6 ±1.30 | ND | ND | | | |
| | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | | |

Notes: ND = Not Detected
Means were not calculated if only ND was reported or if only positive value has been reported.
Blanks = no analyses performed
* Wells in representative network

Well locations are shown in Figure 4.4-2.

| Parameter | Sampling Event | Wells near Portneuf River | | | | | |
|---|---|---|---|---|---|---|---|
| | | 305* | 321 | 322 | 328 | PEI-4* | PEI-6* |
| *Gross alpha* | Jun-92 | ND | ND | ND | | ND | 4.6 ±2.30 |
| | Sep-92 | 3.08 ±0.45 | ND | 2.27 ±0.37 | | ND | 3.39 ±0.35 |
| | Dec-92 | 2.98 ±1.02 | 2.09 ±0.97 | | ND | 2.34 ±1.56 | 2.31 ±0.59 |
| | Mar-93 | 3.93 ±1.37 | 2.97 ±1.33 | | 3.27 ±1.11 | 2.49 ±1.08 | 3.56 ±1.48 |
| | Jul-93 | 2.3 ±0.70 | ND | | ND | | ND |
| *Gross beta* | Jun-92 | ND | ND | 7.2 ±3.10 | | 12 ±3.00 | 9.1 ±2.9 |
| | Sep-92 | 6.89 ±0.52 | 5.42 ±0.35 | 6.35 ±0.49 | | 6.54 ±0.39 | 4.44 ±0.46 |
| | Dec-92 | 5.57 ±0.95 | 5.62 ±0.91 | | 4.62 ±1.0 | 10.1 ±1.1 | 4.04 ±0.56 |
| | Mar-93 | 6.67 ±1.23 | ND | | 6.79 ±1.37 | 21 ±1.95 | ND |
| | Jul-93 | 9.3 ±1.10 | 4.39 ±0.86 | | 4.09 ±0.81 | | 4.1 ±0.80 |
| *Radium-226* | Sep-92 | ND | ND | | | ND | ND |
| | Dec-92 | ND | ND | ND | ND | ND | ND |
| | Mar-93 | 3.41 ±0 | ND | | ND | ND | ND |
| | Jul-93 | ND | ND | | ND | | ND |
| *Radium-228* | Sep-92 | ND | 2.7 ±1.10 | | | 1.3 ±1 | ND |
| | Dec-92 | ND | ND | ND | ND | ND | ND |
| | Mar-93 | 2 ±1.00 | ND | | ND | 1.7 ±0.70 | 5.4 ±1.0 |
| | Jul-93 | ND | ND | | ND | | 5.3 ±0.80 |

| Wells Downgradient from Former East Overflow Pond | | | | |
|---|---|---|---|---|
| 318 | 317 | 320 | 319 | 327 |
| ND | ND | ND | ND | |
| 984.4 ±23.7 | ND | 8.36 ±1.28 | 2.18 ±0.46 | |
| 1340 ±65.7 | | 3.94 ±3.22 | 3.29 ±1.23 | 2.65 ±1.80 |
| 1690 ±106 | 5.17 ±8.56 | ND | 2.45 ±1.00 | ND |
| 648 ±44.8 | ND | ND | ND | ND |
| 33.8 ±4.30 | 11.1 ±3.30 | 7.1 ±3.7 | ND | |
| 1163.2 ±19 | 17.59 ±2.04 | 28.5 ±1.5 | 5.15 ±0.46 | |
| 994 ±38.9 | | 26.4 ±3.53 | 5.76 ±1 | 11.3 ±1.27 |
| 605 ±35 | 19.7 ±6.08 | 33.2 ±7.15 | ND | 11.1 ±1.59 |
| 397 ±29.8 | 11.6 ±5.3 | 38.2 ±7.7 | 5.4 ±0.80 | 6.43 ±1.04 |
| ND | ND | ND | ND | |
| ND | | ND | ND | ND |
| ND | ND | ND | ND | ND |
| ND | ND | ND | ND | ND |
| 7 ±1 | ND | ND | ND | |
| 7.8 ±1.1 | | ND | ND | ND |
| ND | ND | ND | ND | ND |
| ND | ND | ND | 4.7 ±0.80 | ND |

**Table 4.4-9**
**Organic Compounds Detected in Groundwater at Simplot (mg/l)**

| Parameter | Sampling Event | Representative Wells/Unimpacted Areas 301 | PEI-1 | PEI-6 | PEI-4 | Wells 310 | 312 | 300 | 304 | 307 | 316 | PEI-5 | 320 | 318 | Practical Quantitation Limits (mg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***VOLATILE ORGANIC COMPOUNDS*** | | | | | | | | | | | | | | | |
| 2-Butanone | Jun-92 | | 0.003 | | | | | | | | | | | | 0.1 |
| 2-Butanone | Dec-92 | | | | | | | | | | | | | 0.01 | |
| Acetone | Jun-92 | 0.361 | 0.524 | | 0.217 | | 0.394 | | | | 0.22 | 1.85 | | | 0.005 |
| Acetone | Sep-92 | 0.12 | | | 0.073 | 0.026 | | 0.12 | 0.43 | 0.017 | 0.21 | | | 0.032 | |
| Acetone | Dec-92 | | | | | | | | | | | | | 0.061 | 0.005 |
| Ethyl benzene | Jun-92 | 0.001 | | | | | | | | | | | | | 0.005 |
| Methylene chloride | Jun-92 | | | | | | | | | | | 0.001 | | 0.004 | 0.005 |
| Tetrachloroethene | Jun-92 | | | | | | | | | | 0.001 | | | | 0.005 |
| 1,1,1-Trichloroethane | Sep-92 | | | | 0.009 | | | | | | | | | | |
| 1,1,1-Trichloroethane | Dec-92 | | | | | | 0.008 | | | | | | | | 0.005 |
| Trichloroethene | Jun-92 | | | 0.005 | | | | | | 0.028 | | | | | |
| Xylenes, total | Jun-92 | 0.008 | 0.006 | | | | | | | | | | | | 0.005 |
| ***SEMIVOLATILE ORGANIC COMPOUNDS*** | | | | | | | | | | | | | | | |
| Benzoic acid | Sep-92 | | | | | | | | | | | | | 0.003 | 0.01 |
| Benzoic acid | Dec-92 | | | | | | | | | | | | | 0.001 | |
| Bis(2-ethylhexyl)phthalate | Jun-92 | | | 0.001 | | | 0.005 | | | | 0.003 | | | | |
| Bis(2-ethylhexyl)phthalate | Sep-92 | 0.026 | | 0.013 | | | | 0.016 | | | | | | | 0.01 |
| Bis(2-ethylhexyl)phthalate | Dec-92 | 0.054 | | 0.025 | | | | 0.026 | 0.023 | | 0.017 | | 0.006 | | |
| Di-n-butyl phthalate | Jun-92 | | | | | | | | | | 0.001 | | | | 0.01 |
| Di-n-butyl phthalate | Dec-92 | 0.001 | | | | | | | | | | | | | |
| Di-n-octyl phthalate | Sep-92 | | | | | | 0.001 | | | | | | | | |
| Diethyl phthalate | Sep-92 | | | | | | | | | | 0.001 | | | | |
| Dimethyl phthalate | Jun-92 | | | | | | | | | | 0.001 | | | | |
| ***PCBS AND FURANS*** | | | | | | | | | | | | | | | |
| Tetrahydrofuran | Dec-92 | | | | | | 0.292 | | | | | | | | |

**TABLE 4.4-10**
**WELL 318 AND FORMER EAST OVERFLOW POND GROUNDWATER CHEMISTRY – COMPARISON BETWEEN PRE- AND POST-CLOSURE CONDITIONS**

| ANALYTE | 95% UPPER CONFIDENCE LEVEL FOR REPRESENTATIVE GROUNDWATER IN EACH HYDROGEOCHEMICAL REGIME | | WELL 318 PRE-CLOSURE MEAN | WELL 318 POST-CLOSURE (Sampled 6-94) |
|---|---|---|---|---|
| | BANNOCK | PORTNEUF | | |
| **MAJOR IONS (mg/l)** | | | | |
| Calcium | 68.75 | 91.93 | 657 | 508 |
| Magnesium | 19.20 | 35.92 | 216 | 186 |
| Potassium | 10.52 | 7.34 | 242 | 35.80 |
| Sodium | 27.53 | 53.21 | *310* | *424* |
| Sulfate | 43.40 | 70.68 | 2506 | 1960 |
| **PHYSICAL PARAMETERS** | | | | |
| pH | 7.37 to 8.37 | 7.27 to 7.52 | 2.60 | 6.00 |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | |
| Ammonia ($NH_3$ as N) | 0.50 | 0.50 | 19.36 | |
| Nitrate ($NO_3$ as N) | 1.60 | 4.00 | *1.06* | *9.76* |
| Orthophosphate ($PO_4$ as P) | 0.13 | 0.27 | 2304 | 16.70 |
| Fluoride | 0.60 | 0.41 | 1061 | 29.8 |
| **METALS - Not EMF-Related (mg/l)** | | | | |
| Aluminum | 0.5472 | 0.9475 | 360 | 0.0243 |
| Antimony | 0.1340 | 0.1000 | 0.0731 | 0.0483 |
| Arsenic | 0.0180 | 0.0104 | 0.3459 | 0.0121 |
| Barium | 0.1204 | 0.1735 | 0.2346 | 0.0091 |
| Beryllium | 0.0040 | 0.0026 | 0.0462 | 0.0002 |
| Boron | 0.3078 | 0.2500 | 2.8229 | 0.5231 |
| Cadmium | 0.0050 | 0.0050 | 2.6175 | 0.0215 |
| Chromium | 0.0110 | 0.0100 | 3.8110 | 0.0015 |
| Cobalt | 0.0108 | 0.0163 | 0.0719 | 0.0140 |
| Copper | 0.0109 | 0.0130 | 0.8031 | 0.0031 |
| Iron | 0.8402 | 1.0740 | 98 | 0.2428 |
| Lead | 0.0068 | 0.0024 | 0.0087 | 0.0005 |
| Lithium | 0.0165 | 0.0400 | 0.4868 | 0.2384 |
| Manganese | 0.0201 | 0.1097 | 7.07 | 0.7439 |
| Mercury | 0.00078 | 0.00054 | 0.00039 | 0.0010 |
| Molybdenum | 0.0330 | 0.0300 | 0.1067 | 0.0101 |
| Nickel | 0.0200 | 0.00247 | 2.4 | 0.0862 |
| Selenium | 0.0055 | 0.0060 | 0.0254 | 0.0145 |
| Silver | 0.0052 | 0.0040 | 0.0032 | 0.0041 |
| Thallium | 0.0400 | 0.0045 | 0.0327 | 0.0006 |
| Vanadium | 0.1000 | 0.1987 | 14 | 0.2048 |
| Zinc | 0.1700 | 0.1615 | 19 | 0.0643 |

Notes: Shaded values show a significant reduction in concentration after closure of the Former East Overflow Pond.
Those values in italics show relative increase since closure of the Former East Overflow Pond. Increased nitrate likely due to increased pH of groundwater in Well 318 and oxidation of ammonia.

Table 4.4-11

**Table 4.4-11**
**Joint Fenceline Groundwater Chemistry - Common Ions, Physical Parameters, Nutrients, and Fluoride**

JOINT FENCELINE AREA

| ANALYTE (a) | 95% UCL for Representative Groundwater (c) Basmeck Range | Well 109 Mean (b) | Well 110 Mean (b) | Well 123 Mean (b) | Well 136 Mean (b) | Well 142 Mean (b) | Well 143 Mean (b) | Well 144 Mean (b) | Well 145 Mean (b) | Well 161 Mean (f) |
|---|---|---|---|---|---|---|---|---|---|---|
| **COMMON IONS (mg/l)** | | | | | | | | | | |
| Alkalinity, bicarbonate | 171 | 167 | 552 | 737 | 1197 | 936 | 796 | 397 | 1125 | 646 |
| Calcium | 68.75 | 55.9 | 243 | 391 | 303 | 442 | 402 | 212 | 365 | 431 |
| Chloride | 52.42 | 35.1 | 138 | 339 | 152 | 116 | 283 | 149 | 147 | 195 |
| Magnesium | 19.20 | 16.58 | 85.2 | 170 | 280 | 127 | 174 | 70.1 | 209 | 113 |
| Potassium | 10.52 | 6.13 | 18.14 | 32.40 | 122.0 | 18.24 | 35.84 | 15.13 | 81.15 | 19.40 |
| Sodium | 27.53 | 36.5 | 161 | 226 | 668 | 127 | 390 | 85.4 | 582 | 31 |
| Sulfate | 43.40 | 58.5 | 586 | 956 | 1682 | 1038 | 1079 | 396 | 1771 | 812 |
| **PHYSICAL PARAMETERS (d)** | | | | | | | | | | |
| Spec Conductivity (umhos/cm) | 569 | 509 | 2270 | 3389 | 4956 | 3124 | 3601 | 1756 | 4967 | 2798 |
| pH | 7.37 to 8.37 | 7.47 | 6.40 | 6.16 | 6.10 | 6.48 | 6.19 | 6.94 | 6.15 | 6.80 |
| Temperature (degrees Celcius) | 14.5 to 16.6 | 15.1 | 16.2 | 17.3 | 14.9 | 15.6 | 16.1 | 15.3 | 14.6 | 17.0 |
| Total Dissolved Solids (mg/l) | 412 | 351 | 1651 | 2778 | 4098 | 2738 | 2941 | 1258 | 4005 | 2310 |
| Redox (mV) | 44 to 122 | 116 | 147 | 23 | 88 | 112 | 62 | 229 | 171 | - |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.50 | 0.35 | 0.35 | 4.30 | 9.77 | 0.35 | 6.42 | 0.35 | 11.83 | 0.50 |
| *Nitrate (NO3 as N)* | *1.60* | *0.92* | 2.67 | *9.13* | *4.35* | *1.96* | 7.33 | 3.76 | *3.18* | *3.75* |
| Orthophosphate (PO4 as P) | 0.13 | 0.03 | 4.48 | 4.36 | 116 | 0.03 | 13.33 | 0.38 | 87.6 | 0.02 |
| Phosphorus | 0.31 | 0.08 | 8.18 | 4.46 | 96.8 | 0.03 | 14.60 | 1.10 | 85.6 | 0.02 |
| Fluoride | 0.60 | 0.83 | 0.27 | 0.76 | 1.66 | 0.15 | 0.38 | 0.46 | 0.83 | 0.27 |
| **METALS - Not EMF-Related Concentrations (mg/l)** | | | | | | | | | | |
| Aluminum | 0.5472 | 0.0447 | 0.0377 | 0.0446 | 0.0354 | 0.0347 | 0.0474 | 0.2872 | 0.1813 | 0.0243 |
| *Antimony* | *0.1340* | *0.0631* | *0.0631* | *0.0596* | *0.0631* | *0.0631* | *0.0631* | *0.0754* | *0.0690* | *0.0483* |
| Beryllium | 0.0040 | 0.0014 | 0.0014 | 0.0016 | 0.0011 | 0.0022 | 0.0011 | 0.0014 | 0.0014 | 0.0002 |
| Cadmium | 0.0050 | 0.0026 | 0.0026 | 0.0026 | 0.0027 | 0.0014 | 0.0055 | 0.0015 | 0.0015 | 0.0001 |
| Chromium | 0.0110 | 0.0046 | 0.0046 | 0.0044 | 0.0046 | 0.0034 | 0.0025 | 0.0064 | 0.0032 | 0.0010 |
| Cobalt | 0.0108 | 0.0067 | 0.0068 | 0.0087 | 0.0061 | 0.0054 | 0.0066 | 0.0144 | 0.0052 | 0.0027 |
| Copper | 0.0109 | 0.0035 | 0.0061 | 0.0078 | 0.0135 | 0.0089 | 0.0092 | 0.0048 | 0.0104 | 0.0031 |
| Iron | 0.8402 | 0.0292 | 0.1451 | 0.0443 | 0.0256 | 0.0386 | 0.0362 | 0.4633 | 0.1635 | 0.0487 |
| Lead | 0.0068 | 0.0011 | 0.0027 | 0.0036 | 0.0033 | 0.0019 | 0.0013 | 0.0024 | 0.0023 | 0.001 |
| Mercury | 0.00078 | 0.00028 | 0.00022 | 0.00016 | 0.00020 | 0.00019 | 0.00020 | 0.00221 | 0.00048 | 0.0001 |
| Molybdenum | 0.0330 | 0.0143 | 0.0143 | 0.0235 | 0.0146 | 0.0143 | 0.0167 | 0.0153 | 0.0202 | 0.0101 |
| Silver | 0.0052 | 0.0038 | 0.0039 | 0.0037 | 0.0038 | 0.0031 | 0.0033 | 0.0036 | 0.0032 | 0.0041 |
| Thallium | 0.0400 | 0.0017 | 0.0017 | 0.0016 | 0.0017 | 0.0017 | 0.0017 | 0.0017 | 0.0017 | 0.0006 |
| Zinc | 0.1700 | 0.0107 | 0.0095 | 0.0091 | 0.0266 | 0.0153 | 0.0078 | 0.0241 | 0.0094 | 0.0109 |
| **METALS - EMF-Related Concentrations (mg/l)** | | | | | | | | | | |
| Arsenic | 0.0180 | 0.0034 | 0.1197 | 0.5506 | 0.4622 | 0.0043 | 0.3514 | 0.0064 | 0.3631 | 0.0029 |
| *Barium* | *0.1204* | 0.0684 | 0.0850 | 0.0634 | 0.0855 | 0.2457 | 0.0980 | 0.1010 | 0.0967 | 0.088 |
| Boron | 0.3078 | 0.1868 | 0.7379 | 0.9638 | 0.7022 | 0.3299 | 1.0300 | 0.4261 | 0.7892 | 0.0482 |
| Lithium | 0.0165 | 0.0462 | 0.1360 | 0.2569 | 0.5077 | 0.0341 | 0.2834 | 0.0917 | 0.5118 | 0.017 |
| Manganese | 0.0201 | 0.0030 | 0.1360 | 0.5108 | 2.2659 | 0.0240 | 0.6135 | 0.1355 | 1.0662 | 0.0425 |
| Nickel | 0.0200 | 0.0120 | 0.0120 | 0.0137 | 0.0341 | 0.0124 | 0.0580 | 0.0120 | 0.0235 | 0.0105 |
| Selenium | 0.0055 | 0.0018 | 0.0686 | 0.2896 | 0.0863 | 0.0071 | 0.1925 | 0.0134 | 0.1167 | 0.0083 |
| Vanadium | 0.1000 | 0.0066 | 0.0196 | 0.2101 | 0.0240 | 0.0193 | 0.1093 | 0.0090 | 0.0145 | 0.0023 |

| ANALYTE (a) | Well 164 Mean (f) | Well 304 Mean (b) | Well 307 Mean (b) | Well 308 Mean (b) | Well 309 Mean (b) | Well 310 Mean (b) | Well 312 Mean (b) | Well 323 Mean (b) | Well 324 Mean (b) | Well 329 Mean (b) | Well 330 Mean (b) | Well 331 Mean (b) | Well 333 Mean (b) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COMMON IONS (mg/l)** | | | | | | | | | | | | | |
| Alkalinity, bicarbonate | 1130 | 664 | 1187 | 1177 | 811 | 722 | 830 | 562 | 216 | 166 | 164 | 664 | 1090 |
| Calcium | 502 | 426 | 205 | 243 | 369 | 311 | 363 | 425 | 73.0 | 52.2 | 48.1 | 283 | 319 |
| Chloride | 171 | 191 | 129 | 134 | 117 | 117 | 160 | 97.8 | 44.1 | 29.0 | 25.0 | 129 | 146 |
| Magnesium | 152 | 119 | 404 | 300 | 92.2 | 97.3 | 142 | 127 | 21.18 | 15.81 | 14.97 | 106 | 279 |
| Potassium | 19.40 | 16.86 | 31.90 | 35.18 | 55.33 | 25.23 | 23.87 | 26.73 | 6.73 | 6.36 | 5.00 | 18.26 | 31.47 |
| Sodium | 381 | 32.47 | 606 | 623 | 277 | 335 | 300 | 455 | 46.1 | 36.36 | 33.24 | 278 | 505 |
| Sulfate | 1683 | 737 | 1932 | 1958 | 1011 | 1266 | 1262 | 1778 | 422 | 56.50 | 46.50 | 1060 | 2200 |
| **PHYSICAL PARAMETERS (d)** | | | | | | | | | | | | | |
| Spec Conductivity (umhos/cm) | 4738 | 2798 | 5090 | 4823 | 3257 | 3007 | 3633 | 3750 | 751 | 558 | 522 | 3147 | 4823 |
| pH | 6.17 | 6.77 | 6.14 | 6.13 | 6.35 | 6.41 | 6.26 | 5.88 | 7.18 | 7.49 | 7.49 | 6.34 | 6.10 |
| Temperature (degrees Celcius) | 16.3 | 16.6 | 16.3 | 15.7 | 19.3 | 19.7 | 15.8 | 16.8 | 17.1 | 15.9 | 14.5 | 17.1 | 15.7 |
| Total Dissolved Solids (mg/l) | 4320 | 2292 | 4488 | 4428 | 2758 | 2600 | 3016 | 3643 | 474 | 351 | 340 | 2470 | 4330 |
| Redox (mV) | - | 126 | 121 | 103 | 143 | 155 | 154 | 125 | 136 | 134 | 138 | 158 | 141 |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.50 | 0.38 | 1.60 | 28.88 | 0.38 | 0.25 | 0.46 | 0.43 | 0.43 | 0.50 | 0.50 | 1.75 | 1.04 |
| *Nitrate (NO3 as N)* | *4.40* | *5.48* | 2.90 | *25.41* | 2.53 | *2.37* | *4.62* | 2.30 | *0.95* | 3.44 | *0.85* | 30.90 | 3.30 |
| Orthophosphate (PO4 as P) | 40.4 | 11.02 | 163 | 153 | 7.75 | 26.03 | 29.34 | 155 | 0.22 | 0.03 | 0.02 | 22.15 | 93.10 |
| Phosphorus | 40.6 | 11.51 | 158 | 144 | 8.27 | 31.45 | 29.14 | 127 | 0.23 | 0.03 | 0.02 | 27.20 | 89.05 |
| Fluoride | 0.23 | 0.17 | 0.50 | 1.34 | 0.53 | 0.21 | 0.22 | 0.15 | 0.73 | 0.85 | 0.55 | 0.20 | 0.20 |
| **METALS - Not EMF-Related Concentrations (mg/l)** | | | | | | | | | | | | | |
| Aluminum | 0.0243 | 0.0244 | 0.0352 | 0.0431 | 0.1027 | 0.0403 | 0.0389 | 0.4452 | 0.0266 | 0.0300 | 0.0226 | 0.0226 | 0.0226 |
| *Antimony* | *0.0483* | *0.0557* | *0.0637* | *0.0557* | *0.0557* | *0.1002* | *0.0557* | *0.0546* | *0.0546* | *0.0482* | *0.0482* | *0.0482* | *0.0482* |
| Beryllium | 0.0002 | 0.0009 | 0.0009 | 0.0009 | 0.0009 | 0.0012 | 0.0010 | 0.0008 | 0.0008 | 0.0007 | 0.0007 | 0.0007 | 0.0007 |
| Cadmium | 0.0001 | 0.0014 | 0.0018 | 0.0020 | 0.0014 | 0.0018 | 0.0016 | 0.0018 | 0.0018 | 0.0006 | 0.0007 | 0.0006 | 0.0006 |
| Chromium | 0.0005 | 0.0029 | 0.0031 | 0.0047 | 0.0033 | 0.0071 | 0.0029 | 0.0035 | 0.0040 | 0.0031 | 0.0022 | 0.0013 | 0.0011 |
| Cobalt | 0.0027 | 0.0043 | 0.0043 | 0.0043 | 0.0043 | 0.0063 | 0.0045 | 0.0031 | 0.0035 | 0.0027 | 0.0027 | 0.0027 | 0.0027 |
| Copper | 0.0031 | 0.0069 | 0.0089 | 0.0076 | 0.0079 | 0.0074 | 0.0109 | 0.0059 | 0.0040 | 0.0037 | 0.0037 | 0.0037 | 0.0037 |
| Iron | 0.0487 | 0.0321 | 0.0325 | 0.0348 | 0.0541 | 0.0353 | 0.5710 | 0.2700 | 0.0365 | 0.0726 | 0.0620 | 0.0620 | 0.0620 |
| Lead | 0.0005 | 0.0011 | 0.0011 | 0.0018 | 0.0015 | 0.0015 | 0.0011 | 0.0012 | 0.0011 | 0.0008 | 0.0011 | 0.0011 | 0.0008 |
| Mercury | 0.0001 | 0.00016 | 0.00023 | 0.00019 | 0.00017 | 0.00030 | 0.00018 | 0.00020 | 0.00018 | 0.00042 | 0.00011 | 0.00011 | 0.00015 |
| Molybdenum | 0.0101 | 0.0131 | 0.0137 | 0.0177 | 0.0274 | 0.0278 | 0.0233 | 0.0122 | 0.0122 | 0.0192 | 0.0113 | 0.0125 | 0.0113 |
| Silver | 0.0041 | 0.0031 | 0.0031 | 0.0031 | 0.0031 | 0.0039 | 0.0032 | 0.0037 | 0.0035 | 0.0039 | 0.0039 | 0.0039 | 0.0039 |
| Thallium | 0.0006 | 0.0018 | 0.0019 | 0.0019 | 0.0018 | 0.0019 | 0.0018 | 0.0022 | 0.0022 | 0.0009 | 0.0007 | 0.0008 | 0.0012 |
| Zinc | 0.0064 | 0.0054 | 0.0047 | 0.0043 | 0.0124 | 0.0131 | 0.0078 | 0.0091 | 0.0072 | 0.0080 | 0.0042 | 0.0047 | 0.0050 |
| **METALS - EMF-Related Concentrations (mg/l)** | | | | | | | | | | | | | |
| Arsenic | 0.1810 | 0.0037 | 0.5970 | 0.5521 | 0.0897 | 0.1437 | 0.2377 | 0.6581 | 0.0108 | 0.0067 | 0.0055 | 0.2325 | 0.3409 |
| *Barium* | 0.0764 | 0.0870 | 0.0662 | 0.0480 | 0.0624 | 0.0759 | 0.1046 | 0.0502 | 0.0793 | 0.0687 | 0.0544 | 0.0715 | 0.0937 |
| Boron | 0.5141 | 0.0913 | 0.7469 | 0.7373 | 0.4709 | 0.5135 | 0.7986 | 0.5901 | 0.1392 | 0.1085 | 0.0957 | 0.5225 | 0.6874 |
| Lithium | 0.1062 | 0.0195 | 0.6073 | 0.5761 | 0.1943 | 0.1691 | 0.2567 | 0.1858 | 0.0507 | 0.0538 | 0.0471 | 0.2247 | 0.4097 |
| Manganese | 0.0214 | 0.0034 | 0.0997 | 0.4328 | 0.0028 | 0.0110 | 0.6429 | 0.0309 | 0.0080 | 0.0044 | 0.0009 | 0.1014 | 0.0182 |
| Nickel | 0.0105 | 0.0124 | 0.0144 | 0.0167 | 0.0124 | 0.0148 | 0.0309 | 0.0137 | 0.0137 | 0.0127 | 0.0124 | 0.0124 | 0.0124 |
| Selenium | 0.0139 | 0.0104 | 0.0115 | 0.0216 | 0.0072 | 0.0124 | 0.1543 | 0.0054 | 0.0036 | 0.0017 | 0.0014 | 0.0681 | 0.0123 |
| Vanadium | 0.0085 | 0.0199 | 0.0540 | 0.0475 | 0.0055 | 0.0489 | 0.1016 | 0.0042 | 0.0033 | 0.0036 | 0.0022 | 0.0128 | 0.0183 |

Notes:
(a) Chemical concentrations shown on this table are mean values and 95% upper confidence levels (95% UCL) and were calculated from analytical data for groundwater samples collected prior to 1994.
(b) Mean concentrations are shown for each parameter in each well in order to simplify presentation and analysis of data. Instrument detection limits were used for non-detect results in the calculation of mean concentrations.
(c) The 95% UCLs are based on the total population of analytical results for representative groundwater.
(d) 95% UCLs for pH, temperature, and redox were not calculated. Ranges of these parameters are used for representative groundwater.
(e) Redox was not analyzed in wells PEI-1, PEI-3, PEI-5, 153, and 322
(f) Wells 161 and 164 were installed in June 1994. Means were calculated from data collected in June and September 1994.

## Table 4.4-12
## Activities of Radiological Parameters in Groundwater - Joint Fenceline Area (pCi/l)

| Parameter | Sampling Event | 109 | 123 | 110 | 136 | 143 | 144 | 145 | 142 | 301** | PEI-1** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Deep Well | | | | | Deep Well | | Upgradient of FMC Potential Sources | | |
| *Gross alpha* | Jun-92 | 12.2 ±2.7 | ND | 34 ±7.7 | ND | ND | ND | 6.00 ±5.90 | 5.5 ±5.1 | ND | 2.4 ±1.30 |
| | Sep-92 | 5.12 ±1.21 | ND | 2.65 ±0.70 | 4.11 ±1.37 | 2.44 ±0.54 | 7.34 ±0.77 | 2.73 ±1.40 | 36.3 ±1.93 | 4.57 ±0.89 | 2.78 ±0.41 |
| | Dec-92 | 3.20 ±0.60 | 3.89 ±3.35 | 7.22 ±3.19 | 4.4 ±0.96 | 7.59 ±2.75 | 26.80 ±3.03 | ND | 49 ±6.11 | 2.66 ±0.55 | ND |
| | Mar-93 | 2.59 ±1.05 | ND | 3.63 ±3.27 | ND | 7.21 ±4.59 | 27.20 ±4.31 | 8.71 ±5.75 | 31.4 ±6.66 | 4.94 ±1.06 | ND |
| | Jul-93 | 2.27 ±0.57 | ND | ND | ND | ND | ND | ND | ND | 2.5 ±0.80 | |
| *Gross beta* | Jun-92 | 22.9 ±3.8 | 21.7 ±4.30 | 31.9 ±4.1 | 49.1 ±5.2 | 24.2 ±4.3 | 9.30 ±3.7 | 43.80 ±5.1 | 15.1 ±3.2 | ND | 11 ±3.70 |
| | Sep-92 | 6.36 ±1.23 | 29.8 ±2.13 | 21.8 ±1.10 | 85.7 ±2.76 | 17.9 ±1.72 | 22.40 ±0.92 | 77.40 ±3.20 | 23.7 ±1.28 | 6.29 ±0.82 | 7.95 ±0.49 |
| | Dec-92 | 5.9 ±0.71 | 34.4 ±6.33 | ND | 9.9 ±0.74 | ND | 22.20 ±1.74 | 65.70 ±6.97 | 29.9 ±3.37 | 5.87 ±0.7 | ND |
| | Mar-93 | 5.37 ±1.03 | 21.3 ±5.69 | 16.3 ±3.13 | 79.7 ±8.31 | 29.4 ±5.67 | 77.40 ±4.49 | 70.50 ±8.04 | 18.8 ±4.71 | ND | ND |
| | Jul-93 | 4.73 ±0.65 | ND | ND | ND | ND | ND | ND | ND | 10.8 ±1.10 | |
| *Radium-226* | Sep-92 | ND | ND | ND | ND | 2.49 ±0.61 | 1.19 ±0.35 | ±1.23 ±0.31 | 2.75 ±0.57 | 1.65 ±0.53 | ND |
| | Dec-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Mar-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Jul-93 | 3.83 ±0.50 | ND | ND | ND | ND | ND | ND | ND | ND | |
| *Radium-228* | Sep-92 | ND | ND | 6 ±1.3 | ND | ND | 12.90 ±1.30 | ND | 1.1 ±0.7 | 2.7 ±1.00 | ND |
| | Dec-92 | 3.0 ±1.0 | ND | ND | 2.8 ±1.1 | ND | ND | ND | ND | 1 ±0.60 | ND |
| | Mar-93 | ND | ND | ND | ND | ND | ND | ND | ND | 1 ±0.70 | ND |
| | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | 1 ±0.60 | |

| Parameter | Sampline Event | 304 | 307 | 308 | 309 | 310 | 312 | 323 | 324 | 329 | 330 | 331 | 333 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Deep Well | | | | Deep Well | Deep Well | | |
| *Gross alpha* | Jun-92 | ND | ND | ND | 8.8 ±5.70 | 8.35 ±4.7 | ND | | | | | | |
| | Sep-92 | 170 ±3.52 | 11 ±0.03 | ND | 17.49 ±2.30 | 13.5 ±1.54 | 8.63 ±1.95 | | | | | | |
| | Dec-92 | 250 ±12 | ND | ND | 23.7 ±5.14 | 6.55 ±5.00 | ND | ND | 2.26 ±1.66 | | | | |
| | Mar-93 | 182 ±14 | 3.67 ±10.9 | 11 ±7.32 | 21.9 ±7.08 | ND | ND | ND | ND | | | | |
| | Jul-93 | 166 ±12.9 | ND | ND | 23.9 ±4.15 | ND | 5.98 ±2.34 | ND | ND | 2.01 ±1.05 | ND | 4.34 ±2.32 | ND |
| *Gross beta* | Jun-92 | ND | ND | ND | ND | 16.95 ±3.50 | 15.8 ±3.30 | | ND | | | | |
| | Sep-92 | 92.4 ±1.69 | 16.4 ±2.98 | 35.76 ±2.60 | 43.86 ±1.97 | 10.7 ±1.79 | 30.4 ±1.67 | | ND | | | | |
| | Dec-92 | 57.6 ±3.35 | 58.7 ±5.47 | 24.7 ±4.67 | 30.8 ±3.92 | 19.6 ±5.8 | 28.5 ±6.1 | 21.9 ±5.10 | 8.12 ±1.42 | | | | |
| | Mar-93 | 59.1 ±7.01 | 17.4 ±9.31 | 54.7 ±12 | 44.5 ±6.61 | 19.2 ±6.45 | 16.8 ±8.67 | 17.9 ±8.94 | 5.75 ±1.47 | | | | |
| | Jul-93 | 78.3 ±8.6 | 30 ±6.0 | 41.1 ±7.90 | 33.3 ±4.73 | 9.27 ±2.45 | 18.4 ±4.53 | 26.2 ±7.50 | 4.73 ±0.92 | 4.55 ±1.17 | 3.36 ±0.81 | 9.59 ±4.04 | 19.5 ±4.51 |
| *Radium-226* | Sep-92 | ND | ND | ND | ND | ND | ND | | | | | | |
| | Dec-92 | ND | ND | ND | ND | ND | ND | 3.63 ±0.32 | ND | | | | |
| | Mar-93 | ND | ND | ND | ND | ND | ND | ND | ND | | | | |
| | Jul-93 | 1.67 ±0.21 | 1.15 ±0.16 | ND | ND | ND | ND | ND | ND | 1.26 ±0.2 | ND | ND | ND |
| *Radium-228* | Sep-92 | ND | ND | ND | ND | ND | 3 ±1.10 | | | | | | |
| | Dec-92 | 13.8 ±1.80 | ND | ND | 1 ±1.00 | ND | ND | 1.1 ±0.90 | ND | | | | |
| | Mar-93 | 1.9 ±0.70 | 4.1 ±1.0 | ND | ND | 6.1 ±0.90 | ND | 7.4 ±1.20 | ND | | | | |
| | Jul-93 | ND | ND | 1.3 ±0.60 | ND | ND | ND | ND | ND | 1.00 ±0.7 | ND | ND | ND |

Notes:
** These wells are part of representative groundwater network.
Means were calculated only where two or more values were reported.
Blanks = Not analyzed
ND = Not Detected

**Table 4.4-13**

**Northern FMC/Simplot Properties Area Groundwater Chemistry - Common Ions, Physical Parameters, Nutrients and Fluoride**

| ANALYTE (a) | 95% UCL for Representative Groundwater (c) | Michaud Wells: Lindley Well Mean (b) | Old Pilot Well Mean (b) | Well TW-95 Mean (b) | Well 581 Mean (b) | Well 522 Mean (f) | 95% UCL for Representative Groundwater (c) | Banock Wells: New Pilot Well Mean (b) | Well TW-125 Mean (b) | Well 589 Mean (b) | Well 517 Mean (b) | Well 518 Mean (b) | Well 521 Mean (f) | Well 523 Mean (f) | 95% UCL for Representative Groundwater (c) | Portneuf Wells: Prentice Well Mean (b) | Well 584 Mean (b) | Well 585 Mean (b) | Well 586 Mean (b) | Well 587 Mean (b) | Well 588 Mean (b) | Well 589 Mean (b) | Well 520 Mean (b) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **COMMON IONS (mg/l)** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkalinity, bicarbonate | 198 | 274 | 338 | 332 | 170 | | 171 | 160 | 246 | 151 | 341 | 349 | | | 307 | 275 | 162 | 289 | 253 | 291 | 168 | 274 | 282 |
| Calcium | 97.71 | 96.95 | 102.28 | 100.14 | 72.51 | | 68.75 | 49.97 | 116.52 | 44.85 | 116.03 | 120.14 | | | 91.93 | 92.80 | 46.68 | 83.01 | 77.12 | 83.64 | 47.25 | 75.18 | 99.09 |
| Chloride | 192.90 | 262.75 | 260.83 | 249.83 | 107.48 | | 52.42 | 29.05 | 62.17 | 30.72 | 176.50 | 63.50 | | | 67.87 | 42.12 | 29.98 | 57.30 | 58.08 | 54.46 | 31.16 | 49.24 | 68.00 |
| Magnesium | 33.59 | 38.38 | 55.81 | 50.41 | 24.78 | | 19.20 | 15.60 | 44.61 | 15.19 | 44.92 | 42.75 | | | 35.92 | 31.40 | 14.29 | 31.12 | 30.28 | 31.09 | 15.11 | 28.82 | 35.56 |
| Potassium | 12.72 | 12.45 | 106.05 | 127.04 | 6.79 | 9.69 | 10.52 | 5.24 | 20.34 | 4.10 | 76.52 | 9.30 | 5.65 | 7.70 | 7.34 | 7.48 | 5.10 | 6.83 | 6.59 | 6.52 | 4.92 | 6.38 | 7.39 |
| Sodium | 74.28 | 143.35 | 151.90 | 139.49 | 42.44 | | 27.53 | 30.86 | 98.18 | 27.82 | 103.89 | 72.34 | | | 53.21 | 60.95 | 32.87 | 44.89 | 42.65 | 39.94 | 31.46 | 39.31 | 45.07 |
| Sulfate | 72.57 | 177.50 | 205.50 | 177.50 | 71.74 | 63.00 | 43.40 | 50.35 | 316.17 | 49.02 | 229.50 | 203.50 | 44 | 36.00 | 70.68 | 175.80 | 48.94 | 65.60 | 53.02 | 61.44 | 47.74 | 51.86 | 74.00 |
| **PHYSICAL PARAMETERS (d)** | | | | | | | | | | | | | | | | | | | | | | | |
| Spec Conductivity (umhos/cm) | 1136 | 1600 | 1859 | 1909 | 815 | 904 | 569 | 483 | 1327 | 492 | 1748 | 1255 | 640 | 797 | 871 | 981 | 523 | 879 | 822 | 859 | 534 | 809 | 980 |
| pH | 7.29 to 7.70 | 7.17 | 6.84 | 6.89 | 7.71 | 7.3 | 7.37 to 8.37 | 7.49 | 6.37 | 8.00 | 6.89 | 6.67 | 7.6 | 7.34 | 7.27 to 7.52 | 6.88 | 7.58 | 7.15 | 7.22 | 7.10 | 7.87 | 7.53 | 6.94 |
| Temperature (degrees Celcius) | 11.8 to 16.7 | 10.9 | 14.7 | 17.4 | 12.2 | 14.2 | 14.5 to 16.6 | 13.5 | 15.2 | 13.4 | 18.3 | 13.5 | 13.55 | 13.4 | 12.7 to 13.3 | 13.6 | 14.5 | 13.1 | 13.4 | 12.8 | 14.1 | 13.3 | 12.9 |
| Total Dissolved Solids (mg/l) | 861 | 1043 | 1237 | 1173 | 493 | | 412 | 312 | 907 | 296 | 1140 | 818 | | | 580 | 664 | 318 | 514 | 490 | 495 | 315 | 466 | 550 |
| Redox (mV) | 0 to 169 | 83 | 69 | -117 | 109 | | 44 to 122 | 15 | 0 | 116 | 143 | 150 | | | 127 to 171 | 94 | 146 | 150 | 160 | 151 | 154 | 155 | 152 |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | | | | | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.50 | 0.28 | 0.35 | 0.35 | 0.38 | | 0.50 | 0.35 | 18.33 | 0.38 | 0.50 | 0.50 | | | 0.50 | 0.38 | 0.38 | 0.38 | 0.19 | 0.19 | 0.38 | 0.19 | 0.25 |
| Nitrate (NO3 as N) | 5.52 | 6.34 | 12.63 | 12.64 | 1.74 | 3.87 | 1.60 | 1.06 | 13.36 | 1.04 | 9.63 | 2.83 | 0.845 | 3.01 | 4.00 | 1.81 | 1.29 | 2.77 | 3.76 | 1.89 | 1.30 | 3.16 | 2.09 |
| Orthophosphate (PO4 as P) | 0.06 | 0.03 | 7.11 | 2.83 | 0.03 | 0.03 | 0.13 | 0.02 | 27.47 | 0.04 | 0.86 | 3.16 | 0.02 | 0.02 | 0.27 | 2.26 | 0.02 | 0.08 | 0.03 | 0.03 | 0.02 | 0.03 | 0.02 |
| Phosphorous | 0.33 | 0.04 | 7.61 | 3.08 | 0.03 | | 0.31 | 8.88 | 29.63 | 0.02 | 1.07 | 3.44 | | | 0.15 | 2.43 | 0.02 | 0.08 | 0.03 | 0.04 | 0.02 | 0.03 | 0.01 |
| Fluoride | 0.80 | 0.52 | 0.13 | 0.19 | 0.50 | 0.65 | 0.60 | 0.86 | 1.13 | 0.76 | 0.20 | 0.45 | 0.81 | 0.58 | 0.41 | 0.51 | 0.82 | 0.26 | 0.20 | 0.22 | 0.82 | 0.26 | 0.20 |
| **METALS - Non EMF-Related Concentrations (mg/l)** | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | 0.0977 | 0.0428 | 0.0464 | 0.0344 | 0.0272 | | 0.5472 | 0.0394 | 0.0347 | 0.0258 | 0.0226 | 0.0226 | | | 0.9475 | 0.0244 | 0.0244 | 0.0372 | 0.0122 | 0.0339 | 0.0372 | 0.0122 | 0.0254 |
| Antimony | 0.1000 | 0.0980 | 0.0631 | 0.0631 | 0.0557 | | 0.1340 | 0.0631 | 0.0631 | 0.0557 | 0.0482 | 0.0482 | | | 0.1000 | 0.0637 | 0.0585 | 0.0557 | 0.0278 | 0.0278 | 0.0557 | 0.0338 | 0.0225 |
| Beryllium | 0.0020 | 0.0013 | 0.0014 | 0.0011 | 0.0010 | | 0.0040 | 0.0013 | 0.0013 | 0.0009 | 0.0012 | 0.0011 | | | 0.0026 | 0.0019 | 0.0009 | 0.0009 | 0.0005 | 0.0005 | 0.0009 | 0.0004 | 0.0005 |
| Cadmium | 0.0050 | 0.0020 | 0.0014 | 0.0014 | 0.0014 | | 0.0050 | 0.0027 | 0.0045 | 0.0017 | 0.0006 | 0.0012 | | | 0.0050 | 0.0014 | 0.0014 | 0.0014 | 0.0008 | 0.0007 | 0.0014 | 0.0008 | 0.0005 |
| Chromium | 0.0114 | 0.0049 | 0.0028 | 0.0027 | 0.0040 | | 0.0110 | 0.0047 | 0.0029 | 0.0033 | 0.0011 | 0.0007 | | | 0.0100 | 0.0032 | 0.0041 | 0.0032 | 0.0027 | 0.0015 | 0.0036 | 0.0023 | 0.0005 |
| Copper | 0.0085 | 0.1107 | 0.0059 | 0.0052 | 0.0049 | | 0.0109 | 0.0044 | 0.0050 | 0.0049 | 0.0037 | 0.0037 | | | 0.0130 | 0.0055 | 0.0047 | 0.0053 | 0.0039 | 0.0030 | 0.0043 | 0.0024 | 0.0020 |
| Iron | 0.7690 | 0.1077 | 0.0804 | 1.3756 | 0.0490 | | 0.8402 | 0.0771 | 0.3273 | 0.0336 | 0.0620 | 0.0620 | | | 1.0740 | 0.0458 | 0.0384 | 0.0313 | 0.0203 | 0.0280 | 0.0326 | 0.0164 | 0.0345 |
| Lead | 0.0020 | 0.0016 | 0.0013 | 0.0013 | 0.0013 | | 0.0068 | 0.0012 | 0.0016 | 0.0011 | 0.0008 | 0.0008 | | | 0.0024 | 0.0011 | 0.0016 | 0.0011 | 0.0008 | 0.0008 | 0.0015 | 0.0006 | 0.0005 |
| Mercury | 0.00074 | 0.00010 | 0.00022 | 0.00022 | 0.00024 | | 0.00018 | 0.00018 | 0.00034 | 0.00023 | 0.00014 | 0.00019 | | | 0.00054 | 0.00019 | 0.00021 | 0.00029 | 0.00041 | 0.00016 | 0.00019 | 0.00009 | 0.00042 |
| Molybdenum | 0.0245 | 0.0240 | 0.0243 | 0.0230 | 0.0177 | | 0.0330 | 0.0149 | 0.0143 | 0.0218 | 0.0117 | 0.0113 | | | 0.0300 | 0.0177 | 0.0131 | 0.0131 | 0.0109 | 0.0069 | 0.0181 | 0.0066 | 0.0063 |
| Silver | 0.0050 | 0.0034 | 0.0031 | 0.0035 | 0.0032 | | 0.0052 | 0.0039 | 0.0032 | 0.0036 | 0.0039 | 0.0039 | | | 0.0040 | 0.0034 | 0.0032 | 0.0036 | 0.0016 | 0.0019 | 0.0034 | 0.0016 | 0.0020 |
| Thallium | 0.0040 | 0.0022 | 0.0017 | 0.0017 | 0.0018 | | 0.0400 | 0.0017 | 0.0017 | 0.0018 | 0.0009 | 0.0009 | | | 0.0045 | 0.0018 | 0.0018 | 0.0018 | 0.0010 | 0.0011 | 0.0018 | 0.0009 | 0.0005 |
| Vanadium | 0.0745 | 0.0108 | 0.0128 | 0.0103 | 0.0284 | | 0.1000 | 0.0069 | 0.0101 | 0.0126 | 0.0078 | 0.0040 | | | 0.1987 | 0.0146 | 0.0219 | 0.0259 | 0.0082 | 0.0101 | 0.0055 | 0.0025 | 0.0010 |
| **METALS - EMF-Related Concentrations (mg/l)** | | | | | | | | | | | | | | | | | | | | | | | |
| Arsenic | 0.0149 | 0.0056 | 0.0410 | 0.0357 | 0.0052 | 0.0060 | 0.0180 | 0.0046 | 0.0378 | 0.0042 | 0.0320 | 0.0196 | 0.0042 | 0.0080 | 0.0104 | 0.0185 | 0.0048 | 0.0047 | 0.0040 | 0.0028 | 0.0038 | 0.0033 | 0.0017 |
| Barium | 0.2297 | 0.1072 | 0.2344 | 0.1181 | 0.5579 | 0.1600 | 0.1204 | 0.0697 | 0.0380 | 0.0661 | 0.0892 | 0.1171 | 0.0665 | 0.1670 | 0.1735 | 0.1348 | 0.0637 | 0.1425 | 0.1540 | 0.1200 | 0.0679 | 0.1307 | 0.1277 |
| Boron | 0.2935 | 0.3269 | 0.7046 | 0.6443 | 0.1000 | | 0.3078 | 0.0956 | 0.2523 | 0.0854 | 0.5674 | 0.1721 | | | 0.2500 | 0.1561 | 0.1115 | 0.1587 | 0.1135 | 0.1198 | 0.1000 | 0.1117 | 0.146 |
| Cobalt | 0.0145 | 0.0069 | 0.0154 | 0.0134 | 0.0053 | | 0.0108 | 0.0052 | 0.0066 | 0.0053 | 0.0061 | 0.0027 | | | 0.0163 | 0.0043 | 0.0043 | 0.0043 | 0.0021 | 0.0030 | 0.0085 | 0.0041 | 0.0015 |
| Lithium | 0.0610 | 0.0621 | 0.0857 | 0.0890 | 0.0389 | | 0.0165 | 0.0465 | 0.0845 | 0.0416 | 0.0851 | 0.0493 | | | 0.0400 | 0.0513 | 0.0452 | 0.0339 | 0.0275 | 0.0257 | 0.0419 | 0.0217 | 0.0163 |
| Manganese | 0.0518 | 0.0948 | 0.8802 | 1.1005 | 0.0028 | 0.0008 | 0.0201 | 0.0051 | 0.1848 | 0.0020 | 0.0114 | 0.0043 | 0.1204 | 0.0032 | 0.1097 | 0.0018 | 0.0018 | 0.0018 | 0.0010 | 0.0011 | 0.0021 | 0.0011 | 0.0015 |
| Nickel | 0.0200 | 0.0123 | 0.0122 | 0.0120 | 0.0178 | | 0.0200 | 0.0120 | 0.0606 | 0.0138 | 0.0124 | 0.0160 | | | 0.0347 | 0.0146 | 0.0124 | 0.0140 | 0.0081 | 0.0071 | 0.0177 | 0.0062 | 0.0055 |
| Selenium | 0.0037 | 0.0025 | 0.0040 | 0.0022 | 0.0029 | 0.0005 | 0.0055 | 0.0021 | 0.0112 | 0.0028 | 0.0153 | 0.0031 | 0.0035 | 0.0035 | 0.0060 | 0.0033 | 0.0026 | 0.0028 | 0.0022 | 0.0014 | 0.0025 | 0.0021 | 0.0010 |
| Zinc | 0.0501 | 0.1260 | 0.0138 | 0.0099 | 0.0067 | | 0.1700 | 0.0126 | 0.0220 | 0.0085 | 0.0073 | 0.0061 | | | 0.1615 | 0.0124 | 0.0100 | 0.0095 | 0.0038 | 0.0052 | 0.0093 | 0.0039 | 0.0029 |

Notes:

(a) Chemical concentrations shown on this table are mean values and 95% upper confidence levels (95% UCL) and were calculated from analytical data for groundwater samples collected prior to 1994

(b) Mean concentrations are shown for each parameter in each well in order to simplify presentation and analysis of data. Instrument detection limits were used for non-detect results in the calculation of mean concentrations

(c) The 95% UCLs are based on the total population of analytical results for representative groundwater

(d) 95% UCLs for pH, temperature, and redox were not calculated. Ranges of these parameters are used for representative groundwater

(e) Redox was not analyzed in wells PEI-1, PEI-3, PEI-5, 153, and 322.

(f) Wells 521, 522, and 523 were installed in June 1994. Means were calculated from data collected in June and September 1994

## Table 4.4-14
## Activities of Radiological Parameters in Groundwater - Northern FMC/Simplot Properties (pCi/l)

| Parameter | Sampling Event | 500 | 501 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Gross alpha* | Jun-92 | 13.5 ±9.0 | 4.0 ±1.9 | ND | ND | ND | 3.8 ±2.40 | 3.0 ±1.60 | 2.20 ±1.90 | ND | ND |
| | Sep-92 | 2.67 ±0.57 | 2.85 ±0.68 | ND | ND | ND | 2.37 ±0.61 | ND | ND | ND | ND |
| | Dec-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Mar-93 | 3.65 ±0.85 | 3.53 ±0.91 | 2.62 ±0.76 | 2.4 ±0.70 | 3.22 ±0.85 | 3.42 ±2.68 | 3.37 ±0.85 | ND | 2.88 ±0.85 | 2.24 ±0.93 |
| | Jul-93 | ND | ND | 2.25 ±0.83 | ND | 2.06 ±1.08 | ND | ND | 2.31 ±0.97 | ND | ND |
| *Gross beta* | Jun-92 | 67.5 ±8.1 | 12.4 ±2.8 | 6.7 ±3.40 | ND | 5.7 ±2.7 | 8.9 ±2.9 | 10 ±2.7 | 10.50 ±3.0 | 4.40 ±2.9 | 12.5 ±3.30 |
| | Sep-92 | 4.65 ±0.64 | 7.82 ±0.76 | 6.37 ±0.73 | 6.24 ±0.79 | 10.1 ±0.92 | 7.57 ±0.74 | ND | ND | 6.11 ±0.70 | ND |
| | Dec-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Mar-93 | 4.51 ±1.34 | 6.1 ±1.39 | ND | ND | 6.57 ±1.43 | 6.64 ±4.13 | 5.59 ±1.38 | 6.10 ±1.39 | 7.44 ±1.45 | 7.47 ±1.42 |
| | Jul-93 | 3.66 ±0.95 | 4.89 ±1.04 | 2.86 ±0.98 | 4.5 ±1.29 | 4.64 ±1.17 | 5.51 ±1.17 | 3.61 ±0.98 | 4.32 ±0.99 | 5.19 ±1.15 | 4.1 ±1.12 |
| *Radium-226* | Sep-92 | ND | ND | ND | ND | ND | ND | 5.39 ±0.63 | ND | ND | ND |
| | Dec-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Mar-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1.18 0.19 |
| *Radium-228* | Sep-92 | ND | ND | ND | ND | ND | 3.6 ±0.80 | ND | 2.2 ±1.00 | ND | ND |
| | Dec-92 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Mar-93 | ND | ND | ND | ND | ND | ND | 2.7 ±0.80 | ND | ND | 7.20 ±1.00 |
| | Jul-93 | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

Notes: ND = Not Detected
Means were not calculated if only ND was reported or if only positive value has been reported.

| Parameter | Sampling Event | 517 | 518 | 520 | Old Pilot House | New Pilot House | Lindley | Frontier | TW-9S | TW-12S |
|---|---|---|---|---|---|---|---|---|---|---|
| *Gross alpha* | Jun-92 | | | | 20.7 ±6.0 | ND | 5.8 ±4.00 | ND | ND | ND |
| | Sep-92 | | | | 3.09 ±1.40 | ND | 8 ±0.70 | ND | ND | 4.09 ±1.24 |
| | Dec-92 | | | | ND | 2.96 ±0.54 | 13.2 ±2.05 | ND | ND | ND |
| | Mar-93 | | | | ND | ND | 14.3 ±3.73 | 2.12 ±1.62 | ND | ND |
| | Jul-93 | ND | ND | ND | 2.94 ±1.24 | ND | | ND | 13.7 ±2.78 | 15.2 ±3.17 |
| *Gross beta* | Jun-92 | | | | 96.5 ±5.10 | 4.2 ±2.60 | 18 ±3.4 | ND | 94.6 ±6.6 | 18 ±4.10 |
| | Sep-92 | | | | 90.6 ±3.27 | 4.12 ±0.59 | 20.4 ±0.73 | 9.24 ±0.80 | 101 ±1.32 | 20.2 ±2.06 |
| | Dec-92 | | | | 90.2 ±2.56 | 4.8 ±0.64 | 15.3 ±1.32 | ND | 85.5 ±2.37 | 11.8 ±1.71 |
| | Mar-93 | | | | 75.8 ±4.06 | 110 ±3.85 | ND | ND | 88.0 ±4.52 | 11.8 ±1.87 |
| | Jul-93 | 47.5 ±3.63 | 8.68 ±1.27 | 3.6 ±0.69 | 72.8 ±3.63 | 4.12 ±0.81 | | 4.88 ±1.04 | 85.7 ±4.73 | 31.9 ±3.50 |
| *Radium-226* | Sep-92 | | | | ND | ND | | ND | ND | ND |
| | Dec-92 | | | | ND | ND | ND | ND | ND | ND |
| | Mar-93 | | | | ND | 2.2 ±0.29 | ND | ND | ND | ND |
| | Jul-93 | ND | 1.11 ±0.28 | ND | ND | ND | ND | ND | ND | ND |
| *Radium-228* | Sep-92 | | | | 7.1 ±1.40 | 3.3 ±1.10 | | ND | 1.00 ±0.90 | 4.8 ±1.00 |
| | Dec-92 | | | | 1.5 ±1.00 | 1.7 ±1.00 | 1.9 ±0.80 | ND | ND | ND |
| | Mar-93 | | | | ND | ND | ND | ND | ND | ND |
| | Jul-93 | 8.3 ±0.60 | ND | ND | 5.1 ±1.00 | ND | ND | ND | ND | ND |

**Table 4.4-15**

**Organic Compounds Detected in Groundwater in Northern FMC/Simplot Properties (mg/l)**

| Parameter | Sampling Date | Representative Wells 511 | Representative Wells 513 | Unimpacted Wells 501 | Unimpacted Wells 507 | Unimpacted Wells 509 | 505 | Frontier | Old Pilot | TW-12S | TW-9S | Practical Quantitation Limits (mg/l) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***VOLATILE ORGANIC COMPOUNDS*** | | | | | | | | | | | | |
| 2-Butanone | Jun-92 | | 0.004 | | 0.006 | | | 0.007 | | | | |
| Acetone | Jun-92 | 0.044 | 0.1 | 1.04 | 0.481 | 1.656 | | | | | | |
| Acetone | Sep-92 | | | | | | | | | | | 0.1 |
| Acetone | Dec-92 | | | | | | | | | 3.275 | | |
| Carbon disulfide | Jun-92 | 0.027 | 0.033 | | 0.026 | 0.168 | | | | | | 0.005 |
| Ethyl benzene | Jun-92 | | | 0.002 | | | | | | | | |
| | | | | | | | | | | | | 0.005 |
| Tetrachloroethene | Jun-92 | 0.003 | | | 0.003 | 0.002 | 0.001 | | | | | |
| Tetrachloroethene | Sep-92 | 0.001 | | | 0.002 | 0.003 | | | | | | |
| Tetrachloroethene | Dec-92 | 0.003 | | | 0.002 | 0.003 | | | | | | |
| | | | | | | | | | | | | 0.01 |
| Toluene | Jun-92 | | | | | | | | | 0.002 | | |
| Trichloroethene | Jun-92 | | | | | | | | 0.001 | | 0.001 | |
| Trichloroethene | Sep-92 | | | | | | | | | | 0.001 | 0.01 |
| Xylenes, total | Jun-92 | | | 0.011 | | | | | | | | 0.01 |
| Xylenes, total | Sep-92 | | | 0.001 | | | | | | | | |
| ***SEMIVOLATILE ORGANIC COMPOUNDS*** | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | Jun-92 | 0.017 | | 0.002 | | 0.005 | 0.002 | | | | 0.001 | 0.005 |
| Bis(2-ethylhexyl)phthalate | Sep-92 | 0.013 | 0.002 | 0.01 | 0.004 | 0.006 | 0.011 | | 0.001 | 0.002 | 0.005 | |
| Bis(2-ethylhexyl)phthalate | Dec-92 | 0.012 | | 0.014 | 0.003 | 0.011 | 0.007 | | | | | 0.005 |
| Di-n-butyl phthalate | Dec-92 | 0.002 | | | | | 0.001 | | | | 0.004 | 0.005 |
| Di-n-octyl phthalate | Dec-92 | | | | | | 0.002 | | | | | 0.005 |
| Diethyl phthalate | Jun-92 | | | | | | | | | 0.001 | | |
| | | | | | | | | | | | | 0.005 |
| Dimethyl phthalate | Dec-92 | | | | | | | | | 0.019 | 0.004 | |

**Table 4.4-16**

**Area North of I-86 Groundwater Chemistry - Common Ions, Physical Parameters, Nutrients, and Fluoride**

| ANALYTE (a) | Michaud | | | Bennett | | | | | | | | Portneuf | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 95% UCL for Representative Groundwater (c) | Well 502 Mean (b) | Well 516 Mean (b) | 95% UCL for Representative Groundwater (c) | Well 524 Mean (f) | Well 525 Mean (f) | Batiste Springs Mean (b) | Rowlands Well Mean (b) | Tank Farm Well Mean (b) | Well TW-115 Mean (b) | Well TW-111 Mean (b) | 95% UCL for Representative Groundwater (c) | Well 503 Mean (b) | Well 519 Mean (b) | Swanson Road Spring Mean (b) |
| **COMMON IONS (mg/l)** | | | | | | | | | | | | | | | |
| Alkalinity, bicarbonate | 198 | 165 | 163 | 171 | | | 209 | 248 | 178 | 202 | 199 | 307 | 319 | 247 | 286 |
| Calcium | 97.71 | 59.67 | 62.78 | 68.75 | | | 71.07 | 52.99 | 48.58 | 55.34 | 52.52 | 91.93 | 122.15 | 57.10 | 92.70 |
| Chloride | 192.90 | 79.28 | 78.00 | 52.42 | | | 50.76 | 23.39 | 16.94 | 26.44 | 24.48 | 67.87 | 66.00 | 22.00 | 49.30 |
| Magnesium | 33.59 | 20.33 | 20.43 | 19.20 | | | 25.60 | 19.64 | 15.78 | 17.84 | 17.21 | 35.92 | 39.46 | 20.49 | 33.50 |
| Potassium | 12.72 | 6.49 | 8.15 | 10.52 | 4.31 | 4.21 | 10.61 | 5.20 | 3.49 | 4.09 | 5.47 | 7.34 | 8.27 | 5.26 | 7.37 |
| Sodium | 74.28 | 53.04 | 40.82 | 27.53 | | | 57.22 | 47.75 | 17.83 | 31.03 | 35.77 | 53.21 | 72.08 | 38.34 | 55.70 |
| Sulfate | 72.57 | 60.58 | 67.00 | 43.40 | 64.00 | 50.00 | 115.22 | 40.20 | 36.37 | 49.98 | 40.80 | 70.68 | 238.40 | 36.50 | 104.00 |
| **PHYSICAL PARAMETERS (d)** | | | | | | | | | | | | | | | |
| Spec Conductivity (umhos/cm) | 1136 | 752 | 735 | 569 | 548 | 532 | 813 | 721 | 561 | 514 | 517 | 871 | 1234 | 633 | 908 |
| pH | 7.29 to 7.70 | 7.47 | 7.47 | 7.37 to 8.37 | 7.52 | 7.53 | 6.93 | 7.47 | 7.73 | 7.40 | 7.47 | 7.27 to 7.52 | 6.69 | 7.49 | 7.30 |
| Temperature (degrees Celsius) | 11.8 to 16.7 | 12.5 | 13.8 | 14.5 to 16.6 | 12.95 | 13.4 | 12.3 | 13.6 | 12.6 | 12.4 | 13.7 | 12.7 to 13.3 | 13.8 | 14.5 | 13.6 |
| Total Dissolved Solids (mg/l) | 867 | 454 | 422 | 412 | | | 528 | 372 | 274 | 316 | 307 | 580 | 798 | 383 | 540 |
| Redox (mV) | 0 to 169 | 111 | 176 | 44 to 122 | | | 91 | 107 | 96 | 35 | -64 | 127 to 171 | 171 | 139 | NA |
| **NUTRIENTS AND FLUORIDE (mg/l)** | | | | | | | | | | | | | | | |
| Ammonia (NH3 as N) | 0.50 | 0.38 | 0.50 | 0.50 | | | 0.72 | 0.35 | 0.35 | 0.35 | 0.35 | 0.50 | 3.04 | 0.50 | 0.40 |
| Nitrate (NO3 as N) | 5.52 | 3.07 | 1.97 | 1.60 | 2.22 | 1.95 | 3.42 | 1.60 | 1.35 | 1.55 | 1.39 | 4.00 | 4.47 | 1.69 | 2.64 |
| Orthophosphate (PO4 as P) | 0.06 | 0.03 | 0.08 | 0.13 | 0.02 | 0.02 | 1.90 | 0.02 | 0.03 | 0.03 | 0.04 | 0.27 | 4.03 | 0.02 | 0.99 |
| Phosphorus | 0.33 | 0.03 | 0.06 | 0.31 | | | 1.88 | 0.05 | 0.05 | 0.06 | 0.05 | 0.15 | 4.16 | 0.03 | 1.05 |
| Fluoride | 0.80 | 0.78 | 0.70 | 0.60 | 0.84 | 0.86 | 0.52 | 0.27 | 0.75 | 0.77 | 0.83 | 0.41 | 1.22 | 0.35 | 0.50 |
| **METALS - Not EMF-Related Concentrations (mg/l)** | | | | | | | | | | | | | | | |
| Aluminum | 0.0977 | 0.0249 | 0.0226 | 0.5472 | | | 0.0480 | 0.0467 | 0.0360 | 0.0310 | 0.0344 | 0.9475 | 0.0252 | 0.0236 | 0.0280 |
| Antimony | 0.1000 | 0.0637 | 0.0482 | 0.1340 | | | 0.0631 | 0.0681 | 0.0797 | 0.0631 | 0.0667 | 0.1000 | 0.0578 | 0.0482 | 0.0428 |
| Beryllium | 0.0020 | 0.0009 | 0.0007 | 0.0040 | | | 0.0011 | 0.0013 | 0.0011 | 0.0011 | 0.0013 | 0.0026 | 0.0009 | 0.0007 | 0.0009 |
| Cadmium | 0.0050 | 0.0014 | 0.0006 | 0.0050 | | | 0.0017 | 0.0016 | 0.0017 | 0.0026 | 0.0026 | 0.0050 | 0.0024 | 0.0006 | 0.0003 |
| Chromium | 0.0114 | 0.0037 | 0.0042 | 0.0110 | | | 0.0030 | 0.0054 | 0.0030 | 0.0051 | 0.0049 | 0.0100 | 0.0026 | 0.0009 | 0.0015 |
| Copper | 0.0085 | 0.0059 | 0.0037 | 0.0109 | | | 0.0035 | 0.0048 | 0.0082 | 0.0042 | 0.0040 | 0.0130 | 0.0053 | 0.0037 | 0.0035 |
| Iron | 0.7690 | 0.0709 | 0.0620 | 0.8402 | | | 0.0339 | 0.0263 | 0.0761 | 0.1348 | 1.0564 | 1.0740 | 0.0363 | 0.1027 | 0.0380 |
| Lead | 0.0020 | 0.0013 | 0.0008 | 0.0068 | | | 0.0016 | 0.0017 | 0.0017 | 0.0011 | 0.0012 | 0.0024 | 0.0012 | 0.0008 | 0.0005 |
| Mercury | 0.00074 | 0.00026 | 0.00114 | 0.00078 | | | 0.00018 | 0.00034 | 0.00031 | 0.00025 | 0.00021 | 0.00054 | 0.00027 | 0.00041 | 0.00007 |
| Molybdenum | 0.0245 | 0.0237 | 0.0113 | 0.0330 | | | 0.0143 | 0.0164 | 0.0164 | 0.0143 | 0.0143 | 0.0300 | 0.0157 | 0.0113 | 0.0088 |
| Silver | 0.0050 | 0.0032 | 0.0039 | 0.0052 | | | 0.0030 | 0.0033 | 0.0031 | 0.0038 | 0.0039 | 0.0040 | 0.0036 | 0.0039 | 0.0030 |
| Thallium | 0.0040 | 0.0019 | 0.0009 | 0.0400 | | | 0.0023 | 0.0016 | 0.0017 | 0.0017 | 0.0017 | 0.0045 | 0.0019 | 0.0010 | 0.0011 |
| Vanadium | 0.0745 | 0.0203 | 0.0022 | 0.1000 | | | 0.0111 | 0.0216 | 0.0168 | 0.0068 | 0.0102 | 0.1987 | 0.0317 | 0.0028 | 0.0260 |
| **METALS - EMF-Related Concentrations (mg/l)** | | | | | | | | | | | | | | | |
| Arsenic | 0.0149 | 0.0034 | 0.0055 | 0.0180 | 0.0034 | 0.0032 | 0.0150 | 0.0046 | 0.0039 | 0.0034 | 0.0040 | 0.0104 | 0.0169 | 0.0042 | 0.0070 |
| Barium | 0.2297 | 0.0805 | 0.0878 | 0.1204 | 0.0633 | 0.0626 | 0.0570 | 0.0930 | 0.0613 | 0.0608 | 0.0619 | 0.1735 | 0.1137 | 0.0874 | 0.1230 |
| Boron | 0.2935 | 0.1239 | 0.1137 | 0.3078 | | | 0.1423 | 0.1139 | 0.0965 | 0.0896 | 0.0958 | 0.2500 | 0.1606 | 0.0878 | 0.28 |
| Cobalt | 0.0145 | 0.0047 | 0.0027 | 0.0108 | | | 0.0053 | 0.0054 | 0.0052 | 0.0052 | 0.0052 | 0.0163 | 0.0043 | 0.0027 | 0.0025 |
| Lithium | 0.0610 | 0.0462 | 0.0462 | 0.0165 | | | 0.0535 | 0.0188 | 0.0341 | 0.0453 | 0.0492 | 0.0400 | 0.0476 | 0.0222 | 0.0440 |
| Manganese | 0.0518 | 0.0018 | 0.0015 | 0.0201 | | | 0.0070 | 0.0022 | 0.0032 | 0.0022 | 0.0185 | 0.1097 | 0.0450 | 0.0017 | 0.0036 |
| Nickel | 0.0200 | 0.0166 | 0.0124 | 0.0200 | 0.0083 | 0.0027 | 0.0134 | 0.0135 | 0.0143 | 0.0122 | 0.0120 | 0.0247 | 0.0164 | 0.0124 | 0.0081 |
| Selenium | 0.0057 | 0.0020 | 0.0025 | 0.0055 | 0.0035 | 0.0035 | 0.0069 | 0.0022 | 0.0024 | 0.0017 | 0.0019 | 0.0060 | 0.0039 | 0.0014 | 0.0021 |
| Zinc | 0.0501 | 0.0054 | 0.0030 | 0.1700 | | | 0.0123 | 0.0200 | 0.1359 | 0.0090 | 0.0080 | 0.1615 | 0.0118 | 0.0036 | 0.0119 |

Notes:

(a) Chemical concentrations shown on this table are mean values and 95% upper confidence levels (95% UCL) and were calculated from analytical data for groundwater samples collected prior to 1994

(b) Mean concentrations are shown for each parameter in each well in order to simplify presentation and analysis of data. Instrument detection limits were used for non-detect results in the calculation of mean concentrations.

(c) The 95% UCLs are based on the total population of analytical results for representative groundwater

(d) 95% UCLs for pH, temperature, and redox were not calculated. Ranges of these parameters are used for representative groundwater

(e) Redox was not analyzed in wells PEI-1, PEI-3, PEI-5, 153, and 322.

(f) Wells 524 and 525 were installed in June 1994. Means were calculated from data collected in June and September 1994

Table 4.4-17

## Table 4.4-17
## Activities of Radiological Parameters in Groundwater - Area North of I-86 (pCi/l)

| Parameter | Sampling Event | 502 | 503 | 516 | 519 | TW-11S | TW-11I | BATISTE | SWANSON | ROWLANDS | TANK FARM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Gross alpha* | Jun-92 | 4.4 ±2.4 | ND | | | ND | 10 ±2.70 | ND | 2.20 ±1.90 | ND | ND |
| | Sep-92 | 3.55 ±0.68 | 2.07 ±0.48 | | | 5.35 ±1.61 | ND | ND | ND | 2.25 ±0.63 | 2.25 ±0.50 |
| | Dec-92 | 4.08 ±1.01 | ND | | | 2.55 ±0.57 | 2.4 ±0.78 | ND | ND | 3.28 ±0.87 | 2.41 ±0.72 |
| | Mar-93 | 3.66 ±0.88 | 2.54 ±0.94 | | | 2.74 ±0.86 | 2.31 ±1.00 | ND | ND | 2.10 ±1.56 | ND |
| | Jul-93 | 3.94 ±1.38 | 2.95 ±1.07 | ND | 2.03 ±1.13 | 2.94 ±0.75 | ND | ND | 2.31 ±0.97 | ND | ND |
| *Gross beta* | Jun-92 | 9.2 ±2.9 | 16.1 ±3.3 | | | 7.4 ±2.8 | 21.6 ±3.6 | ND | 10.50 ±3.0 | ND | ND |
| | Sep-92 | 6.74 ±0.77 | 10.2 ±0.68 | | | 6.36 ±1.63 | 4.34 ±1.56 | 5.2 ±1.60 | ND | 6.71 ±0.78 | 4.48 ±0.64 |
| | Dec-92 | 7.75 ±0.73 | ND | | | ND | ND | 6.46 ±1.67 | ND | 5.39 ±0.80 | 3.0 ±0.67 |
| | Mar-93 | 4.89 ±1.31 | 7.91 ±1.48 | | | 4.03 ±0.80 | 9.57 ±2.43 | 7.2 ±1.26 | 6.10 ±1.39 | ND | ND |
| | Jul-93 | 5.67 ±1.19 | 5.4 ±1.30 | 6.28 ±1.27 | 4.38 ±1.16 | 3.22 ±0.92 | 3.73 ±0.83 | 9.45 ±0.78 | 4.32 ±0.99 | 3.78 ±1.12 | 2.21 ±1.01 |
| *Radium-226* | Sep-92 | ND | ND | | | ND | ND | ND | ND | ND | ND |
| | Dec-92 | ND | ND | | | ND | ND | ND | ND | ND | ND |
| | Mar-93 | ND | ND | | | ND | ND | ND | ND | ND | ND |
| | Jul-93 | ND | ND | ND | ND | ND | ND | 1.07 ±0.29 | ND | ND | ND |
| *Radium-228* | Sep-92 | ND | ND | | | ND | ND | ND | 2.2 ±1.00 | 1.60 ±0.70 | 7.90 ±1.00 |
| | Dec-92 | ND | ND | | | ND | ND | 4.1 ±1.0 | ND | 9.00 ±1.20 | 3.10 ±0.90 |
| | Mar-93 | ND | ND | | | ND | ND | 7.4 ±1.00 | ND | ND | ND |
| | Jul-93 | ND | ND | ND | ND | ND | ND | 2.2 ±1.10 | ND | ND | ND |

Notes: ND = Not Detected
Means were not calculated if only ND was reported or if only positive value has been reported.
Blanks = no analyses performed
* Wells in representative network

Well locations are shown in Figure 4.4-2.

**Table 4.4-18**
**Organic Compounds Detected in Groundwater North of I-86 (mg/l)**

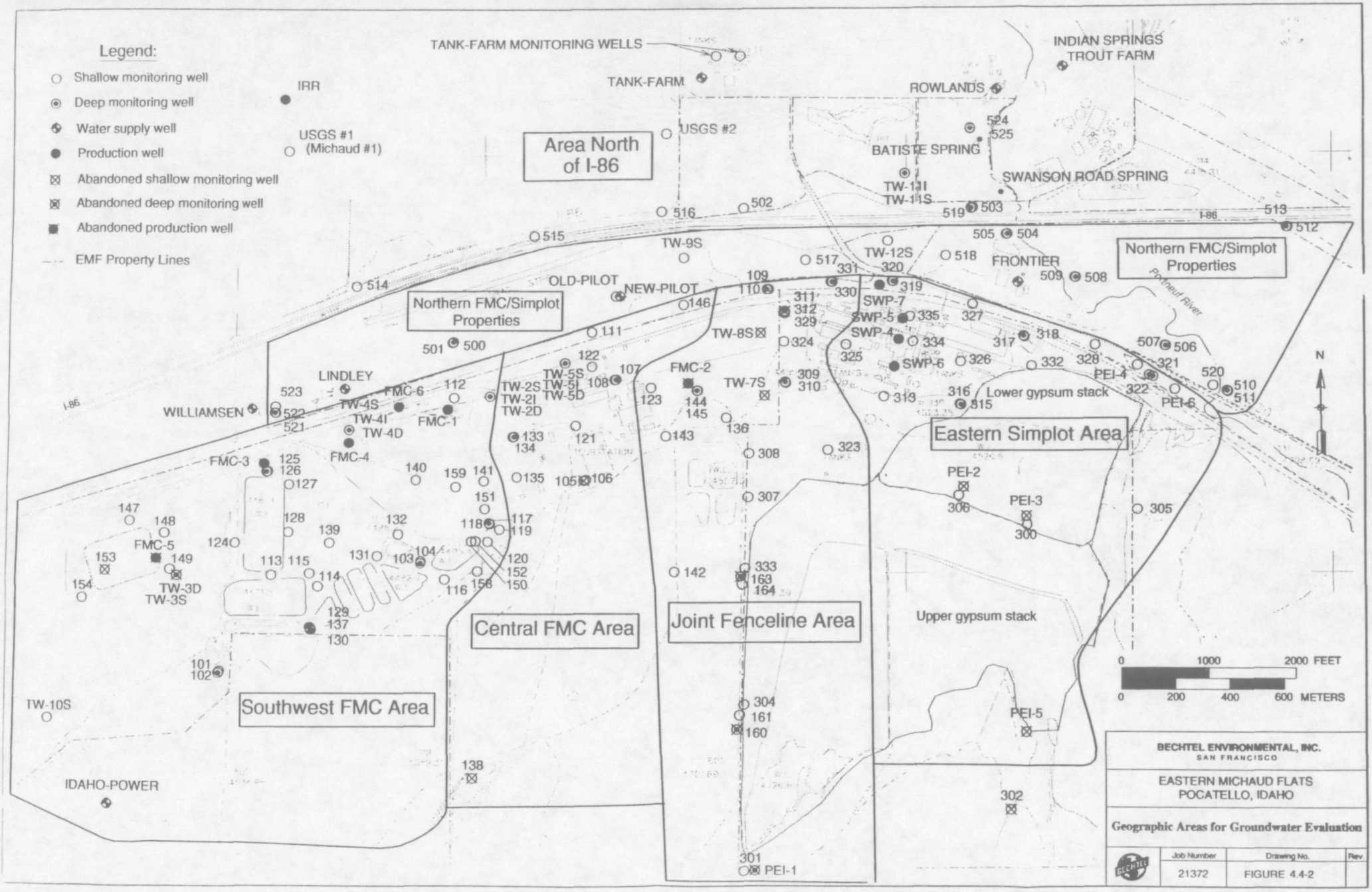
| Parameter | Sampling Date | Unimpacted Wells | | Impacted Wells |
|---|---|---|---|---|
| | | 502 | TW-11S | 503 |
| ***VOLATILE ORGANIC COMPOUNDS*** | | | | |
| 2-Butanone | Jun-92 | | | |
| Acetone | Jun-92 | 0.108 | | |
| Acetone | Sep-92 | 0.12 | | 0.21 |
| Acetone | Dec-92 | | | |
| Carbon disulfide | Jun-92 | 0.005 | 0.001 | |
| Ethyl benzene | Jun-92 | | | |
| Tetrachloroethene | Jun-92 | | | |
| Tetrachloroethene | Sep-92 | | | |
| Tetrachloroethene | Dec-92 | | | |
| Toluene | Jun-92 | | | |
| Trichloroethene | Jun-92 | | | 0.004 |
| Trichloroethene | Sep-92 | | | |
| Xylenes, total | Jun-92 | | | |
| Xylenes, total | Sep-92 | | | |
| ***SEMIVOLATILE ORGANIC COMPOUNDS*** | | | | |
| Bis(2-ethylhexyl)phthalate | Jun-92 | | | 0.001 |
| Bis(2-ethylhexyl)phthalate | Sep-92 | 0.004 | 0.005 | 0.003 |
| Bis(2-ethylhexyl)phthalate | Dec-92 | 0.003 | | 0.012 |
| Di-n-butyl phthalate | Dec-92 | | | |
| Di-n-octyl phthalate | Dec-92 | | | |
| Diethyl phthalate | Jun-92 | | | |
| Dimethyl phthalate | Dec-92 | | | |

**TABLE 4.4-19**
**RADIOLOGICAL PARAMETER SPECIATION RESULTS (pCi/l)**

| PARAMETER | WELL 121 | WELL 123 | WELL 136 | WELL 146 | WELL 150 | WELL 152 | WELL 306 | WELL 309 | BATISTE SPRING | LINDLEY WELL | NEW PILOT | OLD PILOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gross Alpha | ND | ND | ND | ND | ND | ND | 28.3 ± 4.99 | 77.5 ± 8.33 | ND | 12.9 ± 1.77 | 3.1 ± 0.7 | ND |
| Gross Beta | 120 ± 10.7 | 27.3 ± 3.5 | 64.9 ± 17.3 | 40.5 ± 2.36 | 1,110 ± 22.9 | 849 ± 20.3 | 60.3 ± 6.65 | 90.9 ± 7.68 | 10.4 ± 1.2 | 12.7 ± 1.66 | 4.4 ± 0.8 | 85 ± 5.82 |
| Potassium-40 | 184 ± 82 | ND | 126 ± 81.2 | ND | 1,310 ± 143 | 1,190 ± 133 | ND | ND | ND | ND | ND | 112 ± 61.5 |
| Radium 226 | ND | 2.14 ± 0.26 | 1.42 ± 0.56 | ND | ND | ND | ND | 1.39 ± 0.23 | 4.55 ± 0.35 | 1.78 ± 0.55 | ND | 1.56 ± 0.18 |
| Radium 228 | 4.7 ± 1 | ND | 8.4 ± 1 | 1.7 ± 0.8 | ND | 4.5 ± 0.8 | ND | ND | 1.3 ± 0.4 | 4.2 ± 0.8 | ND | ND |
| Uranium 233/234 | ND | ND | ND | ND | ND | ND | 29.4 ± 3.63 | 20.7 ± 2.55 | 1.52 ± 0.452 | 7.53 ± 1.12 | 1.99 ± 0.469 | ND |
| Uranium 238 (alpha) | ND | ND | ND | ND | ND | 1.35 ± 0.393 | 11.2 ± 1.59 | 7.17 ± 1.09 | 1.09 ± 0.375 | 3.71 ± 0.682 | ND | ND |

Note: No other radioisotopes were detected.

# Surface and Subsurface Characterizations Figures for Section 4.4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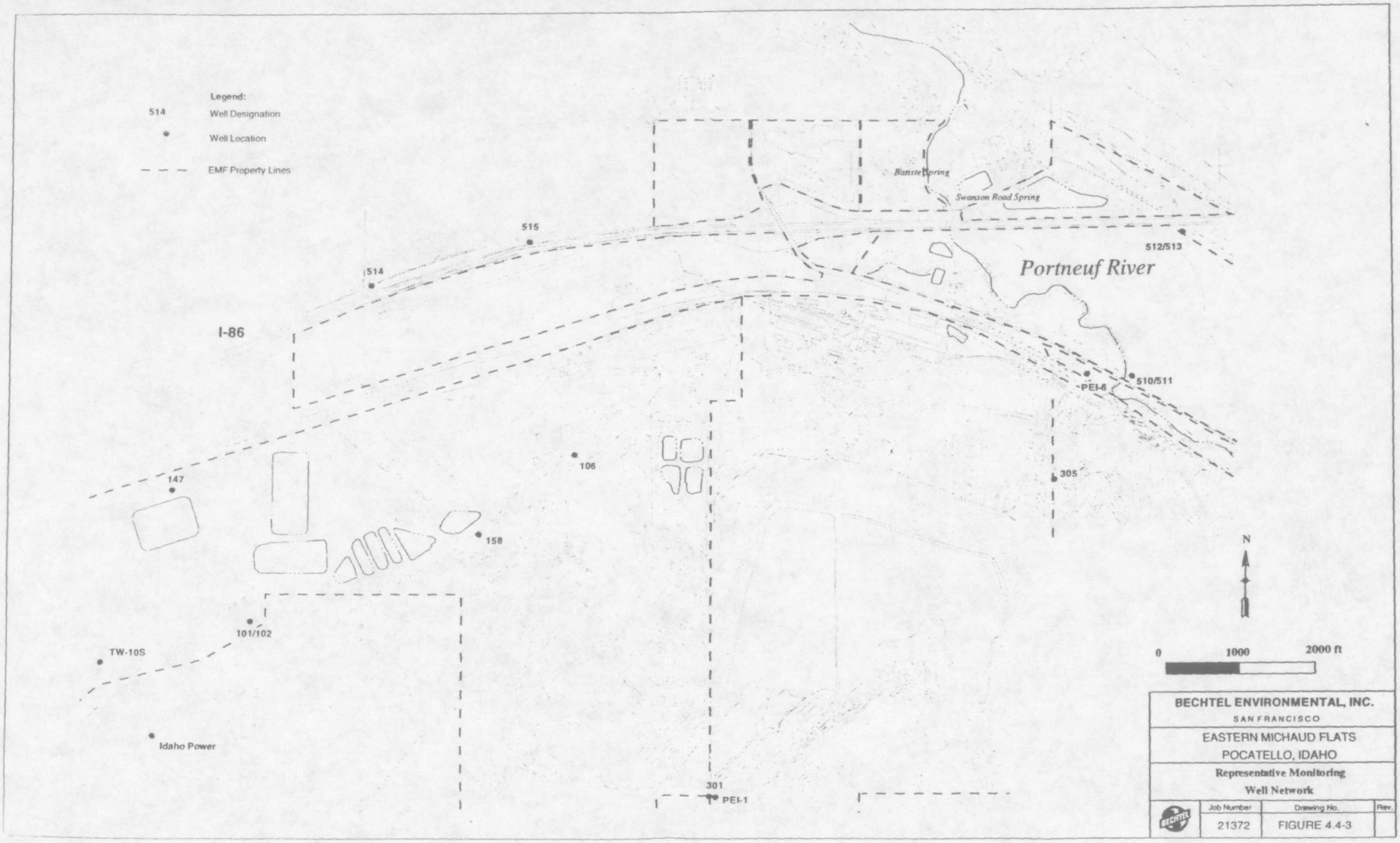
Shallow monitoring well
Deep monitoring well
Water supply well
Production well
Abandoned shallow monitoring well
Abandoned deep monitoring well
Abandoned production well
EMF Property Lines
TANK-FARM MONITORING WELLS
TANK-FARM
IRR
USGS #1 (Michaud #1)
USGS #2
Area North of I-86
INDIAN SPRINGS TROUT FARM
ROWLANDS
BATISTE SPRING
SWANSON ROAD SPRING
TW-11I
TW-11S
I-86
Northern FMC/Simplot Properties
FRONTIER
Portneuf River
TW-9S
TW-12S
OLD-PILOT
NEW-PILOT
SWP-7
SWP-5
SWP-4
SWP-6
TW-8S
LINDLEY
WILLIAMSEN
FMC-6
FMC-1
FMC-4
FMC-3
FMC-5
FMC-2
TW-4S
TW-4I
TW-4D
TW-5S
TW-5I
TW-5D
TW-2S
TW-2I
TW-2D
TW-7S
PEI-4
PEI-6
Lower gypsum stack
Eastern Simplot Area
PEI-2
PEI-3
PEI-5
PEI-1
Upper gypsum stack
Central FMC Area
Joint Fenceline Area
Southwest FMC Area
TW-3D
TW-3S
TW-10S
IDAHO-POWER
N
0 1000 2000 FEET
0 200 400 600 METERS
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Geographic Areas for Groundwater Evaluation
Job Number
21372
Drawing No.
FIGURE 4.4-2
Rev.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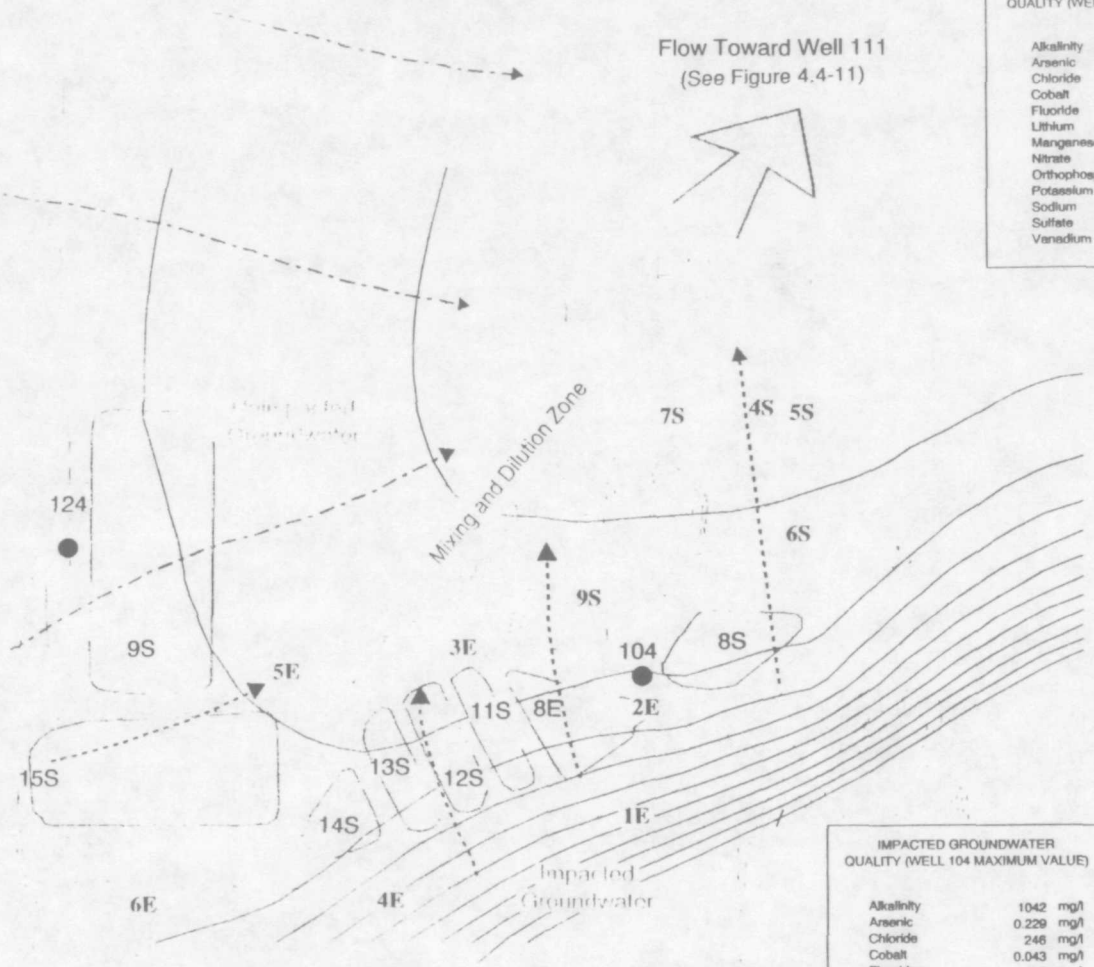
514 Well Designation
Well Location
EMF Property Lines
Banister Spring
Swanson Road Spring
Portneuf River
I-86
515
514
512/513
510/511
PEI-6
305
106
147
158
101/102
TW-10S
Idaho Power
301
PEI-1
N
0
1000
2000 ft
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Representative Monitoring
Well Network
Job Number
21372
Drawing No.
FIGURE 4.4-3
Rev.

UNIMPACTED GROUNDWATER QUALITY (WELL 124 MAXIMUM VALUE)

| | | |
|---|---|---|
| Alkalinity | 211 | mg/l |
| Arsenic | 0.017 | mg/l |
| Chloride | 126 | mg/l |
| Cobalt | 0.005 | mg/l |
| Fluoride | 0.9 | mg/l |
| Lithium | 0.62 | mg/l |
| Manganese | ND | mg/l |
| Nitrate | 2.12 | mg/l |
| Orthophosphate | 0.17 | mg/l |
| Potassium | 13.7 | mg/l |
| Sodium | 91.2 | mg/l |
| Sulfate | 73 | mg/l |
| Vanadium | 0.005 | mg/l |

MIXED GROUNDWATER QUALITY (WELL 111 MAXIMUM VALUE)

| | | |
|---|---|---|
| Alkalinity | 383 | mg/l |
| Arsenic | 0.055 | mg/l |
| Chloride | 358 | mg/l |
| Cobalt | 0.021 | mg/l |
| Fluoride | 0.1 | mg/l |
| Lithium | 0.113 | mg/l |
| Manganese | 1.31 | mg/l |
| Nitrate | 19.8 | mg/l |
| Orthophosphate | 11.8 | mg/l |
| Potassium | 148 | mg/l |
| Sodium | 183 | mg/l |
| Sulfate | 214 | mg/l |
| Vanadium | 0.005 | mg/l |




IMPACTED GROUNDWATER QUALITY (WELL 104 MAXIMUM VALUE)

| | | |
|---|---|---|
| Alkalinity | 1042 | mg/l |
| Arsenic | 0.229 | mg/l |
| Chloride | 246 | mg/l |
| Cobalt | 0.043 | mg/l |
| Fluoride | 9.2 | mg/l |
| Lithium | 4.3 | mg/l |
| Manganese | 5.2 | mg/l |
| Nitrate | 15.9 | mg/l |
| Orthophosphate | 21.3 | mg/l |
| Potassium | 526 | mg/l |
| Sodium | 532 | mg/l |
| Sulfate | 285 | mg/l |
| Vanadium | 0.020 | mg/l |

## Legend

- Well Location
- Flow Path
- Unimpacted Groundwater
- Impacted Groundwater
- Mixing and Dilution Zone
- 8S Existing Ponds
- 5E Former Ponds
- Water Level Contour

N

0 500 1000 FEET

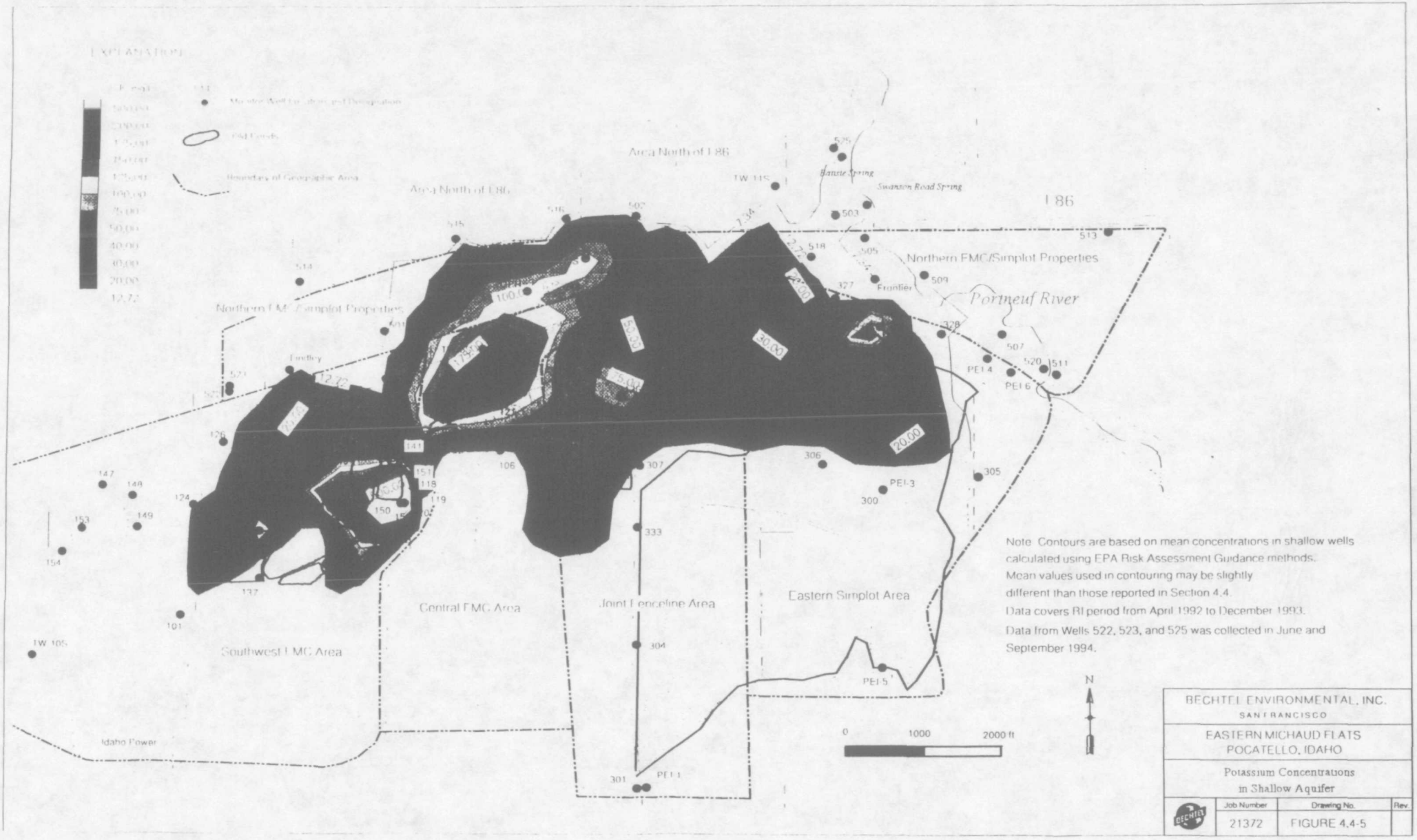
0 100 200 300 METERS

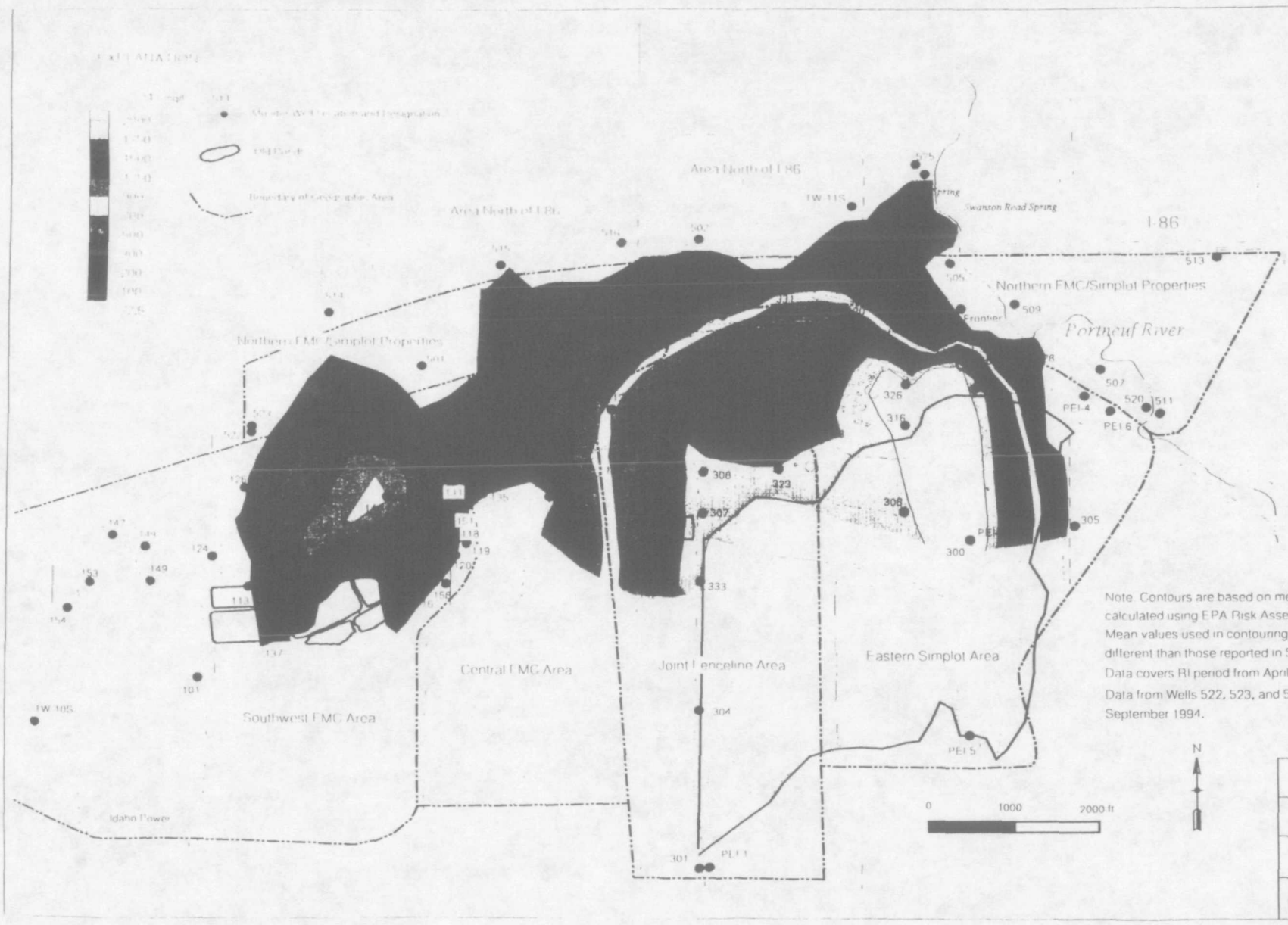
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Groundwater Flow in the Southwestern Area of the FMC Facility**

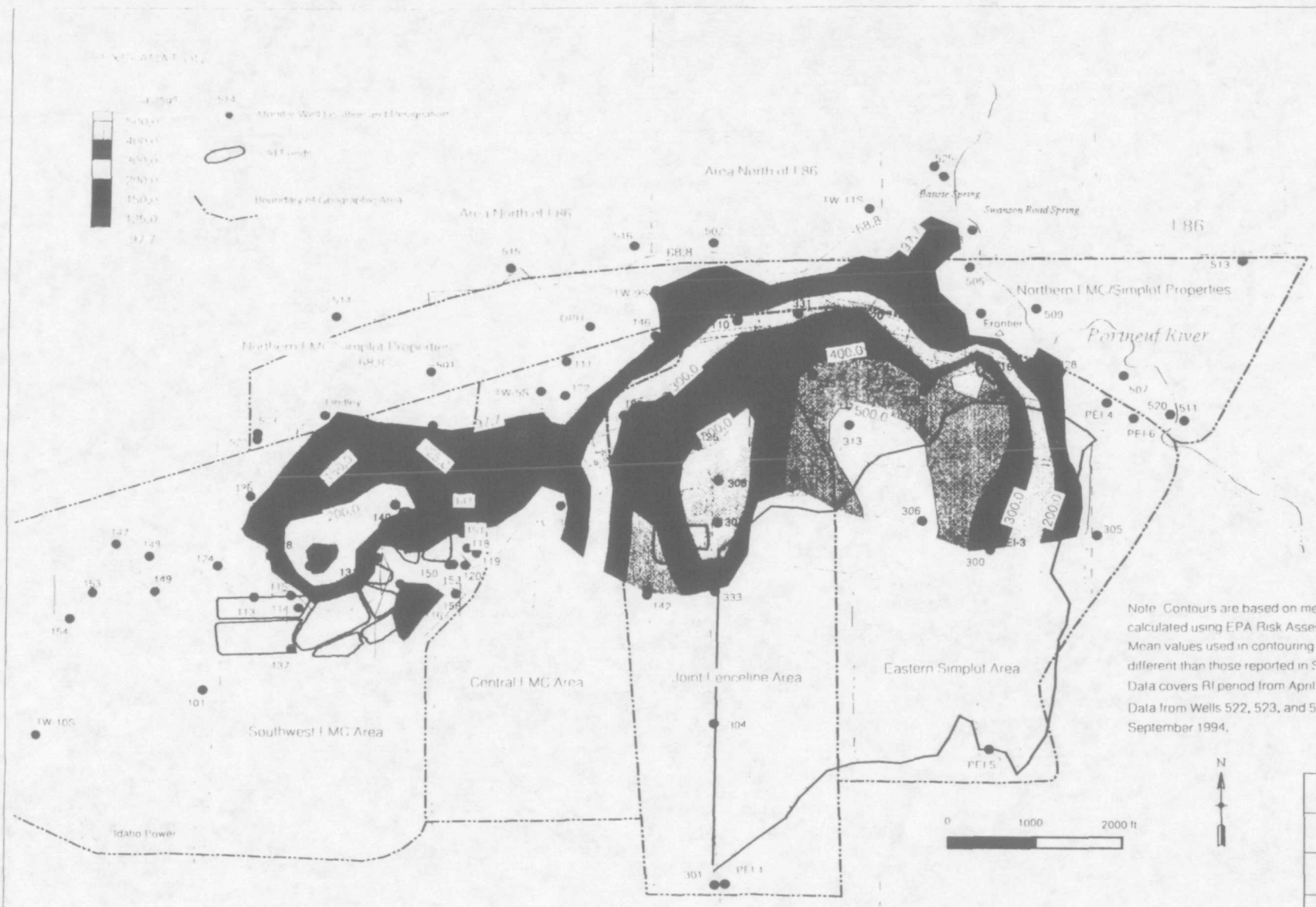
| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.4-4 | |


EXPLANATION
Area North of I-86
Area North of I-86
I-86
Northern FMC/Simplot Properties
Northern FMC/Simplot Properties
Portneuf River
Frontier
Swanson Road Spring
Central FMC Area
Joint Fenceline Area
Eastern Simplot Area
Southwest FMC Area
Idaho Power
Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4.
Data covers RI period from April 1992 to December 1993.
Data from Wells 522, 523, and 525 was collected in June and September 1994.
0
1000
2000 ft
N
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Potassium Concentrations in Shallow Aquifer
Job Number
21372
Drawing No.
FIGURE 4.4-5
Rev.



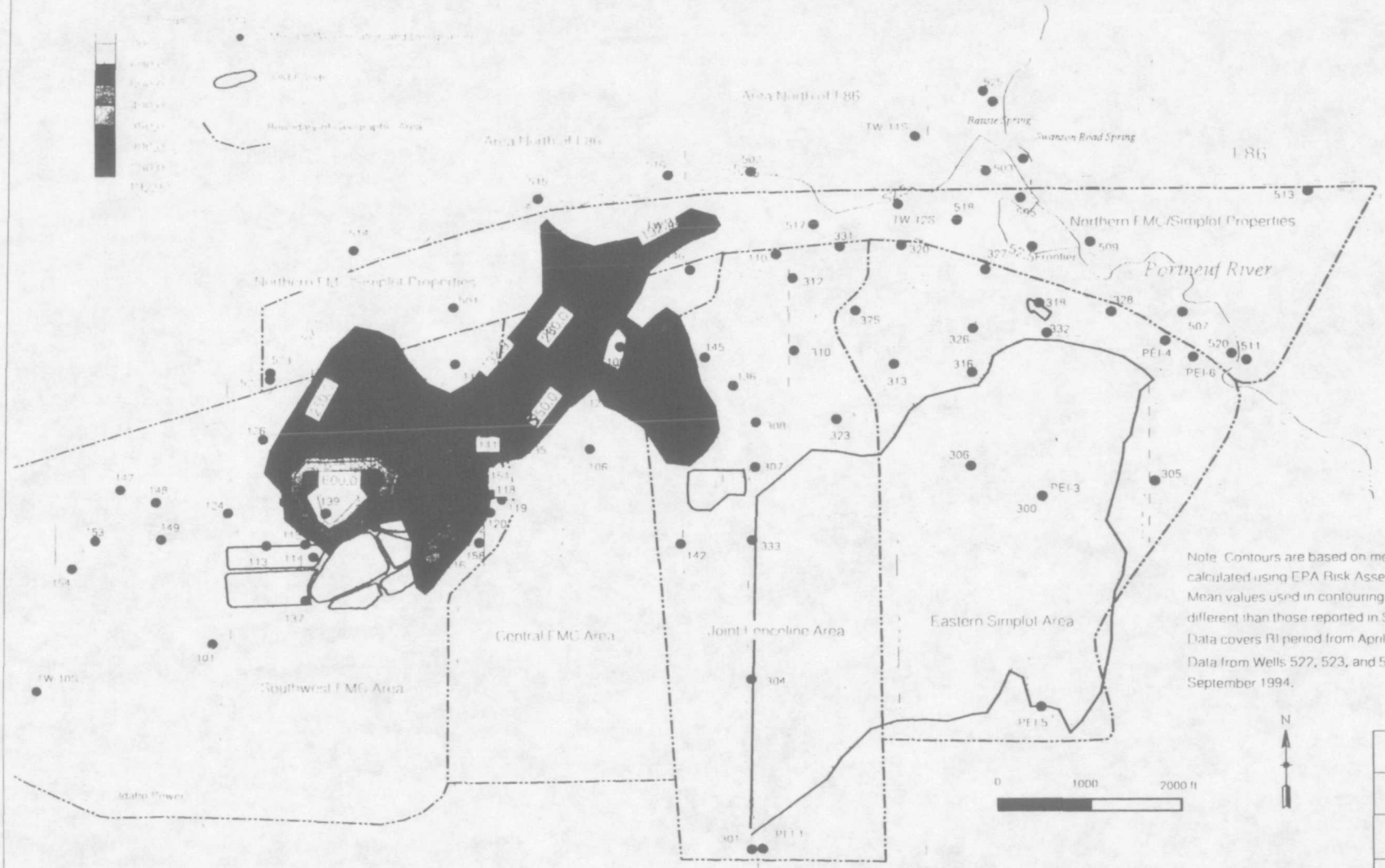

Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4. Data covers RI period from April 1992 to December 1993. Data from Wells 522, 523, and 525 was collected in June and September 1994.

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Sulfate Concentrations in Shallow Aquifer | | | |
| BECHTEL | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.4-6 | |




Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4. Data covers RI period from April 1992 to December 1993. Data from Wells 522, 523, and 525 was collected in June and September 1994.

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| Calcium Concentrations in Shallow Aquifer | | |
| Job Number | Drawing No. | Rev. |
| 21372 | FIGURE 4.4-7 | |

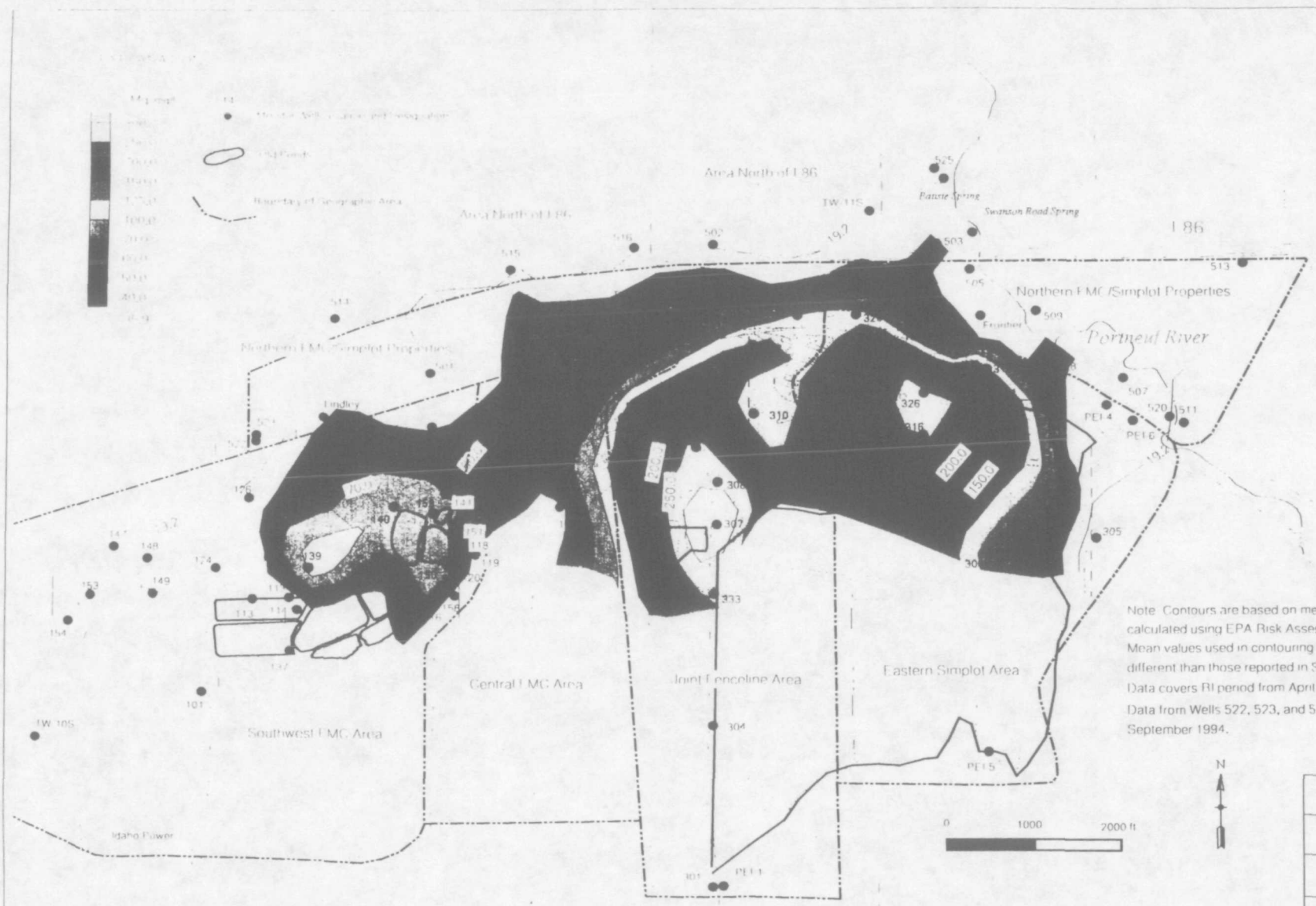



BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

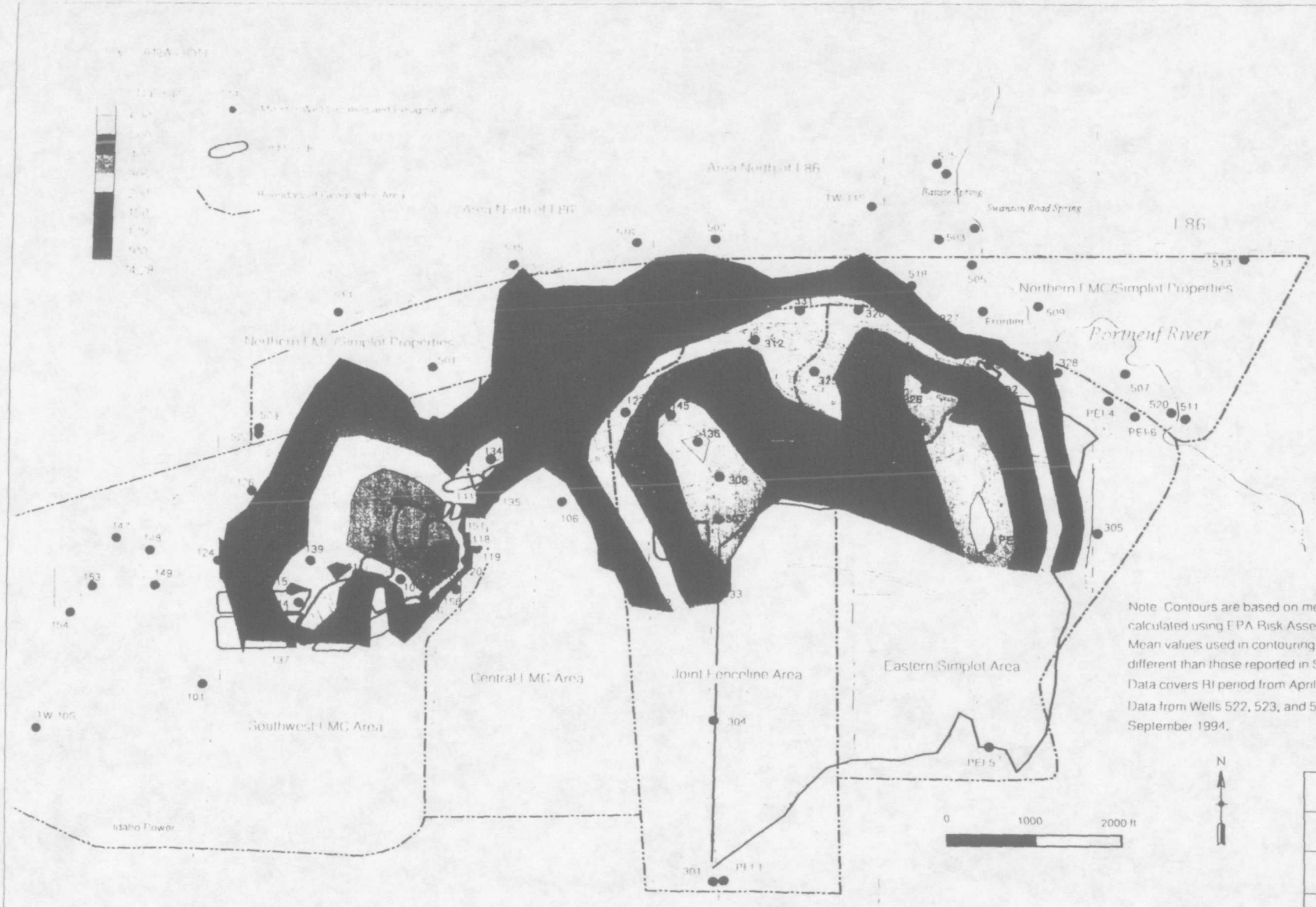
Chloride Concentrations in Shallow Aquifer

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.4-8 | |

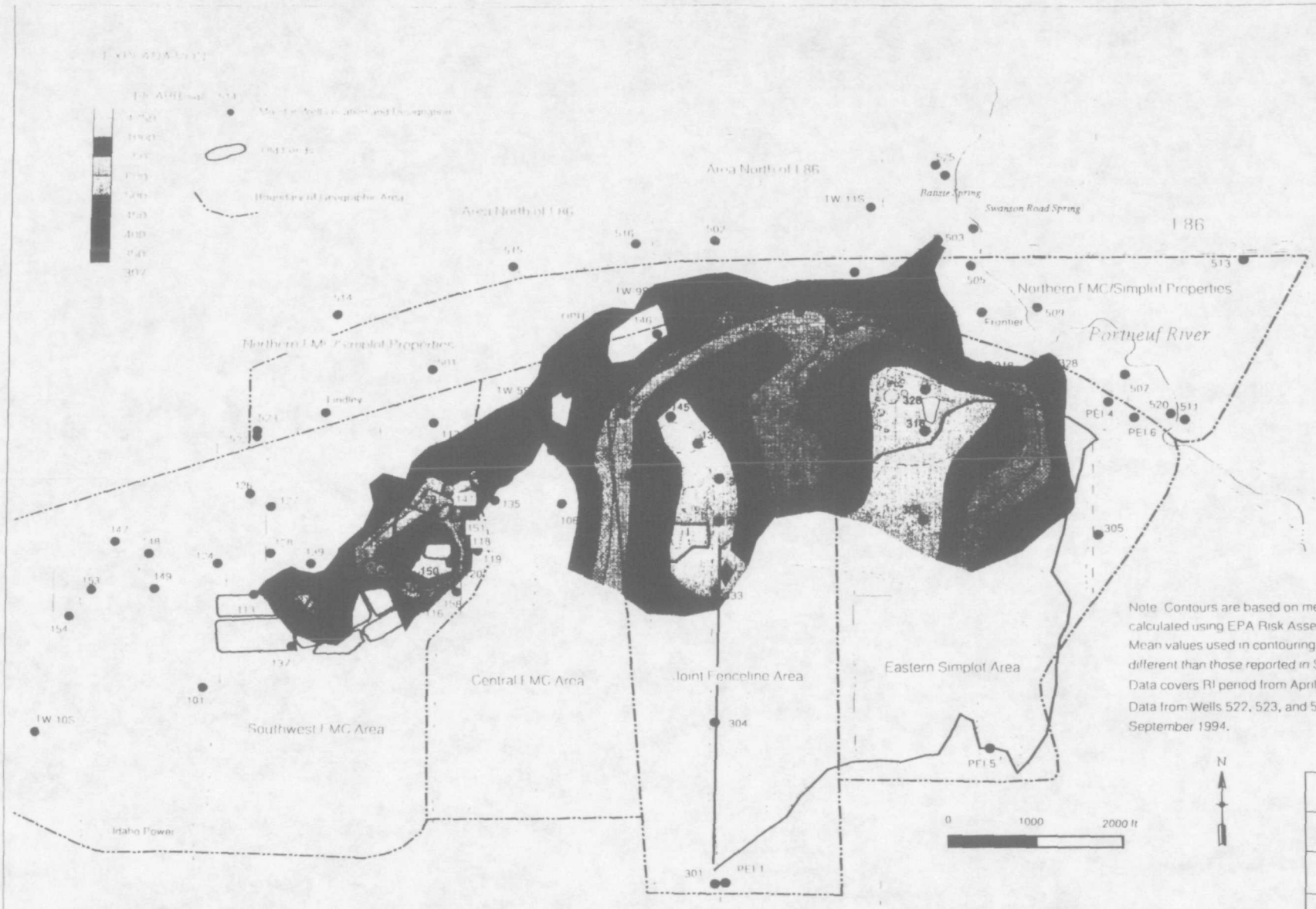



Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4. Data covers RI period from April 1992 to December 1993. Data from Wells 522, 523, and 525 was collected in June and September 1994.

| | | | |
|---|---|---|---|
| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Magnesium Concentrations in Shallow Aquifer | | | |
| BECHTEL | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.4-9 | |




| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| Sodium Concentrations in Shallow Aquifer | | |
| Job Number | Drawing No. | Rev. |
| 21372 | FIGURE 4.4-10 | |



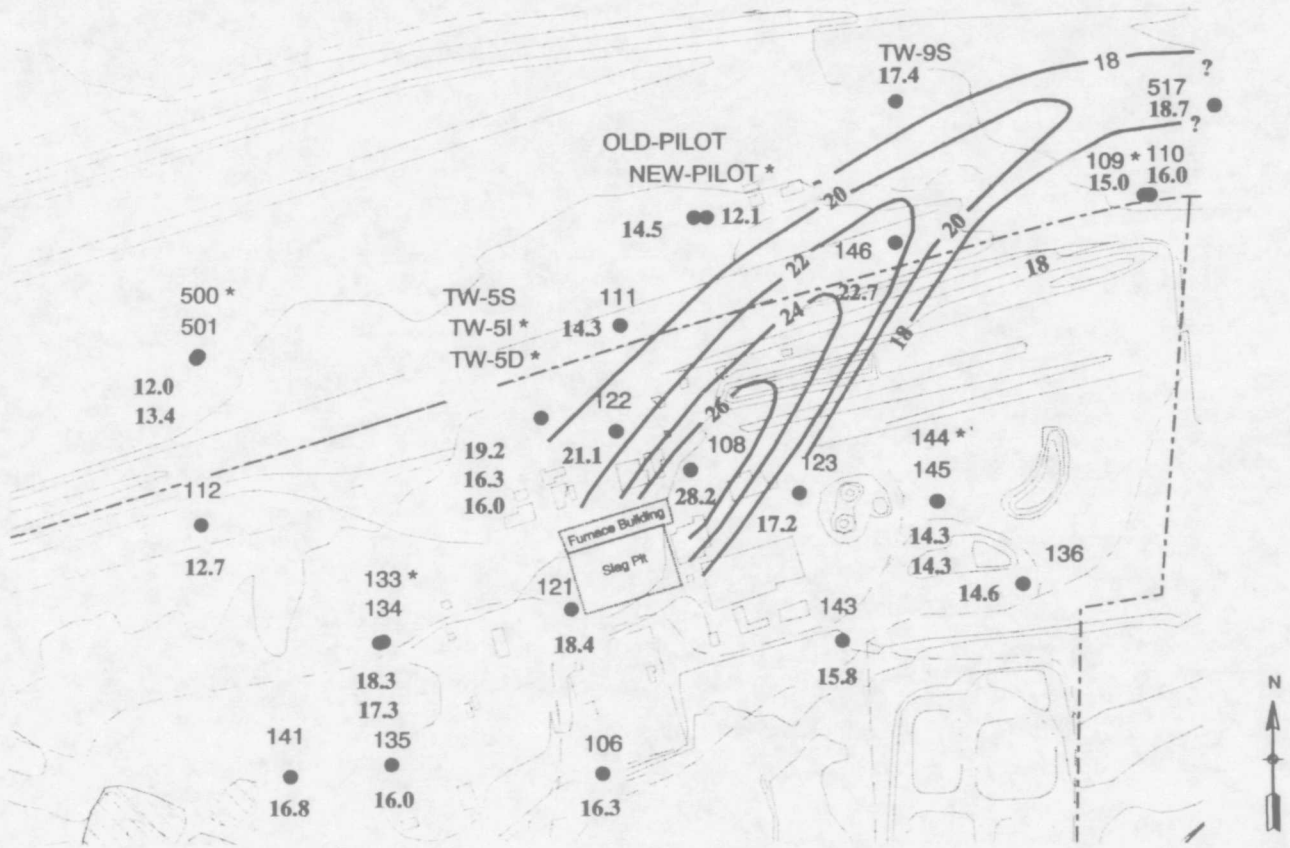

Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4. Data covers RI period from April 1992 to December 1993. Data from Wells 522, 523, and 525 was collected in June and September 1994.

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Bicarbonate Alkalinity Concentrations in Shallow Aquifer

| Job Number | Drawing No. | Re |
|---|---|---|
| 21372 | FIGURE 4.4-11 | |




Legend:

122 Well Designation

● Well Location

21.1 Temperature (degrees C) (August 1993)

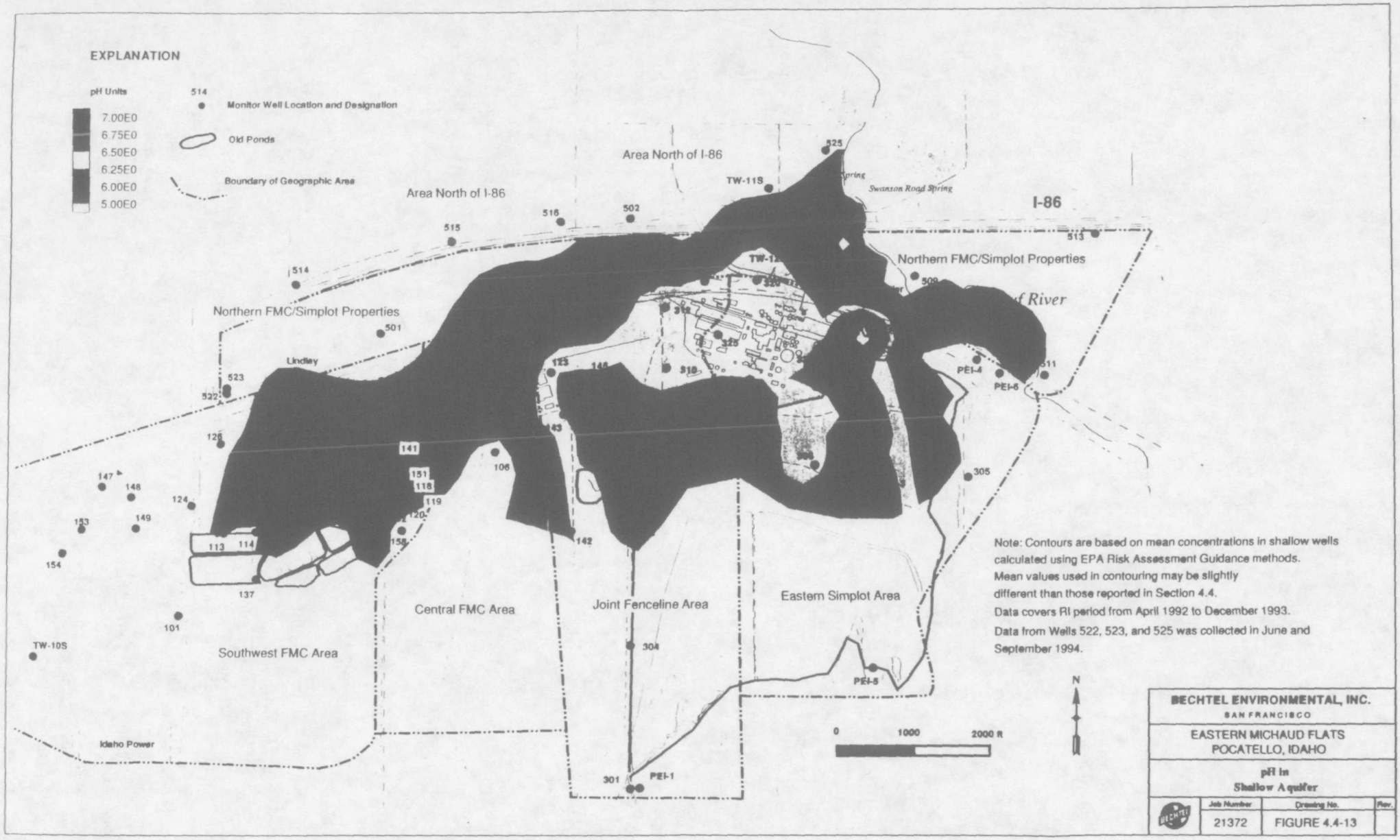
* Deeper Well

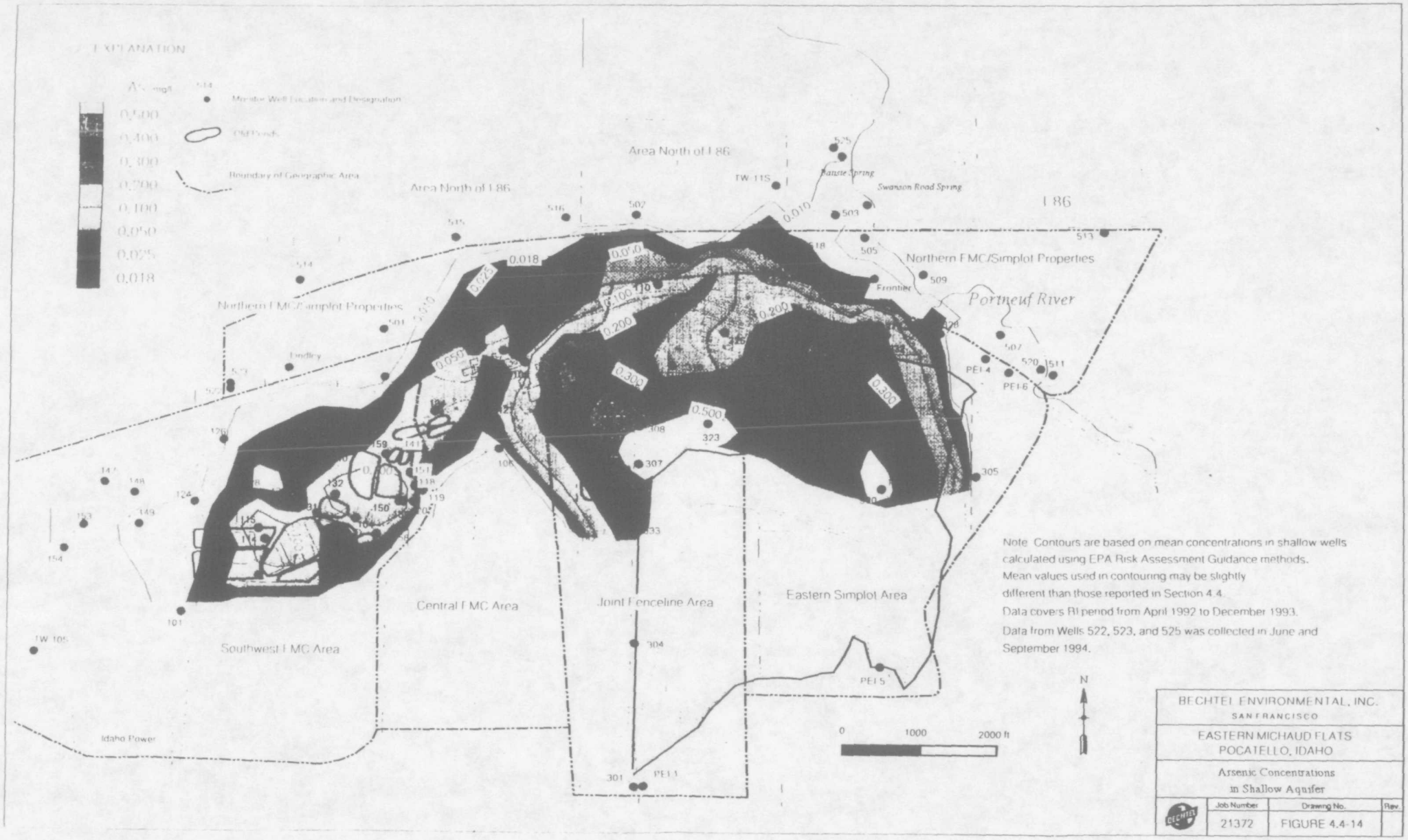
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

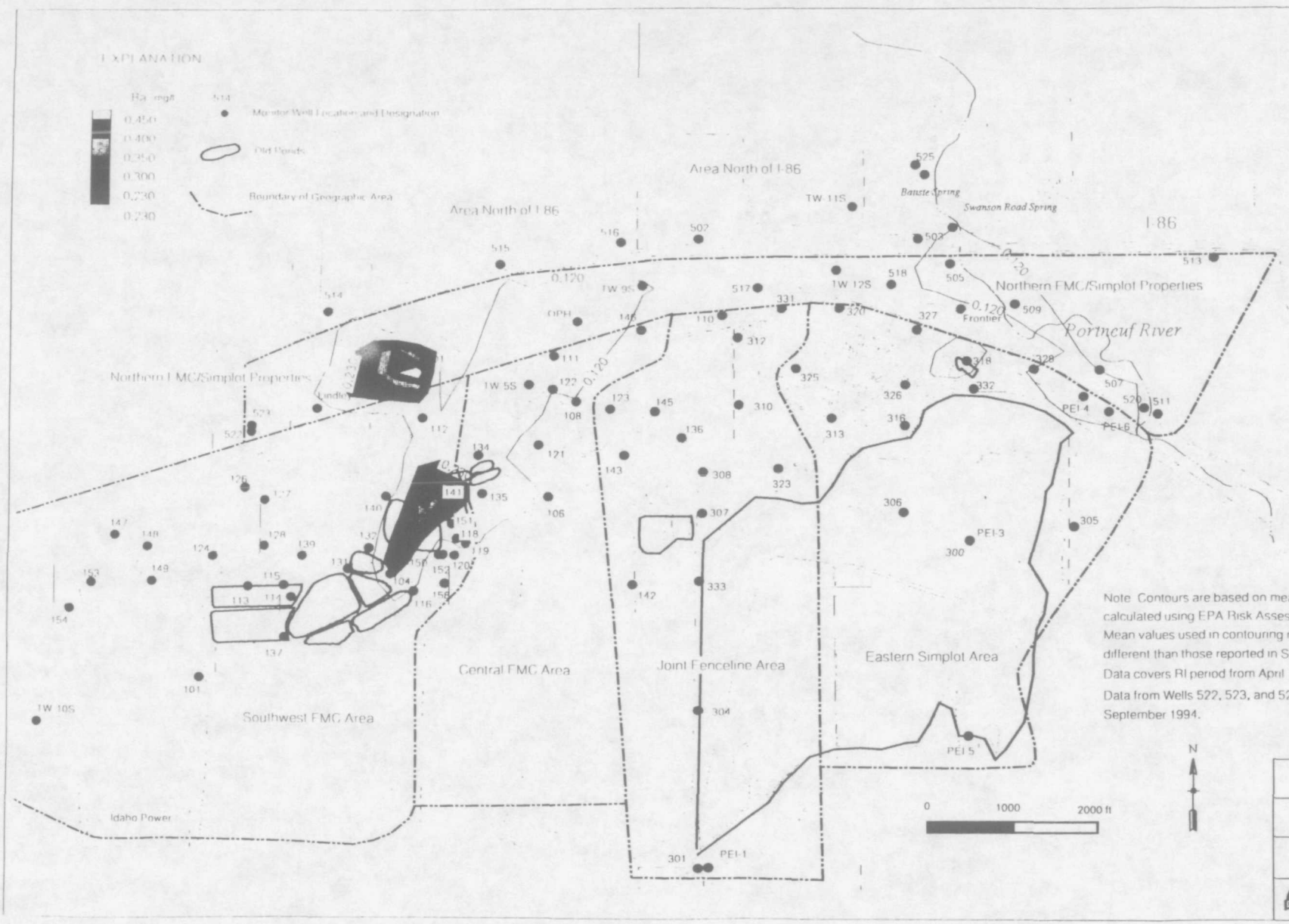
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Temperature Pattern in Groundwater at FMC**

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.4-12 | |


EXPLANATION
pH Units
7.00E0
6.75E0
6.50E0
6.25E0
6.00E0
5.00E0
514
Monitor Well Location and Designation
Old Ponds
Boundary of Geographic Area
Area North of I-86
Area North of I-86
I-86
Northern FMC/Simplot Properties
Northern FMC/Simplot Properties
Lindley
Swanson Road Spring
Central FMC Area
Joint Fenceline Area
Eastern Simplot Area
Southwest FMC Area
Idaho Power
TW-11S
TW-10S
PEI-1
PEI-4
PEI-5
PEI-6
0
1000
2000 ft
N
Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods.
Mean values used in contouring may be slightly different than those reported in Section 4.4.
Data covers RI period from April 1992 to December 1993.
Data from Wells 522, 523, and 525 was collected in June and September 1994.
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
pH in
Shallow Aquifer
Job Number
21372
Drawing No.
FIGURE 4.4-13
Rev.


EXPLANATION
Monitor Well Location and Designation
Old Ponds
Boundary of Geographic Area
0.500
0.400
0.300
0.200
0.100
0.050
0.025
0.018
Area North of I-86
Area North of I-86
I-86
Northern FMC/Simplot Properties
Northern FMC/Simplot Properties
Portneuf River
Swanson Road Spring
Frontier
Lindley
Central FMC Area
Joint Fenceline Area
Eastern Simplot Area
Southwest FMC Area
Idaho Power
0
1000
2000 ft
N
Note Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods.
Mean values used in contouring may be slightly different than those reported in Section 4.4.
Data covers RI period from April 1992 to December 1993.
Data from Wells 522, 523, and 525 was collected in June and September 1994.
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Arsenic Concentrations in Shallow Aquifer
Job Number
21372
Drawing No.
FIGURE 4.4-14
Rev.



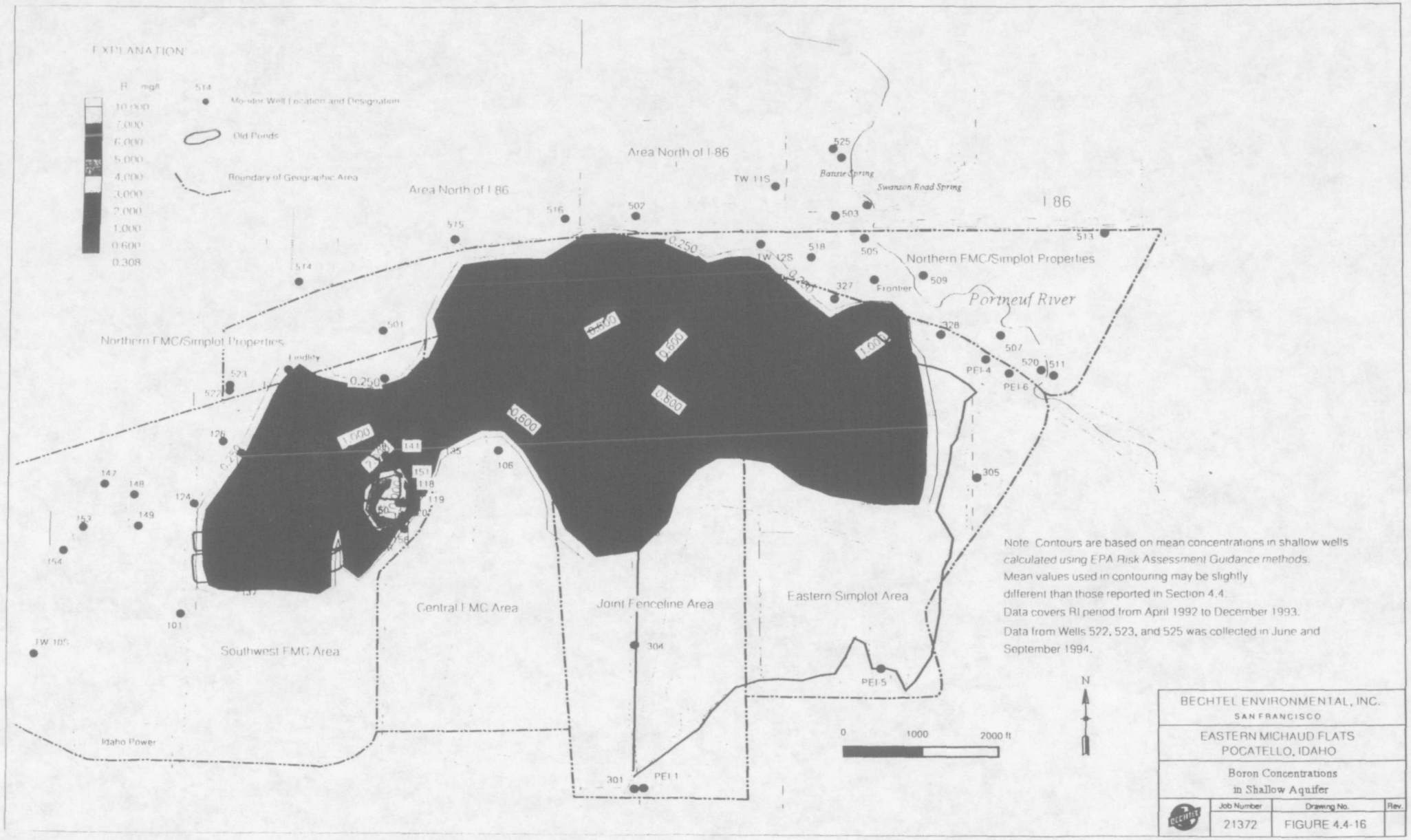

Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4. Data covers RI period from April 1992 to December 1993. Data from Wells 522, 523, and 525 was collected in June and September 1994.

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

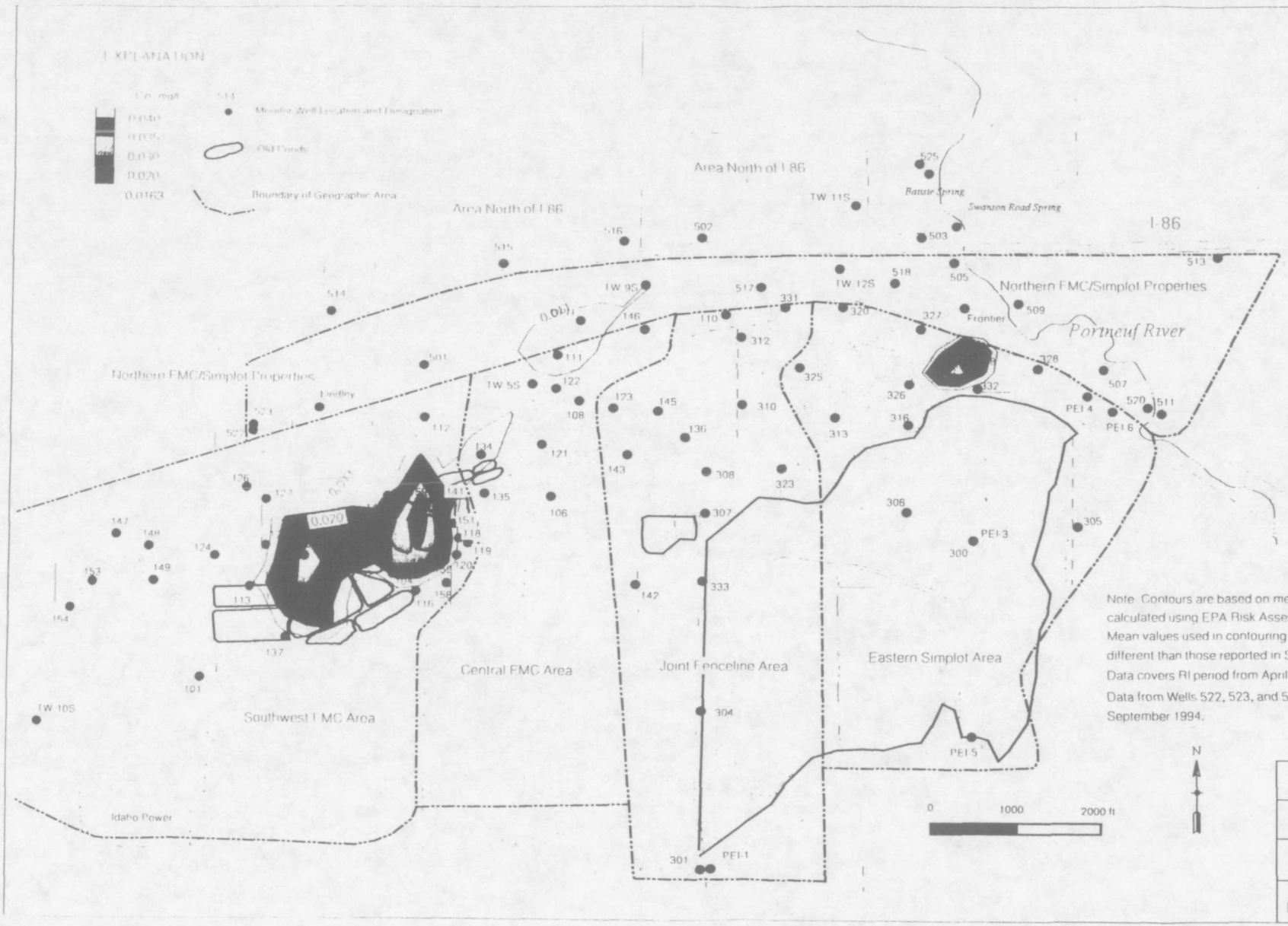
Barium Concentrations in Shallow Aquifer

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.4-15 | |




Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4. Data covers RI period from April 1992 to December 1993. Data from Wells 522, 523, and 525 was collected in June and September 1994.

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| Boron Concentrations in Shallow Aquifer | | |
| Job Number | Drawing No. | Rev. |
| 21372 | FIGURE 4.4-16 | |

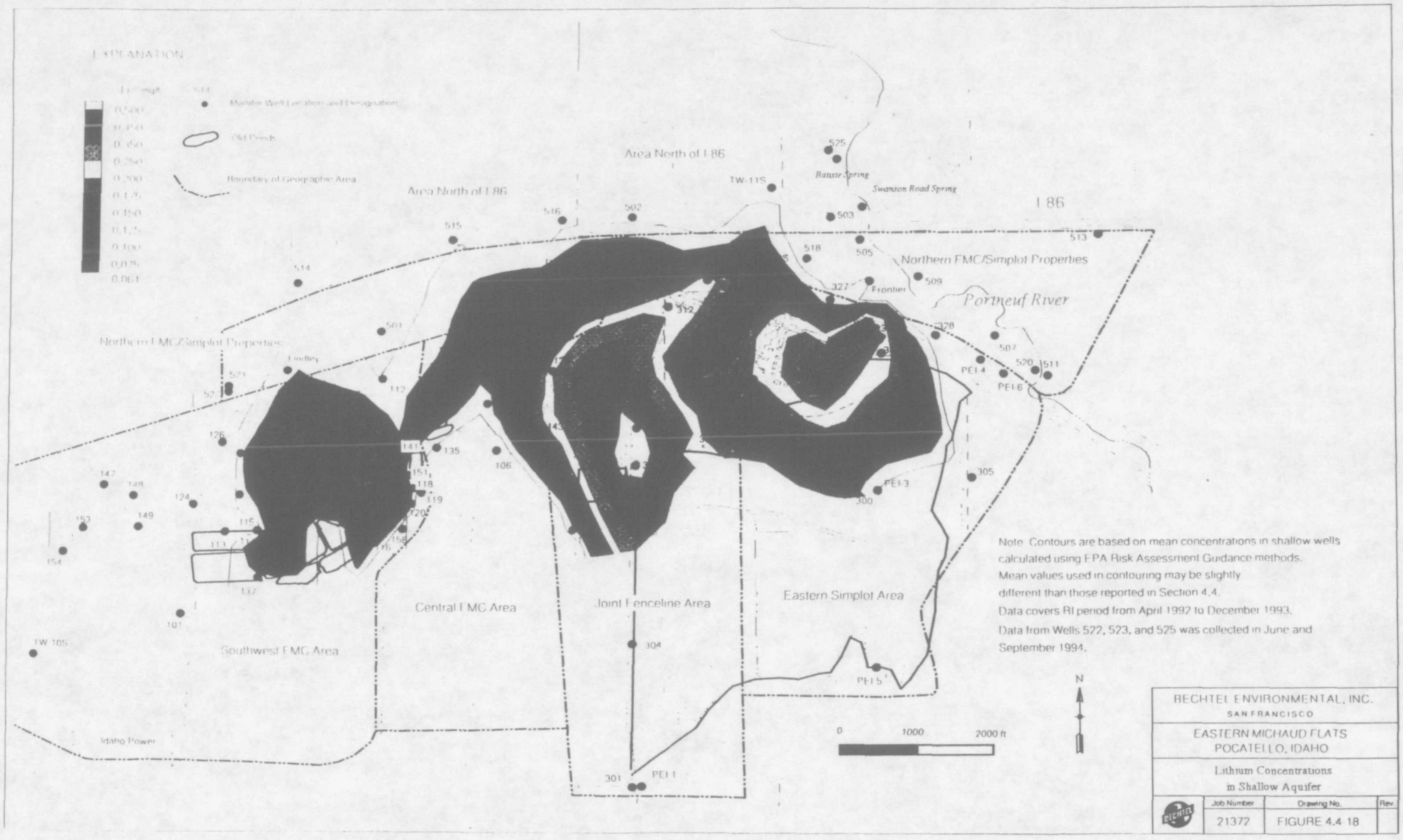


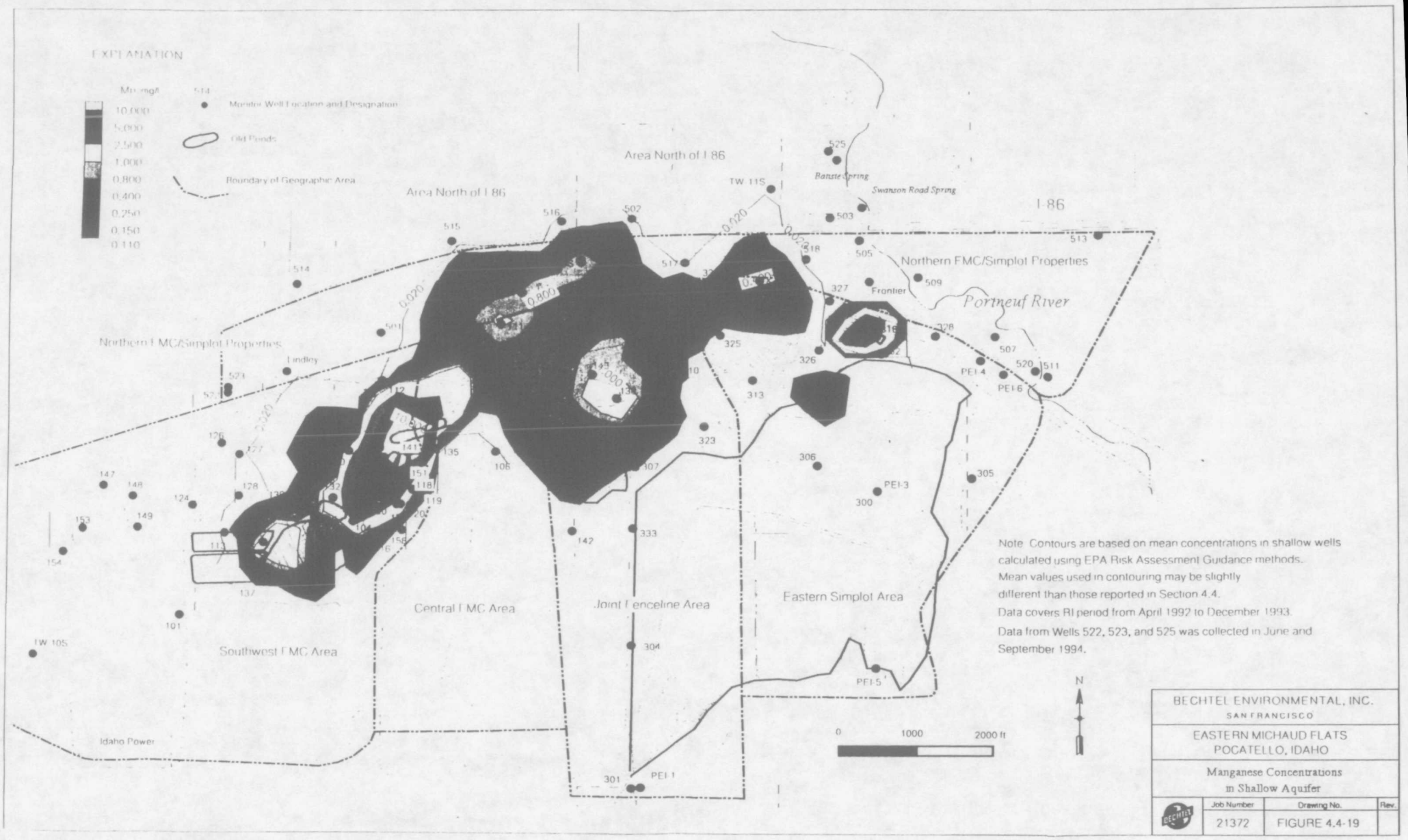

BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

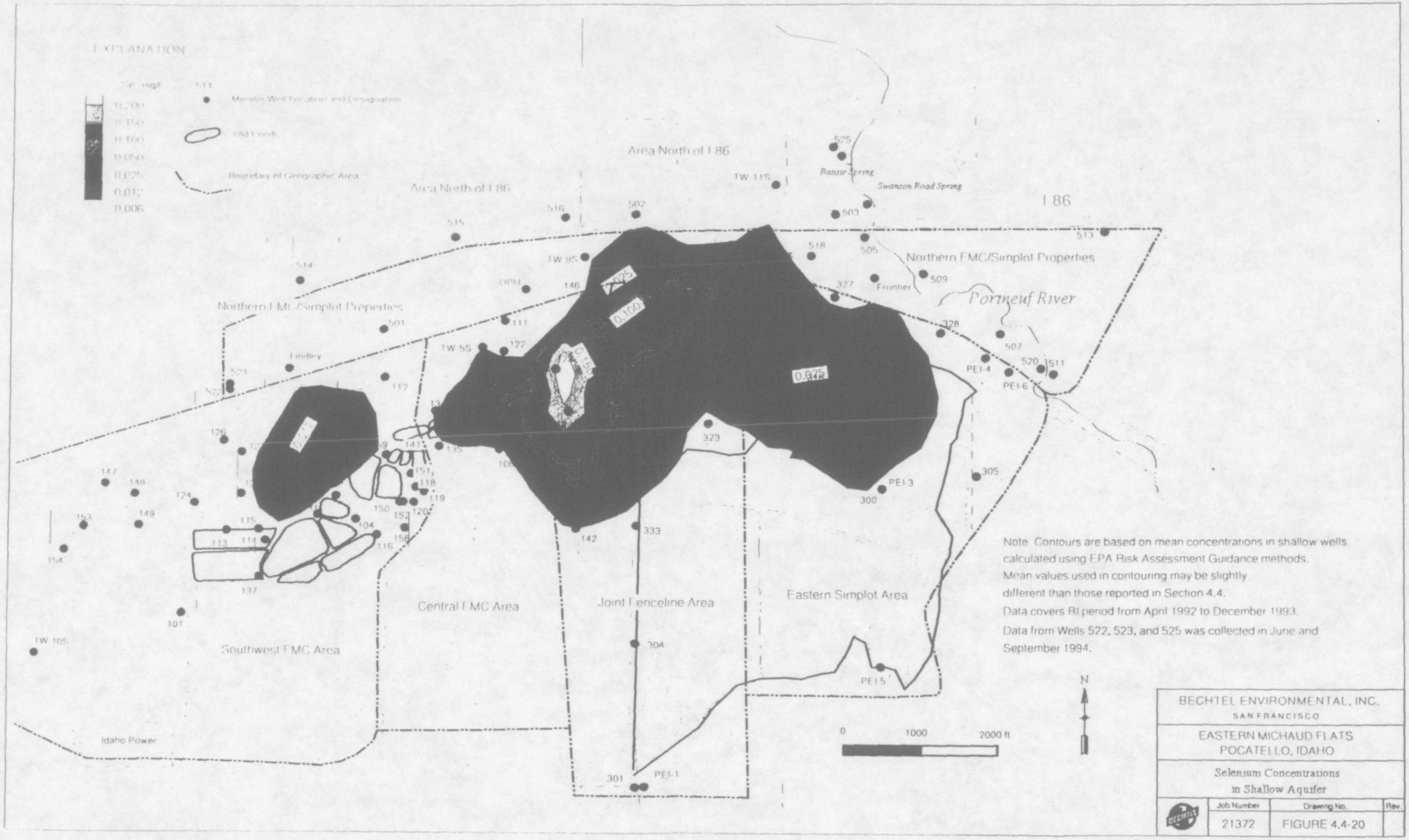
EASTERN MICHAUD FLATS
POCATELLO, IDAHO

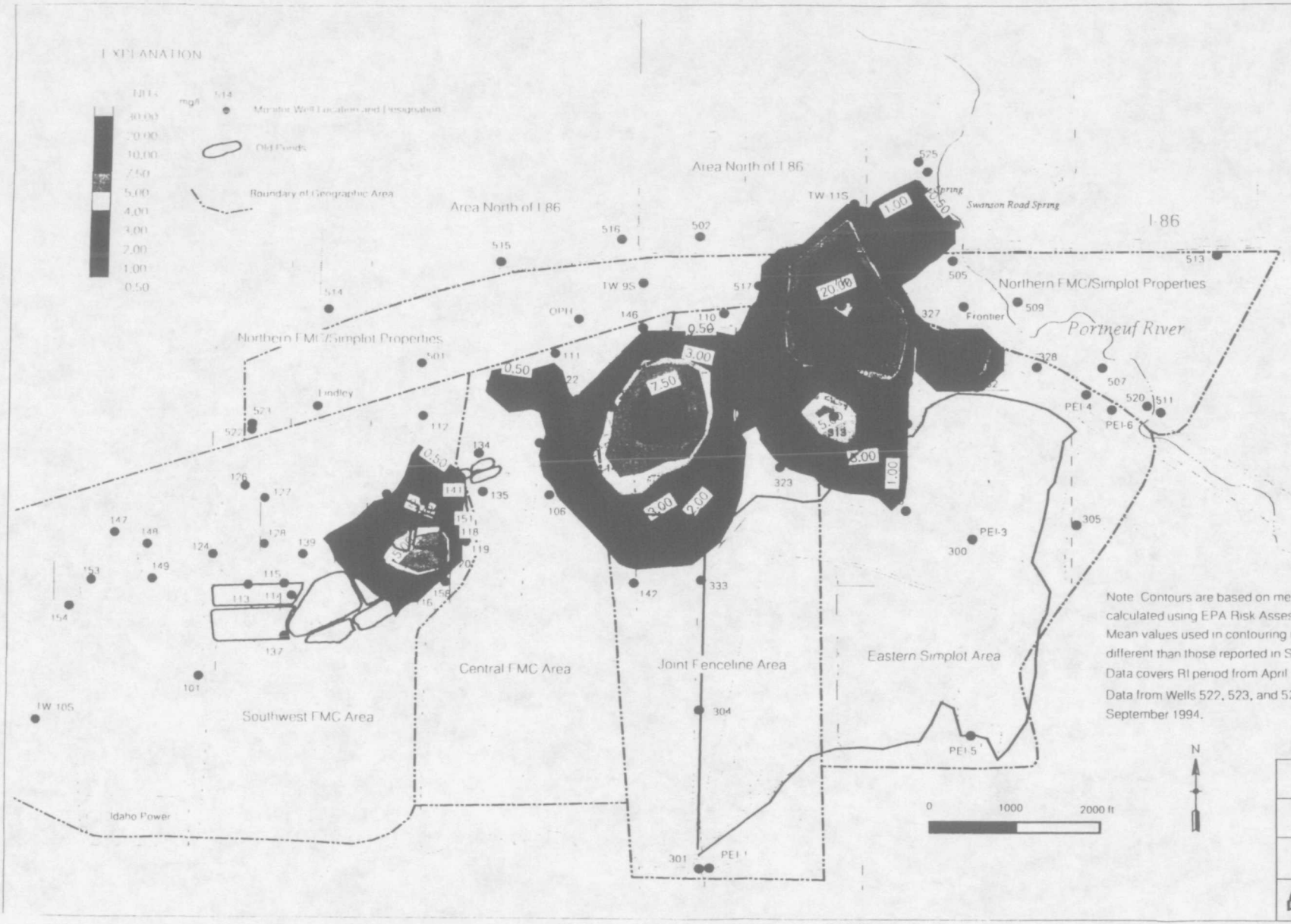
Cobalt Concentrations in Shallow Aquifer

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.4-17 | |


EXPLANATION
Monitor Well Location and Designation
Old Ponds
Boundary of Geographic Area
Area North of I-86
Area North of I-86
I-86
Northern FMC/Simplot Properties
Northern FMC/Simplot Properties
Portneuf River
Batiste Spring
Swanson Road Spring
Frontier
Lindley
Central FMC Area
Joint Fenceline Area
Eastern Simplot Area
Southwest FMC Area
Idaho Power
TW-11S
TW-10S
PEI-1
PEI-3
PEI-4
PEI-5
PEI-6
0
1000
2000 ft
N
Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods.
Mean values used in contouring may be slightly different than those reported in Section 4.4.
Data covers RI period from April 1992 to December 1993.
Data from Wells 522, 523, and 525 was collected in June and September 1994.
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Lithium Concentrations in Shallow Aquifer
Job Number
21372
Drawing No.
FIGURE 4.4-18
Rev.

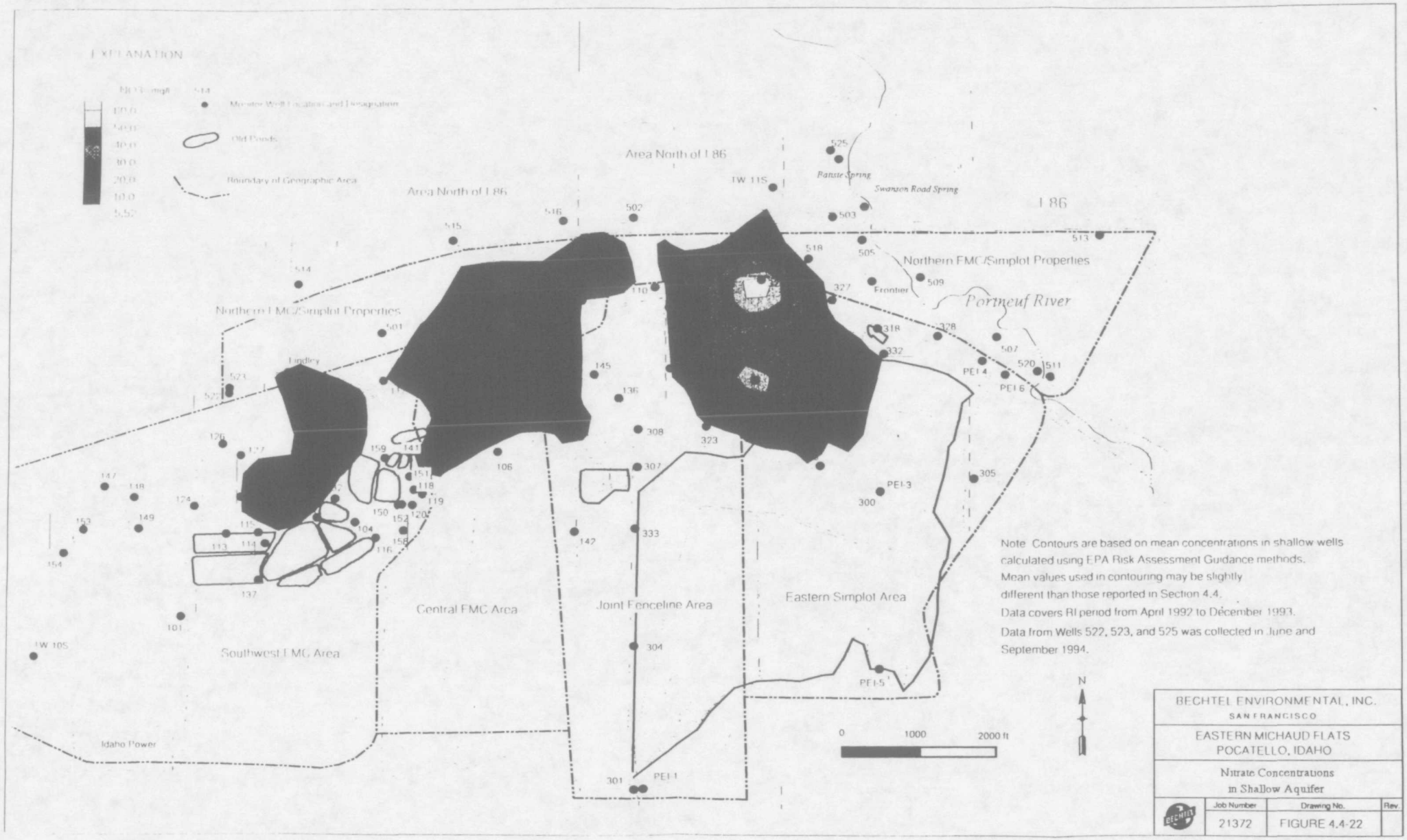

EXPLANATION
Mn mg/l
10,000
5,000
2,500
1,000
0.800
0.400
0.250
0.150
0.110
514
Monitor Well Location and Designation
Old Ponds
Boundary of Geographic Area
Area North of I-86
Area North of I-86
I-86
Northern FMC/Simplot Properties
Northern FMC/Simplot Properties
Portneuf River
Batiste Spring
Swanson Road Spring
Frontier
Lindley
Idaho Power
Southwest FMC Area
Central FMC Area
Joint Fenceline Area
Eastern Simplot Area
TW-11S
TW-10S
PEI-1
PEI-3
PEI-4
PEI-5
PEI-6
0.020
0.800
0.000
Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods.
Mean values used in contouring may be slightly different than those reported in Section 4.4.
Data covers RI period from April 1992 to December 1993.
Data from Wells 522, 523, and 525 was collected in June and September 1994.
0
1000
2000 ft
N
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Manganese Concentrations in Shallow Aquifer
Job Number
21372
Drawing No.
FIGURE 4.4-19
Rev.

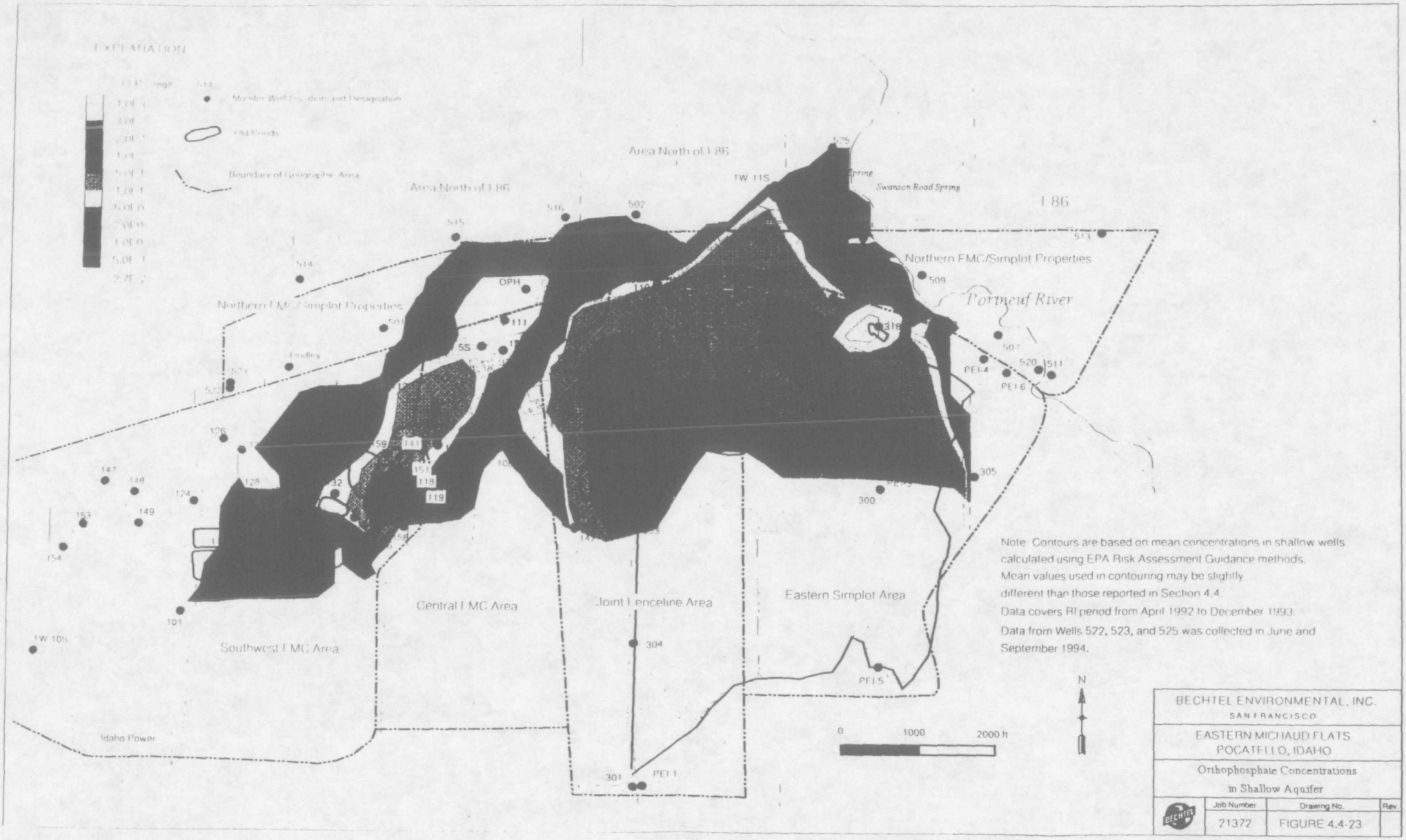

EXPLANATION
Monitor Well Location and Designation
Old Ponds
Boundary of Geographic Area
Area North of I-86
Area North of I-86
I-86
Northern FMC/Simplot Properties
Northern FMC/Simplot Properties
Portneuf River
Batiste Spring
Swanson Road Spring
Frontier
Lindley
Central FMC Area
Joint Fenceline Area
Eastern Simplot Area
Southwest FMC Area
Idaho Power
0.025
0.100
0.075
0
1000
2000 ft
N
Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods.
Mean values used in contouring may be slightly different than those reported in Section 4.4.
Data covers RI period from April 1992 to December 1993.
Data from Wells 522, 523, and 525 was collected in June and September 1994.
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Selenium Concentrations in Shallow Aquifer
Job Number
21372
Drawing No.
FIGURE 4.4-20
Rev.

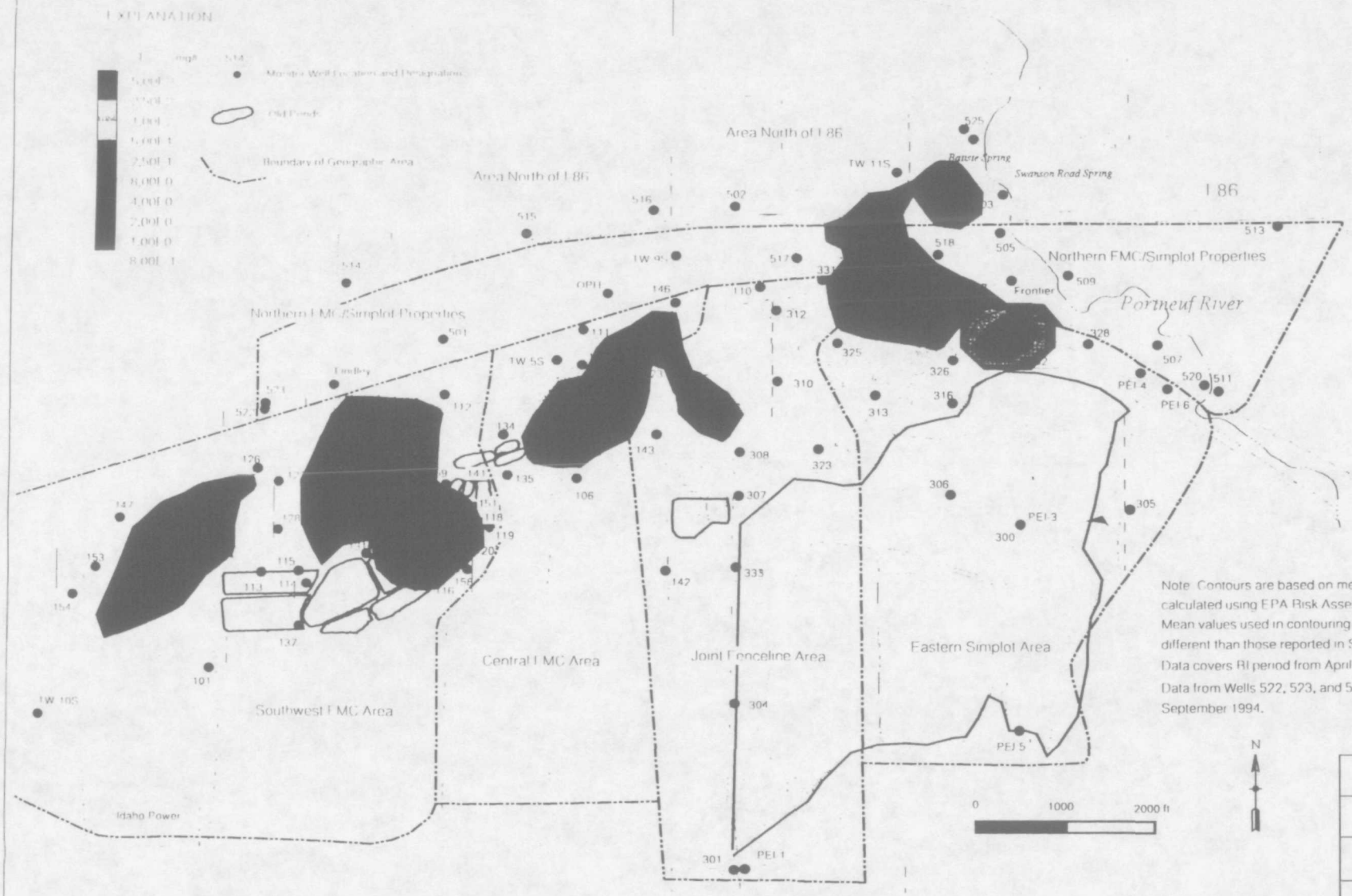



Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4. Data covers RI period from April 1992 to December 1993. Data from Wells 522, 523, and 525 was collected in June and September 1994.

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| Ammonia Concentrations in Shallow Aquifer | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.4-21 | |


EXPLANATION
Monitor Well Location and Designation
Old Ponds
Boundary of Geographic Area
Area North of I 86
Area North of I 86
I 86
Northern FMC/Simplot Properties
Northern FMC/Simplot Properties
Portneuf River
Batsie Spring
Swanson Road Spring
Frontier
Lindley
Central FMC Area
Joint Fenceline Area
Eastern Simplot Area
Southwest FMC Area
Idaho Power
Note Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods.
Mean values used in contouring may be slightly different than those reported in Section 4.4.
Data covers RI period from April 1992 to December 1993.
Data from Wells 522, 523, and 525 was collected in June and September 1994.
0
1000
2000 ft
N
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Nitrate Concentrations in Shallow Aquifer
Job Number
21372
Drawing No.
FIGURE 4.4-22
Rev.


EXPLANATION
Monitor Well Designation and Designation
Old Ponds
Boundary of Geographic Area
Area North of I-86
Area North of I-86
I-86
Northern FMC/Simplot Properties
Northern FMC/Simplot Properties
Portneuf River
Swanson Road Spring
Spring
Central FMC Area
Joint Fenceline Area
Eastern Simplot Area
Southwest FMC Area
Idaho Power
Note: Contours are based on mean concentrations in shallow wells calculated using EPA Risk Assessment Guidance methods.
Mean values used in contouring may be slightly different than those reported in Section 4.4.
Data covers RI period from April 1992 to December 1993.
Data from Wells 522, 523, and 525 was collected in June and September 1994.
0
1000
2000 ft
N
BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO
EASTERN MICHAUD FLATS
POCATELLO, IDAHO
Orthophosphate Concentrations
in Shallow Aquifer
Job Number
21372
Drawing No.
FIGURE 4.4-23
Rev.

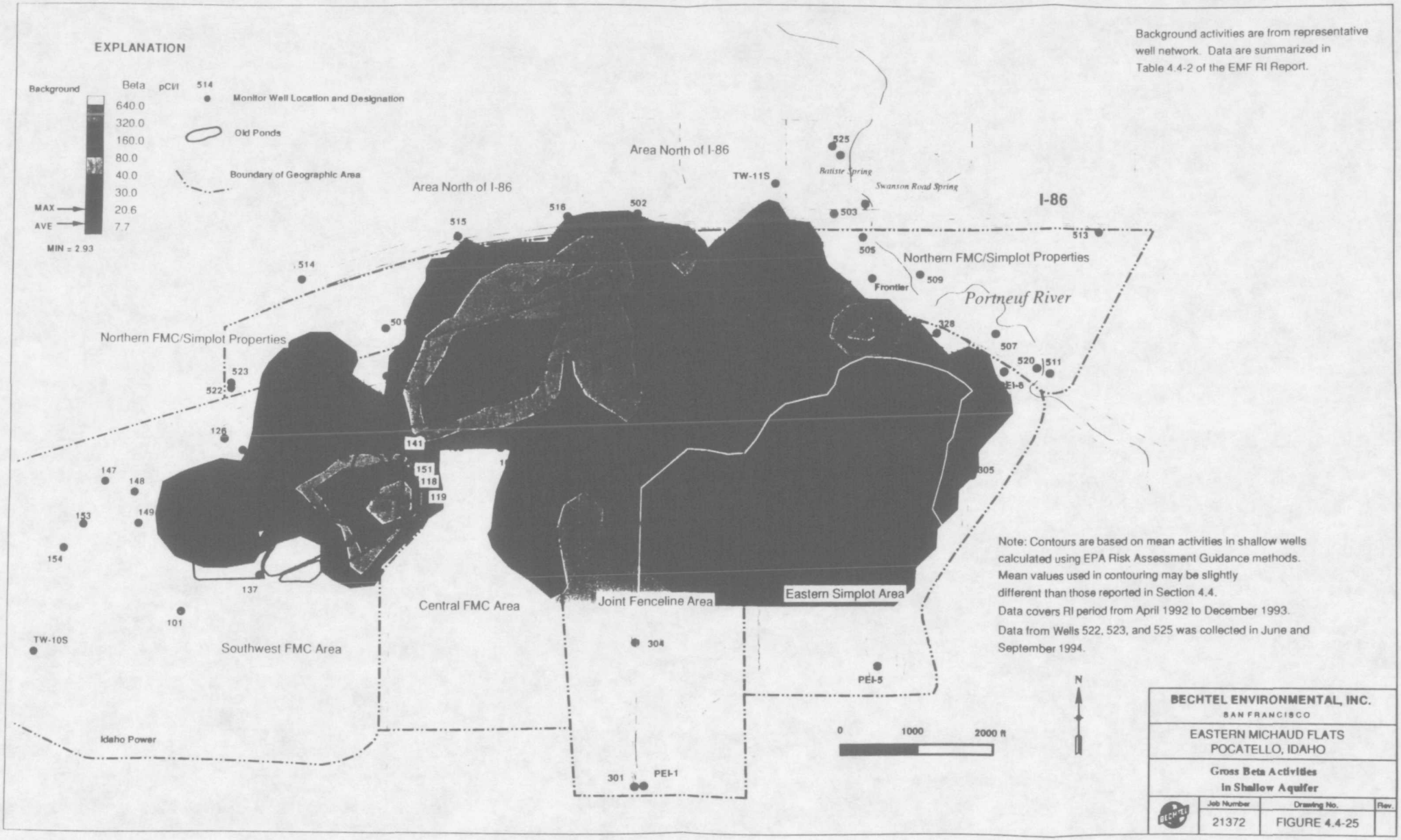



BECHTEL ENVIRONMENTAL, INC.
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

Fluoride Concentrations in Shallow Aquifer

| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.4-24 | |




Background activities are from representative well network. Data are summarized in Table 4.4-2 of the EMF RI Report.

Note: Contours are based on mean activities in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4.

Data covers RI period from April 1992 to December 1993.

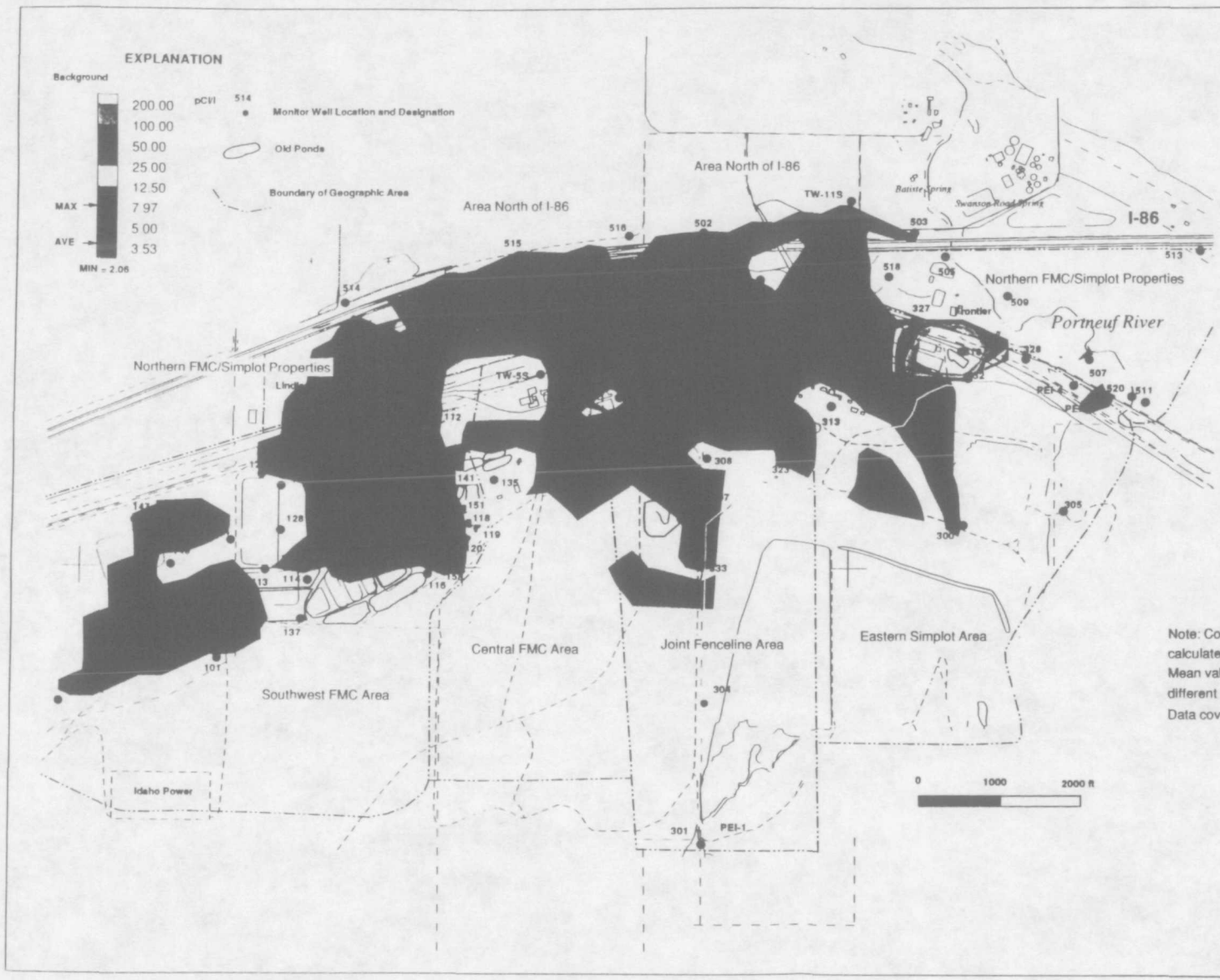
Data from Wells 522, 523, and 525 was collected in June and September 1994.

**BECHTEL ENVIRONMENTAL, INC.**
SAN FRANCISCO

EASTERN MICHAUD FLATS
POCATELLO, IDAHO

**Gross Beta Activities in Shallow Aquifer**

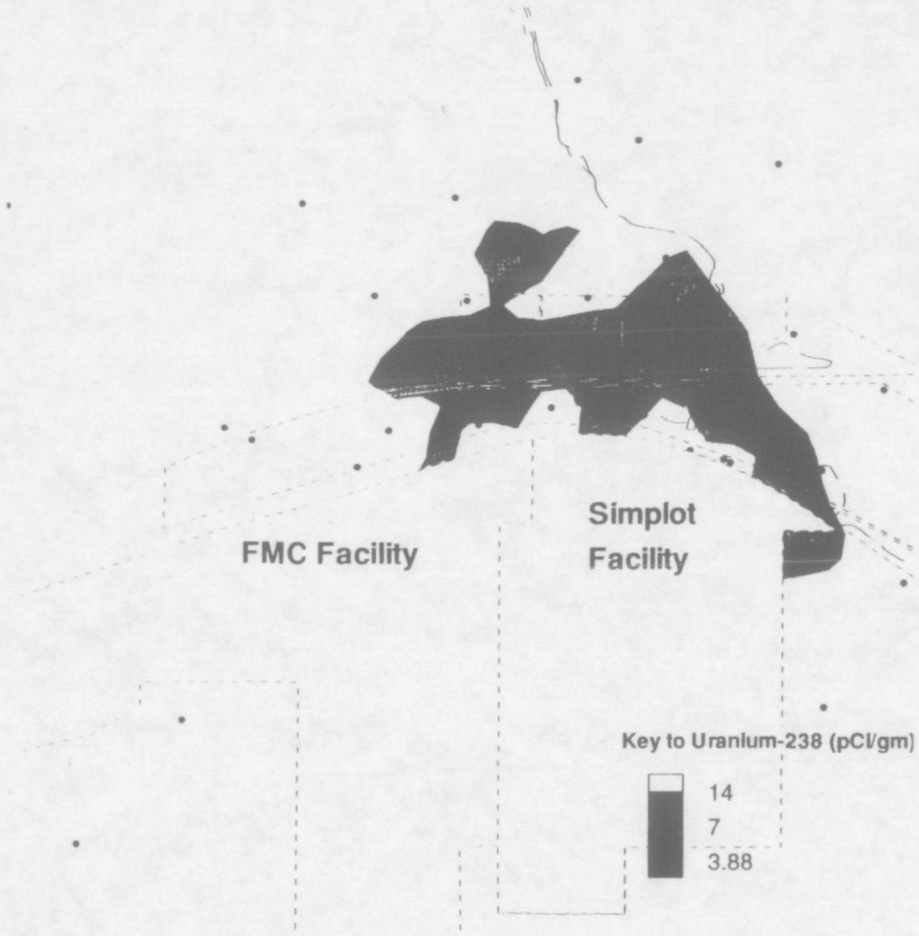
| Job Number | Drawing No. | Rev. |
|---|---|---|
| 21372 | FIGURE 4.4-25 | |



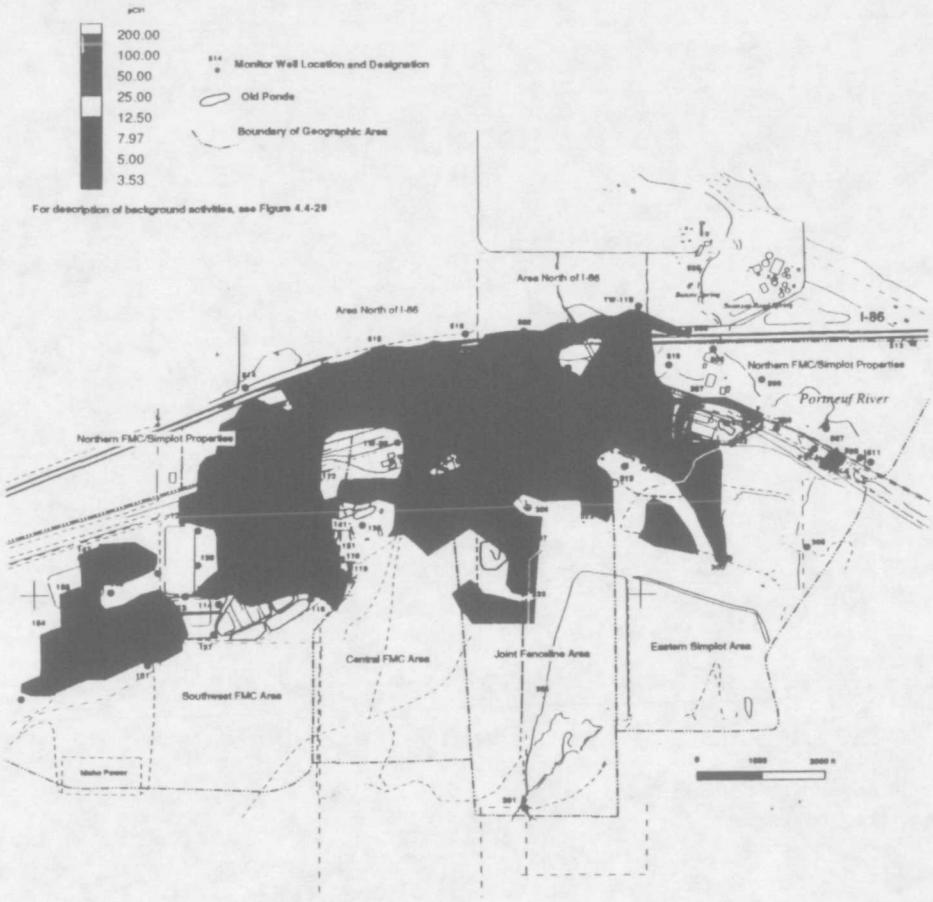

Background activities are from representative well network. Data are summarized in Table 4.4-2 of the EMF RI Report.

Note: Contours are based on mean activities in shallow wells calculated using EPA Risk Assessment Guidance methods. Mean values used in contouring may be slightly different than those reported in Section 4.4. Data covers RI period from April 1992 to December 1993.

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | |
|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | |
| Gross Alpha Activities in Shallow Aquifer | | |
| Job Number | Drawing No. | Rev. |
| 21372 | FIGURE 4.4-26 | |




U-238 in Surface Soils




Gross Alpha in Shallow Aquifer

| BECHTEL ENVIRONMENTAL, INC. SAN FRANCISCO | | | |
|---|---|---|---|
| EASTERN MICHAUD FLATS POCATELLO, IDAHO | | | |
| U-238 in Soil vs. Gross Alpha in Shallow Aquifer | | | |
| | Job Number | Drawing No. | Rev. |
| | 21372 | FIGURE 4.4-27 | |