# SWMU 14 - Roaster Solids Area

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## 5.5.14 SWMU 14 – Roaster Solids Area

The location of Solid Waste Management Unit (SWMU) 14 is shown on Figure 5.5.14-1a and SWMU 14 monitoring stations and sample locations are provided on Figure 5.5.14-1b. SWMU 14, the Roaster Solids Area, is located on the east side of the property just north of the Granulated Slag Pile, (SWMU13), south of the Raw Materials Area (SWMU 6) and east of the Coarse Slag Pile (SWMU 12). There is a small pile of coke dust fines located on the north end of the Roaster Solids Pile. Roaster solids are the solid material by-product from the Roaster Operation, in which crude phosphorus sludge from the 100 foot clarifier or phosphorus handling operation was mixed with kiln nodule fines and heated to vaporize the phosphorus from the sludge material. Crude phosphorus material and kiln nodule fines were metered into the externally heated rotary kiln where the elemental phosphorus was vaporized. The vaporized phosphorus was then condensed and stored in P4 storage tanks. The remaining solid material, the roaster solids, were discharged at the end of the rotary kiln and stockpiled at the present location.

The Roaster solids were recycled in the roaster process, or recycled to the kiln as a raw material. Roaster solids are a sand-like material that were always stockpiled in an area north of the Granulated Slag Pile (SWMU 13). The stockpile is approximately 450 feet by 260 feet by 20 feet high and is estimated to contain 75,000 cubic yards of roaster solids.

Tests of this material show that it is about 40 percent CaO (lime), 30 percent $P_2O_5$ (phosphate), 15 percent $SiO_2$ (silica), 2 to 3 percent F (Fluoride), 1 to 2 percent $Fe_2O_3$ (iron oxide), and the balance (about 10 percent) is water. Like slag, roaster solids have been subjected to high heat, but unlike slag, roaster solids have not been melted and reconstituted as rock.

### 5.5.14.1 Prior Investigation

Information, evaluations, and data regarding the roaster solids are reported in the following documents:

- Current Conditions/Release Assessment Report, Corrective Action Order on Consent, Docket No. RCRA-08-2004-0001, Rhodia Silver Bow Plant, Butte, Montana, prepared by Barr Engineering, dated February 9, 2006 (CCRA) (*see* Section 2.7.2.2.6 of the CCRA).

Available analytical data for roaster solids include:

- Toxicity characteristic leaching procedure (TCLP) and extraction procedure toxicity method (EPTOX)– metals

- General and Site-specific parameters (total and ASTM water leach)
- Metals (total and ASTM water leach)
- Radionuclides (total and ASTM water leach)
- Volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs)

Roaster solids data from SWMU 14 were compared to the background/reference area concentrations. Concentrations above the 95% upper confidence limit of the mean background/reference area concentrations are highlighted on the constituent delineation figures presented in this section. Where a 95% upper limit could not be calculated, the maximum detected concentration or the maximum detection limit was selected.

Constituent concentrations are described in this report as above background/reference area concentrations if the mean and maximum concentrations of the SWMU data exceed both of the mean and maximum background/reference area values. All data will be retained for evaluation in the human health and ecological risk assessments. The definitive background comparison will be conducted in the risk assessment using a statistical approach consistent with EPA guidance (U.S. EPA 2002).

Low concentrations of metals were reported in EPTOX and TCLP tests at concentrations below hazardous waste levels (*see* Table 5.5.14-1). VOCs and SVOCs were not detected in the roaster solids samples (*see* Table 5.5.14-5 and 5.5.14-6, respectively). Several metals were detected in the ASTM D3987 leach test (*see* Table 5.5.14-7). Fluoride, calcium, magnesium, potassium, sodium, phosphorus, and sulfate were detected in the ASTM leachate. Radionuclides were not detected in the ASTM leach.

#### 5.5.14.2 RFI Investigation Activities

To further characterize the leaching potential of the roaster solids, leachate analyses was conducted on two composite roaster solids samples using EPA Method 1312 – Synthetic Precipitation Leaching Procedure (SPLP). Each composite sample was composed of five subsamples that were collected as described in the Field Sampling Plan. The centroid location of each subsample is shown on Figure 5.5.14-1b. The resulting leachate from the composite samples was analyzed for site-specific parameters, general parameters, metals, and radionuclides.

Three composite samples were collected in October 2012 to further characterize the roaster solids. Each composite sample was composed of five subsamples that were collected as described in the

Field Sampling Plan. The location of each subsample and the centroid location of the subsamples are shown on Figure 5.5.14-1b. The samples were analyzed for site-specific parameters, general parameters, metals, and radionuclides.

### 5.5.14.3 RFI Investigation Results

The analytical results for the roaster solids samples for the general and site-specific parameters, radionuclides and metals are summarized in Tables 5.5.14-2, 5.5.14-4, and 5.5.14-3, respectively, and presented on Figures 5.5.14-2, 5.5.14-3 and 5.5.14-4, respectively.

Fluoride, orthophosphate as P, and total phosphorus were detected in the solids samples (*see* Table 5.5.14-2). Fluoride concentrations are elevated compared to background soil concentrations.

Elemental phosphorus was not detected (DL = 0000015 mg/kg) in the roaster solids samples.

The metals concentrations in the roaster solids samples are generally consistent between the 1992, 1997, 2003 and 2012 sample results (*see* Table 5.5.14-3). The following metals have elevated concentrations compared to background soil concentrations: antimony, beryllium, cadmium, calcium, lead, nickel, selenium, silver, sodium, thallium, uranium, vanadium, and zinc.

The radionuclide results for the 2012 samples are generally similar to the 2003 sample results (*see* Table 5.5.14-4). The radionuclide concentrations are elevated compared to background soil concentrations.

The metals and radionuclide concentrations in the roaster solids may not preclude their use as a phosphorus-rich fertilizer or soil amendment. The corrective measures study should address potential uses of the phosphorus-rich material.

Fluoride and total phosphorus are the only general and site-specific parameters detected in the leachate generated by the synthetic precipitation leaching procedure (SPLP) (Table 5.5.14-8). Elemental phosphorus was not detected (DL = 0.000023 ug/L) in the SPLP leachate. The metals detected in the SPLP leachate were arsenic, beryllium, cadmium, calcium, chromium, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, uranium and vanadium (*see* Table 5.5.14-9). Although radium 226 is present at about 18 to 35 pCi/g in the solids (*see* Table 5.5.14-4), it was only detected in the leachate of one SPLP sample at 1.2 pCi/L. Gross alpha and gross beta were detected in both SPLP samples (*see* Table 5.5.14-10).

### 5.5.14.4 Conclusions

Roaster solids are a sand-like material that remains after the crude phosphorus is roasted. The roaster solids were stockpiled separately onsite for reuse in the roasting process, or recycled to the kiln as a raw material. Roaster solids are stockpiled in an area north of the granulated slag pile (*see* Figure 5.5.14-1b). The stockpile is approximately 450 feet by 260 feet by 20 feet high and is estimated to contain 75,000 cubic yards of roaster solids.

Certain metals and radionuclides are present in the roaster solids at concentrations above the background/reference area concentrations. However, the metals and radionuclide concentrations may not preclude the roaster solids from being used as a phosphorus-rich fertilizer or soil amendment.

Cadmium and gross alpha are the only parameters detected in the SPLP leachate at a concentration above its maximum contaminant level for drinking water.

There is sufficient information to conduct the risk assessment for this SWMU. The risk assessment will identify which parameters, if any, are present at concentrations that warrant corrective measures. The dataset would be reviewed at that time and additional sampling may be necessary to inform the corrective measures study or later during the corrective measures design phase.

### 5.5.14.5 References

U.S. EPA. 2002. Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites. U.S. Environmental Protection Agency. EPA 540-R-01-003. OSWER 9285.7-41. September 2002.

# Tables

## Table 5.5.14-1

## Roaster Solids Data - TCLP and EPTOX Metals
## Rhodia Silver Bow Plant

| Station ID | Roaster Solids | | Roaster Solids | | Roaster Solids | | Roaster Solids | |
|---|---|---|---|---|---|---|---|---|
| Sample Date | 11/14/1989 | | 1/22/1992 | | 12/15/1992 | | 8/24/1993 | |
| Sample ID | Roaster Residue | | Roaster Residue | | Roaster Residue | | #6-Roaster Res. | |
| Lab Name | | | Century | | Century | | Century | |
| Lab ID | 100858 | | 8880-2 | | 10534-2 | | 10534-2 | |
| Report | Material Charac | | Material Charac | | Material Charac | | Material Charac | |
| | | | | | | | | |
| Arsenic, TCLP | | | 0.015 U | mg/l | 0.021 U | mg/l | 0.33 U | mg/l |
| Barium, TCLP | | | 0.068 | mg/l | 0.06 U | mg/l | 1.5 | mg/l |
| Cadmium, TCLP | | | 0.167 | mg/l | 0.046 | mg/l | 0.1 | mg/l |
| Chromium, TCLP | | | 0.041 | mg/l | 0.128 | mg/l | 0.32 U | mg/l |
| Lead, TCLP | | | 0.04 U | mg/l | 0.052 | mg/l | 0.1 | mg/l |
| Mercury, TCLP | | | 0.0003 U | mg/l | 0.0003 U | mg/l | 0.0005 U | mg/l |
| Selenium, TCLP | | | 0.02 U | mg/l | 0.618 | mg/l | 0.05 U | mg/l |
| Silver, TCLP | | | 0.006 U | mg/l | 0.003 U | mg/l | 1.2 U | mg/l |
| Arsenic, EPTOX | 0.006 | mg/l | | | | | | |
| Barium, EPTOX | 0.1 U | mg/l | | | | | | |
| Cadmium, EPTOX | 0.181 | mg/l | | | | | | |
| Chromium, EPTOX | 0.2 | mg/l | | | | | | |
| Lead, EPTOX | 0.18 | mg/l | | | | | | |
| Mercury, EPTOX | 0.001 U | mg/l | | | | | | |
| Selenium, EPTOX | 0.005 U | mg/l | | | | | | |
| Silver, EPTOX | 0.02 U | mg/l | | | | | | |

**Table 5.5.14-2**
**Roaster Solids Data - General and Site-Specific Parameters**
**SWMU 14**
**Rhodia Silver Bow Plant**
**[concentrations in mg/kg]**

| Chemical Name | | | | Fluoride | Orthophosphate as P | Phosphorus, elemental (white) | Phosphorus, total |
|---|---|---|---|---|---|---|---|
| Background Mean, Exceedances **Bold** | | | | **4.1** | | | |
| Background Maximum, Exceedances Underline | | | | 37 | | | |
| Background 95% UCL, Exceedances *Italic* | | | | *7.6* | | | |
| **Location ID** | **Sample Date** | **Depth** | **Sample Type** | | | | |
| ESI-RSP-1 | 07/21/2003 | | N | ***53*** | 210 | -- | 100000 J |
| ESI-SSS-1 | 07/21/2003 | 0 - 2 in | N | ***17*** | 27 | -- | 87000 J |
| RS-03-COMP | 10/04/2012 | | N | 123 R | -- | < 0.000015 J | 135000 |
| | | | FD | 4.31 R | -- | < 0.000015 J | 129000 |
| RS-04-COMP | 10/04/2012 | | N | ***9.35*** | -- | < 0.000015 J | 137000 |
| RS-05-COMP | 10/04/2012 | | N | **4.51** | -- | < 0.000015 J | 131000 |

**Table 5.5.14-3**
**Roaster Solids Data - Metals**
**SWMU 14**
**Rhodia Silver Bow Plant**
**[concentrations in mg/kg]**

| Chemical Name / Analysis Location | | | | Aluminum Lab | Antimony Lab | Arsenic Lab | Barium Lab | Beryllium Lab | Cadmium Lab | Calcium Lab | Chromium Lab | Cobalt Lab | Copper Lab | Iron Lab | Lead Lab | Magnesium Lab | Manganese Lab | Mercury Lab | Nickel Lab | Potassium Lab | Selenium Lab | Silver Lab | Sodium Lab | Thallium Lab | Uranium Lab | Vanadium Lab | Zinc Lab |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Background Mean, Exceedances **Bold** | | | | | **0.50** | 23 | 150 | **0.51** | **1.6** | **3900** | **11** | 5.9 | **35** | 19600 | **17** | 3500 | 540 | 0.021 | **5.3** | 3000 | **0.41** | **0.73 (1)** | **140** | **0.35** | **1.8** | **41** | **59** |
| Background Maximum, Exceedances Underline | | | | | 3.9 | 120 | 290 | 1.3 | 8.9 | 14000 | 48 | 9.5 | 300 | 35300 | 190 | 5700 | 1100 | 0.20 | 21 | 5300 | 0.70 | 1.7 (1) | 620 | 1.0 | 4.1 | 83 | 380 |
| Background 95% UCL, Exceedances *Italic* | | | | | *1* | 40 | 170 | *0.55* | *1.1* | *4500* | *12* | 6.1 | *64* | 20600 | *35* | 3700 | 570 | 0.038 | *6* | 3200 | 0.47 | *0.35 (1)* | *220* | *0.46* | *2.0* | *43* | *98* |
| **Location ID** | **Sample Date** | **Depth** | **Sample Type** | | | | | | | | | | | | | | | | | | | | | | | | |
| WF134 | 10/1/1992 | | N | -- | < 3 | < 2 | 62.5 | ***2.1*** | ***7.6*** | ***114000*** | ***431*** | 4.5 | **36.5** | 4340 | 13 | 964 | 63.1 | -- | ***2420*** | 2840 | < 3 | ***3.3*** | ***866000*** | ***178*** | ***--*** | ***493*** | ***318*** |
| RR001-97 | 2/11/1997 | | N | -- | -- | < 5 | 39 | -- | ***20*** | -- | ***250*** | -- | ***--*** | -- | ***65*** | -- | -- | -- | -- | -- | < 5 | ***31*** | -- | -- | -- | -- | -- |
| RR002-97 | 2/11/1997 | | N | -- | -- | < 5 | 42 | -- | ***21*** | -- | ***270*** | -- | ***--*** | -- | ***70*** | -- | -- | -- | -- | -- | ***5*** | ***34*** | -- | -- | -- | -- | -- |
| ESI-RSP-1 | 07/21/2003 | | N | 7170 | ***10.5 J*** | 10.9 | 62.7 | ***0.97 J*** | ***40.6*** | ***274000*** | ***429*** | 2.3 J | ***113*** | 4940 | ***296*** | 1960 | 78.9 | < 0.096 | ***65.0*** | 2950 | ***1.8 J*** | ***124 J*** | ***1490*** | ***1.5 J*** | -- | ***537*** | ***4040*** |
| ESI-SSS-1 | 07/21/2003 | 0 - 2 in | N | 5350 | ***6.7 J*** | 8.2 | 54.4 | ***0.79 J*** | ***31.8*** | ***264000*** | ***358*** | 1.9 J | ***97.8*** | 4150 | ***173*** | 2590 | 64.4 | < 0.10 | ***71.5*** | 2390 | ***0.96 J*** | ***110 J*** | ***2030*** | < 5.0 | -- | ***488*** | ***4200*** |
| RS-03-COMP | 10/04/2012 | | N | -- | ***4.22*** | 1.93 | 55.3 | ***0.84 J*** | 32.74 R | ***293000*** | ***388*** | 1.19 J | ***72.3 J*** | 4760 | ***108 J*** | 2040 | 60.3 | < 0.002 | ***97.8*** | 1930 J | ***4.5*** | ***45.2*** | ***1110 J*** | ***6.960 J*** | ***113 J*** | ***571*** | ***3540*** |
| | | | FD | -- | ***4.27*** | 1.85 | 54.5 | ***0.86 J*** | 36.73 R | ***281000*** | ***369*** | 1.91 J | ***69.8 J*** | 4620 | ***110 J*** | 1780 | 66.4 | 0.004 J | ***90.0*** | 2040 J | ***3.6*** | ***48.2*** | ***1080 J*** | ***7.470 J*** | ***116 J*** | ***546*** | ***3920*** |
| RS-04-COMP | 10/04/2012 | | N | -- | ***4.88*** | 3.17 | 55.4 | ***1.00 J*** | 31.36 R | ***293000*** | ***381*** | 1.54 J | ***79.5 J*** | 4930 | ***134 J*** | 2490 | 66.4 | 0.007 J | ***103*** | 2320 J | ***4.2*** | ***50.2*** | ***1140 J*** | ***8.500 J*** | ***124 J*** | ***686*** | ***5130*** |
| RS-05-COMP | 10/04/2012 | | N | -- | ***3.50*** | 2.27 | 49.1 | ***0.86 J*** | 25.01 R | ***283000*** | ***327*** | 1.00 J | ***65.7 J*** | 4100 | ***81.1 J*** | 2420 | 46.6 | 0.004 J | ***95.8*** | 1880 J | ***2.4*** | ***37.4*** | ***1040 J*** | ***4.610 J*** | ***126 J*** | ***590*** | ***5080*** |

**Table 5.5.14-4**
**Roaster Solids Data - Radionuclides**
**SWMU 14**
**Rhodia Silver Bow Plant**
**[concentrations in pCi/g]**

| Chemical Name | | | | Bismuth 214 | Cesium 137 | Gross Alpha (radiation) | Gross Beta (radiation) | Lead 210 | Lead 212 | Lead 214 | Potassium 40 | Protactinium-234 | Radium 223 | Radium 226 | Thorium 227 | Thorium 230 | Thorium 232 | Thorium 234 | Uranium 234 | Uranium 235 | Uranium 238 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Background Mean, Exceedances **Bold** | | | | | | | | | | | | | | **3.6** | | **0.96** | | | **0.73** | | **0.78** |
| Background Maximum, Exceedances Underline | | | | | | | | | | | | | | 12 | | 3.4 | | | 2.8 | | 2.7 |
| Background 95% UCL, Exceedances *Italic* | | | | | | | | | | | | | | *5.0* | | *1.7* | | | *1.6* | | *1.6* |
| **Location ID** | **Sample Type** | **Depth** | **Sample Type** | | | | | | | | | | | | | | | | | | |
| RRE | 01/01/1999 | | N | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.6 +/- 0.22 | -- | -- | 0.16 +/- 0.33 | -- | -- | -- | < 6.7 |
| RRW | 01/01/1999 | | N | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.2 +/- 0.27 | -- | -- | 0.51 +/- 0.41 | -- | -- | -- | ***8.3 +/- 15.00*** |
| ESI-RSP-1 | 07/21/2003 | | N | 39.3 +/- 3.14 | < 0.174 | 168 +/- 13.0 J | 116 +/- 10.6 J | 31.0 +/- 5.56 | -- | 41.3 +/- 4.07 | 7.56 +/- 1.28 | 53.4 +/- 13.3 | 3.72 +/- 1.15 | ***30.7 +/- 1.70*** | -- | -- | -- | 36.2 +/- 4.20 | -- | 3.24 +/- 1.12 | -- |
| ESI-SSS-1 | 07/21/2003 | 0 - 2 in | N | 38.0 +/- 3.07 | < 0.00136 | 179 +/- 13.0 J | 160 +/- 11.6 J | 27.0 +/- 5.12 | 0.491 +/- 0.185 | 42.0 +/- 4.14 | 6.10 +/- 1.32 | 49.0 +/- 13.2 | -- | ***36.2 +/- 1.88*** | 3.66 +/- 1.56 | -- | -- | 35.0 +/- 4.15 | -- | 3.82 +/- 1.27 | -- |
| RS-03-COMP | 10/04/2012 | | N | -- | -- | -- | -- | 65 +/- 6 | -- | -- | -- | -- | -- | ***22 +/- 1.4*** | -- | ***37 +/- 2.9*** | -- | -- | ***33 +/- 2.7*** | 0.44 +/- 0.68 | ***31.1 +/- 2.6*** |
| | | | FD | -- | -- | -- | -- | 59 +/- 5.5 | -- | -- | -- | -- | -- | ***21 +/- 1.5*** | -- | ***36 +/- 2.9*** | -- | -- | ***32 +/- 2.7*** | 1.8 +/- 0.73 | ***31.4 +/- 2.6*** |
| RS-04-COMP | 10/04/2012 | | N | -- | -- | -- | -- | 53 +/- 47 | -- | -- | -- | -- | -- | ***18 +/- 1.1*** | -- | ***34 +/- 2.4*** | -- | -- | ***35 +/- 2.4*** | 1.3 +/- 0.65 | ***33.4 +/- 2.3*** |
| RS-05-COMP | 10/04/2012 | | N | -- | -- | -- | -- | 44 +/- 5 | -- | -- | -- | -- | -- | ***22 +/- 1.6*** | -- | ***39 +/- 3.2*** | -- | -- | ***38 +/- 3.4 J*** | 1.3 +/- 0.76 | ***37.6 +/- 3.4*** |

**Table 5.14-5**

**Roaster Solids Data - VOCs**
**Rhodia Silver Bow Plant**

| Station ID | Roaster Solids | |
|---|---|---|
| Sample Date | 3/22/1999 | |
| Sample ID | RSP-1 | |
| Lab Name | Energy | |
| Lab ID | 002-99-50887 | |
| Report | Material Charac | |
| | | |
| Acetone | 10 U | mg/Kg |
| Acrolein | 4 U | mg/Kg |
| Acrylonitrile | 4 U | mg/Kg |
| Benzene | 0.2 U | mg/Kg |
| Bromobenzene | 0.2 U | mg/Kg |
| Bromochloromethane | 0.2 U | mg/Kg |
| Bromodichloromethane | 0.2 U | mg/Kg |
| Bromoform | 0.2 U | mg/Kg |
| Butyl benzene | 0.2 U | mg/Kg |
| Butylbenzene, sec- | 0.2 U | mg/Kg |
| Butylbenzene, tert- | 0.2 U | mg/Kg |
| Carbon disulfide | 0.2 U | mg/Kg |
| Carbon tetrachloride | 0.2 U | mg/Kg |
| Chlorobenzene | 0.2 U | mg/Kg |
| Chloroethane | 0.2 U | mg/Kg |
| Chloroform | 0.2 U | mg/Kg |
| Chlorodibromomethane | 0.2 U | mg/Kg |
| 2-Chloroethylvinyl ether | 0.2 U | mg/Kg |
| Chlorotoluene, o- | 0.2 U | mg/Kg |
| Chlorotoluene, p- | 0.2 U | mg/Kg |
| Cumene (isopropyl benzene) | 0.2 U | mg/Kg |
| Cymene, p- | 0.2 U | mg/Kg |
| 1,2-Dibromo-3-chloropropane | 0.2 U | mg/Kg |
| 1,2-Dibromoethane | 0.2 U | mg/Kg |
| Dibromomethane | 0.2 U | mg/Kg |
| 1,2-Dichlorobenzene | 0.2 U | mg/Kg |
| 1,3-Dichlorobenzene | 0.2 U | mg/Kg |
| 1,4-Dichlorobenzene | 0.2 U | mg/Kg |
| Dichlorodifluoromethane | 0.2 U | mg/Kg |
| 1,1-Dichloroethane | 0.2 U | mg/Kg |
| 1,2-Dichloroethane | 0.2 U | mg/Kg |
| 1,1-Dichloroethylene | 0.2 U | mg/Kg |
| 1,2-Dichloroethylene, cis- | 0.2 U | mg/Kg |
| 1,2-Dichloroethylene, trans- | 0.2 U | mg/Kg |
| 1,1-Dichloropropane | | |
| 1,2-Dichloropropane | 0.2 U | mg/Kg |
| 1,3-Dichloropropane | 0.2 U | mg/Kg |
| 2,2-Dichloropropane | 0.2 U | mg/Kg |
| 1,1-Dichloro-1-propene | 0.2 U | mg/Kg |
| 1,3-Dichloro-1-propene, cis- | 0.2 U | mg/Kg |
| 1,3-Dichloro-1-propene, trans- | 0.2 U | mg/Kg |
| Ethyl benzene | 0.2 U | mg/Kg |
| 2-Hexanone | 4 U | mg/Kg |
| Hexachlorobutadiene | | |
| Bromomethane | 0.2 U | mg/Kg |
| Chloromethane | 0.2 U | mg/Kg |
| Methylene chloride | 0.2 U | mg/Kg |
| Methyl ethyl ketone | 4 U | mg/Kg |
| Methyl tertiary butyl ether | 0.2 U | mg/Kg |
| Iodomethane | 0.2 U | mg/Kg |

**Table 5.14-5**

**Roaster Solids Data - VOCs**
**Rhodia Silver Bow Plant**

| Station ID | Roaster Solids | |
|---|---|---|
| Sample Date | 3/22/1999 | |
| Sample ID | RSP-1 | |
| Lab Name | Energy | |
| Lab ID | 002-99-50887 | |
| Report | Material Charac | |
| Methyl isobutyl ketone | 4 U | mg/Kg |
| Naphthalene | 0.2 U | mg/Kg |
| Propylbenzene | 0.2 U | mg/Kg |
| Styrene | 0.2 U | mg/Kg |
| 1,1,1,2-Tetrachloroethane | 0.2 U | mg/Kg |
| 1,1,2,2-Tetrachloroethane | 0.2 U | mg/Kg |
| Tetrachloroethylene | 0.2 U | mg/Kg |
| Toluene | 0.2 U | mg/Kg |
| 1,2,3-Trichlorobenzene | 0.2 U | mg/Kg |
| 1,2,4-Trichlorobenzene | 0.2 U | mg/Kg |
| 1,1,2-Trichloroethane | 0.2 U | mg/Kg |
| Trichloroethylene | 0.2 U | mg/Kg |
| Trichlorofluoromethane | 0.2 U | mg/Kg |
| 1,2,3-Trichloropropane | 0.2 U | mg/Kg |
| 1,2,4-Trimethylbenzene | 0.2 U | mg/Kg |
| 1,3,5-Trimethylbenzene | 0.2 U | mg/Kg |
| Vinyl acetate | 0.2 U | mg/Kg |
| Vinyl chloride | 0.2 U | mg/Kg |
| Xylenes, Total | 0.2 U | mg/Kg |

**Table 5.5.14-6**

**Roaster Solids Data - SVOCs**
**Rhodia Silver Bow Plant**

| Station ID | Roaster Solids | |
|---|---|---|
| Sample Date | 3/22/1999 | |
| Sample ID | RSP-1 | |
| Lab Name | Energy | |
| Lab ID | 002-99-50887 | |
| Report | Material Charac | |
| | | |
| Acenaphthene | 0.33 U | mg/Kg |
| Acenaphthylene | 0.33 U | mg/Kg |
| Anthracene | 0.33 U | mg/Kg |
| Azobenzene | 0.33 U | mg/Kg |
| Benzidine | 0.67 U | mg/Kg |
| Benzo(a)anthracene | 0.33 U | mg/Kg |
| Benzo(b)fluoranthene | 0.33 U | mg/Kg |
| Benzo(k)fluoranthene | 0.33 U | mg/Kg |
| Benzo(g,h,i)perylene | 0.33 U | mg/Kg |
| Benzo(a)pyrene | 0.33 U | mg/Kg |
| Biphenyl | | |
| Bis(2-chloroethoxy)methane | 0.33 U | mg/Kg |
| Bis(2-chloroethyl)ether | 0.33 U | mg/Kg |
| Bis(2-chloroisopropyl)ether | 0.33 U | mg/Kg |
| Bis(2-ethylhexyl)phthalate | 0.33 U | mg/Kg |
| 4-Bromophenyl phenyl ether | 0.33 U | mg/Kg |
| Butyl benzyl phthalate | 0.33 U | mg/Kg |
| 4-Chloro-3-methylphenol | 0.33 U | mg/Kg |
| 2-Chloronaphthalene | 0.33 U | mg/Kg |
| 2-Chlorophenol | 0.33 U | mg/Kg |
| 4-Chlorophenol | 0.33 U | mg/Kg |
| 4-Chlorophenyl phenyl ether | 0.33 U | mg/Kg |
| Chrysene | 0.33 U | mg/Kg |
| p- & m-Cresol | 0.33 U | mg/Kg |
| o-Cresol | 0.33 U | mg/Kg |
| Dibenz(a,h)anthracene | 0.33 U | mg/Kg |
| Di-n-butyl phthalate | 0.33 U | mg/Kg |
| 1,2-Dichlorobenzene | 0.33 U | mg/Kg |
| 1,3-Dichlorobenzene | 0.33 U | mg/Kg |
| 1,4-Dichlorobenzene | 0.33 U | mg/Kg |
| 3,3`-Dichlorobenzidine | 0.33 U | mg/Kg |
| 2,4-Dichlorophenol | 0.33 U | mg/Kg |
| Diethyl phthalate | 0.33 U | mg/Kg |
| 2,4-Dimethylphenol | 0.33 U | mg/Kg |
| Dimethyl phthalate | 0.33 U | mg/Kg |
| 2-Methyl-4,6-dinitrophenol | 1.7 U | mg/Kg |
| 2,4-Dinitrophenol | 1.7 U | mg/Kg |
| 2,4-Dinitrotoluene | 0.33 U | mg/Kg |
| 2,6-Dinitrotoluene | 0.33 U | mg/Kg |
| Di-n-octyl phthalate | 0.33 U | mg/Kg |
| Fluoranthene | 0.33 U | mg/Kg |
| Fluorene | 0.33 U | mg/Kg |
| Hexachlorobenzene | 0.33 U | mg/Kg |
| Hexachlorobutadiene | 0.33 U | mg/Kg |
| Hexachlorocyclopentadiene | 0.33 U | mg/Kg |
| Hexachloroethane | 0.33 U | mg/Kg |
| Indeno(1,2,3-cd)pyrene | 0.33 U | mg/Kg |
| Isophorone | 0.33 U | mg/Kg |
| 1-Methylnaphthalene | 0.33 U | mg/Kg |
| 2-Methylnaphthalene | 0.33 U | mg/Kg |

**Table 5.5.14-6**

## Roaster Solids Data - SVOCs
## Rhodia Silver Bow Plant

| Station ID | Roaster Solids | |
|---|---|---|
| Sample Date | 3/22/1999 | |
| Sample ID | RSP-1 | |
| Lab Name | Energy | |
| Lab ID | 002-99-50887 | |
| Report | Material Charac | |
| | | |
| Naphthalene | 0.33 U | mg/Kg |
| Nitrobenzene | 0.33 U | mg/Kg |
| 2-Nitrophenol | 0.33 U | mg/Kg |
| 4-Nitrophenol | 1.7 U | mg/Kg |
| N-Nitrosodimethylamine | 0.33 U | mg/Kg |
| N-Nitrosodiphenylamine | 0.33 U | mg/Kg |
| N-Nitrosodi-n-propylamine | 0.33 U | mg/Kg |
| N-Nitrosopyrrolidine | | |
| Pentachlorobenzene | | |
| Pentachlorophenol | 1.7 U | mg/Kg |
| Phenanthrene | 0.33 U | mg/Kg |
| Phenol | 0.33 U | mg/Kg |
| Pyrene | 0.33 U | mg/Kg |
| Pyridine | 0.33 U | mg/Kg |
| 1,2,4,5-Tetrachlorobenzene | | |
| 1,2,4-Trichlorobenzene | | |
| 2,4,5-Trichlorophenol | 0.33 U | mg/Kg |
| 2,4,6-Trichlorophenol | 0.33 U | mg/Kg |

## Table 5.5.14-7

## Roaster Solids Data - ASTM Leachate
## Rhodia Silver Bow Plant

| Station ID | Roaster-1 | |
|---|---|---|
| Sample Date | 10/14/1997 | |
| Sample ID | Roaster-1 | |
| Lab Name | Energy | |
| Lab ID | 97-63416 | |
| Report | Voluntary Clean | |
| | | |
| Aluminum, ASTM | 1.6 | mg/l |
| Antimony, ASTM | 0.05 U | mg/l |
| Arsenic, ASTM | 0.006 | mg/l |
| Barium, ASTM | 0.1 U | mg/l |
| Beryllium, ASTM | 0.001 U | mg/l |
| Cadmium, ASTM | 0.022 | mg/l |
| Chromium, ASTM | 0.04 | mg/l |
| Cobalt, ASTM | 0.01 U | mg/l |
| Copper, ASTM | 0.1 | mg/l |
| Iron, ASTM | 1.24 | mg/l |
| Lead, ASTM | 0.01 U | mg/l |
| Manganese, ASTM | 0.02 | mg/l |
| Mercury, ASTM | 0.001 U | mg/l |
| Nickel, ASTM | 0.22 | mg/l |
| Selenium, ASTM | 0.014 | mg/l |
| Silver, ASTM | 0.005 U | mg/l |
| Thallium, ASTM | 0.1 U | mg/l |
| Vanadium, ASTM | 0.2 | mg/l |
| Zinc, ASTM | 5.48 | mg/l |
| Calcium, ASTM | 12 | mg/l |
| Magnesium, ASTM | 2 | mg/l |
| Sodium, ASTM | 6 | mg/l |
| Potassium, ASTM | 3 | mg/l |
| Chloride, ASTM | 1 | mg/l |
| Fluoride, ASTM | 0.72 | mg/l |
| Phosphorus, ASTM | 23.2 | mg/l |
| Sulfate, ASTM | 15 | mg/l |
| Gross Alpha, ASTM | 1 U | pCi/l |
| Radium-226, ASTM | 0.2 U | pCi/l |
| Radium-228, ASTM | 1 U | pCi/l |
| Uranium, ASTM | 0.005 | mg/l |
| Strontium, ASTM | 2 U | pCi/l |
| Alkalinity, Total, ASTM | 11 | mg/l |
| Nitrate, ASTM | 0.05 U | mg/l |
| Nitrite, ASTM | 0.05 U | mg/l |
| Total Dissolved Solids, ASTM | 171 | mg/l |

**Table 5.5.14-8**
**Roaster Solids Data - SPLP General and Site-Specific Parameters**
**SWMU 14**
**Rhodia Silver Bow Plant**
**[concentrations in mg/l]**

| | | Chemical Name | Fluoride | Phosphorus, elemental (white) | Phosphorus, total |
|---|---|---|---|---|---|
| Location ID | Sample Date | Sample Type | | | |
| RS-01 | 05/28/2009 | N | **1.2** | < 0.000023 | **9.35** |
| RS-02 | 05/28/2009 | N | **1.1** | < 0.000023 | **7.87** |

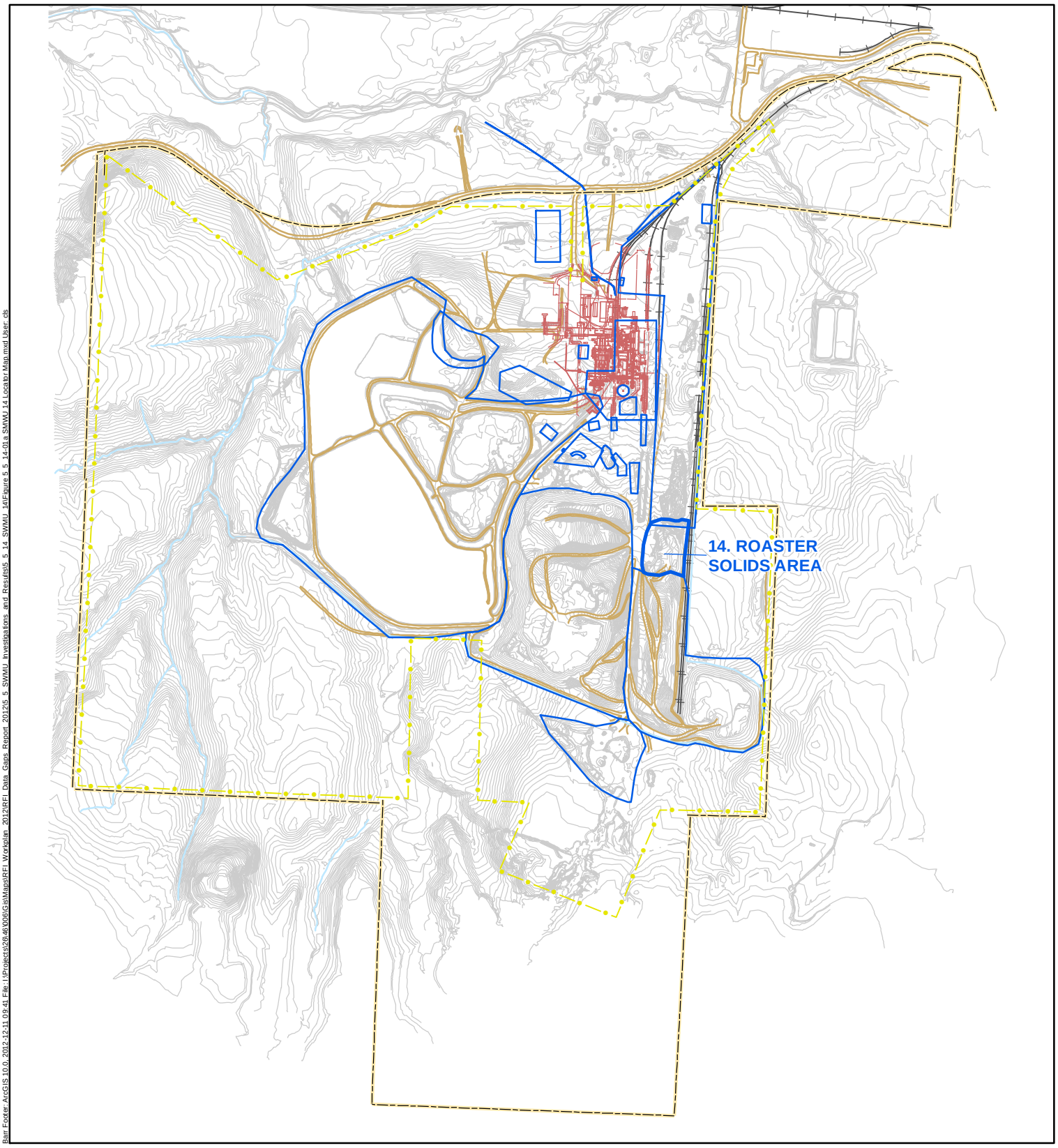
**Table 5.5.14-9**
**Roaster Solids Data - SPLP Metals**
**SWMU 14**
**Rhodia Silver Bow Plant**
**[concentrations in mg/l]**

| Chemical Name / Analysis Location | | | Antimony Lab | Arsenic Lab | Barium Lab | Beryllium Lab | Cadmium Lab | Calcium Lab | Chromium Lab | Cobalt Lab | Copper Lab | Iron Lab | Lead Lab | Magnesium Lab | Manganese Lab | Mercury Lab | Nickel Lab | Potassium Lab | Selenium Lab | Silver Lab | Sodium Lab | Thallium Lab | Uranium Lab | Vanadium Lab |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Location ID** | **Sample Date** | **Sample Type** | | | | | | | | | | | | | | | | | | | | | | |
| RS-01 | 05/28/2009 | N | < 0.010 | **0.0009** | < 0.082 | **0.0002** | **0.0223** | **13.4** | **0.032** | < 0.0010 | < 0.040 | **0.56** | **0.07** | **0.896** | **0.0117** | < 0.0010 | **0.048** | **1.9** | < 0.0010 | **0.028** | **3.44** | < 0.010 | **0.00457** | **0.150** |
| RS-02 | 05/28/2009 | N | < 0.010 | **0.0007** | < 0.067 | < 0.0002 | **0.0279** | **12.1** | **0.039** | < 0.0010 | < 0.037 | **0.74** | **0.09** | **0.772** | **0.0131** | < 0.0010 | **0.045** | **1.5** | **0.0010** | **0.030** | **3.68** | < 0.010 | **0.00379** | **0.144** |

**Table 5.5.14-10**
**Roaster Solids Data - SPLP Radionuclides**
**SWMU 14**
**Rhodia Silver Bow Plant**
**[concentrations in pCi/l]**

| | | Chemical Name | Gross Alpha (radiation) | Gross Beta (radiation) | Radium 226 | Radium 228 |
|---|---|---|---|---|---|---|
| Location ID | Sample Date | Sample Type | | | | |
| RS-01 | 05/28/2009 | N | **13 +/- 3.3** | **14 +/- 3.3** | < 1.1 | < 3 |
| RS-02 | 05/28/2009 | N | **17 +/- 3.7** | **25 +/- 4.1** | **1.2 +/- 0.42** | < 3 |

# Figures



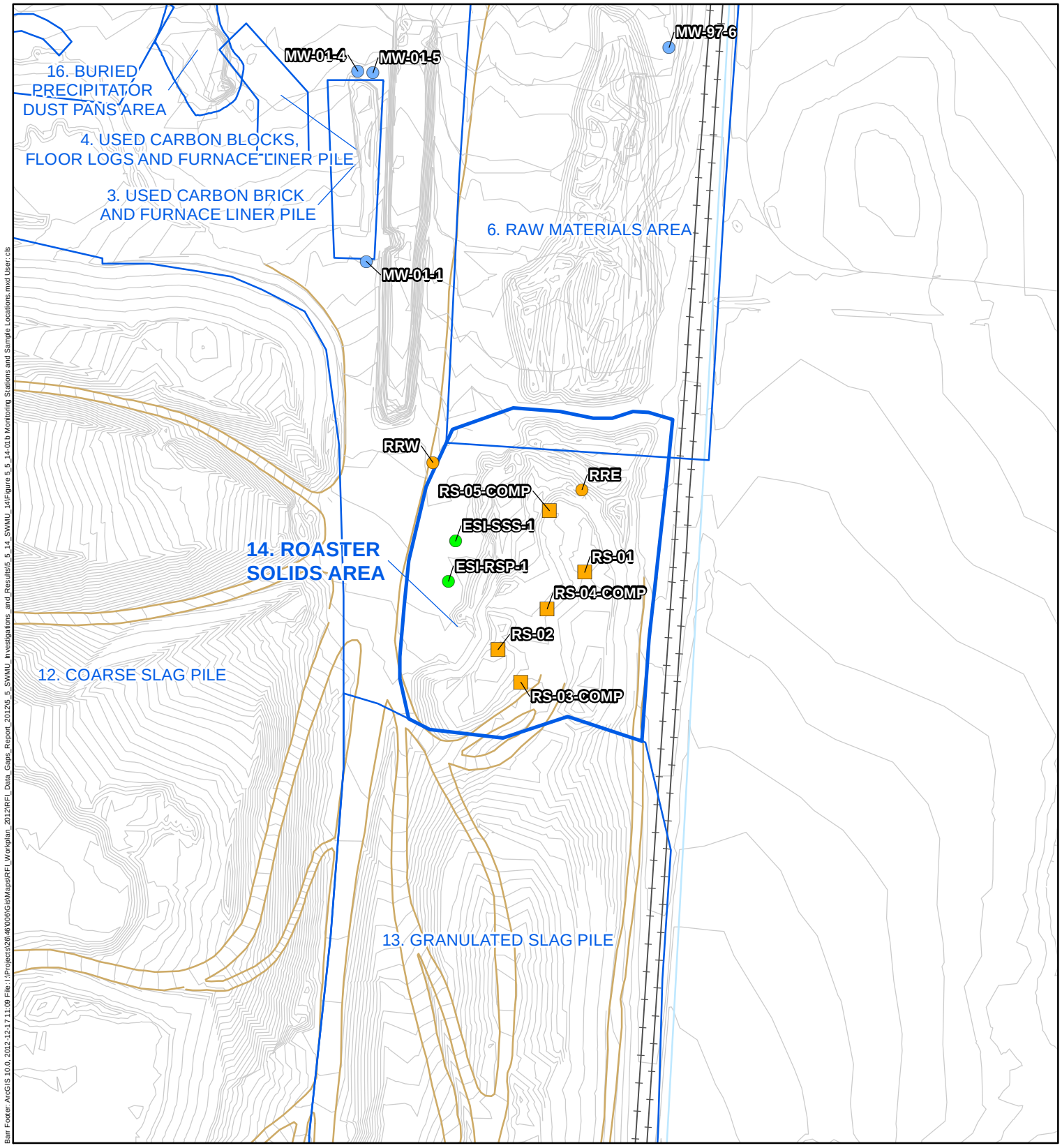

SWMU 14
Other SWMUs
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures
Property Boundary
Fence Line

N

Feet
1,000 0 1,000

Figure 5.5.14-1a

SWMU 14 LOCATION
Rhodia Silver Bow Plant
Montana




Composite Sample Centroid Location
Monitoring Well
Roaster Solids Sample
Soil Sample
SWMU 14
Other SWMUs

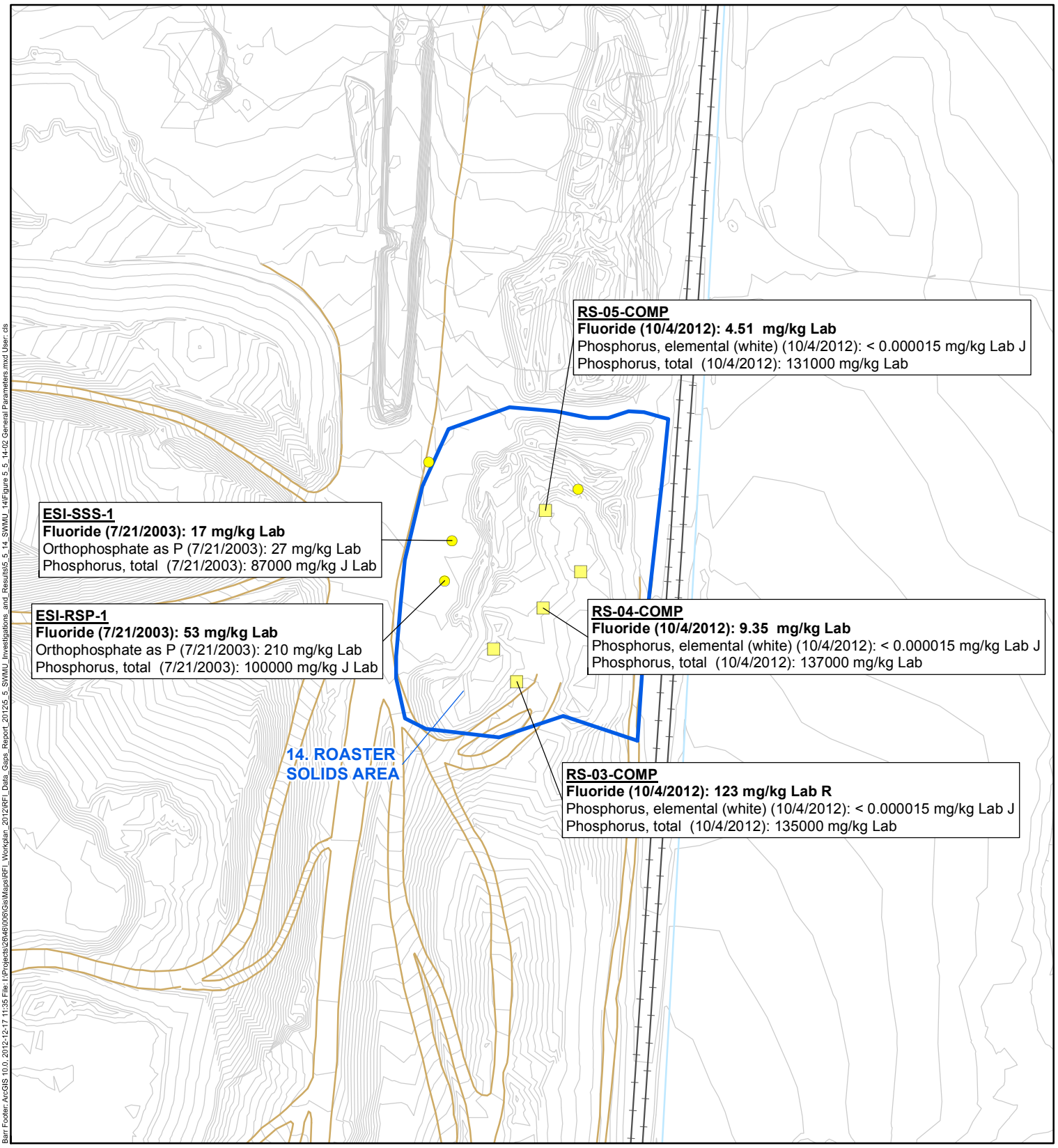
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures

N

Feet
200 0 200

Figure 5.5.14-1b

SWMU 14
MONITORING STATIONS
AND SAMPLE LOCATIONS
Rhodia Silver Bow Plant
Montana




Composite Sample Centroid Location
Sample Location
SWMU 14
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures

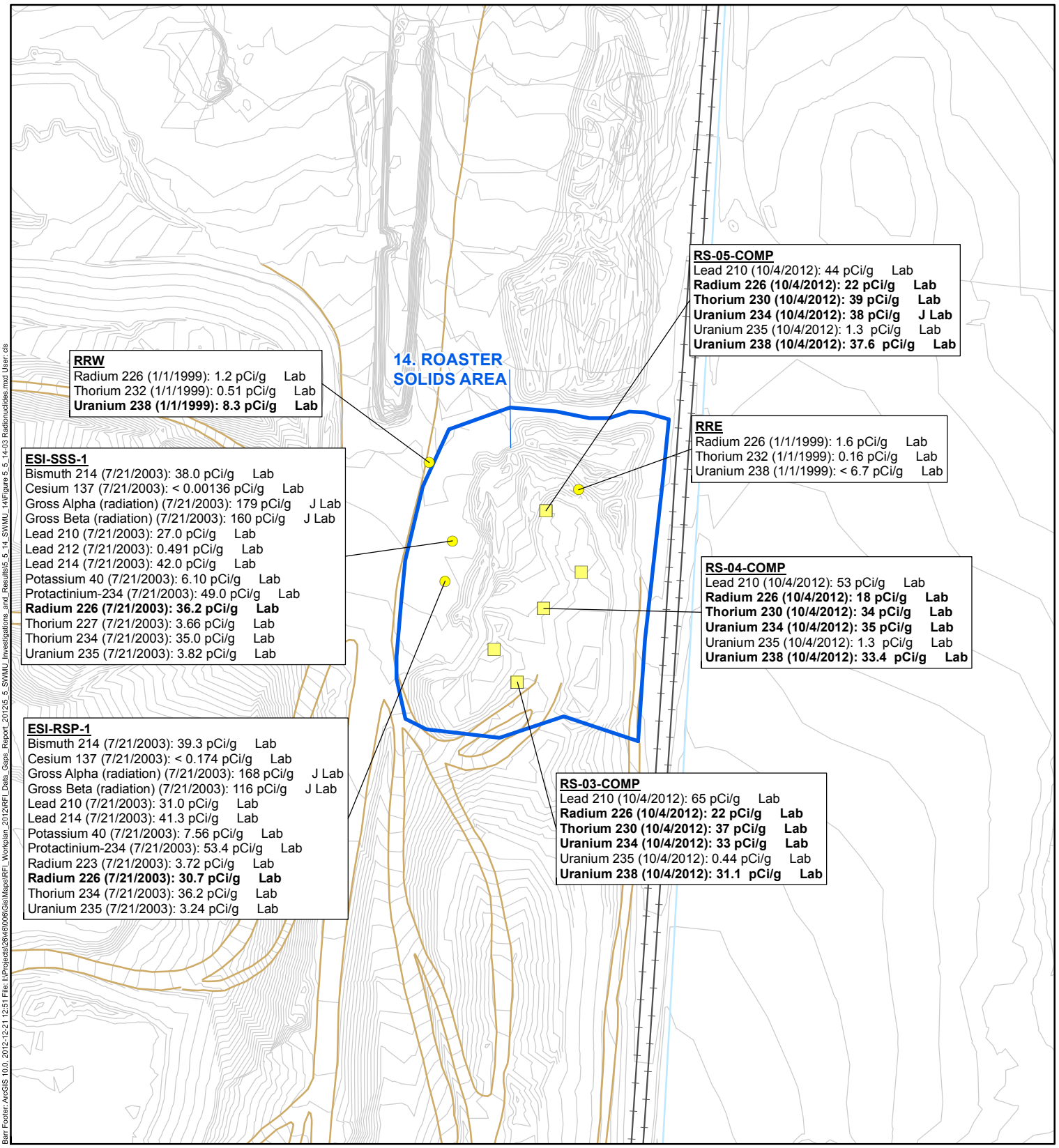
**Bold** font indicates that sample concentration is greater than the 95% UPL Reference Area Concentration.

N

Feet
200 0 200

Figure 5.5.14-2

SWMU 14
GENERAL PARAMETERS
Rhodia Silver Bow Plant
Montana




Barr Footer: ArcGIS 10.0, 2012-12-21 12:51 File: I:\Projects\26\4\6006\Gis\Maps\RFI_Workplan_2012\RFI_Data_Gaps_Report_20125_5_SWMU_Investigations_and_Results\5_5_14_SWMU_14\Figure 5_5_14-03 Radionuclides.mxd User: cls

Composite Sample Centroid Location
Sample Location
SWMU 14
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures

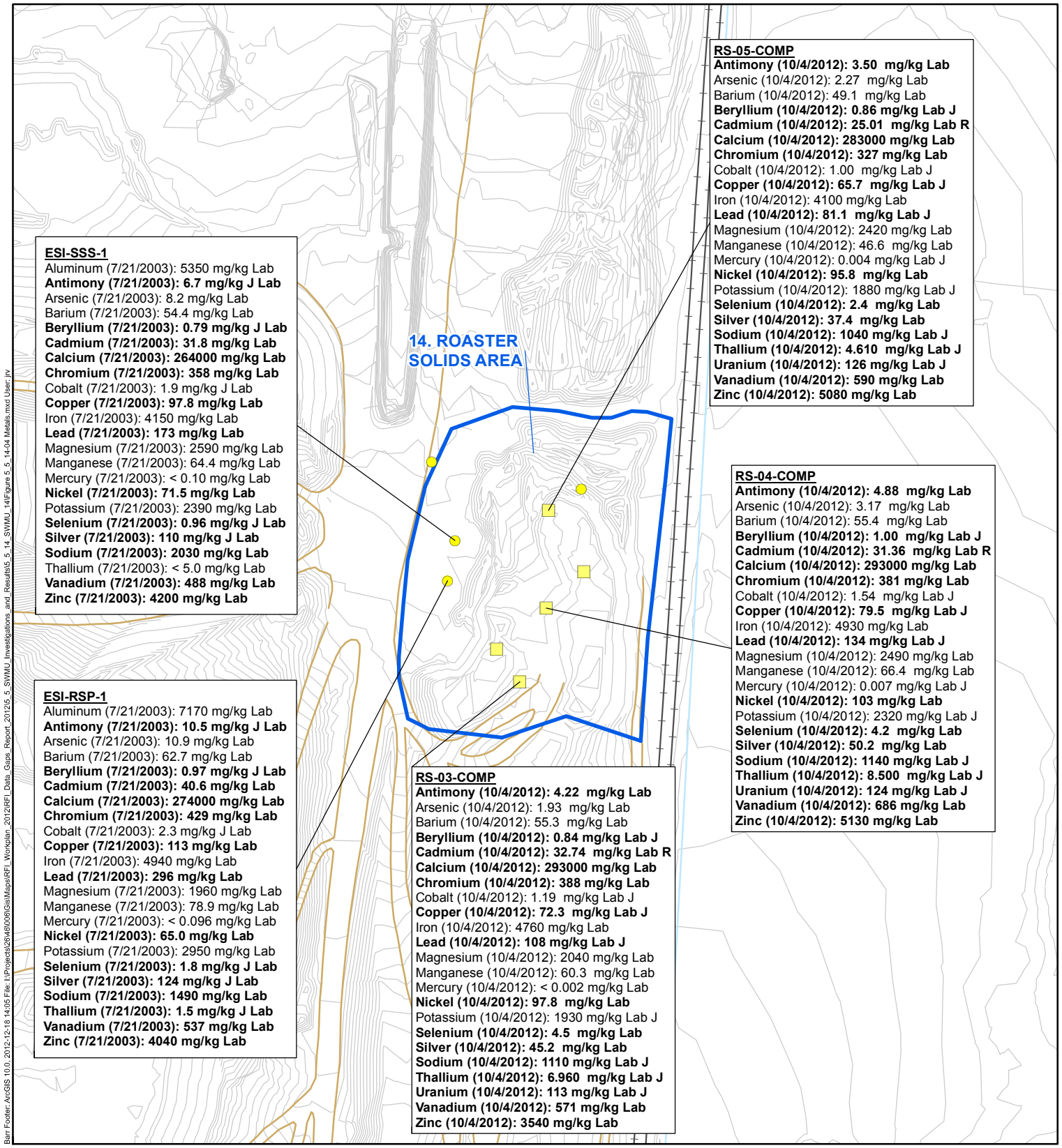
N

Feet
200 0 200

**Bold** font indicates that sample concentration is greater than the 95% UCL of mean Reference Area Concentration.

Figure 5.5.14-3

SWMU 14
RADIONUCLIDES
Rhodia Silver Bow Plant
Montana




Composite Sample Centroid Location
Sample Location
SWMU 14
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures

N

Feet
200 0 200

**Bold** font indicates that sample concentration is greater than the 95% UCL of mean Reference Area Concentration.

Figure 5.5.14-4

SWMU 14
METALS
Rhodia Silver Bow Plant
Montana