Section 4.2 Upstream Sediment Quality

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4.2 Upstream Sediment Quality

Sediment quality monitoring stations were established along Sheep Gulch at the locations shown on Figure 4.2-1. Sediment samples were collected during the September 2008 sample collection event. The sediment samples were analyzed for general and site-specific parameters, metals, SVOCs, VOCs, and radionuclides. Since a limited number of samples were collected from the upstream sediment monitoring stations (i.e., 4 samples in Sheep Gulch), the maximum detected concentration or the maximum detection limit, whichever is greater, was selected as the upstream concentration for comparison proposes as directed by EPA in the September 21, 2011 letter.

4.2.1 Sheep Gulch

Stations SD-18, SD-19, SD-20, and SD-8 are located in Sheep Gulch, upstream of the tailing basin, and were established to provide upstream concentrations for sediment in Sheep Gulch as detailed in Section 5.4 of the EPA-approved Final RFI Work Plan (Barr, 2009). These locations were chosen because they are upstream of the known impacts. The spatial distribution of the hazardous constituents and analytical parameters were evaluated to identify whether additional monitoring stations were needed to provide better definition of extent and magnitude of any release of hazardous constituents and whether the data indicate a potential unacceptable risk to human health or the environment. The analytical results confirm the appropriateness and representativeness of these locations as the constituent concentrations for sediment samples collected are consistent between locations. Sediment was collected at SD-8, SD-18, and SD-20 using a piston-tube corer in accordance with the SOP for Sediment Sample Collection, included in the Field Sampling Plan (Appendix D of the Final Phase 1 RFI Work Plan). In these locations, an aluminum tube with a rubber piston at the tube base was pushed into the sediment to a depth of 10 cm as the piston was held at the surface of the sediment. The tube containing the sample was then pulled up and the sediment was either extruded or shaken into a stainless steel bowl. In order to obtain sufficient sample volume for laboratory analysis, multiple cores were collected at each location. The first core was sampled for VOCs and then additional cores were taken near the first core and homogenized. The homogenized sediment was used to fill sample jars for the analysis of SVOCs, total metals, general chemistry, radionuclides, and elemental phosphorus.

The piston-tube corer was not effective at SD-19 (dry sediment), so a hand auger was used to collect the sediment sample at this location. This modification from the work plan was communicated to the EPA by email on September 22, 2008. The hand auger was advanced to a mark placed 10 cm from the base of the barrel. The 10 cm did not include the auger teeth, and soil in the teeth was removed and discarded when brought to the surface. Sediment from the first barrel was removed and placed in

a stainless steel bowl and the VOC sample was packaged. Subsequent 0-10 cm cores were placed in the same stainless steel bowl, homogenized, and sampled for the analysis of SVOCs, total metals, general chemistry, radionuclides, and elemental phosphorus.

The sediments at SD-18 and SD-19 were not saturated at the time of the sample collection activities; however, these locations would have surface water flow during run-off events.

The EPA requires the data to be reported to the sample-specific detection limit and not the more standardized method reporting limit. Constituents detected above the detection limit and below the method reporting limit are J-qualified, indicating it is an estimated value. Since the sample-specific detection limits are reported, the higher of the maximum detected concentration or the maximum detection limit was selected to represent the upstream concentration. This method accounts for the variability in the sample-specific detection limits. However, sample-specific detection limits were not used if the detection limit was elevated due to sample dilution requirements. The rationale for selecting the upstream concentration (maximum method detection limit or maximum detected concentration) is outlined for each constituent presented in Tables 4.2-1 through 4.2-5.

4.2.1.1 General & Site-specific Parameters

The analytical results for the general and site-specific parameters included in the upstream sediment data set for Sheep Gulch are summarized in Table 4.2-1. The maximum detected concentration or the maximum detection limit for each parameter is also identified in the table.

The analytical results are generally consistent between the upstream locations. Chloride and sulfate concentrations are lower in the samples from unsaturated areas (i.e., SD-18 and SD-19). Elemental phosphorus was not detected in the upstream samples from Sheep Gulch. Total phosphorus concentrations ranged from 288 mg/kg to 813 mg/kg.

4.2.1.2 Metals

The analytical results for the metals included in the upstream sediment data set for Sheep Gulch are summarized in Table 4.2-2 along with the maximum detected concentration or the maximum detection limit. The metals concentrations are generally consistent between the four upstream stations.

4.2.1.3 SVOCs

The analytical results for the SVOCs included in the upstream sediment data set for Sheep Gulch are summarized in Table 4.2-3 along with the maximum detected concentration or the maximum

detection limit. SVOCs were not detected in the upstream samples, with the exception of benzoic acid, di-n-butyl phthalate, and p-cresol. The sample-specific detection limit is shown in parenthesis after the detected concentration in Table 4.2-3. These SVOCs were detected at very low concentrations, and may be representative of the sampling and analytical system influence.

4.2.1.4 VOCs

The analytical results for the VOCs included in the upstream sediment data set for Sheep Gulch are summarized in Table 4.2-4 along with the maximum detected concentration or the maximum detection limit. Review of the laboratory report for SD-18 indicates that this sample was analyzed on a different instrument, which did not achieve the Quality Assurance Project Plan (QAPP)-specified method detection limit (MDL) for some of the VOC constituents. Consequently, the data that did not meet the QAPP-specified MDL were not used for selecting the maximum upstream concentration in the upstream data set.

VOCs were not detected in the upstream samples, with the exception of acetone, benzene, carbon disulfide, ethyl benzene, methyl ethyl ketone, toluene, o-xylene, and m&p-xylene. The sample-specific detection limit is shown in parenthesis after the detected concentration in Table 4.2-4. These VOCs are common laboratory contaminants and were detected at very low concentrations. The detected compounds may be representative of the sampling and analytical system influence.

4.2.1.5 Radionuclides

The analytical results for the radionuclides included in the upstream data set for Sheep Gulch are summarized in Table 4.2-5 along with the maximum detected concentration or the maximum detection limit. Radionuclide concentrations are generally consistent between the four upstream stations.

4.2.2 Conclusions and Recommendations

The upstream data set consists of sediment samples for four stations located upstream of the Silver Bow Plant. In a letter dated September 21, 2011, the EPA recommended using the maximum value of each constituent as a representation of background concentrations. Due to the small number of samples, the “maximum” value was determined to be the highest value recorded between the maximum detected concentrations and the maximum method detection limit. These upstream concentrations will be compared to the sediment concentrations for the other sediment stations established along Sheep Gulch.

4.2.3 References

Barr, 2009. Final Phase 1 RCRA Facility Investigation Work Plan, Corrective Action Order on Consent, Docket No. RCRA-08-2004-0001, Rhodia Silver Bow Plant, Butte, Montana, March 25, 2009.

Tables

Table 4.2-1
Upstream Sediment Data - General and Site-Specific Parameters
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	Chloride	Fluoride by Bellack	Nitrate + Nitrite	Nitrogen, ammonia as N	Phosphorus, elemental (white)	Phosphorus, total	Sulfate
SD-8	09/20/2008	**59.7**	**230**	< 0.8	**28.3**	< 0.000280	**437**	**81.8**
SD-18	09/21/2008	**2.3**	**222**	**0.7**	< 0.6	< 0.000280	**288**	**2.9**
SD-19	09/21/2008	**6.2**	**216**	< 0.6	**24.1**	< 0.000280	**813**	**7.6**
SD-20	09/21/2008	**45.8**	**223 J**	< 0.8	**27.4**	< 0.000280 J	**476**	**152**
Upstream Concentation								
Maximum		**59.7**	**230**	**0.8**	**28.3**	**0.00028**	**813**	**152**
Rationale		**MDC**	**MDC**	**MMDL**	**MDC**	**MMDL**	**MDC**	**MDC**

Table 4.2-2
Upstream Sediment Data - Metals
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Uranium	Vanadium	Zinc
SD-8	09/20/2008	0.84	9.72	178	0.45 J	0.83 J	4400	8.7	4.24	72.1	11800	29.0	3000	185	0.031	6.23	2960	< 0.4	0.25	649	0.248	1.000	25.5	81.8
SD-18	09/21/2008	1.68	6.82	245	0.43 J	0.15 J	5290	11.8	3.40	16.0	9550	8.7 J	3280	276	0.014 J	5.71	3130	< 0.4	0.04	78	0.164	0.39	22.9	27.5
SD-19	09/21/2008	0.68	14.2	252	0.69 J	1.47	4880	10.3	7.31	65.8	19400	24.5	4760	700	0.033	7.28	4920	< 0.4	0.18	130	0.407	2.200	42.0	91.9
SD-20	09/21/2008	0.32 J	7.96 J	295	0.62 J	0.38 J	5740	12.9	5.92	34.4	15100	11.2 J	3760	137	0.021	8.90	4220	< 0.4	0.12 J	1000	0.282 J	1.100 J	32.2	66.0
Upstream Concentation																								
Maximum		1.68	14.2	295	0.69	1.47	5740	12.9	7.31	72.1	19400	29.0	4760	700	0.033	8.90	4920	0.4	0.25	1000	0.407	2.200	42.0	91.9
Rationale		MMDL	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MDC	MMDL	MDC	MDC	MDC	MDC	MDC	MDC

Table 4.2-3
Upstream Sediment Data - SVOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,2-Diphenylhydrazine	1,3-Dichlorobenzene	1,4-Dichlorobenzene	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Chloronaphthalene	2-Chlorophenol
SD-8	09/20/2008	< 0.012	< 0.020	< 0.016	< 0.020	< 0.019	< 0.019	< 0.016	< 0.018	< 0.017	< 0.12	< 0.016	< 0.017	< 0.011	< 0.011
SD-18	09/21/2008	< 0.011	< 0.018	< 0.015	< 0.019	< 0.018	< 0.018	< 0.015	< 0.017	< 0.016	< 0.12	< 0.015	< 0.016	< 0.010	< 0.0099
SD-19	09/21/2008	< 0.011	< 0.018	< 0.015	< 0.019	< 0.018	< 0.018	< 0.015	< 0.017	< 0.016	< 0.12	< 0.015	< 0.016	< 0.010	< 0.0099
SD-20	09/21/2008	< 0.013	< 0.020	< 0.017	< 0.021	< 0.020	< 0.019	< 0.016	< 0.019	< 0.017	< 0.13	< 0.017	< 0.018	< 0.012	< 0.011
Upstream Concentation															
Maximum		**0.013**	**0.020**	**0.017**	**0.021**	**0.020**	**0.019**	**0.016**	**0.019**	**0.017**	**0.13**	**0.017**	**0.018**	**0.012**	**0.011**
Rationale		**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**

Table 4.2-3
Upstream Sediment Data - SVOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	2-Methyl-4,6-dinitrophenol	2-Methylnaphthalene	2-Nitroaniline	2-Nitrophenol	3,3-Dichlorobenzidine	3-Nitroaniline	4-Bromophenyl phenyl ether	4-Chloro-3-methylphenol	4-Chloroaniline	4-Chlorophenyl phenyl ether	4-Nitroaniline	4-Nitrophenol	Acenaphthene	Acenaphthylene	Anthracene	Benzidine
SD-8	09/20/2008	< 0.16	< 0.012	< 0.018	< 0.015	< 0.029	< 0.19	< 0.013	< 0.018	< 0.016	< 0.018	< 0.20	< 0.16	< 0.015	< 0.018	< 0.015	< 0.45 R
SD-18	09/21/2008	< 0.15	< 0.011	< 0.017	< 0.014	< 0.027	< 0.18	< 0.013	< 0.017	< 0.015	< 0.016	< 0.18	< 0.15	< 0.014	< 0.016	< 0.014	< 0.42 R
SD-19	09/21/2008	< 0.15	< 0.011	< 0.017	< 0.014	< 0.027	< 0.18	< 0.013	< 0.017	< 0.015	< 0.016	< 0.18	< 0.15	< 0.014	< 0.016	< 0.014	< 0.42 R
SD-20	09/21/2008	< 0.16	< 0.013	< 0.019	< 0.016	< 0.030	< 0.20	< 0.014	< 0.019	< 0.016	< 0.018	< 0.20	< 0.17	< 0.015	< 0.018	< 0.016	< 0.47 R
Upstream Concentation																	
Maximum		**0.16**	**0.13**	**0.19**	**0.16**	**0.030**	**0.20**	**0.014**	**0.019**	**0.016**	**0.018**	**0.20**	**0.17**	**0.015**	**0.018**	**0.016**	**--**
Rationale		**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**--**

Table 4.2-3
Upstream Sediment Data - SVOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Benzoic Acid	Benzyl alcohol	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl) ether	Bis(2-chloroisopropyl) ether	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Carbazole	Chrysene	Dibenz(a,h) anthracene	Dibenzofuran	Diethyl phthalate
SD-8	09/20/2008	< 0.014	< 0.022	< 0.019	< 0.022	< 0.021	< 0.15	< 0.018	< 0.012	< 0.013	< 0.015	< 0.020	< 0.018	< 0.012	< 0.013	< 0.030	< 0.013	< 0.015
SD-18	09/21/2008	< 0.013	< 0.020	< 0.018	< 0.021	< 0.020	< 0.14	< 0.017	< 0.011	< 0.012	< 0.015	< 0.019	< 0.017	< 0.012	< 0.012	< 0.028	< 0.012	< 0.015
SD-19	09/21/2008	< 0.013	< 0.020	< 0.018	< 0.021	< 0.020	**0.46 J**	< 0.017	< 0.011	< 0.012	< 0.015	< 0.019	< 0.017	< 0.012	< 0.012	< 0.028	< 0.012	< 0.015
SD-20	09/21/2008	< 0.014	< 0.022	< 0.019	< 0.023	< 0.022	< 0.16	< 0.019	< 0.013	< 0.013	< 0.016	< 0.021	< 0.018	< 0.013	< 0.014	< 0.031	< 0.014	< 0.016
Upstream Concentation																		
Maximum		**0.014**	**0.022**	**0.019**	**0.023**	**0.022**	**0.46**	**0.019**	**0.013**	**0.013**	**0.016**	**0.021**	**0.018**	**0.013**	**0.014**	**0.031**	**0.014**	**0.016**
Rationale		**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MDC**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**

Table 4.2-3
Upstream Sediment Data - SVOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Indeno(1,2,3-cd) pyrene	Isophorone	Naphthalene	Nitrobenzene	N-Nitrosodimethylamine	N-Nitrosodi-n-propylamine
SD-8	09/20/2008	< 0.018	**0.013 J**	< 0.026	< 0.013	< 0.014	< 0.016	< 0.015	< 0.014	< 0.023	< 0.042	< 0.015	< 0.016	< 0.028	< 0.027	< 0.021
SD-18	09/21/2008	< 0.017	< 0.013	< 0.024	< 0.012	< 0.013	< 0.015	< 0.015	< 0.013	< 0.022	< 0.039	< 0.014	< 0.015	< 0.027	< 0.026	< 0.020
SD-19	09/21/2008	< 0.017	< 0.013	< 0.024	< 0.012	< 0.013	< 0.015	< 0.015	< 0.013	< 0.022	< 0.039	< 0.014	< 0.015	< 0.027	< 0.026	< 0.020
SD-20	09/21/2008	< 0.019	< 0.014	< 0.027	< 0.013	< 0.015	< 0.017	< 0.016	< 0.014	< 0.024	< 0.043	< 0.016	< 0.016	< 0.029	< 0.028	< 0.022
Upstream Concentation																
Maximum		**0.019**	**0.014**	**0.027**	**0.013**	**0.015**	**0.017**	**0.016**	**0.014**	**0.024**	**0.043**	**0.016**	**0.016**	**0.029**	**0.028**	**0.022**
Rationale		**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**

Table 4.2-3
Upstream Sediment Data - SVOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	N-Nitrosodiphenylamine	o-Cresol	p-Cresol	Pentachlorophenol	Phenanthrene	Phenol	Pyrene	Pyridine
SD-8	09/20/2008	< 0.020	< 0.018	< 0.018	< 0.14	< 0.011	< 0.021	< 0.015	< 0.022
SD-18	09/21/2008	< 0.018	< 0.017	< 0.017	< 0.13	< 0.010	< 0.020	< 0.014	< 0.020
SD-19	09/21/2008	< 0.018	< 0.017	< 0.017	< 0.13	< 0.010	< 0.020	< 0.014	< 0.020
SD-20	09/21/2008	< 0.020	< 0.019	**0.037 J**	< 0.14	< 0.012	< 0.022	< 0.016	< 0.022
Upstream Concentation									
Maximum		**0.020**	**0.019**	**0.037**	**0.14**	**0.012**	**0.022**	**0.016**	**0.022**
Rationale		**MMDL**	**MMDL**	**MDC**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**

Table 4.2-4
Upstream Sediment Data - VOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloro-1-propene	1,1-Dichloroethane	1,1-Dichloroethylene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromo-3-chloropropane	1,2-Dibromoethane	1,2-Dichlorobenzene
SD-8	09/20/2008	< 0.00021	< 0.00017	< 0.00011	< 0.000099	< 0.00017	< 0.000054	< 0.000079	< 0.00016	< 0.00031	< 0.00025	< 0.00011	< 0.00088	< 0.00022	< 0.000071
SD-18	09/21/2008	< 0.0091	< 0.0036	< 0.0080	< 0.012 *	< 0.022 *	< 0.0098 *	< 0.023 *	< 0.0079	< 0.024 *	< 0.0054	< 0.0072	< 0.038 J	< 0.0082 *	< 0.0060
SD-19	09/21/2008	< 0.00033	< 0.00028	< 0.00017	< 0.00016	< 0.00028	< 0.000087	< 0.00013	< 0.00026	< 0.00049	< 0.00040	< 0.00017	< 0.0015	< 0.00035	< 0.00012
SD-20	09/21/2008	< 0.00020	< 0.00017	< 0.000099	< 0.000098	< 0.00017	< 0.000054	< 0.000078	< 0.00016	< 0.00030	< 0.00025	< 0.00011	< 0.00087	< 0.00022	< 0.000070
Upstream Concentation															
Maximum		**0.0091**	**0.0036**	**0.0080**	**0.00016**	**0.00028**	**0.000087**	**0.00013**	**0.0079**	**0.00049**	**0.0054**	**0.0072**	**0.038**	**0.00035**	**0.0060**
Rationale		**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**

Table 4.2-4
Upstream Sediment Data - VOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	1,2-Dichloroethane	1,2-Dichloroethylene, cis	1,2-Dichloroethylene, trans	1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichloro-1-propene, trans	1,3-Dichloro-1-propene, cis	1,3-Dichlorobenzene	1,3-Dichloropropane	1,4-Dichlorobenzene	2,2-Dichloropropane	2-Chloroethyl Vinyl Ether	2-Hexanone	Acetone	Acrolein
SD-8	09/20/2008	< 0.000061	< 0.000092	< 0.000054	< 0.000074	< 0.000045	< 0.00012	< 0.000035	< 0.000079	< 0.000067	< 0.00012	< 0.00012	< 0.00035	< 0.00088	**0.032 J**	< 0.0039
SD-18	09/21/2008	< 0.0061	< 0.013 *	< 0.011	< 0.0092	< 0.0094	< 0.011 *	< 0.010 *	< 0.0067	< 0.0098 *	< 0.0085	< 0.022 *	< 0.049 * J	< 0.22	< 0.27	< 0.20 R
SD-19	09/21/2008	< 0.000098	< 0.00015	< 0.000087	< 0.00012	< 0.000073	< 0.00019	< 0.000057	< 0.00013	< 0.00011	< 0.00019	< 0.00019	< 0.00057	< 0.0015	**0.32 J**	< 0.0062
SD-20	09/21/2008	< 0.000060	< 0.000090	< 0.000054	< 0.000072	< 0.000045	< 0.00012	< 0.000035	< 0.000078	< 0.000066	< 0.00012	< 0.00012	< 0.00035	< 0.00087	**0.037 J**	< 0.0038
Upstream Concentation																
Maximum		**0.0061**	**0.00015**	**0.011**	**0.0092**	**0.0094**	**0.00019**	**0.000057**	**0.0067**	**0.000011**	**0.0085**	**0.00019**	**0.00057**	**0.22**	**0.32**	**0.0062**
Rationale		**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MDC**	**MMDL**

Table 4.2-4
Upstream Sediment Data - VOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	Acrylonitrile	Benzene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	Butyl benzene	Butylbenzene, sec	Butylbenzene, tert-	Carbon disulfide	Carbon tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroethane
SD-8	09/20/2008	< 0.0012	**0.0030 J**	< 0.00011	< 0.00029	< 0.000050	< 0.00029	< 0.00048	< 0.000099	< 0.000074	< 0.000061	**0.0052 J**	< 0.000088	< 0.000061	< 0.00018	< 0.00034
SD-18	09/21/2008	< 0.036 *	< 0.0077	< 0.012 *	< 0.011	< 0.0098 *	< 0.011	< 0.022 * J	< 0.0083	< 0.0088	< 0.012	< 0.017 *	< 0.024 *	< 0.0071	< 0.0077	< 0.017
SD-19	09/21/2008	< 0.0019	**0.0036 J**	< 0.00017	< 0.00046	< 0.000080	< 0.00046	< 0.00076	< 0.00016	< 0.00012	< 0.000098	**0.0017 J**	< 0.00015	< 0.000098	< 0.00029	< 0.00055
SD-20	09/21/2008	< 0.0012	**0.016**	< 0.00011	< 0.00028	< 0.000049	< 0.00028	< 0.00047	< 0.000098	< 0.000072	< 0.000060	**0.0061**	< 0.000087	< 0.000060	< 0.00018	< 0.00034
Upstream Concentation																
Maximum		**0.0019**	**0.016**	**0.00017**	**0.011**	**0.0000080**	**0.011**	**0.00076**	**0.0083**	**0.0088**	**0.012**	**0.0061**	**0.00015**	**0.0071**	**0.0077**	**0.017**
Rationale		**MMDL**	**MDC**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MDC**	**MMDL**	**MMDL**	**MMDL**	**MMDL**

Table 4.2-4
Upstream Sediment Data - VOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	Chloroform	Chloromethane	Chlorotoluene o-	Chlorotoluene p-	Cumene (isopropyl benzene)	Cymene p- (Toluene isopropyl p-)	Dibromomethane (methylene bromide)	Dichlorodifluoromethane (CFC-12)	Ethyl benzene	Hexachlorobutadiene	Iodomethane	Methyl ethyl ketone	Methyl isobutyl ketone
SD-8	09/20/2008	< 0.000054	< 0.000065	< 0.000058	< 0.00011	< 0.000035	< 0.000094	< 0.00021	< 0.000081	**0.00026 J**	< 0.00020	< 0.00067	**0.0044 J**	< 0.00027
SD-18	09/21/2008	< 0.011 *	< 0.011	< 0.0070	< 0.0092 *	< 0.011 *	< 0.0078	< 0.020 *	< 0.024 *	< 0.0051	< 0.018	< 0.11 *	< 0.24	< 0.39 *
SD-19	09/21/2008	< 0.000087	< 0.00011	< 0.000093	< 0.00017	< 0.000057	< 0.00016	< 0.00033	< 0.00014	< 0.000075	< 0.00031	< 0.0011	**0.034 J**	< 0.00044
SD-20	09/21/2008	< 0.000054	< 0.000064	< 0.000057	< 0.00011	< 0.000035	< 0.000092	< 0.00020	< 0.000080	< 0.000046	< 0.00019	< 0.00066	**0.01**	< 0.00027
Upstream Concentation														
Maximum		**0.000087**	**0.011**	**0.0070**	**0.00017**	**0.000057**	**0.0078**	**0.00033**	**0.00014**	**0.0051**	**0.018**	**0.0011**	**0.24**	**0.00044**
Rationale		**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**

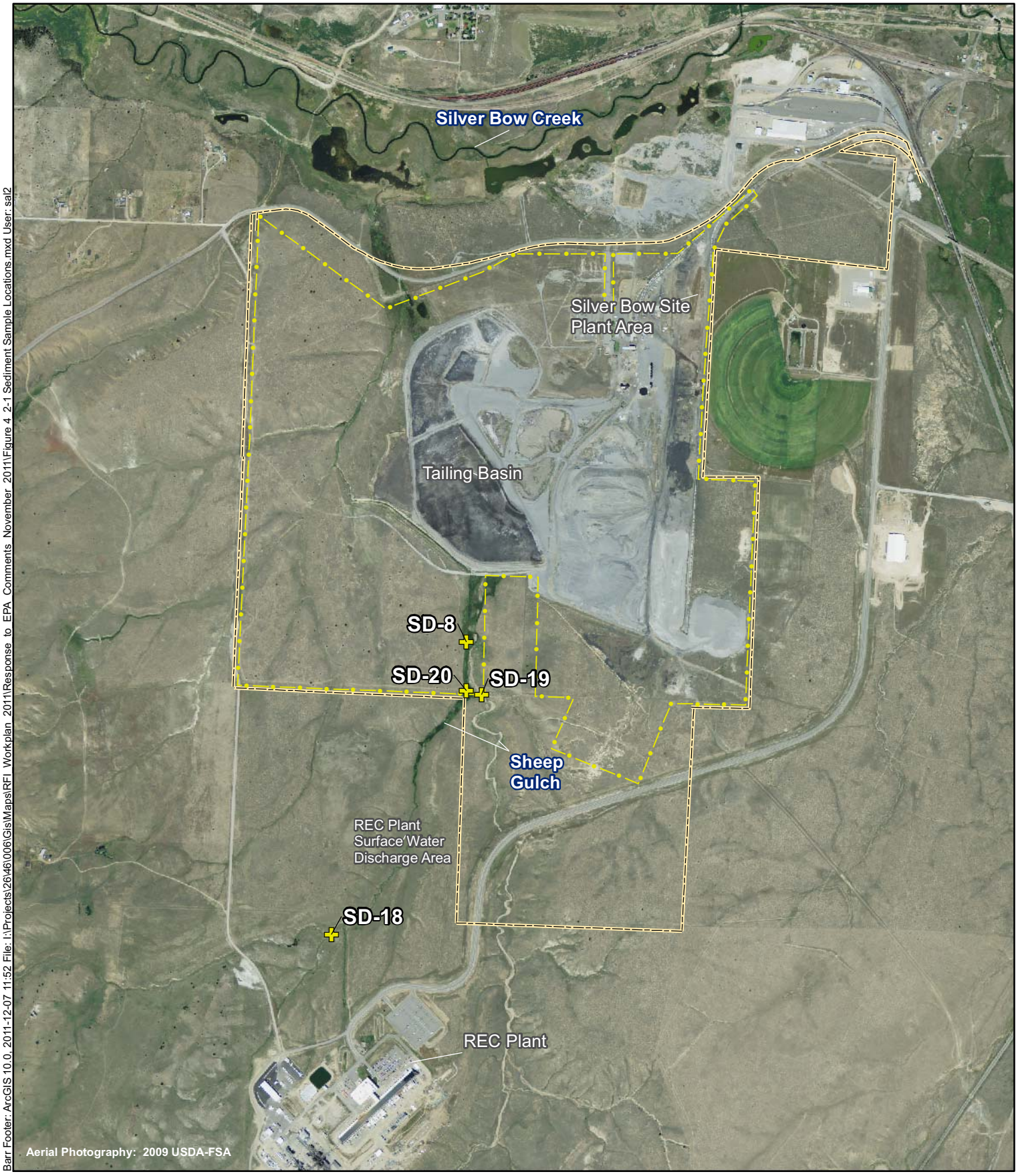
Table 4.2-4
Upstream Sediment Data - VOCs
Sheep Gulch
Rhodia Silver Bow Plant
[concentration in mg/kg]

Location ID	Date	Methyl tertiary butyl ether (MTBE)	Methylene chloride	Naphthalene	Propylbenzene	Styrene	Tetrachloroethylene	Toluene	Trichloroethylene	Trichlorofluoromethane	Vinyl acetate	Vinyl chloride	Xylene m & p	Xylene, o-
SD-8	09/20/2008	< 0.000090	< 0.00016	< 0.00036	< 0.000070	< 0.000086	< 0.00014	**0.0025 J**	< 0.00015	< 0.000061	< 0.00068	< 0.000065	< 0.00047	**0.00020 J**
SD-18	09/21/2008	< 0.017 *	< 0.011	< 0.0077	< 0.011 *	< 0.0051	< 0.017 *	< 0.0096	< 0.015	< 0.026 *	< 0.042 *	< 0.022 *	< 0.011	< 0.0077
SD-19	09/21/2008	< 0.00015	< 0.00026	< 0.00058	< 0.00012	< 0.00014	< 0.00022	**0.0017 J**	< 0.00024	< 0.000098	< 0.0011	< 0.00011	**0.00096 J**	**0.00038 J**
SD-20	09/21/2008	< 0.000089	< 0.00016	< 0.00036	< 0.000069	< 0.000085	< 0.00014	**0.0039 J**	< 0.00015	< 0.000060	< 0.00067	< 0.000064	< 0.00049	**0.00023 J**
Upstream Concentation														
Maximum		**0.00015**	**0.011**	**0.0077**	**0.00012**	**0.0051**	**0.00022**	**0.0096**	**0.015**	**0.0000098**	**0.0011**	**0.00011**	**0.011**	**0.0077**
Rationale		**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**	**MMDL**

Table 4.2-5
Upstream Sediment Data - Radionuclides
Sheep Gulch
Rhodia Silver Bow Plant
[concentrations in pCi/g]

Location ID	Date	Gross Alpha (radiation)	Gross Beta (radiation)	Radium 226	Radium 228
SD-8	09/20/2008	**16 +/- 2**	**8.2 +/- 1**	**2.4 +/- 0.63**	< 2.8
SD-18	09/21/2008	**5.7 +/- 1.2**	**5.8 +/- 0.89**	**1.7 +/- 0.57**	**3.4 +/- 1.3**
SD-19	09/21/2008	**12 +/- 1.8**	**14 +/- 1.2**	**3.4 +/- 0.74**	**3 +/- 1.3**
SD-20	09/21/2008	**7.3 +/- 1.4**	**7.6 +/- 1**	**2.4 +/- 0.68**	**4.1 +/- 1.3**
Upstream Concentation					
Maximum		**16**	**14**	**3.4**	**4.1**
Rationale		**MDC**	**MDC**	**MDC**	**MDC**

Figures



Barr Footer: ArcGIS 10.0, 2011-12-07 11:52 File: i:\Projects\26\46\006\Gis\Maps\RFI Workplan 2011\Response to EPA Comments November 2011\Figure 4 2-1 Sediment Sample Locations.mxd User: sal2

SD-20 Sediment sample collected Fall 2008.

Fence Line

Property Boundary

Feet
1,500 0 1,500

Figure 4.2-1

UPSTREAM SEDIMENT SAMPLE LOCATIONS
Rhodia Silver Bow Plant
Montana