

Table 2-1
 Comparison - Half Hour Wind Direction and Speed, Hayden and Winkelman Stations
 August 4, 2010 and August 13, 2010
 ASARCO Hayden Plant Site, Hayden, Arizona

		Winkelman		Hayden					Winkelman		Hayden		
Date	Time	Average Wind Direction (degrees)	Average Wind Speed (mph)	Average Wind Direction (degrees)	Average Wind Speed (mph)	Wind Direction Difference (degrees)	Date	Time	Average Wind Direction (degrees)	Average Wind Speed (mph)	Average Wind Direction (degrees)	Average Wind Speed (mph)	Wind Direction Difference (degrees)
8/4/2010	24 Hour Avg.	198.1	2.9	171.1	3.9		8/13/2010	24 Hour Avg.	200.3	3.5	202.4	4.0	
8/4/2010	12:00 AM	68	0.4	145	0.9	77	8/13/2010	12:00 AM	78	0.4	135	0.6	57
8/4/2010	12:30 AM	207	0.4	131	0.5	76	8/13/2010	12:30 AM	43	0.4	131	1.2	88
8/4/2010	1:00 AM	80	0.5	133	2.2	53	8/13/2010	1:00 AM	39	1.3	129	0.1	90
8/4/2010	1:30 AM	190	0.7	132	3.9	58	8/13/2010	1:30 AM	52	0.4	182	0.1	130
8/4/2010	2:00 AM	165	0.7	132	3.8	33	8/13/2010	2:00 AM	209	1.0	139	0.6	70
8/4/2010	2:30 AM	51	2.1	135	3.0	84	8/13/2010	2:30 AM	49	0.4	229	0.5	180
8/4/2010	3:00 AM	90	1.9	128	3.8	38	8/13/2010	3:00 AM	181	1.0	305	0.5	124
8/4/2010	3:30 AM	223	2.9	155	2.3	68	8/13/2010	3:30 AM	206	0.6	150	1.4	56
8/4/2010	4:00 AM	316	0.9	22	1.8	66	8/13/2010	4:00 AM	190	0.6	116	0.5	74
8/4/2010	4:30 AM	260	0.4	134	1.8	126	8/13/2010	4:30 AM	103	0.4	129	1.7	26
8/4/2010	5:00 AM	169	0.6	124	3.9	45	8/13/2010	5:00 AM	205	0.6	131	1.1	74
8/4/2010	5:30 AM	44	0.4	135	3.5	91	8/13/2010	5:30 AM	91	0.4	135	1.2	44
8/4/2010	6:00 AM	208	2.1	130	4.1	78	8/13/2010	6:00 AM	57	0.4	133	1.6	76
8/4/2010	6:30 AM	201	2.7	116	3.4	85	8/13/2010	6:30 AM	62	0.4	139	1.8	77
8/4/2010	7:00 AM	187	0.5	128	1.7	59	8/13/2010	7:00 AM	89	0.4	127	2.0	38

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8/4/2010	7:30 AM	111	0.4	122	3.5	11	8/13/2010	7:30 AM	109	1.6	115	4.2	6
8/4/2010	8:00 AM	122	1.6	114	4.8	8	8/13/2010	8:00 AM	124	1.8	104	6.3	20
8/4/2010	8:30 AM	135	2.5	102	5.3	33	8/13/2010	8:30 AM	144	3.4	107	5.1	37
8/4/2010	9:00 AM	160	1.7	114	5.1	46	8/13/2010	9:00 AM	152	3.4	120	5.5	32
8/4/2010	9:30 AM	170	2.1	118	5.4	52	8/13/2010	9:30 AM	182	3.5	124	4.7	58
8/4/2010	10:00 AM	136	1.8	125	3.9	11	8/13/2010	10:00 AM	200	2.0	153	2.9	47
8/4/2010	10:30 AM	196	1.4	142	3.5	54	8/13/2010	10:30 AM	252	2.6	221	2.7	31
8/4/2010	11:00 AM	169	1.6	149	3.4	20	8/13/2010	11:00 AM	217	3.0	211	2.8	6
8/4/2010	11:30 AM	178	1.7	161	2.3	17	8/13/2010	11:30 AM	241	3.6	260	5.3	19
8/4/2010	12:00 PM	193	1.6	171	2.4	22	8/13/2010	12:00 PM	262	4.2	241	5.7	21
8/4/2010	12:30 PM	191	2.4	121	2.5	70	8/13/2010	12:30 PM	294	5.0	280	6.1	14
8/4/2010	1:00 PM	134	2.2	130	3.9	4	8/13/2010	1:00 PM	310	8.3	266	8.4	44
8/4/2010	1:30 PM	167	4.0	192	3.8	25	8/13/2010	1:30 PM	327	8.4	274	8.0	53
8/4/2010	2:00 PM	290	4.5	244	4.6	46	8/13/2010	2:00 PM	302	6.8	278	6.6	24
8/4/2010	2:30 PM	235	4.2	203	3.2	32	8/13/2010	2:30 PM	313	8.0	280	7.8	33
8/4/2010	3:00 PM	166	4.7	287	4.0	121	8/13/2010	3:00 PM	313	10.0	258	9.9	55
8/4/2010	3:30 PM	281	3.2	268	4.8	13	8/13/2010	3:30 PM	312	11.0	287	11.2	25
8/4/2010	4:00 PM	320	5.9	273	6.7	47	8/13/2010	4:00 PM	312	11.0	268	9.6	44
8/4/2010	4:30 PM	291	5.8	274	5.5	17	8/13/2010	4:30 PM	302	10.3	265	10.1	37

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8/4/2010	5:00 PM	256	6.0	259	5.4	3	8/13/2010	5:00 PM	296	8.8	258	10.4	38
8/4/2010	5:30 PM	245	4.0	257	4.5	12	8/13/2010	5:30 PM	292	9.0	265	9.3	27
8/4/2010	6:00 PM	293	8.2	283	8.9	10	8/13/2010	6:00 PM	286	9.8	258	9.3	28
8/4/2010	6:30 PM	312	10.1	279	9.6	33	8/13/2010	6:30 PM	296	8.5	273	9.1	23
8/4/2010	7:00 PM	310	9.3	283	8.3	27	8/13/2010	7:00 PM	290	7.2	267	7.0	23
8/4/2010	7:30 PM	298	5.5	273	5.1	25	8/13/2010	7:30 PM	299	5.1	278	4.8	21
8/4/2010	8:00 PM	302	4.4	289	3.2	13	8/13/2010	8:00 PM	309	1.4	301	0.8	8
8/4/2010	8:30 PM	296	3.7	279	0.8	17	8/13/2010	8:30 PM	303	0.4	296	0.3	7
8/4/2010	9:00 PM	295	1.4	270	1.2	25	8/13/2010	9:00 PM	242	0.9	279	0.2	37
8/4/2010	9:30 PM	200	0.4	143	1.5	57	8/13/2010	9:30 PM	222	0.4	141	0.6	81
8/4/2010	10:00 PM	157	5.0	108	6.4	49	8/13/2010	10:00 PM	223	0.9	131	0.4	92
8/4/2010	10:30 PM	111	5.4	80	7.1	31	8/13/2010	10:30 PM	117	0.4	308	0.1	169
8/4/2010	11:00 PM	120	2.7	99	3.9	21	8/13/2010	11:00 PM	94	0.4	99	0.4	5
8/4/2010	11:30 PM	208	0.4	122	1.2	86	8/13/2010	11:30 PM	22	0.4	139	0.4	117

12/48 > 60° directional difference
 3/48 > 90° directional difference
 2/48 > 120° directional difference

14/48 > 60° directional difference
 6/48 > 90° directional difference
 4/48 > 120° directional difference

Table 2-2
 Summary of PM₁₀ Fraction Laboratory Data from 1999 to 2001
 ADEQ Hayden Jail Monitoring Station
 ASARCO Hayden Plant Site, Hayden, Arizona

Analyte	Arizona Ambient Air Quality Standards (ug/m ³)	EPA Region IX Regional Screening Levels (RSLs) ³	Number of Analyses ⁵	Number of Detections ⁵	Percentage of Detections (%)	Minimum Detected Value ⁵ (ug/m ³)	Maximum Detected Value ⁵ (ug/m ³)	Arithmetic Mean Value ⁵ (ug/m ³)
Aluminum	--	--	167	167	100	0.0939	5.07	1.65
Antimony	--	--	167	3	2	0.0352	0.119	0.0266
Arsenic	0.000441 ¹	0.00057	167	166	99	0.00361	0.134	0.0331
Barium	--	--	167	13	8	0.0854	0.248	0.0907
Bromine	--	--	167	149	89	0.00166	0.0154	0.0041
Cadmium	0.00105 ¹	0.0014	167	23	14	0.0146	0.0314	0.0168
Calcium	--	--	167	167	100	0.102	7.57	1.67
Chlorine	--	--	167	105	63	0.0339	0.756	0.115
Chromium	--	--	167	2	1	0.00792	0.0121	0.00641
Cobalt	0.000686 ¹	0.00027	167	0	0	ND	ND	ND
Copper	--	--	167	167	100	0.0229	4.51	0.865
Gallium	--	--	167	2	1	0.00427	0.00546	0.00316
Gold	--	--	167	0	0	ND	ND	ND
Indium	--	--	167	0	0	ND	ND	ND
Iron	--	--	167	167	100	0.0967	4.55	1.45
Lanthanum	--	--	167	0	0	ND	ND	ND
Lead	0.15 ^{2,4}	--	167	167	100	0.00664	0.221	0.0686
Magnesium	--	--	167	165	99	0.0368	0.707	0.211
Manganese	0.0521 ¹	--	167	165	99	0.00567	0.0622	0.0188
Mercury	0.313 ¹	--	167	3	2	0.00489	0.0058	0.00386
Molybdenum	--	--	167	163	98	0.00483	0.112	0.0189
Nickel	--	0.0094	167	25	15	0.00207	0.0172	0.00347
Palladium	--	--	167	0	0	ND	ND	ND
Phosphorus	--	--	167	3	2	0.0307	0.0647	0.0232
Potassium	--	--	167	167	100	0.0402	1.62	0.53
Rubidium	--	--	167	158	95	0.00109	0.00867	0.00323
Selenium	--	--	167	164	98	0.00183	0.0939	0.017
Silicon	--	--	167	167	100	0.339	16.7	5.06
Silver	--	--	167	10	6	0.175	0.0418	0.0154

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 ADEQ Hayden Jail Monitoring Station
 ASARCO Hayden Plant Site, Hayden, Arizona

Analyte	Arizona Ambient Air Quality Standards (ug/m ³)	EPA Region IX Regional Screening Levels (RSLs) ³	Number of Analyses ⁵	Number of Detections ⁵	Percentage of Detections (%)	Minimum Detected Value ⁵ (ug/m ³)	Maximum Detected Value ⁵ (ug/m ³)	Arithmetic Mean Value ⁵ (ug/m ³)
Sodium	--	--	167	72	43	0.0591	0.409	0.157
Strontium	--	--	167	166	99	0.00189	0.0226	0.00786
Sulfur	--	--	167	167	100	0.156	2.74	1.13
Thallium	--	--	167	0	0	ND	ND	ND
Tin	--	--	167	9	5	0.0273	0.0372	0.0227
Titanium	--	--	167	164	98	0.0467	0.316	0.104
Uranium	--	--	167	0	0	ND	ND	ND
Vanadium	--	--	167	1	1	0.0255	0.0255	0.0178
Yttrium	--	--	167	51	31	0.00222	0.00513	0.00247
Zinc	--	--	167	167	100	0.00547	0.388	0.0743
Zirconium	--	--	167	145	87	0.00194	0.0092	0.00378

Table Notes:

¹ Arizona Department of Environmental Quality Chronic Ambient Air Concentrations, Title 18, Chapter 2, Article 17

² Arizona Department of Environmental Quality Ambient Air Quality Standards, Title 18, Chapter 2, Article 2, December 2007

³ EPA Region IX Regional Screening Levels (RSL) Residential Air Supporting Table November 2011

⁴ The averaging time for the criteria is the quarterly average

⁵ Source of Data: Sandra Wardwell, Data Management Team, Arizona Department of Environmental Quality, "ADEQ XRF Data, Hayden PM10

Dichot Filters 1991-2001," E-mail to Prabhat Bhargava, October 13, 2005

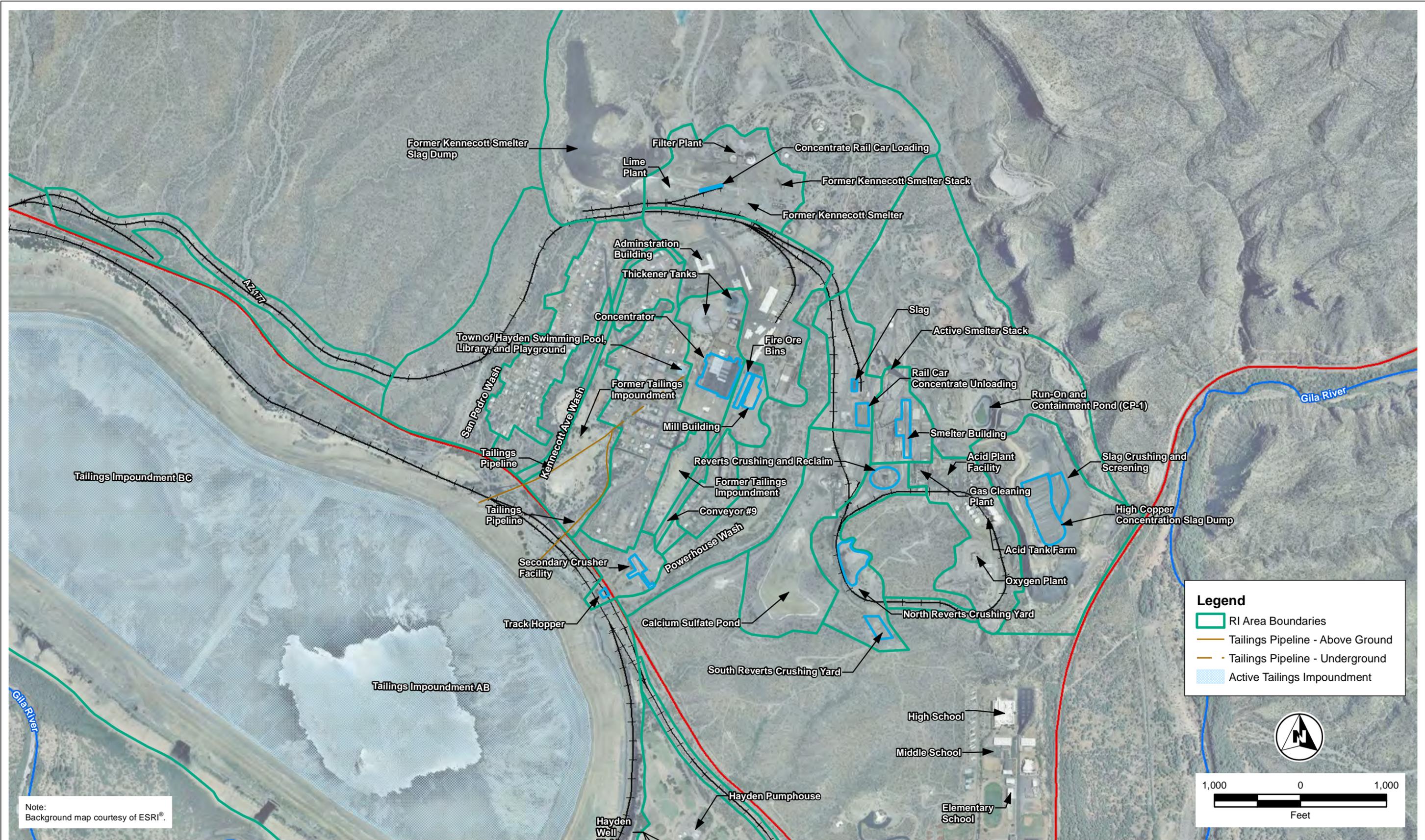
Bold values with bold outline indicate the result exceeds one or more of the comparison criteria

-- = Not established

% = percent

ND = not detected

ug/m³ = micrograms per cubic meter



ASARCO Hayden Plant Site
 Final Phase II RI/FS Work Plan (Part 1 of 2 - Air)
 Hayden, Arizona

Figure 2-3
 Key Features of Study Area

Table 2-4
 Air Release Data from Toxic Release Inventory Explorer Database
 2003-2009
 ASARCO Hayden Plant Site, Hayden, Arizona

Chemical	2003			2004			2005			2006			2007			2008			2009		
	On-Site Fugitive Air (lbs)	On-Site Point Source Air (lbs)	Total Air Emissions (lbs)	On-Site Fugitive Air (lbs)	On-Site Point Source Air (lbs)	Total Air Emissions (lbs)	On-Site Fugitive Air (lbs)	On-Site Point Source Air (lbs)	Total Air Emissions (lbs)	On-Site Fugitive Air (lbs)	On-Site Point Source Air (lbs)	Total Air Emissions (lbs)	On-Site Fugitive Air (lbs)	On-Site Point Source Air (lbs)	Total Air Emissions (lbs)	On-Site Fugitive Air (lbs)	On-Site Point Source Air (lbs)	Total Air Emissions (lbs)	On-Site Fugitive Air (lbs)	On-Site Point Source Air (lbs)	Total Air Emissions (lbs)
Antimony Compounds	125	11	136	87	0	87	68	34	102	60	26	86	84	32	116	112	6	118	139	110	249
Arsenic Compounds	4,811	490	5,301	2,035	433	2,468	1,416	664	2,080	1,951	768	2,719	2,224	857	3,081	4,579	967	5,546	3,045	882	3,927
Barium Compounds	0	921	921	4	77	81	3	8,624	8,627	0	5,889	5,889	1	19,886	19,887	0	2,588	2,588	0	6,214	6,214
Cadmium Compounds	77	502	579	62	36	98	40	46	86	67	67	134	100	88	188	76	64	140	66	45	111
Chromium Compounds (except Chromite Ore mined in the Transvaal Region)	0	42	42	6	0	6	3	60	63	2	46	48	4	42	46	5	8	13	5	41	46
Cobalt Compounds	0	1	1	1	1	2	1	2	3	1	2	3	0	1	1	0	1	1	0	7	7
Copper Compounds	57,579	4,161	61,740	63,242	5,704	68,946	50,484	6,089	56,573	67,862	6,981	74,843	74,242	7,190	81,432	75,094	1,237	76,331	70,127	2,225	72,352
Lead Compounds	6,419	2,131	8,550	2,909	102	3,011	1,787	758	2,545	3,749	874	4,623	6,764	908	7,672	9,243	465	9,708	5,960	1,292	7,252
Manganese Compounds	0	906	906	1	0	1	1	20	21	1	10	11	22	7	29	23	3	26	23	10	33
Mercury Compounds	0	16	16	0	2	2	0	11	11	0	13	13	0	14	14	0	28	28	0	0	0
Nickel Compounds	0	4	4	5	0	5	1	40	41	4	32	36	1	28	29	1	19	20	2	25	27
Selenium Compounds	790	12	802	757	0	757	643	3	646	761	2	763	917	3	920	1,087	20	1,107	815	25	840
Silver Compounds	176	13	189	162	0	162	114	16	130	143	16	159	173	17	190	136	39	175	144	61	205
Sulfuric Acid ("Acid Aerosols" only)	1,381	436,592	437,973	1,347	122,290	123,637	1,316	236,847	238,163	1,431	259,129	260,560	1,476	209,579	211,055	1,496	200,607	202,103	1,465	370,495	371,960
Vanadium (except when contained in an alloy)	0	0	0	0	0	0	0	6	6	0	4	4	0	3	3	0	1	1	0	2	2
Zinc Compounds	3,001	15,903	18,904	3,369	2,190	5,559	2,126	27,268	29,394	3,103	30,995	34,098	4,008	34,965	38,973	4,285	4,971	9,256	3,968	31,679	35,647
Total	74,359	461,705	536,064	73,987	130,835	204,822	58,003	280,488	338,491	79,135	304,854	383,989	90,127	273,620	363,747	96,325	211,024	307,349	85,759	413,113	498,872
Polycyclic Aromatics													111	0		188	0		0	0	

lbs = pounds

Table 3-1
Calendar Year Comparison
24-Hour Average PM₁₀ and Metals Concentrations at Hayden and Winkelman Stations
ASARCO Hayden Plant Site, Hayden, Arizona

Hayden Station Data							
COPC	Year	2006 (10/22-12/27)	2007	2008	2009	2010	Annual Average 2007 - 2010
	# of readings	11	55	66	59	58	
PM ₁₀	Maximum	51.53	91.48	177.21	82.17	113.26	--
	Average	N/A	39.27	33.33	26.98	35.73	33.83
Arsenic	Maximum	0.104	0.1894	0.2276	0.2107	0.1880	--
	Average	N/A	0.0238	0.0264	0.0214	0.0300	0.0254
Copper	Maximum	3.997	3.88	3.82	2.347	2.664	--
	Average	N/A	0.6957	0.5577	0.3738	0.5795	0.5517
Lead	Maximum	0.5947	0.8362	0.984	0.965	0.4503	--
	Average	N/A	0.0838	0.1128	0.0740	0.0833	0.0885
Cadmium	Maximum	0.0166	0.0351	0.0346	0.0215	0.0137	--
	Average	N/A	0.0069	0.0034	0.0017	0.0023	0.0036
Chromium	Maximum	0.0025	0.0072	0.0104	0.0092	0.0149	--
	Average	N/A	0.0022	0.0018	0.0012	0.0018	0.0017

Winkelman Station Data							
COPC	Year	2006 (11/21-12/27)	2007	2008	2009	2010	Annual Average 2007 - 2010
	# of readings	7	48	60	55	44	
PM ₁₀	Maximum	18.25	82.41	77.09	91.92	24.50	--
	Average	N/A	21.42	18.36	17.76	13.46	17.75
Arsenic	Maximum	0.0110	0.0282	0.0339	0.0266	0.0389	--
	Average	N/A	0.0087	0.0080	0.0065	0.0087	0.0080
Copper	Maximum	0.2996	1.303	1.390	0.4293	1.0290	--
	Average	N/A	0.3101	0.2218	0.1257	0.1687	0.2086
Lead	Maximum	.0275	0.0830	0.2067	0.0656	0.1328	--
	Average	N/A	0.0240	0.0276	0.0160	0.0240	0.0229
Cadmium	Maximum	0.0033	0.0033	0.0027	0.0032	0.0049	--
	Average	N/A	0.0020	0.0021	0.0006	0.0006	0.0013
Chromium	Maximum	0.0012	0.0056	0.0042	0.0038	0.0040	--
	Average	N/A	0.0014	0.0011	0.0006	0.0007	0.0009

All concentration values are expressed in micrograms per cubic meter
The highest maximum concentrations for each analyte are highlighted for each monitoring station.

"average" value is the arithmetic mean value

TABLE 3-2
 Air Quality Standards and Risk-Based Reference Values with Background Concentrations
 ASARCO Phase II RI/FS Work Plan

Air Quality Parameter	National Ambient Air Quality Standards (NAAQS)				EPA Regional Screening Levels (RSL) November 2011 Residential Air Carcinogenic (ug/m ³)	Agency for Toxic Substances and Disease Registry Minimal Risk Levels 2010 (ug/m ³)			California Office of Environmental Health Hazard Assessment and Air Resources Board Reference Exposure Levels (REL) February 2011 (ug/m ³)			Arizona Ambient Air Quality Guidelines May 1999 (ug/m ³)			Arizona Ambient Air Quality Standards R18-2-201, 206 (ug/m ³)		Arizona Chronic Ambient Air Concentrations R18-2-1708 Table 3 (ug/m ³)		Pinal County Air Quality Control District Ambient Air Quality Standards PCAQCD Code of Regulations 2-1-020, 070 (ug/m ³)				Background Concentrations ^b Organ Pipe National Monument		
	24-Hr	Rolling 3-Month Average	Qtrly Avg	Annual	Annual	Acute (1-14 Days)	Intermediate (>14-364 Days)	Chronic (≥ 365 Days)	Acute	8-Hour Exposure	Chronic	1-Hr Avg	24-Hr Avg	Annual Average	Calendar Quarter	Annual Average	Acute	Chronic	24-Hr Avg	Calendar Quarter	Annual Average	3-Yr Avg	Arithmetic Mean	Minimum Detected Value	Maximum Detected Value
Arsenic					0.000570				0.20	0.015	0.015	0.06	0.016	0.00023			2500	0.000441					ND	ND	ND
Cadmium					0.001400	0.03		0.01			0.020	0.77	0.20	0.00056			250	0.001050					ND	ND	ND
Chromium												15.00	4.00										0.000493	0.0003	0.0017
Chromium (VI)					0.000011		0.30					0.017	0.0044	0.000012			100	0.000158							
Copper									100			3.0 ^a	0.79										0.00142	0.0005	0.0043
Lead		0.15	1.50											1.50					1.50				0.00133	0.0008	0.0027
TSP																									
PM ₁₀	150											150	50	150	50			150			50		16	6.58	71.9
PM _{2.5}	35			15										65	15			65			15				

a Copper as fume

b The data is based on analysis of 15 PM10 filter samples collected at 24-day intervals from January 2, 2006, to December 4, 2006, at Organ Pipe National Monument

Table 3-3
 Comparison of Hayden and Winkelman Station Data to
 Phoenix and Tucson NATTS Data (2006-2007)
 ASARCO Hayden Plant Site, Hayden, Arizona

Ambient Monitor Station	Arsenic Concentration Range (ug/m3)	Comparison	Cadmium Concentration Range (ug/m3)	Comparison	Chromium Concentration Range (ug/m3)	Comparison
Hayden	0.0034 -0.1894	Exceeds Phoenix Exceeds Tuscon	0.0108-0.0351	Exceeds Phoenix Exceeds Tuscon	0.0014-0.0072	Within Range Phoenix Within Range Tuscon
Winkelman	0.0023-0.0282	Exceeds Phoenix Exceeds Tuscon	0.0022-0.0029	Within Range Phoenix Within Range Tuscon	0.0013-0.0056	Within Range Phoenix Within Range Tuscon
NATTS-Phoenix	0.00012 - 0.01000		0.00035 - 0.0321		0.00005 - 0.238	
NATTS- Tucson	0.00004 - 0.00292		0.00012 - 0.0131		0.00011 - 0.211	

Table 3-4
 Calendar Year and
 Shutdown Period Comparison
 ASARCO Hayden Plant Site, Hayden, Arizona

HAYDEN STATION DATA

COPC		2007	Known Shutdown 2007	2008	Known Shutdown 2008	2009	Planned Shutdown 2009
		55 Samples	3 Samples	66 Samples	4 Samples	59 Samples	6 Samples
PM ₁₀	Maximum	91.48	17.36	177.21	37.8	82.17	27.43
	Average	39.27	13.09	33.33	24.29	26.98	20.65
Arsenic	Maximum	0.1894	0.0073	0.2276	0.0091	0.2107	0.0059
	Average	0.0238	0.0043	0.0264	0.0042	0.0214	0.0023
Copper	Maximum	3.88	0.3001	3.82	0.7425	2.347	0.4115
	Average	0.6957	0.1758	0.5577	0.3046	0.3738	0.1591
Lead	Maximum	0.8362	0.0099	0.984	0.064	0.965	0.0102
	Average	0.0838	0.0049	0.1128	0.0235	0.074	0.0062
Cadmium	Maximum	0.0351	.00051	0.0346	0.0024	0.0215	ND
	Average	0.0069	.00051	0.0034	0.002	0.0017	ND
Chromium	Maximum	0.0072	0.0022	0.0104	0.01	0.0092	0.0015
	Average	0.0022	0.0013	0.0018	0.0034	0.0012	0.0009

WINKELMAN STATION DATA

COPC		2007	Known Shutdown 2007	2008	Known Shutdown 2008	2009	Planned Shutdown 2009
		48 Samples	3 Samples	60 Samples	2 Samples	55 Samples	6 Samples
PM ₁₀	Maximum	82.41	7.29	77.09	12.47	91.92	17.43
	Average	21.42	6.58	18.36	7.33	17.76	14.12
Arsenic	Maximum	0.0282	0.0044	0.0339	0.0021	0.0266	0.0013
	Average	0.0087	0.003	0.008	0.0015	0.0065	0.0007
Copper	Maximum	1.303	0.2415	1.39	0.0538	0.4293	0.0709
	Average	0.3101	0.2217	0.2218	0.047	0.1257	0.0494
Lead	Maximum	0.083	0.0085	0.2067	0.0044	0.0656	0.0042
	Average	0.024	0.0062	0.0276	0.0034	0.016	0.0036
Cadmium	Maximum	0.0033	0.0018	0.0027	0.0021	0.0032	ND
	Average	0.002	0.0018	0.0021	0.0019	0.0006	ND
Chromium	Maximum	0.0056	0.003	0.0042	0.0009	0.0038	0.0006
	Average	0.0014	0.0016	0.0011	0.0009	0.0006	0.0003

All concentration values expressed as micrograms per cubic meter (ug/m³)

"average" value is the arithmetic mean value

Table 4-1
 Chemicals of Potential Concern¹
 ASARCO Hayden Plant Site, Hayden, Arizona

Chemicals of Potential Concern
Particulate matter:
PM10
PM2.5
Metals:
Aluminum ³
Antimony ³
Arsenic ²
Barium ³
Beryllium ³
Boron ⁴
Cadmium ²
Chromium ²
Cobalt ³
Copper ³
Lead ²
Manganese ³
Molybdenum ³
Mercury ³
Nickel ³
Selenium ³
Silver ³
Thallium ³
Zinc ³
Cyanide ⁴
Radionuclides ⁴ :
Radium 226
Radium 228
Uranium
Thorium
Gross Alpha
Gross Beta
Sulfate ⁴
Sulfur Dioxide (SO ₂) in Ambient Air ⁴
Volatile Organic Compounds ⁴
Semi-Volatile Organic Compounds ⁴

Table Notes:

Source: Draft Report - Remedial Investigation Report for the ASARCO LLC Hayden Plant, Table 1-3, CH2MHill, August 2008

¹ COPCs for the Phase II RI/FS includes all contaminants of concern (COCs) and COPCs from Phase I RI/FS.

² Based on historic data and previous studies, these chemicals have exceeded state or federal regulatory criteria for air.

³ Chemicals of Potential Concern list includes those that may be present at elevated levels because of their association with ore processing and/or smelting activities.

⁴ Chemicals of Potential Concern that are not included in the Phase II RI/FS air investigation sampling/analyses based on previous investigations and the absence of data gaps for these COPCs.

Table 5-1
Preliminary ARARs
ASARCO Hayden Plant Site, Hayden, Arizona

SELECTED CHEMICAL-SPECIFIC POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

FEDERAL CLEAN AIR ACT (CAA) ARARS

NAAQS			
<i>Chemical Name</i>	<i>Requirements</i>	<i>Prerequisite for Applicability</i>	<i>Citation</i>
PM ₁₀ primary/secondary standard	150 ug/m ³ 24-hour	National Standard	40 CFR § 50.6
PM _{2.5} primary/secondary standard	35 ug/m ³ 24-hour 15 ug/m ³ annual	National Standard	40 CFR § 50.7; § 50.13
Lead	1.5 ug/m ³ 3-months	National Standard	40 CFR § 50.12
NESHAPs			
All HAPs	General Provisions	Major and Area Source of HAPs	40 CFR Part 63 Subpart A
Arsenic	Design, equipment, work practice & operational	New or existing copper converter w/ annual average charge rate > 165 lb/hr	40 CFR Part 61 Subpart O
Arsenic, Cadmium, Lead, Manganese	PM/opacity emission limitations & work practices	Major Source of HAPs	40 CFR Part 63 Subpart QQQ
Arsenic, Cadmium, Chromium, Lead	PM/opacity emission limitations & work practices	Area Source of HAPs	40 CFR Part 63 Subpart EEEEEEE
AMBIENT AIR QUALITY MONITORING			
All	General Network Design Requirements	State air pollution control agencies; Any local air pollution control agency to which the State has delegated authority to operate a portion of the State's SLAMS network; Owners or operators of proposed sources	40 CFR Part 58 Subpart B 40 CFR Part 58 Appendix A 40 CFR Part 58 Appendix C 40 CFR Part 58 Appendix D 40 CFR Part 58 Appendix E
PM ₁₀	Reference method for determination of PM ₁₀ in the atmosphere	PM ₁₀ ambient air monitor for purpose of determining attainment and maintenance of the NAAQS for PM.	40 CFR Part 50 Appendix J 40 CFR Part 53
PM _{2.5}	Reference method for determination of PM _{2.5} in the atmosphere	PM ₁₀ ambient air monitor for purpose of determining attainment and maintenance of the NAAQS for PM.	40 CFR Part 50 Appendix L 40 CFR Part 53
Lead	Reference method for determination of lead in the atmosphere	PM ₁₀ ambient air monitor for purpose of determining attainment and maintenance of the NAAQS for PM.	40 CFR Part 50 Appendix B 40 CFR Part 50 Appendix G 40 CFR Part 53

STATE CAA ARARS

STATE HAZARDOUS AIR POLLUTANT PROGRAM			
<i>Chemical Name</i>	<i>Requirements</i>	<i>Prerequisite for Applicability</i>	<i>Citation</i>
ALL HAP	Installation of Emission Control Technology	Major and Minor Sources of HAPs	AAC R18-2-1701-1709

THERE ARE NO LOCAL CAA CHEMICAL-SPECIFIC ARARS IDENTIFIED

Table 5-2
ARAR and TBC Based Minimum Ambient Air Criteria Level
ASARCO Hayden Plant Station, Hayden, Arizona

Air Quality Parameter	National Ambient Air Quality Standards (NAAQS)				EPA Regional Screening Levels (RSL) November 2011 Residential Air Carcinogenic (ug/m ³)	Agency for Toxic Substances and Disease Registry Minimal Risk Levels 2010 (ug/m ³)			California Office of Environmental Health Hazard Assessment and Air Resources Board Reference Exposure Levels (REL) February 2011 (ug/m ³)			Arizona Ambient Air Quality Guidelines May 1999 (ug/m ³)			Arizona Ambient Air Quality Standards R18-2-201, 206 (ug/m ³)		Arizona Chronic Ambient Air Concentrations R18-2-1708 Table 3 (ug/m ³)		Pinal County Air Quality Control District Ambient Air Quality Standards PCAQCD Code of Regulations 2-1-020, 070 (ug/m ³)				Minimum Ambient Air Criteria Level
	24-Hr	Rolling 3-Month Average	Qtrly Avg	Annual	24-Hour Avg.	Acute (1-14 Days)	Intermediate (>14-364 Days)	Chronic (≥ 365 Days)	Acute	8-Hour Exposure	Chronic	1-Hr Avg	24-Hr Avg	Annual Average	Calendar Quarter	Annual Average	Acute	Chronic	24-Hr Avg	Calendar Quarter	Annual Average	3-Yr Avg	ug/m ³
Aluminum					5.2																		5.2
Antimony												4											4
Arsenic					0.00057				0.20	0.015	0.015	0.06	0.016	0.00023			2500	0.000441					0.00023
Barium					0.52000							4.000											0.52
Beryllium					0.00100							0.007	0.160										0.001
Boron					21.00							7.900											21
Cadmium					0.00140	0.03		0.01			0.020	0.77	0.20	0.00056			250	0.001050					0.00056
Calcium																							
Chromium												15.00	4.00										4
Chromium (IV)					0.00001		0.30				0.017	0.0044	0.000012			100	0.000158						0.000011
Cobalt					0.00027																		0.00027
Copper									100			3.0 ^a	0.79										0.79
Iron																							
Lead		0.15	1.50													1.50				1.50			0.15
Magnesium																							
Manganese					0.05200						0.09												0.052
Mercury					0.31000				0.60		0.03	0.400											0.03
Molybdenum																							
Nickel					0.00940				6.00		0.05	0.120											0.0094
Potassium																							
Selenium					21.00						20.00	1.60											1.6
Silver												0.079											0.079
Sodium																							
Thallium												0.790											0.79
Vanadium												0.40											0.4
Zinc																							
TSP																							
PM ₁₀	150											150	50	150	50			150		50			50
PM _{2.5}	35			15								65	15	65	15			65			15		15

a Copper as fume

Table 6-1
ASARCO Air Monitoring Locations and Configurations
ASARCO Hayden Plant Site, Hayden, Arizona

No	Type	Monitor Number	Air Monitoring Location	Proposed Location (NAD 1983)		Measurement Methods	Schedule	Analyses/ Parameters	Status	Justification for Location and Purpose	AQS #	
				Latitude	Longitude						(If Applicable)	
1	A	ST-01	Hayden Maintenance Yard	33.00241471	-110.7847976	Federal Reference Method for PM ₁₀ and TSP/ MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / TSP/ SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/ Particle Count & Concentration	Existing	EXISTING: Location originally selected in 2006 to quantify impact to residential areas near to Hayden Complex operations including fugitive sources, such as tailings impoundments, crushing and conveying operations, and point source emissions from smelter and converter operations, etc. PROPOSED: Based on a review of existing data, potential health impacts remain; therefore, this location is to be maintained to provide continuity of data for ongoing data trends analysis, historical to present, and to support site-wide risk assessment. Total Suspended Particulate (TSP) monitor to be added to this location to provide NAAQS lead compliance data. MiniVols, EBAM, and DustTrak DRX to be added to support SAS and feasibility study. Possible addition of short-term sampling recommended to assess varying meteorological conditions in Hayden.	TBD	(SPM)
2	A	ST-02	High School in Winkelman	32.99498741	-110.7717783	Federal Reference Method for PM ₁₀ and TSP/ MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM/ MOUDI	USEPA 6th Day Schedule (MOUDI 12 Day Schedule)	TAL-Metals/ PM ₁₀ / TSP/ SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/ Particle Count & Concentration/Size Fractions	Existing	EXISTING: Location originally selected in 2006 to quantify impact to residential areas near to Hayden Complex operations including fugitive sources, such as tailings impoundments, crushing and conveying operations, and point source emissions from smelter and converter operations, etc. PROPOSED: Based on a review of existing data, potential health impacts remain; therefore, this location is to be maintained to provide continuity of data for ongoing data trends analysis, historical to present, and to support site-wide risk assessment. Total Suspended Particulate (TSP) monitor to be added to this location to provide NAAQS lead compliance data. MiniVols, EBAM, DustTrak DRX, and MOUDI to be added to support SAS and feasibility study. Possible addition of short-term sampling recommended to assess varying meteorological conditions in Hayden.	TBD	(SPM)
3	A	ST-03	Montgomery Ranch	33.02822783	-110.8094108	Federal Reference Method for PM ₁₀ / MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	Existing	EXISTING: Ongoing location for SO ₂ and meteorological monitoring. Site originally selected based on air dispersion modeling indicating the location as high-impact area from point source (stack) emissions and may have elevated PM emissions. PROPOSED: Addition of PM ₁₀ monitor for two-fold purpose: (1) to assess the areal extent of site impacts & dispersion of site COPCs (metals) for site-wide risk assessment; (2) correlate broad area meteorological data with concentrations of COPCs for identification of potential non-source impacts.	TBD	(SPM)
4	A	ST-04	Hayden Junction	33.01129161	-110.8096618	Federal Reference Method for PM ₁₀ / MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	Existing	EXISTING: Ongoing location for SO ₂ and meteorological monitoring. Site originally selected based on air dispersion modeling indicating the location as high-impact area from point source (stack) emissions and may have elevated PM emissions. PROPOSED: Addition of PM ₁₀ for two-fold purpose: (1) to assess the areal extent of site impacts & dispersion of site COPCs (metals) for site-wide risk assessment; (2) correlate meteorological data with concentrations of COPCs for identification of potential west end tailings and railyard area impacts.	TBD	(SPM)
5	A	ST-05	Globe Highway - EPA	33.0018353	-110.7655169	Federal Reference Method for PM ₁₀ and TSP/ MiniVol Samplers with filters 1, 2, 3 & 4/ EBAM/ OPC	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / TSP/ SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/ Particle Count & Concentration	Existing	EXISTING: Ongoing location for SO ₂ and meteorological monitoring. Site located along State Highway 77 (the Globe Highway), about 1/2 mile northeast of the high school in Winkelman PROPOSED: Maintain operation of site for continuity of SO ₂ data. Site proposed in Newfields Draft RI/FS Workplan (Section 8.1.2.1) "Globe Highway Station" for addition of PM ₁₀ and COPC metals analysis to fill data gap with regard to impacts to ambient air from the slag pouring, reclaim, and crushing area. An examination of wind roses for the ASARCO operations area, as reported in the draft Phase I RI Report, indicated frequent air transport toward the north-northeast up the Globe Highway portion of the Gila River valley. SEM analysis proposed to support both SAS (in the identification of contributing sources of COPC concentrations) and feasibility study. ADEQ selected TSP monitor for compliance determination for lead NAAQS.	TBD	(SPM)
6	A	ST-06	Hayden Jail	33.00619903	-110.786702	Federal Reference Method for PM ₁₀ and TSP/ MiniVol Samplers with filters 1, 2, 3 & 4/ EBAM/ OPC	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / TSP/ SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/ Particle Count & Concentration	Existing	EXISTING: ADEQ ongoing SO ₂ and PM ₁₀ Monitoring. PROPOSED: Maintain operation of site for continuity of data. Add analysis of PM ₁₀ results for COPCs to further support site-wide risk assessment. Total Suspended Particulate (TSP) monitor to be added to this location to provide NAAQS lead compliance data. MiniVols, EBAM, Dust Trax DRX to be added to support SAS and feasibility study. Possible addition of short-term sampling recommended to assess varying meteorological conditions in Hayden.	04-007-1001	
7	A	ST-07	Garfield Avenue	33.00254333	-110.7845669	NA	NA	NA	Existing	EXISTING: Ongoing SO ₂ Monitor; No additional plans for this station. Site data to be considered in air dispersion evaluation; Monitor not part of RI ambient air quality network.	NA	
8	A	ST-08	EPA Hayden West Side Location	33.00608228	-110.7915735	Federal Reference Method for PM ₁₀ / MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	PROPOSED: Location is situated on western edge of town as a neighborhood scale site, an intermediate distance from ASARCO operations, and is necessary to fill COPC data gap for assessing source impacts along with data from ST-03 and ST-04. Additional PM ₁₀ /metals data necessary for site-wide risk assessment at this elevated location that may experience unique wind patterns relative to closer sites; COPC SEM analysis also necessary to support SAS.	TBD	
9	A	ST-09 ^A	South-Southeast of Crushing Facility. Locate within 100 Feet of Existing Trails	TBD	TBD	Federal Reference Method for PM ₁₀ / MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	PROPOSED: Location sited on southeastern slope of hill south of smelter hill within 100 feet of existing trails. To provide data to assess ambient air impacts from the smelter activities. PM ₁₀ monitoring and metals analysis to further define impact of COPCs on community, in particular Hayden High School and houses west of the high school in support of risk assessment and feasibility study including trespassers using existing trail network. COPCs SEM analysis necessary to support SAS.	TBD	(SPM)
	S	ST-09 ^S	Primary Reverts Crushing Station, South	Current Crusher Area of operation	Current Crusher Area of operation	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	MiniVol sampling to characterize fugitive PM ₁₀ and COPC emissions from reverts crushing operations. PROPOSED location just above the currently used reverts crusher to provide close proximity monitoring of reverts crusher emissions. Selected sampling when ACR reverts, bricks, or other high arsenic, lead, and/or chromium materials are being processed. SEM analysis of collected particles also necessary to support SAS. This sample location to be moved to follow location of crushing operation. (In plume sampling)		
10	M	ST-10	Smelter Hill 05 Feet Above Hill	32.99952532	-110.7750201	TBD	NA	NA	New	PROPOSED: (Location on top of hill south of smelter operations.) To be used to provide centralized MET data to support NAAQS determination and assess diurnal inversion as potential influence to COPC concentrations in ambient air in the community.		
11		ST-11	Reserved	NA	NA	NA	NA	NA	NA			
12		ST-12	Reserved	NA	NA	NA	NA	NA	NA			

Table 6-1
ASARCO Air Monitoring Locations and Configurations
ASARCO Hayden Plant Site, Hayden, Arizona

No	Type	Monitor Number	Air Monitoring Location	Proposed Location (NAD 1983)		Measurement Methods	Schedule	Analyses/ Parameters	Status	Justification for Location and Purpose	AQS #
				Latitude	Longitude						(If Applicable)
13	S	ST-13	Smelter Hill Base, North Side	33.00134828	-110.7766826	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Location on base of hill south of smelter operations, PM ₁₀ monitoring and COPC analysis/SEM analysis to support SAS and feasibility study. Because of high winds in this area of the industrial operations, this point will work together with ST-14 and ST-22 to characterize ground level emissions. This site would account for localized emissions that are missed by sites near the smelter parking lot (ST-14) and the bedding area (ST-22). This location may be used for a short period to confirm any local emissions.	
14	A	ST-14 ^A	Water Treatment Filter Cake Storage Area / Smelter Parking Lot	33.00260883	-110.7780141	Federal Reference Method for PM ₁₀ , PM _{2.5} and TSP/ MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/EBAM	USEPA 6th Day Schedule (PM _{2.5} 1 in 3 Day Schedule)	TAL-Metals/ PM ₁₀ ² / PM _{2.5} /TSP/ SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/ Particle Count	New	PROPOSED: PM ₁₀ and metals analysis necessary to delineate impact to community and support risk assessment. COPC SEM analysis necessary to support SAS. TSP and PM _{2.5} monitoring for compliance with air quality standards. This site will assess ambient conditions of ground level smelter emissions that may be missed by other source monitors and determine changes as CPOCs move from sources toward receptors. Site for initial short term monitoring.	TBD (SPM)
	S	ST-14 ^S	Water Treatment Filter Cake Storage Area / Smelter Parking Lot	TBD	TBD	MiniVol with filter 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration		MiniVol samplers located in Smelter parking lot just to the west of the fence separating it from the filter plant. COPC SEM analysis needed to characterize fugitive emissions from sludge drying area for input to SAS.	
16	A	ST-16	Terrace Station	32.99986483	-110.7860351	Federal Reference Method for PM ₁₀ / MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	PROPOSED: Site proposed in Newfields Draft RI/FS Workplan (Section 8.1.2.1) to provide data to assess ambient air impacts from the ore crushing facilities located to the southeast and the vicinity of the tailings impoundments. Site is located on an open terrace in a residential area adjacent to the ore crushing facility. PM ₁₀ monitoring and metals analysis to further define impact of COPCs on community in support of risk assessment and feasibility study. COPC SEM analysis necessary to support SAS and potential identification of source fraction contributing to ambient air concentrations.	TBD (SPM)
17	S	ST-17	Warehouse Station	33.00734485	-110.780231	MiniVol with Filter Pack 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Site proposed in Newfields Draft RI/FS (Section 8.1.2.1) to provide data necessary to quantify the potential local fugitive emission sources, including bedding activities and fugitive emissions from the flash furnaces, the converters, and the anode furnaces. This site is located within Asarco's property near one of its warehouses. COPC SEM analysis added to support SAS.	
18	A	ST-18	North Hayden Station	33.01105609	-110.7866119	Federal Reference Method for PM ₁₀ / MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	PROPOSED: Site proposed in Newfields Draft RI/FS Workplan (Section 8.1.2.1) to provide data necessary to quantify ambient air quality concentrations potentially affected by emissions from Asarco's handling of dewatered concentrates, the storage of this material, and the loading of the concentrates into railcars for shipment to the smelter. This proposed site is situated in the northwestern corner of the Hayden Complex, directly west and west-southwest of concentrate handling areas. The North Hayden monitoring site will fill the gap created by the absence of a monitor representative of exposures of populations in the northwestern part of Hayden supporting the site-wide risk assessment. COPC SEM analysis added to support SAS and feasibility study. PM ₁₀ second colocation site.	TBD (SPM)
19	S	ST-19	Secondary Hood Baghouse Discharge to Stack	33.00565541	-110.7758211	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Series of Source tests, every 2 months for 6 months	TAL-Metals/PM ₁₀ / CCSEM/ (EC/OC) Mass Concentrations/Ions/ Pb Isotopes/Particle Count	New	Source testing of discharge from converter secondary hoods baghouse to quantify and characterize PM, PM ₁₀ , and COPCs contained in emissions prior to entering annulus of stack (emission source HP-2). SEM analysis of collected particles also necessary to support SAS. (Diluted in plume sampling)	
20	S	ST-20	Vent Gas Cottrell Discharge to Stack	33.00564891	-110.7757551	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Series of Source Tests, every 2 months for 6 months; select to include periods of slag tapping and matte tapping	TAL-Metals/PM ₁₀ / CCSEM/ (EC/OC) Mass Concentrations/Ions/ Pb Isotopes/Particle Count	New	Source testing of discharge from smelter secondary hoods electrostatic precipitator (Cottrell) to quantify and characterize PM, PM ₁₀ , and COPCs contained in emissions prior to entering annulus of stack (emission source HP-2). SEM analysis of collected particles also necessary to support SAS. (Diluted in plume sampling)	
20	S	St-20	Vent Gas Cottrell Discharge, on Smelter Shutdown	33.00564891	-110.7757551	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Series of short-term samples collected at smelter shutdown	TAL-Metals/PM ₁₀ / CCSEM/ (EC/OC) Mass Concentrations/Ions/ Pb Isotopes/Particle Count	New	sampling is to allow determination of smelter shutdown(s) PM and HAP emissions with primary off-gas vented through secondary gas system for SAS purposes. (Diluted in plume sampling due to high temperature)	
21	S	ST-21	Acid Plant Tail Gas Discharge to Inner Stack	33.00564562	-110.7756554	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Series of Source tests, every 2 months for 6 months	TAL-Metals/PM ₁₀ / CCSEM/ (EC/OC) Mass Concentrations/Ions/ Pb Isotopes/Particle Count	New	Source testing to quantify and characterize PM and COPC emissions from the acid plant discharge to the stack. (Diluted in plume sampling)	
22	S	ST-22	Concentrate Bedding Area	33.00413374	-110.7774282	MiniVol Samplers with Filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/PM ₁₀ / CCSEM/ (EC/OC) Mass Concentrations/Ions/ Pb Isotopes/Particle Count	New	MiniVol sampling located just downwind of the concentrate bedding area to characterize PM and COPCs contained in fugitive emissions arising from operations in the concentrate bedding area. SEM analysis of collected particles also necessary to support SAS.	

Table 6-1
ASARCO Air Monitoring Locations and Configurations
ASARCO Hayden Plant Site, Hayden, Arizona

No	Type	Monitor Number	Air Monitoring Location	Proposed Location (NAD 1983)		Measurement Methods	Schedule	Analyses/ Parameters	Status	Justification for Location and Purpose	AQS #	
				Latitude	Longitude						(If Applicable)	
23	A	ST-23	Hillcrest Avenue	33.00354391	-110.7824472	Federal Reference Method for PM ₁₀ , PM _{2.5} ² and TSP/ MiniVol Samplers with Filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule (PM _{2.5} 1 in 3 Day Schedule)	TAL-Metals/ PM ₁₀ ² / PM _{2.5} ² /TSP/ SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/ Particle Count	New	PROPOSED: Location at the end of Hillcrest Avenue near elevated conveyor belt. Yard remediation project indicated large amounts of particulate from conveyor deposited in this area. This location is in closer proximity to ASARCO operations than the current existing locations, see ST-01, ST-06 and ST-07, therefore this location will allow for a more direct comparison of PM ₁₀ /metals data between monitors in relationship to concurrent met data to assist in determining potential source operations and development of site-wide risk assessment. COPC SEM analysis to be performed in support of SAS and feasibility study. TSP and PM _{2.5} monitoring for compliance determination with air quality standards.	TBD	(SPM)
24	S	ST-24	Converter Building Roof	33.00310343	-110.7754131	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Samples to be collected by placing sampler nozzle into openings of roof monitors and collection of samples when the closest converters are rolled out and secondary hoods are used for emissions control. SEM analysis of collected particles also necessary to support SAS. Results from sampling will be used as input to the SAS and the Feasibility Study. (In plume sampling)		
25	S	ST-25	Flash Furnace Roof	33.00362878	-110.7759073	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Samples to be collected by placing sampler nozzle into openings of smelter roof and collection of samples when the slag and when matte is being tapped. SEM analysis of collected particles also necessary to support SAS. Results from sampling will be used as input to the SAS and the Feasibility Study. (In plume sampling)		
26	A	ST-26A	Concentrator Station (Post Office)	33.00605616	-110.7839137	Federal Reference Method for PM ₁₀ ² , PM _{2.5} ² and TSP ² / MiniVol Samplers with Filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule (PM _{2.5} 1 in 3 Day Schedule)	TAL-Metals/ PM ₁₀ / PM _{2.5} ² /TSP/ SEM/ EC/OC Mass Concentrations/Ions/ Pb Isotope/Particle Count	New	PROPOSED: PM ₁₀ and PM _{2.5} data and COPC analysis necessary to assess community impact from concentrator operations in support of risk assessment. SEM analysis to provide data in support of SAS and feasibility study. TSP and PM _{2.5} monitoring for compliance with air quality standards.	TBD	(SPM)
	S	ST-26S	Concentrator Station (Post Office)	TBD	TBD	MiniVol Samplers with Filter 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration		Locate sampler approximately 250 feet due west of concentrator building. Samples to be taken during periods when wind direction is to the west. SEM Data will be used in the SAS and feasibility study.		
27	A	ST-27A	Tailings Pile	32.99672541	-110.7879588	Federal Reference Method for PM ₁₀ / MiniVol Samplers with filters 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	PROPOSED: Location to be on the tailings pile south of Hayden. Area has public access; therefore PM ₁₀ data and COPC analysis necessary to assess community impact from tailings pond area in support of risk assessment.	TBD	(SPM)
	S	ST-27S	Tailings Pile	32.99672541	-110.7879588	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration		A portable sampler will be used to collect sample sets during high wind periods. Samples may be moved to other tailings locations based on observed site conditions. Data will be used as input to the SAS and CSM.		
28	S	ST-28	Slag Dump Station	33.00075319	-110.7696949	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Location on south-southwest side of current slag dumping operations. Mini-Vol sampling sets of slag dumping fugitive emissions to characterize PM, PM ₁₀ and COPCs to update Asarco's 1987 SAS. Sampling protocol similar to that described in the previous SAS to be used for collecting samples. (Diluted in plume sampling)		
29	S	ST-29	Converter Source Station	33.00304218	-110.775421	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Sampling of converter secondary hoods to characterize PM, PM ₁₀ and COPCs contained in converter process fugitive emissions to update Asarco's 1987 SAS. Sampling protocol similar to that described in the previous SAS to be used for collecting samples. (Diluted in plume sampling)		
30	S	ST-30	Flash Furnace Source Station	33.0036335	-110.7758394	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Sampling of smelter secondary hoods to characterize process fugitive PM, PM ₁₀ and COPCs contained in emissions for update of Asarco's 1987 SAS. Separate sample sets shall be collected when matte is being tapped and when slag is being tapped. Sampling protocol similar to that described in the previous SAS to be used for collecting samples. (Diluted in plume sampling)		

Table 6-1
ASARCO Air Monitoring Locations and Configurations
ASARCO Hayden Plant Site, Hayden, Arizona

No	Type	Monitor Number	Air Monitoring Location	Proposed Location (NAD 1983)		Measurement Methods	Schedule	Analyses/ Parameters	Status	Justification for Location and Purpose	AQS #
				Latitude	Longitude						(If Applicable)
31	S	ST-31	Anode Pour Source Station	33.00462546	-110.7754927	MiniVol Samplers with filters 1, 2, & 3/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Sampling of anode furnace hoods, during blowing, to characterize PM, PM ₁₀ and COPCs from anode operations. (Diluted in plume sampling)	
32	S	ST-32	Reverts Crushing Station North	33.00247356	-110.7765211	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Focused series of source tests during normal and ACR reverts crushing for 1 year	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Sample under normal operation and when ACR materials and/or bricks are being processed (potential for high As, Pb, Cr, Cd, & Se emissions). (In plume sampling)	
33	S	ST-33 ST	Crusher Source Monitoring	32.99872088	-110.7862236	MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Focused sampling sets (at least 3 samples each) at each scrubber stack during reverts crushing for 1 year	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Mini Vol sampling of wet scrubber stacks to characterize PM, PM ₁₀ and COPCs contained in emissions from crusher operations. Source sampling under normal operation. Source testing of discharge from secondary crushers to quantify and characterize PM, PM ₁₀ and COPCs contained in emissions.	
	S	ST-33 S	Crusher Air Dust monitoring			MiniVol Samplers with filters 1, 2, 3 & 4/ OPC	Four rounds of sampling spaced approximately every three months.	TAL-Metals/ PM ₁₀ / SEM/EC/OC Mass Concentrations/Ions/ Pb Isotopes/Particle Count & Concentration	New	Mini-Vol sampling of air within the crusher building (as described in the SAS) during crushing operations. Samples will be collected simultaneously with the source test samples collected for the crusher scrubbers.	
34	A	ST-34	Background Monitor	TBD	TBD	Federal Reference Method for PM ₁₀ , PM _{2.5} and TSP/ MiniVol Samplers with Filter Packs 1, 2, 3 & 4/ OPC/ EBAM	USEPA 6th Day Schedule (PM _{2.5} 1 in 3 Day Schedule)	TAL-Metals/ PM ₁₀ /PM _{2.5} /TSP/ SEM/ (EC/OC) Mass Concentrations/Ions/ Pb Isotopes/Particle Count	New	PROPOSED: Alternative, representative background site is necessary to compliment background data from the Organ Pipe monitor. A location within the community of Florence, AZ, was found to be similar to the general area of Hayden, but not directly influenced by ASARCO or related smelter sources. This site would provide background PM ₁₀ , PM _{2.5} and TSP and metal COPCs data in addition to the historical data from the Organ Pipe monitor. Exact location TBD.	TBD (SPM) (BCKGRD)

Notes:

A=Ambient Air Monitoring location
S=Source Monitoring location
M=Meteorological data collection location only
NA=Not Applicable
TAL=Target Analyte List

1=At least three (3) replicate source test samples shall be taken for each condition specified & duration shall be (a) in accordance with EPA test methods for source sampling, and (b) of a sufficient duration to collect sufficient material for SEM analysis.

2= Collocated monitor of identical configuration as QA/QC check or ARAR requirement. Collocated PM_{2.5} monitor(s) to sample on US EPA one in three day schedule..

MiniVol samplers will be configured with either PM₁₀ or PM_{2.5} inlets

MiniVol samplers will be equipped with one of four filters: PM_{2.5} Inlet - Filter 1 = Teflon-membrane filter [PM Mass by gravimetry; Metals by XRF; Pb, Cd, AS by ICP/MS; isotopes by ICP/MS] | PM_{2.5} Inlet - Filter 2 = Polycarbonate Filter [Morphology and speciation by SEM/EDX; ion by ion chromatography] | PM₁₀ Inlet - Filter 3 = Teflon-membrane filter [PM Mass by gravimetry; Metals by XRF; Pb, Cd, AS by ICP/MS; isotopes by ICP/MS] | PM₁₀ - Filter 4 = Quartz-fiber filter [PM Mass by gravimetry; EC/OC by Improve-TOR, ion by ion chromatography]

ACR = Amarillo Copper Refinery
SEM/EDX = scanning electron microscopy and energy-dispersive X-ray spectroscopy
COPC = chemical of potential concern
CSM = conceptual site model
DMO = Data Management Objective (see Table 2 for more information)

PM_{2.5} = particulate matter less than 2.5 microns in diameter

PM₁₀ = particulate matter less than 10 microns in diameter

SPM = Special Purpose Monitor as defined in 40 CFR 58.20

SAS = Source Apportionment Study

TSP = total suspended particulate

EBAM = Beta Attenuation Monitor with very sharp cut cyclone for PM_{2.5}

OPC = Optical Particle Counter for continuous particle size distribution

MOUDI = micro-orifice uniform deposition impactor for collecting size-fractionated particle samples

Table 6-2
Air-Related Soil Samples
ASARCO Hayden Plant Site, Hayden, Arizona

Sample Designator	Sample Location	RI Area	Analyses	Description
SP1	Ore Overland conveyor at point of crossing site fence	09	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Sampling of spillage from Conveyor No. 9 near the closest residence where the conveyor crosses the Site boundary fence.
SP2	Concentrate material from the concentrate stockpile	04	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Sampling of concentrate spillage at the load-out station of the concentrator. Material is stored in open stockpiles and subject to transport during high wind conditions.
SP3	North Reverts Crushing Yard	15	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Sampling of accumulated spilled material in the area of the North Reverts Crushing Yard. One sample to be collected during normal operations. If ACR reverts or bricks are crushed at this location, a sample will be collected following crushing operations. Samples are needed to represent impact from fugitive emissions during typical operations and "non Ray mine" material processing. Material accumulates in piles in the outdoor environment and is subject to transport by wind.
SP4	South Reverts Crushing Yard	15	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Sampling of accumulated spilled material in the area of the South Reverts Crushing Yard. One sample to be collected during normal operations. If ACR reverts or bricks are crushed at this location, a sample will be collected following crushing operations. Samples are needed to represent impact from fugitive emissions during typical operations and "non Ray mine" material processing. Material accumulates in piles in the outdoor environment and is subject to transport by wind.
SP5	Slag Crushing & Screening Station	17	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Sampling of accumulated spilled material in the area northeast of the active slag pile. Material accumulates in piles in the outdoor environment and is subject to transport by wind.
SP6	Kennecott Slag Crushing & Screening Area	3	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Sampling of accumulated spilled material in the Kennecott slag crushing area. Accumulated material in piles in the outdoor environment is subject to transport by wind.
SP7	Smelter Concentrate mix at Feed Bedding Area	12	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Sampling of spillage at the smelter feed mixing and bedding station. Material accumulates in piles in the outdoor environment and is subject to transport by wind.
SP8	Effluent Treatment plant filter cake dump area	11	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Sampling of dried filter cake from the fringes of the filter cake load-out station. Material accumulates in piles in the outdoor environment and is subject to resuspension and transport by wind and vehicle traffic.

Table 6-2
Air-Related Soil Samples
ASARCO Hayden Plant Site, Hayden, Arizona

Sample Designator	Sample Location	RI Area	Analyses	Description		
				Northing	Easting	
SP9	Road dust samples ²	NA	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Periodic samples of road dust collected at these five different locations along high traffic areas of haul roads within the smelter plant boundaries. Samples are needed to determine the impact of dust generated from traffic and operations.	-110.771835	33.003594
		13			-110.774002	33.003504
		13			-110.776970	33.003136
		11			-110.777556	33.005691
		12			-110.781471	33.007385
06						
SP10	Smelter Vicinity Samples	14	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Samples will consist of composites of five sub-samples of areas of loose fine-grained material, piles of apparent process-related material, and areas of discoloration or staining.		
SP11	Smelter Complex Interior Samples ²	14	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Areas within the Smelter where spilled material has collected on horizontal surfaces and locations where process materials are transported and added to the smelter, converter, anode furnaces, and anode pour station		
SP12	Concentrator Complex Interior Samples ²	7	Resuspension of PM ₁₀ & PM _{2.5} fractions of bulk material onto Teflon™ filters for XRF and IC Analysis	Areas within the concentrator where spilled materials have collected on horizontal surfaces and locations where process materials are transported.		

Notes:
1 = All samples to be resuspended
2 = Samples collected in accordance with FSP SOP 12
ACR = Amarillo Copper Refinery
XRF = X-ray fluorescence
IC = ion chromatography
COPC = contaminant of potential concern
NA = Not Applicable
PM₁₀ = particulate matter less than 10 microns
PM_{2.5} = particulate matter less than 2.5 microns

Table 6-3
 Project Components Related to
 Field Monitors and Laboratory Analyses
 ASARCO Hayden Plant Site, Hayden, Arizona

Project Element	Category	Objective	Field Monitor	Lab Analysis
Ambient Air And Emission Sources	Particulate Quantity	Particulate Mass	PM ₁₀	Gravimetry
			PM _{2.5}	
			TSP	
			MiniVol	
			E-BAM	N/A
	OPC			
	Particulate Characteristics	Bulk Chemistry	PM ₁₀	X-Ray Fluorescence
			PM _{2.5}	ICP-MS
			TSP	IC/ICP-MS
			MiniVol	Ion Chromatography
			E-BAM	Thermal Optical Ref.
	Particulate Chemistry	MiniVol MOUDI	EDX	
Physical Morphology	MiniVol MOUDI	SEM		

Table 10-1
Project Schedule
ASARCO Hayden Plant Site, Hayden, Arizona

Project Activity/Deliverable	Assumptions/Notes	Day Number
Draft RI/FS Work Plan Part I of II (Air) {1st Draft}	Assume beginning date as date following Watson Study and FSP drafts complete.	Complete
EPA and ADEQ comments on the Draft RI/FS Work Plan {1st Draft}; ITSI continue working on developing select sections of WP	Assume 30 days	Complete
Draft Final RI/FS Work Plan Part I of II (Air) {2nd Draft}	Assume 45 days	Complete
EPA and ADEQ comments on the Draft Final RI/FS Work Plan Part I of II (Air) {2nd Draft}	Assume 30 days	Complete
Final RI/FS Work Plan Part I of II (Air)	Assume 30 days	Complete
EPA approval of RI/FS Work Plan	Assume 24 days	24
Manufacture and delivery of all air monitors, access agreements ¹ , utility arrangements.	Assume occurs simultaneous with RI/FS Work Plan finalization process	184
Deployment of Monitors	Assume 180 days	204
Implement RI	Assume 2 years for sample collection	934
Complete Data Analysis/Data Reduction	Assume 90 days	1024
Submit Draft RI Report and Revised Draft Human Health Risk Assessment	Assume 90 days after data reduction complete	1114
EPA/ADEQ Comments and Finalize RI Report and Revised Human Health Risk Assessment	Assume 90 days after submittal of Draft RI Report	1204
Submit Draft FS Report	90 days after EPA approval of RI Report	1294
EPA/ADEQ Comments and Finalize FS Report	Assume 90 days after submittal of draft FS report	1384

¹Access areements will be the critical path for this line item and difficult access could extend this duration.