Executive Sum	mary			ES-1
ES 1.0	Introdu	ction		ES-1
) Site Investigation			
	ES 2.1	Source Ch	naracterization	ES-2
		ES 2.1.1	Mine Site Source Characterization	ES-3
		ES 2.1.2	Tailing Facility Source Characterization	ES-5
	ES 2.2	Soil Samp	ling	ES-6
	ES 2.3	Terrestria	l Biota Sampling	ES-7
	ES 2.4	Groundwa	ater Investigations	ES-8
			Vater and Sediment Sampling	
	ES 2.6	Aquatic B	iota Sampling	ES-9
	ES 2.7	Waste Ro	ck Pile Characterization	ES-10
	ES 2.8	Geophysi	cal Investigations	ES-10
ES 3.0	Results	s and Conc	lusions	ES-11
	ES 3.1	Mine Site		ES-11
		ES 3.1.1	Terrestrial Media	ES-11
		ES 3.1.2	Groundwater	
			ES 3.1.2.1 Red River Alluvial Groundwater	ES-14
			ES 3.1.2.2 Colluvial Groundwater	
			ES 3.1.2.3 Bedrock Groundwater	ES-15
			ES 3.1.2.4 Pre-Mining Groundwater Concentrations	ES-15
		ES 3.1.3	Aquatic Media	ES-16
	ES 3.2	Tailing Fa	acility	ES-17
		ES 3.2.1	Terrestrial Media	ES-17
		ES 3.2.2	Groundwater	ES-19
		ES 3.2.3	Aquatic Media	ES-21
Section 1	Introdu	ction		1-1
Section 2	Site Inv	vestigation		2-1
	2.1	Surface S	oil Sampling	
			Soil Sampling Sites and Sampling Dates	
			2.1.1.1 Mine Site	
			2.1.1.2 Tailing Facility	
			2.1.1.3 Red River and Riparian Areas	2-13
		2.1.2	Soil Collection Procedures	2-15
		2.1.3	Soil Analyses	2-17
	2.2	Surface W	Vater Sampling	2-19
		2.2.1	Description of FSP Surface Water Sampling Events	2-20
			2.2.1.1 FSP Seasonal Surface Water Sampling Events .	
			2.2.1.2 Snowmelt Runoff and Rainstorm Events	
		2.2.2	Surface Water Sampling Sites and Sampling Dates	2-22
			2.2.2.1 Red River and Cabresto Creek	2-23
			2.2.2.2 Lakes, Ponds, and Unique Habitats	2-25

		2.2.2.3 Mine Site Storm Wa	ater Catchments	2-25
		2.2.2.4 Drainages Upstream	n of the Mine	2-26
			nd Irrigation Return Flow	
		ē		2-26
		2.2.2.6 Tailing Impoundme	nts	2-28
	2.2.3		on Procedures	
		2.2.3.1 River and Stream Sa	ampling	2-28
			low Measurements	
		2.2.3.3 Snowmelt Runoff S	ampling	2-30
			mpling	
			poundment Sampling	
			r Sampling	
	2.2.4			
2.3	Sedime	t Sampling		
	2.3.1	Sediment Sampling Sites and	d Sampling Dates	2-36
			esto Creek	
		2.3.1.2 Lakes, Ponds, and U	Jnique Habitats	2-38
			n of the Mine	
		2.3.1.4 Irrigation Ditches an		
		-	<u> </u>	2-39
		2.3.1.5 Tailing Impoundme	nts	2-39
	2.3.2		ures	
		2.3.2.1 Stream Sediment Co	ollection	2-40
		2.3.2.2 Lake, Pond, and Im	poundment Sediment	
			-	2-41
		2.3.2.3 Other Sediment Col	lection	2-42
	2.3.3	Sediment Analyses		2-42
2.4	Ground	vater Data Collection		
	2.4.1	Drilling and Installation of N	Ionitoring Wells and	
		0		2-43
		2.4.1.1 Location of New Bo	orings and Wells	2-44
		2.4.1.1.1 Mine Sit	e New Wells and	
		Piezome	ters	2-44
			Facility New Wells and	
		0	ters	2-46
		2.4.1.2 Borehole Drilling		2-53
		6	d Development	
	2.4.2		ents	
		U	rence Wells and Springs	
		2.4.2.2 Tailing Facility and		
		č		2-63
	2.4.3	1 0	ocedures	
			ures	
			Level Measurements	

		2.4.3.1.2 Monitor Well Sampling	2-69
		2.4.3.1.3 Extraction Well Sampling	2-70
		2.4.3.1.4 Supply Well Sampling	2-70
		2.4.3.1.5 Seeps and Springs Sampling	2-70
		2.4.3.1.6 Sample Handling	2-71
		2.4.3.2 Chemical Analyses	2-71
	2.4.4	Hydraulic Testing	2-72
	2.4.5	Colloidal Borescope	2-73
2.5	Vegetat	ion Sampling	2-74
	2.5.1	Vegetation Sample Sites	2-75
	2.5.2	Terrestrial Plant Sample Collection	2-78
	2.5.3	Plant Community Characterization	2-79
	2.5.4	Rye Grass Bioassay	2-80
	2.5.5	Edible Riparian Sampling	2-81
	2.5.6	Garden Produce Sampling	2-83
2.6	Animal	Sampling	2-85
	2.6.1	Animal Sampling Sites	
		2.6.1.1 Mine Site Area	2-87
		2.6.1.2 Tailing Facility	2-87
	2.6.2	Small Mammal Sampling	2-88
		2.6.2.1 Small Animal Samples at Areas Other than	
		Toe of Capulin	2-89
		2.6.2.2 Small Mammal Sampling at the Toe of	
		Capulin Rock Pile	
	2.6.3	Soil Macroinvertebrate Sampling	
	2.6.4	Earthworm Bioassay	
	2.6.5	Soil Fauna Community Structure Field Activities	
	2.6.6	Waterfowl Collection Activities	
2.7		Biota Sampling	
	2.7.1	Aquatic Sampling Sites	
		2.7.1.1 Aquatic Sampling Sites in Streams	
		2.7.1.2 Aquatic Sampling Sites in Lakes and Ponds	
	2.7.2	Fish Populations	2-103
		2.7.2.1 Fish Population Sampling in Streams	2-103
		2.7.2.2 Fish Population Sampling in Lakes and Ponds	2-103
	2.7.3	Fish Tissues	2-104
	2.7.4	Benthic Invertebrate Populations	2-105
		2.7.4.1 Benthic Invertebrate Population Sampling	
			2-105
		2.7.4.2 Benthic Invertebrate Population Sampling in	
		Lakes and Ponds	
	2.7.5	Benthic Invertebrate Tissues	2-108
	2.7.6	Habitat Evaluation	2-109
	2.7.7	Periphyton Populations	2-110

 $R:PROJECTS:22236246_REMEDIAL_INVEST_REP:TASK_01:10.0_WORD_PROC:4TH DRAFT TO CMI;MASTER_TOC_ART_07-01-09.DOC;7/1/2009 4:44 PM$

	2.7.8	Bryophyte, Macrophyte, and Periphyton Tissues	0
	2.7.9	Surface Water Bioassays	
		2.7.9.1 Bioassay Test Methods	
		2.7.9.2 Base Flow	
		2.7.9.3 Snowmelt Runoff	
		2.7.9.4 Storm Water	
	2.7.10	Sediment Bioassay	3
2.8	Roadsid	e Rock Pile and Debris Fan Characterization	
	2.8.1	Roadside Rock Pile and Debris Fan Characterization	
		Objectives	
	2.8.2	Sample Locations and Collection Methods 2-11	.6
	2.8.3	Field and Laboratory Analyses 2-11	.9
2.9	Geophys	sical Investigations2-12	21
2.10	Other Re	elated Studies	24
	2.10.1	Wildlife Impact Study2-12	24
		2.10.1.1 Sample Sites and Species Selection	26
		2.10.1.2 Plant Community Characterization	26
		2.10.1.3 Sample Collection	27
		2.10.1.4 Sample Analysis	27
	2.10.2	Historic Tailing Spill Report2-12	28
	2.10.3	EPA Focused Studies	
		2.10.3.1 GSI Studies	33
		2.10.3.2 Benthic Macroinvertebrate and Physical	
		Habitat Assessment	57
		2.10.3.3 Radon 222 Tracer Study 2-13	<i>\$</i> 9
		2.10.3.4 Serial Dilution Tests	0
		2.10.3.5 Metals Load Model and Mass Balance	
		Estimation	1
	2.10.4	Air Quality Monitoring	1
		2.10.4.1 Monitoring Sites	1
		2.10.4.2 PM ₁₀ Monitoring Instrumentation	2
		2.10.4.3 Metals Monitoring Instrumentation	2
	2.10.5	Fuel Storage Tank Investigations	-3
		2.10.5.1 Used Oil UST No. 1	3
		2.10.5.2 Gasoline UST No. 2	4
		2.10.5.3 Diesel Fuel No. 2 AST	-5
		2.10.5.4 Old Abandoned ASTs 2-14	6
	2.10.6	Previous Investigations	6
2.11	Sample .	Analysis	ŀ7
	2.11.1	Routine (Planned) Chemical Analyses	7
		2.11.1.1 QC Sample Overview	
		2.11.1.2 Assessment of Data Quality Indicators	
		2.11.1.3 Data Validation Process Overview	
		2.11.1.4 On-site Chemical Analyses	50
		-	

				2.11.1.4.1	Hexavalent Chromium	2-150
				2.11.1.4.2	Ammonia	2-151
			2.11.1.5	Off-Site Ch	nemical Analyses	2-152
				2.11.1.5.1	Laboratories	2-152
				2.11.1.5.2	Routine/Planned Analyses	2-152
				2.11.1.5.3	Summary of Matrix-Related	
					Analysis Problems	2-152
				2.11.1.5.4	Summary of Laboratory	
					Contaminants	2-156
		2.11.2	Non-Rou	tine Sample	Analysis	2-159
			2.11.2.1	February 20	004 Groundwater Sampling Event	2-159
				2.11.2.1.1	University of Arizona	2-159
				2.11.2.1.2	University of Miami	2-160
				2.11.2.1.3	Frontier Geosciences	2-160
			2.11.2.2	Roadside R	ock Pile Characterization	2-161
				2.11.2.2.1	Sample Processing and Chemical	
					Analyses Conducted by SVL	2-162
				2.11.2.2.2	Routine RI Chemical Analyses	
					Conducted by STL-Burlington	2-163
				2.11.2.2.3	Mineralogical Analyses Conducted	
					by DCM	2-163
			2.11.2.3	Arsenic Spe	eciation for Fish Tissue Samples	2-164
		2.11.3	Bioassay	Toxicity Ar	nalyses	2-165
		2.11.4	Populatio	on and Comr	nunity Structure Analyses	2-165
	2.12	Data M	lanagement	Procedures .		2-166
		2.12.1	Data Mar	nagement Di	uring Field Activities	2-166
			2.12.1.1	Sample Ma	nagement Office	2-166
					e System	
			2.12.1.3	Field COC	Forms	2-167
			2.12.1.4	Logbooks a	and Field Data Sheets	2-167
			2.12.1.5	Custody on	Sample Storage Units	2-167
			2.12.1.6	Sample Shi	pping	2-167
			2.12.1.7	Sample Tra	cking	2-168
		2.12.2	Data Tra	cking and Q	uality Assessment	2-168
		2.12.3	Database	Managemen	nt	2-170
Section 3	Physic	al Chara	cteristics			3-1
	5					
	3.1					
					e Area	
					er Ranch Reference Area	
	2.2		-		Riparian Area	
	3.2					
		3.2.2	1 alling Fac	111ty		3-5

3.3	3 Surface Water Hydrology			
	3.3.1	Red Rive	er	
		3.3.1.1	Morphology	
		3.3.1.2	Flow	
		3.3.1.3	Surface Water/Groundwater Relationship	
	3.3.2	Lakes an	d Ponds	
	3.3.3	Columbi	ne Creek	
	3.3.4	Cabresto	Creek	
	3.3.5	Tributary	y Drainages Upstream of the Mine	
	3.3.6		n Ditches	
	3.3.7	Mine Sit	e Hydrology	
		3.3.7.1	Pre-Mining Conditions	
		3.3.7.2	Current Conditions	
		3.3.7.3	Watershed Yield	
		3.3.7.4	Storm Water Collection Systems	
		3.3.7.5	Infiltration at Rock Piles	
	3.3.8	Tailing F	Facility Hydrology	
		3.3.8.1	Tailing and Water Management	
		3.3.8.2	Permitted Outfall Discharges	
		3.3.8.3	Irrigation Return Flows	
		3.3.8.4	Red River Fish Hatchery Water Supply	
3.4	Geolo	gy		
	3.4.1	Mine Sit	e Geology	
		3.4.1.1	Mixed Volcanics	
		3.4.1.2	Ore Body Geology	
		3.4.1.3	Intrusive Volcanics	
		3.4.1.4	Pyritic Veins	
		3.4.1.5	Calcite and Fluorite Veins	
		3.4.1.6	Galena, Sphalerite, and Chalcopyrite Veins.	
		3.4.1.7	Hydrothermal Scars	
		3.4.1.8	Alluvial Deposits	
	3.4.2	Tailing F	Facility	
		3.4.2.1	Sedimentary Rocks	
		3.4.2.2	Volcanic Rocks	
		3.4.2.3	Quartz Latite	
		3.4.2.4	Dacite	
		3.4.2.5	Olivine Andesite	
		3.4.2.6	Servilleta Basalt	
		3.4.2.7	Structural Geology	
3.5	Hydro	geology		
	3.5.1	Mine Sit	e	
		3.5.1.1	Regional Hydrogeology	
		3.5.1.2	Local Hydrogeology	

	3.5.1.3	Red River	Alluvial Aquifer	3-62
		3.5.1.3.1	Occurrence	
		3.5.1.3.2	Water Levels and Direction of Flow.	
		3.5.1.3.3	Rate of Flow	
		3.5.1.3.4	Controls on Flow	
		3.5.1.3.5	Effects of Operational Pumping	
		3.5.1.3.6	Groundwater Collection Systems	
		3.5.1.3.7	Groundwater/Surface Water	
			Interaction	3-75
		3.5.1.3.8	Seeps and Springs	
	3.5.1.4	Colluvium	/Debris Flow Groundwater	
		3.5.1.4.1	Spring and Blind Gulches	3-80
		3.5.1.4.2	Sulphur Gulch	
		3.5.1.4.3	Drainage Beneath Middle Rock Pile.	
		3.5.1.4.4	Drainage Beneath Sugar Shack South	
			Rock Pile	
		3.5.1.4.5	Slick Line Gulch	3-86
		3.5.1.4.6	Goathill Gulch	3-88
		3.5.1.4.7	Capulin Canyon	3-90
	3.5.1.5	Bedrock W	Vater-Bearing Unit	3-92
		3.5.1.5.1	Capulin Canyon	3-96
		3.5.1.5.2	Goathill and Slick Line Gulch	3-97
		3.5.1.5.3	Spring, Blind and Sulphur Gulches	3-100
		3.5.1.5.4	Roadside Piles	3-102
		3.5.1.5.5	Red River Floodplain	
	3.5.1.6		Fractures and Faults on Flow	
	3.5.1.7		nd Workings and Open Pit	
	3.5.1.8	•	nel	
	3.5.1.9		Underground Dewatering and Bedroc	
		-	one	
	3.5.1.10		ulch Subsidence Zone	
	3.5.1.11	-		
3.5.2			ence Area	
	3.5.2.1		ter Occurrence	
	3.5.2.2		els and Direction of Flow	
	3.5.2.3		DW	
3.5.3			ence Area	
	3.5.3.1		ogic Units	
	3.5.3.2		els and Direction of Flow	
254	3.5.3.3		DW	
3.5.4	0	•		
	3.5.4.1	-	Hydrogeology	
	3.5.4.2	Local Hyd	rogeology	3-127

			3.5.4.3	Upper Alluvial Aquifer	3-134
				3.5.4.3.1 Occurrence	3-134
				3.5.4.3.2 Water Levels and Direction of Flow	3-135
				3.5.4.3.3 Rate of Flow	3-138
			3.5.4.4	Basal Alluvial Aquifer	3-138
				3.5.4.4.1 Occurrence	3-138
				3.5.4.4.2 Water Levels and Direction of Flow	3-140
				3.5.4.4.3 Rate of Flow	3-141
			3.5.4.5	Basal Bedrock Aquifer	3-142
				3.5.4.5.1 Occurrence	3-142
				3.5.4.5.2 Water Levels and Direction of Flow	3-144
				3.5.4.5.3 Rate of Flow	3-144
			3.5.4.6	Seeps and Springs	3-145
			3.5.4.7	Effects of Faulting on Groundwater Flow	3-146
			3.5.4.8	Seepage Interception System	3-147
			3.5.4.9	Water Balance	
			3.5.4.10	Seepage Estimates from Impoundments	
		3.5.5	Tailing F	Facility Reference Area	3-154
			3.5.5.1	Upper Alluvial Aquifer	
			3.5.5.2	Basal Alluvial Aquifer	3-154
			3.5.5.3	Basal Bedrock Aquifer	
	3.6			ogy (Vegetation and Wildlife)	
		3.6.1		e	
			3.6.1.1	Mine Site Upland Vegetation	
			3.6.1.2	Mine Site Riparian Vegetation	
			3.6.1.3	Mine Site Wildlife	
			3.6.1.4	Mine Site Threatened or Endangered Species	
		3.6.2	0	Facility	
			3.6.2.1	Tailing Facility Upland Vegetation	
			3.6.2.2	Tailing Facility Riparian Vegetation	
			3.6.2.3	South of Tailing Vegetation	
			3.6.2.4	Tailing Facility Wildlife	
			3.6.2.5	Tailing Facility Threatened or Endangered	
	- -			Species	
	3.7	-		7	
		3.7.1		River	
		3.7.2		Creek	
		3.7.3	Lakes an	d Impoundments	3-175
Section 4	Nature	e and Ex	tent of Cor	ntamination at the Mine Site	4-1
	4.1	Mine	Site Sourc	e Characterization	4-1
		4.1.1		Sources in the Mill Area	
		4.1.2		Sources in the Administration and M&E Area	
		4.1.3		es as Potential Sources	

	4.1.4 4.1.5			the Truck Shop Slice Area Potential Source	
	4.1.6			a Potential Source	
	4.1.7			Tailing Pipeline Emergency Sumps.	
	4.1.8			Mine Site Scars as Sources	
	4.1.9			ent Source Areas	
4.2					
7.4	4.2.1				
	4.2.2			ion of Piles	
	4.2.3			hemical Characterization by Rock	
	1.2.5				4-12
		4.2.3.1			
			C	X-ray Diffraction Analysis	
				Petrographic Analysis of Thin Section	
				Samples	
			4.2.3.1.3	Heavy Mineral Analysis	
		4.2.3.2	Geochemi	cal Characterization	
			4.2.3.2.1		
			4.2.3.2.2	-	
			4.2.3.2.3	Leachate Testing Comparisons	
			4.2.3.2.4	Patterns in SPLP 2:1 Leachates	
	4.2.4	Geochen	nical Chara	cterization by Rock Pile	4-22
		4.2.4.1	Capulin	-	4-23
			4.2.4.1.1	Location/Description	4-23
			4.2.4.1.2	Previous Investigations	
			4.2.4.1.3	Physical Characterization	
			4.2.4.1.4	Chemistry of Materials	
		4.2.4.2	Goathill N	Jorth	4-25
			4.2.4.2.1	Location/Description	4-25
			4.2.4.2.2	Previous Investigations	
			4.2.4.2.3	Physical Characterization	4-27
			4.2.4.2.4	Chemistry of Materials	4-28
		4.2.4.3	Goathill S	outh	4-28
			4.2.4.3.1	Location/Description	4-28
			4.2.4.3.2	Previous Investigations	4-28
			4.2.4.3.3	Chemistry of Materials	4-29
		4.2.4.4	Sugar Sha	ck West	4-29
			4.2.4.4.1	Location/Description	4-29
			4.2.4.4.2	Previous Investigations	4-29
			4.2.4.4.3	Physical Characterization	4-30
			4.2.4.4.4	Chemistry of Materials	
		4.2.4.5	0	ck South	
			4.2.4.5.1	Location/Description	
			4.2.4.5.2	Previous Investigations	4-32

4.3

4.4

	4.2.4.6	4.2.4.5.3 4.2.4.5.4 Middle	Physical Characterization Chemistry of Materials	. 4-34
	7.2.7.0		Location/Description	
		4.2.4.6.2	Previous Investigations	
		4.2.4.6.3	Physical Characterization	
		4.2.4.6.4	Chemistry of Materials	
	4.2.4.7	Sulphur G	ulch North/Blind Gulch	
		4.2.4.7.1	Location/Description	
		4.2.4.7.2	Previous Investigations	
		4.2.4.7.3	Physical Characterization	
		4.2.4.7.4	Chemistry of Materials	
	4.2.4.8	Spring Gul	lch	. 4-41
		4.2.4.8.1	Location/Description	. 4-41
		4.2.4.8.2	Previous Investigations	. 4-42
		4.2.4.8.3	Physical Characterization	. 4-43
		4.2.4.8.4	Chemistry of Materials	. 4-44
	4.2.4.9	Sulphur G	ulch South	. 4-45
		4.2.4.9.1	Location/Description	
		4.2.4.9.2	Previous Investigations	. 4-46
		4.2.4.9.3	Physical Characterization	. 4-46
		4.2.4.9.4	Chemistry of Materials	
	4.2.4.10	Summary.		. 4-48
Catchn	nent Wate	r		. 4-50
4.3.1			ents	
4.3.2			nents	
4.4.1			Aquifer	
	4.4.1.1		d Pathways	
	4.4.1.2		ter Quality and Concentration Ranges	
	4.4.1.3		t Distribution	
	4.4.1.4	Additional	Sampling and Analysis	. 4-69
	4.4.1.5	Evaluation	of Seeps and Springs Along Red River	. 4-79
	4.4.1.6			
4.4.2			ring Unit	
	4.4.2.1		d Pathways	
	4.4.2.2		nemistry and Concentration Ranges	
	4.4.2.3		t Distribution	
	4.4.2.4		Sampling and Analysis	
1 1 2	4.4.2.5		· · · · · ·	
4.4.3			ing Unit	
	4.4.3.1		d Pathways	
	4.4.3.2		t Concentrations	
	4.4.3.3	Constituen	t Distribution	4-120

				Additional Sampling and Analysis	
			4.4.3.5	Summary	4-127
		4.4.4	Mine Site	Reference	4-128
			4.4.4.1	General Chemistry	4-129
			4.4.4.2	Constituent Concentrations and Distribution	4-130
		4.4.5	Compariso	on of Mine Site Concentrations to Reference	
				tions	4-133
		4.4.6	Compariso	on of Mine Site Concentrations to Pre-Mining	
			Concentra	tions	4-136
	4.5		e Soil		4-141
		4.5.1	Soil Expos	sure Area 1	4-143
			4.5.1.1	Human Health	4-144
		4.5.2	Soil Expos	sure Area 2	4-144
			4.5.2.1	Human Health	4-144
		4.5.3	Soil Expos	sure Area 3	4-145
			4.5.3.1	Human Health	4-146
			4.5.3.2	Ecological	4-146
		4.5.4	Soil Expos	sure Area 4	4-147
			4.5.4.1	Human Health	4-148
			4.5.4.2	Ecological	4-148
		4.5.5			
			4.5.5.1	Human Health	4-149
			4.5.5.2	Ecological	4-149
		4.5.6	Summary	and Conclusions	4-149
	4.6	Terres	trial Vegeta	tion	4-151
		4.6.1	Vegetation	n Community Measurement	4-151
		4.6.2	•		
		4.6.3	Presence of	of COPCs in Vegetation Samples	4-154
		4.6.4		ulation	
		4.6.5	Summary	and Conclusions	4-159
	4.7	Terres	trial Anima	ls	4-161
		4.7.1		nmal and Invertebrate Communities	
				Small Mammals	
			4.7.1.2	Soil Fauna Community	4-162
		4.7.2		n Bioassay Results	
		4.7.3		of COPCs in Tissue Samples	
				Small Mammal Tissue Data	
				Earthworm Tissue Data	
				Roadside Rock Piles Small Mammal Data	
		4.7.4	Summary	and Conclusions	4-175
5	Nature	e and Ex	tent of Cont	amination at the Tailing Facility	5-1
	5.1	Tailin	g Facility So	ource Characterization	5-1
				poundments	
			e		

Section

		5.1.1.1 5.1.1.2 5.1.1.3	History Previous Investigations Source Characterization 5.1.1.3.1 Tailing Solids – In Tailing Facility 5.1.1.3.2 Tailing Solids – Currently Produced from Mill	5-2 5-3 5-3
			5.1.1.3.3 Tailing Water	
	5.1.2	-	Pipeline and Lower Dump Sump	
	5.1.3	•	ntenance Area	
	5.1.4			
5.0	5.1.5	1	ke	
5.2			nd Sediments	
	5.2.1		Water	
		5.2.1.1	Tailing Impoundments	
		5.2.1.2	Irrigation Ditches	
		5.2.1.3	Irrigation Return Flow	
	5.0.0	5.2.1.4	Hunt's Pond	
	5.2.2		ts	
		5.2.2.1	Tailing Impoundments	
		5.2.2.2	Irrigation Ditches	
		5.2.2.3	Irrigation Return Flow	
5 2	A	5.2.2.4	Hunt's Pond	
5.3	-		Tailing Impoundment	
	5.3.1	-	ulations	
	5.3.2		sue	
	5.3.3		Invertebrate Populations	
	5.3.4		Invertebrate Tissue	
	5.3.5	0	ssue	
	5.3.6		Water Bioassay	
5 1	5.3.7		t Bioassay	
5.4				
	5.4.1	Soll Exp	osure Area 7 wn Particulate Deposition	5-18
	5.4.2 5.4.3			
	5.4.5 5.4.4		Material	
55			y and Conclusions	
5.5	5.5.1		Illuvial A avifan	
	3.3.1		lluvial Aquifer	
		5.5.1.1	Sources and Pathways	
		5.5.1.2	General Chemistry and Concentration Ranges	
		5.5.1.3 5.5.1.4	Constituent Distribution	
	550		Summary	
	5.5.2		luvial Aquifer	
		5.5.2.1	Sources and Pathways	
		5.5.2.2	General Chemistry and Concentration Ranges	3-32

			5.5.2.3 Constituent Distribution	. 5-34
			5.5.2.4 Summary	. 5-36
		5.5.3	Basal Bedrock Aquifer	
			5.5.3.1 Sources and Pathways	
			5.5.3.2 Constituent Concentrations	. 5-37
			5.5.3.3 Constituent Distribution	. 5-39
			5.5.3.4 Summary	. 5-42
		5.5.4	Seepage and Interception System	. 5-43
		5.5.5	Tailing Facility Reference	. 5-44
		5.5.6	Comparison of Concentrations between Tailing Facility	
			and Reference	. 5-45
	5.6	Terres	rial Vegetation	
		5.6.1	Vegetation Community Measurement	
		5.6.2	Bioassay	
		5.6.3	Presence of COPCs in Vegetation Samples	. 5-51
		5.6.4	Bioaccumulation	. 5-55
		5.6.5	Garden Vegetables	. 5-58
		5.6.6	Summary and Conclusions	
	5.7	Terres	rial Animals	. 5-62
		5.7.1	Small Mammal and Invertebrate Communities	. 5-62
			5.7.1.1 Small Mammals	
			5.7.1.2 Soil Fauna Community	. 5-63
		5.7.2	Earthworm Bioassay Results	. 5-64
		5.7.3	Presence of COPCs in Tissue Samples	
			5.7.3.1 Small Mammal Tissue Data	
			5.7.3.2 Earthworm Tissue Data	
		5.7.4	Summary and Conclusions	
	5.8	-	ality	
		5.8.1	Wind Speed and Direction	
		5.8.2	PM ₁₀ Concentrations	
		5.8.3	Metal Concentrations	. 5-73
		5.8.4	Comparison of Tailing Facility Ambient Air Metals	
			Concentrations to Risk Based Concentrations and	
			Background Concentrations	. 5-74
Section 6	Nature	and Ext	ent of Contamination In Red River and Riparian Areas	6-1
	6.1	Riparia	an Soil	6-1
		6.1.1	Soil Exposure Area 5	6-4
		6.1.2	Campgrounds	6-5
		6.1.3	Soil Exposure Area 6	6-6
		6.1.4	Soil Exposure Area 8	6-7
		6.1.5	Soil Exposure Area 9	6-8
		6.1.6	Summary and Conclusions	6-9
	6.2	Terres	rial Vegetation	. 6-10

	6.2.1	-	•	Measurement	
	6.2.2				
	6.2.3			Vegetation Samples	6-16
		6.2.3.1		of Riparian and Reference Riparian	c 1 c
		()))			6-16
		6.2.3.2	-	of Concentrations Among Life	c 10
		()))			6-19
		6.2.3.3	-	of Unwashed and Washed Vegetation	c 10
	6.2.4	Discourse		ling Facility)	
	0.2.4	6.2.4.1		avagency and Dalaw Crownd	0-20
		0.2.4.1		oveground and Below Ground	6 20
		() ()		- CODC Concentrations in	. 6-20
		6.2.4.2		of COPC Concentrations in	C 01
		6040	•	nd Soils	6-21
		6.2.4.3		of Concentrations in Aboveground	< 2 2
				round Vegetation	
	6.2.5			tion	
	6.2.6			ons	
6.3					
	6.3.1			ertebrate Communities	
		6.3.1.1		als	
		6.3.1.2		ommunity	
	6.3.2		•	esults	
	6.3.3			Fissue Samples	
		6.3.3.1		al Tissue Data	
		6.3.3.2		issue Data	
	6.3.4		•	ons	
6.4	Surfac				
	6.4.1				
		6.4.1.1	Source of Co	nstituent Loading	6-43
		6.4.1.2	General Cher	nistry	6-44
		6.4.1.3		ntrations from RI Seasonal Sampling	
			Events		6-46
		6.4.1.4	Concentration	n Data from Other Sampling	
			Investigation	s	6-55
			6.4.1.4.1 U	SGS Tracer-Dilution Studies	6-55
			6.4.1.4.2 Sa	mpling Required for DP-1055	6-57
			6.4.1.4.3 Fo	ocused Sampling at 1,000-Foot	
				ansects	
			6.4.1.4.4 Fo	cused Sampling Radon 222 Study	6-60
				asonal Changes in Concentrations	
		6.4.1.5		oads	
				our RI Sampling Events	
			SGS Tracer-Dilution Studies		

	6.4.2	Tributari	es	6-69
	6.4.3	Red Rive	r Loading Analysis (Low Flow)	
	6.4.4	Lakes an	d Beaver Ponds	
	6.4.5	Red Rive	er (High Flow)	
	6.4.6	Comparis	son to Reference Concentrations	
		6.4.6.1	Red River	
		6.4.6.2	Eagle Rock Lake	
		6.4.6.3	Red River Seeps/Springs	
6.5	Sedime	ent	1 1 0	
	6.5.1	Red Rive	э г	
		6.5.1.1	COPC Concentrations from RI Seasonal San	npling
			Events	
		6.5.1.2	Focused Sampling on Red River at 1,000-Fo	
			Transects	
	6.5.2	Cabresto	Creek	
	6.5.3		d Beaver Ponds	
		6.5.3.1	Eagle Rock Lake and Upper Fawn Lake	
		6.5.3.2	Beaver Ponds	
	6.5.4		son to Reference Concentrations	
		6.5.4.1	Red River	
		6.5.4.2	Eagle Rock Lake	
	6.5.5		/ and Conclusion	
6.6		•	· · · · · · · · · · · · · · · · · · ·	
0.0	6.6.1	0,	eaches of the Red River Upstream of Placer	
		Creek	1	
		6.6.1.1	Fish Populations	
		6.6.1.2	Fish Tissue	
		6.6.1.3	Benthic Invertebrates	
		6.6.1.4	Benthic Invertebrate Tissue	
		6.6.1.5	Periphyton Population	
		6.6.1.6	Bryophytes Tissue	
		6.6.1.7	Surface Water Bioassay	
		6.6.1.8	Sediment Bioassay	
		6.6.1.9	Habitat Evaluation	
	6.6.2		Town of Red River to the Upstream (East) M	
	0.0.2		ndary	
		6.6.2.1	Fish	
		6.6.2.2	Fish Tissue	
		6.6.2.3	Benthic Invertebrates	
		6.6.2.4	Benthic Invertebrate Tissues	
		6.6.2.5	Periphyton Population	
		6.6.2.6	Bryophytes Tissue	
		6.6.2.7	Surface Water Bioassay	
		6.6.2.8	Sediment Bioassay	
		0.0.2.0	Seament Diousbuy	

	6.6.2.9	Habitat Evaluation	6-132
6.6.3	From the	e Upstream (East) Mine Site Boundary to Cabrest	0
		· · · ·	
	6.6.3.1	Fish	6-133
	6.6.3.2	Fish Tissue	6-134
	6.6.3.3	Benthic Invertebrates	6-136
	6.6.3.4	Benthic Invertebrate Tissue	6-137
	6.6.3.5	Periphyton Population	6-138
	6.6.3.6	Bryophytes Tissue	6-138
	6.6.3.7	Surface Water Bioassay	6-139
	6.6.3.8	Sediment Bioassay	6-139
	6.6.3.9	Habitat Evaluation	6-139
6.6.4	Downstr	ream of Cabresto Creek to the Rio Grande River	6-140
	6.6.4.1	Fish	6-140
	6.6.4.2	Fish Tissue	6-141
	6.6.4.3	Benthic Invertebrates	6-142
	6.6.4.4	Benthic Invertebrate Tissue	6-143
	6.6.4.5	Periphyton Population	6-143
	6.6.4.6	Bryophytes Tissue	6-143
	6.6.4.7	Surface Water Bioassay	6-144
	6.6.4.8	Sediment Bioassay	6-144
	6.6.4.9	Habitat Evaluation	6-144
6.6.5	Cabresto	o Creek	6-145
	6.6.5.1	Fish	6-145
	6.6.5.2	Fish Tissue	
	6.6.5.3	Benthic Invertebrates	
	6.6.5.4	Benthic Invertebrate Tissue	6-146
	6.6.5.5	Periphyton Population	6-146
	6.6.5.6	Bryophytes Tissue	6-146
	6.6.5.7	Surface Water Bioassay	6-146
	6.6.5.8	Sediment Bioassay	
	6.6.5.9	Habitat Evaluation	
6.6.6	Upper F	awn Lake	
	6.6.6.1	Fish	6-147
	6.6.6.2	Fish Tissue	
	6.6.6.3	Benthic Invertebrates	
	6.6.6.4	Benthic Invertebrate Tissues	6-147
	6.6.6.5	Algal Tissues	
	6.6.6.6	Surface Water Bioassay	
	6.6.6.7	Sediment Bioassay	
6.6.7	•	ock Lake	
	6.6.7.1	Fish	
	6.6.7.2	Fish Tissue	
	6.6.7.3	Benthic Invertebrates	6-149

			6.6.7.4	Benthic Invertebrate Tissues	
			6.6.7.5	Algae and Macrophyte Tissues	6-149
			6.6.7.6	Surface Water Bioassay	
			6.6.7.7	Sediment Bioassay	6-149
		6.6.8	Focused	Sampling	6-150
			6.6.8.1	Transect Study	
			6.6.8.2	Serial Dilution Study	
		6.6.9	Biotic and	nd Abiotic Relationships	
			6.6.9.1	Fish	
			6.6.9.2	Benthic Invertebrates	
				ry and Conclusions	
	6.7	Summ		SI Study	
		6.7.1		ocations	
		6.7.2	Results	and Conclusions	6-159
Section 7	Fate a	nd Tran	sport		7-1
	7.1	Potent	ial Migra	tion Routes	
		7.1.1	Surface	Water and Sediment Transport Pathways	
			7.1.1.1	Mine Site	
			7.1.1.2	Tailing Facility	
		7.1.2	Groundy	water Transport Pathways	
			7.1.2.1	Mine Site	
				Tailing Facility	
	7.2	Conta	minant Pe	ersistence and Mobility	
		7.2.1		te	
		7.2.2	0	Facility	
	7.3			lodeling of Potential Sources of Waters Enterin	-
		7.3.1		s: PHREEQC Analysis	
		7.3.2		and Discussion	
			7.3.2.1	MMW-28A, Roadside Rock Pile Wells, and	
				Neighboring Red River Water	
			7.3.2.2	Cabin Springs and Neighboring Wells and Red	
				River Water	
			7.3.2.3	Spring 39, Neighboring Wells, and Red River	
			7224	Water	
			1.3.2.4	MMW-50A, Spring 13, MMW-45A, and	7 01
	7.4	Loadii	ng Analys	Neighboring Wells, and Red River Water sis for Mine Site Rock Piles and Best Managem	
			•	is for this one floor i nes and Dest manager	
		7.4.1		le Loading	
				Uncertainty of Loading Estimates	
		7.4.2		emoved by Best Management Practices at	
				e Rock Piles	

		7.4.3	Comparison Between Rock Pile Loading and Load Removed by Withdrawal System
Section 8	Concl	usions	
	8.1	Mine	Site
		8.1.1	Terrestrial Media
		8.1.2	Groundwater
			8.1.2.1 Red River Alluvial Groundwater
			8.1.2.2 Colluvial Water-Bearing Unit
			8.1.2.3 Bedrock Water-Bearing Unit
			8.1.2.4 Pre-Mining Groundwater Concentrations
		8.1.3	Aquatic Media
	8.2	Tailin	g Facility
		8.2.1	Terrestrial Media
		8.2.2	Groundwater
		8.2.3	Aquatic Media
	8.3	Summ	hary of Conclusions
Section 9	Refere	ences	

List of Tables

Table ES-1	Summary of Sources and Potentially Affected Media
Table ES-2	Summary of Chemicals of Potential Concern for Mine Site and Tailing Facility Media
Table 2.1-1	Mine Site Soil Sample Summary
Table 2.1-2	Tailing Facility Soil Sample Summary
Table 2.1-3	Riparian Soil Sample Summary
Table 2.2-1	Additions to the FSP for Surface Water Data Collection and Sampling During the RI
Table 2.2-2	Summary of Surface Water Sampling Locations
Table 2.2-3	Seasonal Surface Water Sampling Events and Analyses (September 2002 through June 2004)
Table 2.2-4	Surface Water Sampling and Analyses During Snowmelt and Storm Events
Table 2.2-5	Surface Water Sampling and Analyses on Red River Upstream and Downstream of Springs 13 and 39
Table 2.2-6	Surface Water Sampling for Analyses of Stable Isotopes
Table 2.2-7	Surface Water Sampling and Analyses of Irrigation Ditches by EPA in August 2005
Table 2.3-1	Summary of Sediment Sampling Sites, Sampling Dates, and Analyses
Table 2.4-1	Summary of Deviations from the FSP for Well and Piezometer Installation and Groundwater Sampling
Table 2.4-2	Information for New and Existing Monitoring Wells, Piezometers, Extraction Wells, and Supply Wells at the Mine Site and Tailing Facility
Table 2.4-3	Schedule of Groundwater Sampling at the Mine Site and Tailing Facility
Table 2.4-4	Organic Analyses for Groundwater Samples
Table 2.5-1	Overview of Terrestrial Vegetation Sampling, Plant Community Characterization, and Bioassay
Table 2.5-2	Summary of Edible Riparian Sampling

Table 2.5-3	Summary of Garden Produce Sampling
Table 2.5-4	Schedule of Vegetation Sampling
Table 2.5-5	Species Collected for Terrestrial Vegetation Sampling
Table 2.5-6	List of Plant Species Collected in Terrestrial Plant Sampling
Table 2.6-1	Summary of Animal Sampling Sites and Sampling Periods
Table 2.6-2	Approved Modifications to the FSP for Animal Sampling
Table 2.7-1	Time, Location, and Number of Fish That Were Sampled for Tissue Analyses
Table 2.7-2	Surface Water Bioassay Site Toxicity Test, Duration, Dilution Water, and Water Collection Dates
Table 2.7-3	Sediment Bioassay Sites, Test Organisms, and Sampling Dates
Table 2.8-1	Summary Information for Roadside Rock Pile and Debris Fan Samples
Table 2.8-2	Summary Information for Thin Section Samples
Table 2.10-1	Comparison of Wildlife Impact Study and Terrestrial Vegetation Sampling for the RI
Table 2.10-2	Species Collected for the Wildlife Impact Study
Table 2.10-3	Wildlife Impact Study Sample Sites
Table 2.10-4	GSI Study Analyses
Table 2.10-5	Analyses Performed During the Serial Dilution Tests
Table 2.11-1	RI Sampling Event and Data Package Summary
Table 2.11-2	Molycorp RI Laboratories
Table 2.11-3	Chemical Parameters Analyzed During the RI
Table 2.11-4	Non-Organic Chemical Analysis Parameters for Aqueous Media
Table 2.11-5	Chemical Analysis Parameters for Leachate Media
Table 2.11-6	Non-Organic Chemical Analysis Parameters for Abiotic Solid Media
Table 2.11-7	Chemical Analysis Parameters for Biota
Table 2.11-8	Organic Chemical Analysis Parameters

- Table 2.11-9Leachate Procedures for Rock Pile Samples
- Table 2.11-10Mineralogy Analyses
- Table 2.11-11Bioassay and Toxicity Analyses Parameters
- Table 2.11-12
 Population and Community Structure Field Analyses
- Table 3.2-1Monthly Climate Summary for Red River, New Mexico (297323) Weather
Station
- Table 3.2-2Summary of Annual Precipitation and Potential Evaporation for Mine Site
Weather Stations
- Table 3.2-3Monthly Climate Summary for Cerro, New Mexico
- Table 3.3-1
 Information for USGS Stream Flow Gaging Stations in the Red River Basin
- Table 3.3-2Summary Statistics for Daily, Monthly, Annual and Peak Flows for USGS
Gaging Station in the Red River Basin
- Table 3.3-3Mean Monthly Stream Flow for USGS Gaging Stations
- Table 3.3-4Irrigation Ditches in Questa, NM
- Table 3.3-5Mine Site Sub-Watershed Areas and Yield Estimates
- Table 3.3-6
 Comparison of Rock Pile Yield Estimates and Simulated Rock Pile Infiltration
- Table 3.5-1Saturated Thickness of Alluvium, Colluvium/Debris Flow Material and Mine
Rock at the Mine Site
- Table 3.5-2Horizontal Hydraulic Gradients in the Alluvial Aquifer
- Table 3.5-3Vertical Hydraulic Gradients in the Alluvial Aquifer (April 2004)
- Table 3.5-4Summary of Hydraulic Conductivity Values at the Mine Site
- Table 3.5-5Seepage Velocities and Approximate Flow through the Alluvial Aquifer along
the Mine Site
- Table 3.5-6Mine Site Recharge Estimates Based on Chloride Balance
- Table 3.5-7Summary of Hydraulic Conductivity Estimates within the Straight Creek
Watershed
- Table 3.5-8
 Summary of Hydraulic Conductivity Estimates at the Tailing Facility
- Table 3.5-9Details for Extraction Wells at the Tailing Facility Seepage Interception
System
- Table 3.5-10Pumping and Flow Rates for the Seepage Interception System at the Tailing
Facility (September 9, 2003)

Table 3.5-11	Water Balance for Tailing Facility for Calendar Year 2003
Table 3.6-1	Vegetation Types in Mine Site Investigation Area
Table 3.6-2	Vegetation Types in Mine Site Riparian Investigation Area
Table 3.6-3	Small Mammals Collected in the Mine Site Investigation Area
Table 3.6-4	Small Mammals Collected in the Mine Site Riparian Investigation Area
Table 3.6-5	Vegetation Types in Tailing Facility Area
Table 3.6-6	Vegetation Types in the Tailing Facility Riparian Area
Table 3.6-7	Vegetation Types South of Tailing Facility Investigation Area
Table 3.6-8	Small Mammals Collected in the Tailing Facility Investigation Area
Table 3.6-9	Small Mammals Collected in the Tailing Facility Riparian Investigation Area
Table 4.2-1	Approximate Configurations of Questa Rock Piles
Table 4.2-2	Summary Information for Roadside Rock Pile and Debris Fan Samples
Table 4.2-3	Rock Pile Characterization Selected Data Sources
Table 4.2-4	Static Acid-Base Accounting Results for Robertson GeoConsultants Inc. Humidity Cell Tests
Table 4.2-5	Analyses for Rock Pile and Debris Fan Samples
Table 4.2-6	Temperature vs. Depth Data
Table 4.2-7	Spring Gulch Rock Pile Paste pH and ABA Summary
Table 4.2-8	Selected Total Metals Concentrations Summary
Table 4.2-9	Rock Pile Geochemical Characterization Summary
Table 4.3-1	Comparison of COPC Concentrations in the Pumpback Catchment Water to Ecological and Human Health SLC
Table 4.3-2	Comparison of COPC Concentrations in Storm Water Catchment Samples to Human Health and Ecological SLC
Table 4.4-1	Trends in Key Constituent Concentrations at the Mine Site and Reference
Table 4.4-2	Age Dating Results for Select Mine Site Wells and Springs
Table 4.4-3	Upper Tolerance Limit and Upper Prediction Limit Values for Mine Site Reference Groundwater

Table 4.4-4	Comparison of Mine Site Groundwater Concentrations to Reference Concentrations		
Table 4.4-5	Summary of Inferred Pre-Mining Groundwater Concentrations from U.S. Geological Survey Background Study		
Table 4.4-6	Comparison of Mine Site Concentrations to Pre-Mining Concentrations from U.S. Geological Survey Background Study		
Table 4.5-1	Comparison of COPC Concentrations in Soil Exposure Area Samples to Human Health and Ecological SLC		
Table 4.5-2	Results of Statistical Comparison of COPC Concentrations in Mine Site Soil to Reference Soil and Mine Site Scars to Reference Scars		
Table 4.5-3	Summary of Concentrations for Metal COPCs Exceeding SLC at the Mine Site		
Table 4.5-4	Summary of Concentrations for Organic COPCs Exceeding SLC at the Mine Site		
Table 4.6-1	Vegetation Cover and Species Richness at the Mine Site Ecological Area and Reference for Mine Site		
Table 4.6-2	Plant Species Cover and Occurrence		
Table 4.6-3	Ecological Summary		
Table 4.6-4	Ground Cover in the Mine Site Ecological Area and Reference for Mine Site		
Table 4.6-5	Topography and Ground Surface		
Table 4.6-6	Results of Statistical Tests for Terrestrial Vegetation		
Table 4.6-7	Summary of pH Adjustments for Ryegrass Bioassay		
Table 4.6-8	Percent Detects in Vegetation Samples		
Table 4.6-9	Comparison of COPC Concentrations at Mine Site Ecological Area and Reference for Mine Site		
Table 4.6-10	Comparison of COPC Concentrations in Life Forms		
Table 4.6-11	BAFs for COPCs at Mine Site Ecological Area and Reference for Mine Site in Aboveground and Below Ground Vegetation		
Table 4.6-12	COPCs with BAFs >1.0 in Aboveground Vegetation Media at the Mine Site Ecological Area		
Table 4.6-13	COPCs with BAFs >1.0 in Below Ground Vegetation Media at the Mine Site Ecological Area		

Table 4.6-14	Summary and Comparison of BAFs at Mine Site Ecological Area and Reference for Mine Site			
Table 4.6-15	Significant Correlations of Concentrations in Vegetation and Soils			
Table 4.6-16	Ratios of COPC Concentrations in Aboveground Vegetation to Below Ground Vegetation			
Table 4.6-17	Percent of Co-Located Soil Samples that Exceed Screening Level Criteria, Mine Site Ecological Area and Reference for Mine Site			
Table 4.7-1	Summary of Small Mammals Captured at Mine Site and Mine Site Reference Areas			
Table 4.7-2	Summary of Invertebrate Community Structure Data Collected from the Mine Site and Mine Site Reference Areas			
Table 4.7-3	Summary of Earthworm Bioassay Data			
Table 4.7-4	Summary of Aluminum Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-5	Summary of Antimony Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-6	Summary of Arsenic Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-7	Summary of Barium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-8	Summary of Boron Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-9	Summary of Cadmium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-10	Summary of Chromium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-11	Summary of Cobalt Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-12	Summary of Copper Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-13	Summary of Iron Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			
Table 4.7-14	Summary of Lead Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals			

Table 4.7-15	Summary of Manganese Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-16	Summary of Mercury Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-17	Summary of Molybdenum Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-18	Summary of Nickel Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-19	Summary of Selenium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-20	Summary of Silver Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-21	Summary of Thallium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-22	Summary of Vanadium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-23	Summary of Zinc Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 4.7-24	Small Mammal Collection Data for the Rock Piles (EA 3)
Table 4.7-25	Concentrations in Base of Capulin Small Mammals and Nearby Soils, Fresh Weight Basis
Table 4.7-26	Concentrations in Base of Capulin Small Mammals and Nearby Soils, Dry Weight Basis
Table 4.7-27	Median Bioaccumulation Factors by Tissue Type for Base of Capulin Animals
Table 5.2-1	Summary of Surface Water COPC Concentrations in the Tailing Facility Area
Table 5.2-2	Comparison of COPC Concentrations in Surface Water to Human Health Screening Level Criteria
Table 5.2-3	Comparison of COPC Concentrations in Surface Water to Ecological Screening Level Criteria
Table 5.2-4	Summary of Sediment COPC Concentrations in the Tailing Facility Area
Table 5.2-5	Comparison of COPC Concentrations in Sediment to Ecological and Human Health SLC
Table 5.4-1	Comparison of COPC Concentrations in Tailing Soil EA Samples to Human Health and Ecological SLC

Table 5.4-2	Summary of Statistical Results for the Tailing Facility
Table 5.4-3	Summary of Concentrations for COPCs Exceeding SLC at the Tailing Facility
Table 5.4-4	Analytical Results of Tailing Material
Table 5.5-1	Trends in Key Constituent Concentrations at the Tailing Facility and Reference
Table 5.5-2	Upper Tolerance Limit and Upper Prediction Limit Values for Each COPC for Reference Groundwaters
Table 5.5-3	Comparison of Tailing Facility Groundwater Concentrations to Reference Concentrations
Table 5.5-3a	Comparison of Tailing Facility Groundwater Concentrations to Reference Concentrations for Non-COPC Constituents
Table 5.6-1	Vegetation Cover and Species Richness at the Tailing Facility and Reference Area at Cater Ranch
Table 5.6-2	Plant Species Cover and Occurrence
Table 5.6-3	Ecological Summary
Table 5.6-4	Ground Cover in the Tailing Facility and Reference Area at Cater Ranch
Table 5.6-5	Topography and Ground Surface
Table 5.6-6	Results of Statistical Analyses
Table 5.6-7	Percent Detects in Vegetation Samples
Table 5.6-8	Comparison of COPC Concentrations at Tailing Facility and Reference Area at Cater Ranch
Table 5.6-9	Summary of Statistically Significant Differences in COPC Concentrations at Tailing Facility and Reference Area at Cater Ranch
Table 5.6-10	Number of Dual Purpose Samples in Wildlife Impact Study
Table 5.6-11	Comparison of Median Values for Unwashed Vegetation from the Remedial Investigation and Wildlife Impact Study Datasets
Table 5.6-12	Comparison of COPC Concentrations Among Life Forms (Remedial Investigation Data)
Table 5.6-13	Comparison of COPC Concentrations in Washed and Unwashed Vegetation – Wildlife Impact Study Data
Table 5.6-14	BAFs for COPCs at Tailing Facility and Reference Area at Cater Ranch in Aboveground and Below Ground Vegetation (Remedial Investigation Data)
Table 5.6-15	COPCs with BAFs >1.0 in Vegetation Media at the Tailing Facility

Table 5.6-16	BAFs for COPCs at Tailing Facility and Reference Area at Cater Ranch in Aboveground and Below Ground Vegetation (Wildlife Impact Study Data)
Table 5.6-17	Summary and Comparison of BAFs at Tailing Facility and Reference Area at Cater Ranch
Table 5.6-18	Significant Correlations of Concentrations in Tailing Facility Vegetation and Soils (Remedial Investigation Data)
Table 5.6-19	Ratios of COPC Concentrations in Unwashed Aboveground Vegetation to Below Ground Vegetation (Remedial Investigation Data)
Table 5.6-20	Percent Detects in Garden Vegetable Samples
Table 5.6-21	COPC Concentrations in Garden Vegetables
Table 5.6-22	Comparison of COPC Concentrations in Garden Vegetables to Concentrations in Forbs at the Cater Ranch Reference Area
Table 5.6-23	Percent of Co-Located Soil Samples that Exceed Screening Level Criteria, Tailing Facility and Reference Area at Cater Ranch
Table 5.7-1	Summary of Small Mammals Captured at Tailing Facility and Tailing Facility Reference Areas
Table 5.7-2	Summary of Invertebrate Community Structure Data Collected from the Tailing Facility and Tailing Facility Reference Areas
Table 5.7-3	Summary of Earthworm Bioassay Data
Table 5.7-4	Summary of Antimony Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-5	Summary of Barium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-6	Summary of Boron Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-7	Summary of Cadmium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-8	Summary of Chromium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-9	Summary of Copper Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-10	Summary of Iron Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-11	Summary of Lead Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals

Table 5.7-12	Summary of Manganese Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-13	Summary of Mercury Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-14	Summary of Molybdenum Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-15	Summary of Selenium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-16	Summary of Vanadium Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.7-17	Summary of Zinc Concentrations and Bioaccumulation Factors for Earthworms and Small Mammals
Table 5.8-1	Summary of Tailing Facility Particulate Matter 10 Microns in Size or Smaller Measurements – 2003 through 2006
Table 5.8-2	Toxic Metals Summary
Table 6.1-1	Comparison of COPC Concentrations in Riparian Soil Exposure Area Samples to Human Health and Ecological SLC
Table 6.1-2	Results of Statistical Comparison of COPC Concentrations in Riparian Area Soil to Reference Riparian Soil
Table 6.1-3	Summary of Concentrations of COPC Exceeding SLC at the Riparian Areas
Table 6.2-1	Summary of Vegetation Cover and Species Richness for the Red River Riparian and Reference Riparian Areas
Table 6.2-2	Plant Species Cover and Occurrence for the Red River Riparian and Reference Riparian Areas
Table 6.2-3	Ecological Summary for the Red River Riparian and Reference Riparian Areas
Table 6.2-4	Ground Cover for the Red River Riparian and Reference Riparian Sample Sites
Table 6.2-5	Topography and Ground Surface of the Red River Riparian and Reference Riparian Sites
Table 6.2-6	Results of Statistical Tests for the Red River Riparian and Reference Riparian Sample Sites
Table 6.2-7	Summary of pH Adjustments for Ryegrass Bioassay
Table 6.2-8	Percent Detects in Vegetation Samples

Table 6.2-9	Comparison of COPC Concentrations at Riparian and Reference Riparian Areas
Table 6.2-10	Summary of Statistically Significant Differences in COPC Concentrations at Riparian and Reference Riparian Areas
Table 6.2-11	Comparison of COPC Concentrations Among Life Forms
Table 6.2-12	Comparison of COPC Concentrations in Washed and Unwashed Vegetation – South of Tailing Facility Data
Table 6.2-13	BAFs for COPCs at Riparian and Reference Riparian Areas
Table 6.2-14	COPCs with BAFs >1.0 in Vegetation Media in Riparian Areas
Table 6.2-15	Summary and Comparison of BAFs at Riparian and Reference Riparian Areas
Table 6.2-16	Significant Correlations of Concentrations in Vegetation and 0-24 Inch Soils
Table 6.2-17	Ratios of COPC Concentrations in Aboveground Vegetation to Below Ground Vegetation
Table 6.2-18	Percent Detects in Edible Riparian Plant Samples
Table 6.2-19	COPC Concentrations in Edible Riparian Plants
Table 6.2-20	Comparison of COPC Concentrations in Edible Riparian Vegetation and General Riparian Vegetation
Table 6.2-21	Percent of Co-Located Soil Samples that Exceed SLCs, Tailing Facility and Reference Area at Cater Ranch
Table 6.3-1	Small Mammals Collected from the Riparian and Riparian Reference Areas
Table 6.3-2	Summary of Small Mammals Collected by Area
Table 6.3-3	Summary of Soil Fauna Community Structure by Area
Table 6.3-4	Summary of Earthworm Bioassay Data
Table 6.3-5	Summary of Aluminum Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-6	Summary of Antimony Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-7	Summary of Arsenic Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-8	Summary of Barium Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-9	Summary of Boron Concentrations and BAFs for Earthworms and Small Mammals

Table 6.3-10	Summary of Cadmium Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-11	Summary of Chromium Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-12	Summary of Cobalt Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-13	Summary of Copper Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-14	Summary of Iron Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-15	Summary of Lead Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-16	Summary of Manganese Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-17	Summary of Mercury Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-18	Summary of Molybdenum Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-19	Summary of Nickel Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-20	Summary of Selenium Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-21	Summary of Silver Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-22	Summary of Thallium Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-23	Summary of Vanadium Concentrations and BAFs for Earthworms and Small Mammals
Table 6.3-24	Summary of Zinc Concentrations and BAFs for Earthworms and Small Mammals
Table 6.4-1	Comparison of COPC Concentrations in Red River Samples to Human Health and Ecological SLC
Table 6.4-2	Comparison of COPC Concentrations in Cabresto Creek Samples to Human Health and Ecological SLC
Table 6.4-3	Red River Loading Analysis for Aluminum (September 2003 Low Flow)

Table 6.4-4	Red River Loading Analysis for Fluoride (September 2003 Low Flow)
Table 6.4-5	Red River Loading Analysis for Manganese (September 2003 Low Flow)
Table 6.4-6	Red River Loading Analysis for Sulfate (September 2003 Low Flow)
Table 6.4-7	Red River Loading Analysis for Zinc (September 2003 Low Flow)
Table 6.4-8	Comparison of COPC Concentrations in Eagle Rock Lake Samples to Human Health and Ecological SLC
Table 6.4-9	Comparison of COPC Concentrations in Upper Fawn Lake Samples to Human Health and Ecological SLC
Table 6.4-10	Comparison of COPC Concentrations in Snowmelt Runoff River Samples to Human Health and Ecological SLC
Table 6.4-11	Comparison of COPC Concentrations in Storm Event River Samples to Human Health and Ecological SLC
Table 6.4-12	Summary of COPC Concentrations for Red River and Eagle Rock Lake Exposure Areas and Reference Areas
Table 6.4-13	Comparison of Red River, Eagle Rock Lake, and Mine Seep/Spring Human Health and Ecological Exposure Area Concentrations to Reference Concentrations
Table 6.5-1	Comparison of COPC Concentrations in Sediment Samples to Human Health and Ecological SLC
Table 6.5-2	Comparison of Red River and Eagle Rock Lake Human Health and Ecological Exposure Area Sediment Concentrations to Reference Concentrations
Table 6.6-1	Analysis of Long-Term Trends in Fish Density and Biomass for the Red River and Cabresto Creek 1997-2005
Table 6.6-2	Region III Risk-Based Criteria Table for Fish Tissue
Table 6.6-3	Habitat Depth Parameters and Habitat Ratings
Table 6.6-4	Average Sediment Parameters for Fall 2002-2005
Table 6.6-5	Average Sediment Parameters for Spring 2002-2005
Table 6.6-6	Average Percentage of Habitat Types 2002-2005
Table 7.2-1	Summary of Inorganic Chemicals of Potential Concern for Mine Site and Tailing Facility Media
Table 7.3-1	Questa Mine Area Mineralogy – Summary of Mineralogy from the Literature

T 11 T 2 2	DUDEEOGI			T 1 2002
Table 7.3-2	PHREEQC Inverse	e Modeling of M	IMW-28A – .	July 2003

- Table 7.3-3PHREEQC Inverse Modeling of MMW-28A July 2003 (Including
Chambers Springs)
- Table 7.3-4PHREEQC Inverse Modeling of MMW-28A April 2003
- Table 7.3-5PHREEQC Inverse Modeling of MMW-43A April 2003
- Table 7.3-6
 PHREEQC Inverse Modeling of Cabin Springs July 2003
- Table 7.3-7PHREEQC Inverse Modeling of MMW-33A July 2003
- Table 7.3-8PHREEQC Inverse Modeling of Spring 39 April 2003
- Table 7.3-9 PHREEQC Inverse Modeling of MMW-50A April 2004
- Table 7.3-10PHREEQC Inverse Modeling of Spring 13 April 2004 (with Stable Isotopes)
- Table 7.3-11PHREEQC Inverse Modeling of MMW-45A July 2003 (with Stable Isotopes)
- Table 7.4-1
 Rock Pile Infiltration and Representative Constituent Concentrations
- Table 7.4-2Estimated Loading from Rock Piles
- Table 7.4-3Average Load Removed by Groundwater Withdrawal System (February 2003
through 2006)

List of Figures

Figure ES-1	Molycorp Remedial Investigation Area
Figure 1-1	Site Location Map
Figure 1-2	Molycorp Mine Site and 2005 Aerial Photograph
Figure 1-3	Molycorp Tailing Facility and 2005 Aerial Photograph
Figure 2.1-1	Soil Investigation Areas
Figure 2.1-2	Soil Area 1 Sampling Locations
Figure 2.1-3	Soil Area 2 Sampling Locations
Figure 2.1-4	Soil Areas 3, 5, 6, 7, and 8 Sampling Locations
Figure 2.1-5	Soil Areas 4A1, 4A2, and 4A3 Sampling Locations
Figure 2.1-6	Soil Area 9, Reference Riparian, Reference Riparian Campground, and Riparian Campground Sampling Locations
Figure 2.1-7	Soil Areas 11, 12, 13, 14, 15, 16, 17, Reference for Tailing Facility, Hunt's Pond and Residential Area South of Tailing Facility Sampling Locations
Figure 2.1-8	Tailing Facility Reference Area Soil Sampling Locations – Cater Ranch
Figure 2.2-1	Surface Water Sampling Locations
Figure 2.2-2	Summary of RI Sampling Events in Red River Reaches Adjacent to the Mine Site and Tailing Facility
Figure 2.2-3	Summary of RI Sampling Events in Stream Reaches Upstream of the Mine and Upstream of the Tailing Facility
Figure 2.2-4	Rainfall at Mill and Stage at USGS Gage (September 2002)
Figure 2.2-5	Correlation Between River Stage at USGS Gage and Staff Height at ISCO RR-12
Figure 2.3-1	Sediment Sampling Locations
Figure 2.3-2	Sediment Sample Locations at Hunt's Pond
Figure 2.3-3	Sediment Sample Locations in Irrigation Ditches and Return Flow Ditches
Figure 2.4-1	Mine Site Groundwater Sampling Locations and On-Mine Site Reference Locations
Figure 2.4-2	Tailing Facility Groundwater Sampling Locations and Reference Locations

Figure 2.4-3	Off-Mine Reference Groundwater Sampling Locations
Figure 2.4-4	EPA Domestic Well Sample Locations – July 2005
Figure 2.5-1	Terrestrial Vegetation Sample Sites
Figure 2.5-2	Terrestrial Vegetation Sample Sites – Cater Ranch
Figure 2.5-3	Edible Riparian Vegetation Sample Sites
Figure 2.5-4	Garden Produce Sample Sites
Figure 2.6-1	Animal Sampling Locations at the Mine Site and Tailing Facility
Figure 2.6-2	Animal Sampling Locations at Cater Ranch
Figure 2.7-1	Aquatic Biological Sampling Locations
Figure 2.8-1	Rock Pile and Debris Fan Sample Locations
Figure 2.8-2	Sample Preparation Flow Chart for Rock Pile and Debris Fan Samples
Figure 2.9-1	Geophysical Transects Mine Site
Figure 2.9-2	Geophysical Transects Tailing Facility
Figure 2.10-1	Wildlife Impact Study Sampling Locations at Tailing Facility
Figure 2.10-2	Wildlife Impact Study Sampling Locations at Cater Ranch Reference Area
Figure 2.10-3	EPA Focused Sampling Locations
Figure 2.10-4	Tailing Facility and Location of PM_{10} Sampling Sites
Figure 2.10-5	Tailing Facility Annual Wind Rose
Figure 2.10-6	PM ₁₀ Monitoring Equipment
Figure 3.1-1	Generalized Soil Types in Vicinity of Molycorp Questa Mine
Figure 3.3-1	Red River Watershed and Tributaries
Figure 3.3-2	Profile of Red River
Figure 3.3-3	Average Daily Flow at Red River Near Red River, NM USGS Gage
Figure 3.3-4	Average Daily Flow at Red River Below Zwergle Dam Site Near Red River, NM USGS Gage

Figure 3.3-5	Average Daily Flow at Red River Near Questa, NM USGS Gage
Figure 3.3-6	Red River Flows at Questa, NM USGS Gage (January 2001 through June 2006)
Figure 3.3-7	Average Daily Flow at Red River Below Fish Hatchery, NM USGS Gage
Figure 3.3-8	Average Daily Flow of Red River at Confluence with Rio Grande, NM USGS Gage
Figure 3.3-9	Estimated Flow of Red River from USGS August 2001 Tracer-Dilution Study
Figure 3.3-10	Estimated Flow of Red River from USGS March 2002 Tracer-Dilution Study
Figure 3.3-11	Red River Flow Measurements (2002 and 2003)
Figure 3.3-12	Conceptual Gaining and Losing Stream Flow Conditions
Figure 3.3-13	Generalized Cumulative Net Gain/Loss in Red River Stream Flow (2002 and 2003)
Figure 3.3-14	Cumulative Gain/Loss of Red River Flow During August 2001 USGS Tracer- Dilution Study
Figure 3.3-15	Regression Between Stream Flow at Columbine Creek and Red River at the Questa Ranger Station
Figure 3.3-16	Average Daily Flow at Cabresto Creek Near Questa, NM USGS Gage
Figure 3.3-17	Cabresto Creek Stream Flow Measurements (2002 and 2003)
Figure 3.3-18	Irrigation Ditches in Questa, NM
Figure 3.3-19	Average Daily Flow at Llano Ditch Near Questa, NM USGS Gage
Figure 3.3-20	Annual Diversions for Llano Ditch
Figure 3.3-21	Mine Site Topography and Major Watersheds Prior to Open Pit Development (1963)
Figure 3.3-21a	Historic Aerial Photo September 23, 1969
Figure 3.3-22	Relationship for Estimating Mean Annual Yield (MAY) for the Mine Site
Figure 3.3-23	Mine Site Sub-Watersheds Used in Yield Analysis
Figure 3.3-24	Mine Site Storm Water Management
Figure 3.3-25	Topography Prior to Tailing Impoundment Construction (1963)
Figure 3.4-1	Schematic Stratigraphy of Geological Sequence in the Questa Region
Figure 3.4-2	Locations of Geologic Cross Sections
Figure 3.4-3	Geologic Cross Sections A-A' and B-B' at the Mine Site

Figure 3.4-4	Underground Mine Workings and Conveyances, Open Pit Area, Hydrothermal Scars, Mine Rock Piles, Ore Zones, and Faults at the Mine Site
Figure 3.4-5	Geologic Map of the Tailing Facility Area
Figure 3.4-6	Generalized West to East Geologic Cross Section C-C' at the Tailing Facility
Figure 3.5-1	Mine Site Features, Cross Section Locations, and Extent of Red River Alluvium and Colluvium
Figure 3.5-2	Red River Alluvial Aquifer Cross Section J-J' through Columbine Park
Figure 3.5-3	Longitudinal Profile Along Red River Alluvium
Figure 3.5-4	Water Table Contour Map of Red River Alluvial Aquifer and Colluvium/Debris Flow Water-Bearing Unit (April 2004)
Figure 3.5-5	Distribution of Hydraulic Conductivity Values for the Mine Site Water- Bearing Units and Aquifers
Figure 3.5-6	Average Daily Pumping Rates for Columbine No. 1 and 2 Wells (January 2000 through September 2003)
Figure 3.5-7	Daily Pumping Time for Columbine No. 1 and 2 Wells (January 2000 through September 2003)
Figure 3.5-8	Columbine No. 2 Pumping and Water Level Response in Well P-1
Figure 3.5-9	Average Daily Pumping Rates for Mill 1 and 1A Wells (January 2000 through September 2003)
Figure 3.5-10	Daily Pumping Time for Mill 1 and 1A Wells (January 2000 through September 2003)
Figure 3.5-11	Mill Well Pumping and Change in Groundwater Levels in Alluvial Monitoring Wells
Figure 3.5-12	Historical Pumping from Mill and Columbine Wells and Water Level Response in MMW-10A
Figure 3.5-13	Groundwater Withdrawal Well Pumping Rates from Startup through 2003
Figure 3.5-14	Springs 13 and 39 Pumping Rates from Startup through 2003
Figure 3.5-15	Measured Flow from Alluvial Seeps and Springs
Figure 3.5-16	Lower Sulphur Gulch Cross Section F-F'
Figure 3.5-17	South Sulphur Gulch Cross Section E-E'
Figure 3.5-18	Base of Sulphur Gulch Cross Section G-G'
Figure 3.5-19	Drainage Beneath Middle Rock Pile Cross Section C-C'
Figure 3.5-20	Base of Middle Rock Pile Cross Section D-D'

Figure 3.5-21	Drainage Beneath Sugar Shack South Rock Pile Cross Section A-A'
Figure 3.5-22	Base of Sugar Shack South Rock Pile Cross Section B-B'
Figure 3.5-23	M&E Cross Section N-N'
Figure 3.5-24	M&E Cross Section O-O'
Figure 3.5-25	Lower Goathill Gulch Cross Section H-H'
Figure 3.5-26	Mouth of Capulin Canyon Cross Section I-I'
Figure 3.5-27	Generalized Cross Section K-K' through Subsidence Zone Showing Bedrock Water Elevation
Figure 3.5-28	Generalized Cross Section L-L' through "D" Ore Body Showing Bedrock Water Elevation
Figure 3.5-29	Generalized Cross Section M-M' through East End of Underground Workings Showing Bedrock Water Elevation
Figure 3.5-30	Potentiometric Surface Map for the Bedrock Water-Bearing Unit (April 2004)
Figure 3.5-31	Change in Water Levels for Bedrock Wells Beneath the Red River Alluvium
Figure 3.5-32	Change in Water Levels for Bedrock Wells Near the Margin of Red River Alluvium
Figure 3.5-33	Change in Water Levels for Bedrock Wells Interior to the Mine
Figure 3.5-34	Contour Map of the Bedrock Surface in Goathill and Slick Line Gulches
Figure 3.5-35	Schematic Cross Section through Underground Workings
Figure 3.5-36	Totalized Flow Rate from the Underground Mine (2000 through 2004)
Figure 3.5-37	Locations of Monitoring Stations for New Underground Mine
Figure 3.5-38	Water Balance for Underground Mine (April and July 2003)
Figure 3.5-39	Estimated Inflow Rate to Moly Tunnel and Bulkhead Pressure Readings
Figure 3.5-40	Estimated Extent of Dewatering Influences and Approximate Bedrock Capture Zone
Figure 3.5-41	Off-Mine Site Reference Wells and Springs
Figure 3.5-42	Water Table Contour Map of Straight Creek Colluvium and Red River Alluvial Aquifer (January 2004)
Figure 3.5-43	On-Mine Site Reference Wells in Capulin Canyon
Figure 3.5-44	Tailing Facility Features and Geologic Cross Section Locations
Figure 3.5-45	West to East Cross Section A-A' through Sections 35 and 36 Tailing Impoundments
Figure 3.5-46	South to North Cross Section B-B' through Section 35 Tailing Impoundment

Figure 3.5-47	South to North Cross Section C-C' through Section 36 Tailing Impoundment
Figure 3.5-48	Southwest to Northeast Cross Section D-D' South of Tailing Facility
Figure 3.5-49	Contour Map of Total Clay Thickness in the Upper and Basal Alluvial Aquifers
Figure 3.5-50	Water Table Contour Map of the Tailing Facility and Questa Area
Figure 3.5-51	Potentiometric Surface Map for the Basal Alluvial and Bedrock Aquifers Near the Tailing Facility
Figure 3.5-52	Plan View of the Tailing Facility Seepage Interception System
Figure 3.5-53	Measured Flows from the Tailing Facility Seepage Interception System (February 2002)
Figure 3.5-54	Water Balance and Seepage Estimates for the Tailing Facility (2003)
Figure 4.1-1	Potential Sources in Mine Site Area and Other Site Features
Figure 4.1-2	Potential Sources in the Mill Area and Other Site Features
Figure 4.1-3	Mine Site Investigative Features
Figure 4.2-1	Minerals Detected (as a Percentage of the Sample) using Semi-Quantitative XRD for 2004 Mixed-Volcanic (MV) Mine Rock Samples
Figure 4.2-2	Minerals Detected (as a Percentage of the Sample) using Semi-Quantitative XRD for 2004 Andesite (AND) Mine Rock Samples
Figure 4.2-3	Minerals Detected (as a Percentage of the Sample) using Semi-Quantitative XRD for 2004 Rhyolite (RHY) and Aplite (APL) Mine Rock Samples
Figure 4.2-4	Thin Section of Sulphur Gulch Rock Pile Andesite Sample SI44B-T01N- MINE-AND-TS Showing Calcite
Figure 4.2-5	Thin Section of Sulphur Gulch Rock Pile Andesite Sample SI44B-T01N- MINE-AND-TS Showing Pyrite
Figure 4.2-6	Thin Section of Andesite Colluvium Sample Underlying Sugar Shack South Rock Pile (SI50-T05N-COL-AND1-TS), Showing Weathered Pyrite Partially Replaced by Hematite/Goethite
Figure 4.2-7	Thin Section of Scar Sample SSWOUT-T01N-SCAR-GRA-TS, from the Third Bench of the Sugar Shack South Rock Pile, Showing Clean, but Rounded Grains of Pyrite
Figure 4.2-8	Heavy Minerals as a Percentage of the -35 +100 Mesh (Sand) Size Fraction of 2004 Rock Pile Samples: Mixed-Volcanic (MV), Andesite (AND), Aplite (APL) and Colluvium (COL)

Figure 4.2-9	Heavy Minerals as a Percentage of the -35 +100 Mesh (Sand) Size Fraction for 2004 Andesite (AND) Mine Rock Samples
Figure 4.2-10	Heavy Mineral Concentrates from Bulk Andesite Sample SI44B-T01N- MINE-AND, Showing Pyrite Grains Rimmed with Hematite/Goethite
Figure 4.2-11	Heavy Mineral Concentrates from Bulk Aplite Sample SI48B-T01N-MINE- APL, Showing Hematite/After Pyrite
Figure 4.2-12	Heavy Mineral Concentrates from Bulk Rhyolite Sample SI50-T03N-MINE- RHY, Showing Grain of Magnesite (White Striated Mineral)
Figure 4.2-13	Distribution of Sulfur Species by Rock Type for 2004 Rock Pile Samples
Figure 4.2-14	Relationship between AGP and XRD Pyrite for 2004 Rock Pile Samples
Figure 4.2-15	Relationship between AGP and Heavy Mineral Pyrite as Percent of -35 +100 Mesh (Sand) Size Fraction
Figure 4.2-16	Distribution of Sulfur Species by Bench and Rock Pile for 2004 Rock Pile Samples
Figure 4.2-17	Relationship between AGP and ANP by Rock Type for RGC and 2004 Rock Pile Samples
Figure 4.2-18	Relationship between ANP and AGP by Rock Pile for RGC and 2004 Rock Pile Samples
Figure 4.2-19	Relationship between NNP and Field Paste pH by Rock Type for RGC and 2004 Rock Pile Samples
Figure 4.2-20	Relationship between NNP and Field Paste pH by Rock Pile for RGC and 2004 Rock Pile Samples
Figure 4.2-21	Leachate Sulfate, Calcium, and pH as a Function of Time for HCT HC3 Volcanic Mine Rock from WRD-2, 55-60' in Spring Gulch
Figure 4.2-22	Leachate Sulfate, Calcium, and pH as a Function of Time for HCT HC6 Rhyolite Tuff Mine Rock from WRD-6, 30-35' in Sugar Shack West
Figure 4.2-23	Leachate Sulfate, Calcium, and pH as a Function of Time for HCT HC1 Aplite Mine Rock from WRD-1, 5-10' in Spring Gulch
Figure 4.2-24	Leachate Sulfate, Calcium, and pH as a Function of Time for HCT HC2 Black Andesite Mine Rock from WRD-1, 50-55' in Spring Gulch
Figure 4.2-25	Leachate Sulfate, Calcium, and pH as a Function of Time for HCT HC5 Rhyolite Mine Rock from WRD-5, 5-10' in Sugar Shack South
Figure 4.2-26	Leachate Sulfate, Calcium, and pH as a Function of Time for HCT HC4 Mixed Andesite/Aplite Mine Rock from WRD-3, 20-25' in Sugar Shack South
Figure 4.2-27	Comparison of Final Leachate pH with Field Paste pH for 2004 Rock Pile Samples

Figure 4.2-28	Relationship between RGC (2000b) SPLP's 2:1 Leach and SRK's Shake Flask 3:1 Leach, Considering All Measured Constituents
Figure 4.2-29	Leachate Manganese Concentrations Normalized to mg/kg of Rock Sample for 2004 Rock Pile Materials (Samples are Arranged from Lower to Higher Leachate pH for Each Rock Type)
Figure 4.2-30	Leachate Aluminum Concentrations Normalized to mg/kg of Rock Sample for 2004 Rock Pile Materials (Samples are Arranged from Lower to Higher Leachate pH for Each Rock Type)
Figure 4.2-31	Comparison of Aluminum Concentrations in 2:1 Leachates of 2004 Rock Pile Samples with Leachate pH by Borehole by Rock Pile
Figure 4.2-32	Comparison of Aluminum Concentrations in 2:1 Leachates of 2004 Rock Pile Samples with Leachate pH by Rock Type
Figure 4.2-33	Concentration Patterns in Colluvial Water along the Rock Piles
Figure 4.2-34	Ratio Patterns in Colluvial Water along Rock Piles
Figure 4.2-35	Concentration Patterns in 2:1 Leachates of Rock Pile and Underlying Materials in SI-52B (First Bench, Sulphur Gulch Rock Pile) Compared with MMW-39A Water
Figure 4.2-36	Ratio Patterns in 2:1 Leachates of Rock Pile and Underlying Materials in SI- 52B (First Bench, Sulphur Gulch Rock Pile) Compared with MMW-39A Water
Figure 4.2-37	Concentration Patterns in 2:1 Leachates of Rock Pile and Underlying Materials in SI-51B (Toe of Sulphur Gulch Rock Pile) Compared with MMW-16 Water
Figure 4.2-38	Ratio Patterns in 2:1 Leachates of Rock Pile and Underlying Materials in SI- 51B (Toe of Sulphur Gulch Rock Pile) Compared with MMW-16 Water
Figure 4.2-39	Concentration Patterns in 2:1 Leachates of Materials in SI-45B (Second Bench, Middle Rock Pile) Compared with MMW-38A Water
Figure 4.2-40	Ratio Patterns in 2:1 Leachates of Materials in SI-45B (Second Bench, Middle Rock Pile) Compared with MMW-38A Water
Figure 4.2-41	Concentration Patterns in 2:1 Leachates of Rock Pile and Underlying Materials in SI-50B (First Bench, Sugar Shack South Rock Pile) Compared with MMW-11A Water
Figure 4.2-42	Ratio Patterns in 2:1 Leachates of Rock Pile and Underlying Materials in SI-50B (First Bench, Sugar Shack South Rock Pile) Compared with MMW-11A Water
Figure 4.2-43	Temperature vs. Depth Profile

Figure 4.2-44	NANP and Paste pH for 2004 Rock Pile Samples from Sugar Shack South and Middle Rock Piles
Figure 4.2-45	NANP and Paste pH for 2004 Rock Pile Samples for Sulphur Gulch Rock Pile
Figure 4.3-1	Aluminum Concentrations in the Capulin Pumpback Catchment and in Water Discharged to Goathill Gulch
Figure 4.3-2	Cadmium Concentrations in the Capulin Pumpback Catchment and in Water Discharged to Goathill Gulch
Figure 4.3-3	Fluoride Concentrations in the Capulin Pumpback Catchment and in Water Discharged to Goathill Gulch
Figure 4.3-4	Manganese Concentrations in the Capulin Pumpback Catchment and in Water Discharged to Goathill Gulch
Figure 4.3-5	Sulfate Concentrations in the Capulin Pumpback Catchment and in Water Discharged to Goathill Gulch
Figure 4.3-6	Zinc Concentrations in the Capulin Pumpback Catchment and in Water Discharged to Goathill Gulch
Figure 4.3-7	pH Values in Storm Water Catchment Samples
Figure 4.3-8	Aluminum Concentrations in Storm Water Catchment Samples
Figure 4.3-9	Cadmium Concentrations in Storm Water Catchment Samples
Figure 4.3-10	Fluoride Concentrations in Storm Water Catchment Samples
Figure 4.3-11	Manganese Concentrations in Storm Water Catchment Samples
Figure 4.3-12	Sulfate Concentrations in Storm Water Catchment Samples
Figure 4.3-13	Zinc Concentrations in Storm Water Catchment Samples
Figure 4.4-1	Conceptualization of Primary Constituent Sources and Pathways for Red River Alluvial Groundwater
Figure 4.4-2	Piper Diagram of Mine Site Red River Alluvial Groundwater (April 2004)
Figure 4.4-3	Map of Stiff Diagrams for Red River Alluvial, Colluvial, and Bedrock Wells and Seeps at the Mine Site (April 2004)
Figure 4.4-4	Isoconcentration Contour Map for Aluminum (Total) in Red River Alluvial Aquifer and Colluvial Water Bearing Unit (April 2004)
Figure 4.4-5	Isoconcentration Contour Map for Fluoride (Total) in Red River Alluvial Aquifer and Colluvial Water Bearing Unit (April 2004)
Figure 4.4-6	Isoconcentration Contour Map for Manganese (Total) in Red River Alluvial Aquifer and Colluvial Water Bearing Unit (April 2004)

Figure 4.4-7	Molybdenum (Total) in Red River Alluvial Aquifer and Colluvial Water Bearing Unit (April 2004)
Figure 4.4-8	Isoconcentration Contour Map for Nickel (Total) in Red River Alluvial Aquifer and Colluvial Water Bearing Unit (April 2004)
Figure 4.4-9	Isoconcentration Contour Map for Sulfate (Total) in Red River Alluvial Aquifer and Colluvial Water Bearing Unit (April 2004)
Figure 4.4-10	Isoconcentration Contour Map for Zinc (Total) in Red River Alluvial Aquifer and Colluvial Water Bearing Unit (April 2004)
Figure 4.4-11	Isoconcentration Contour Map for pH in Red River Alluvial Aquifer and Colluvial Water Bearing Unit (April 2004)
Figure 4.4-12	Lead Isotopes for Alluvial, Colluvial and Bedrock Waters ²⁰⁶ Pb/ ²⁰⁷ Pb vs. Total Pb
Figure 4.4-13	Lead Isotopes for Alluvial, Colluvial and Bedrock Waters 207 Pb/ 204 Pb vs. 206 Pb/ 204 Pb
Figure 4.4-14	Lead Isotopes for Alluvial, Colluvial, and Bedrock Waters 208 Pb/ 204 Pb vs. 206 Pb/ 204 Pb
Figure 4.4-15	Sulfur Isotope Ratios for Groundwater, Leachate, and Mineral Samples
Figure 4.4-16	Lanthanide Concentrations in Alluvial, Colluvial, and Bedrock Waters
Figure 4.4-17	Lanthanide Concentrations in Alluvial, Colluvial, and Bedrock Waters Normalized to NASC
Figure 4.4-18	Compositions of Stable Isotopes of Oxygen and Hydrogen for Mine Site Wells and Springs and Red River Surface Water (February and April 2004)
Figure 4.4-19	Compositions of Stable Isotopes of Oxygen and Hydrogen in Alluvial Wells and Springs (February and April 2004)
Figure 4.4-20	Age of Water in Selected Mine Site Wells and Springs
Figure 4.4-21	Relationship between Times of High River Flow (Stage) and Flow at Cabin Springs
Figure 4.4-22	Hydrograph for Alluvial Well P-5B Near Cabin Springs
Figure 4.4-23	Historical Chemistry of Cabin Springs
Figure 4.4-24	Aluminum vs. Sulfate Concentrations for Cabin Springs and Surrounding Alluvial Groundwater (Fall 2002 through Spring 2004)
Figure 4.4-25	Manganese vs. Sulfate Concentrations for Cabin Springs and Surrounding Alluvial Groundwater (Fall 2002 through Spring 2004)
Figure 4.4-25a	Fluoride vs. Sulfate Concentrations for Cabin Springs and Surrounding Alluvial Groundwater (Fall 2002 through Spring 2004)

Figure 4.4-26	pH vs. Sulfate Concentrations for Cabin Springs and Surrounding Alluvial Groundwater (Fall 2002 through Spring 2004)
Figure 4.4-27	Box and Whisker Plot of Aluminum (Total) for Cabin Springs and Surrounding Waters
Figure 4.4-28	Box and Whisker Plot of Fluoride for Cabin Springs and Surrounding Waters
Figure 4.4-29	Box and Whisker Plot of Manganese (Total) for Cabin Springs and Surrounding Waters
Figure 4.4-30	Box and Whisker Plot of Sulfate for Cabin Springs and Surrounding Waters
Figure 4.4-31	Box and Whisker Plot of Zinc (Total) for Cabin Springs and Surrounding Waters
Figure 4.4-32	Box and Whisker Plot of pH for Cabin Springs and Surrounding Waters
Figure 4.4-33	Historical Chemistry of Spring 39
Figure 4.4-34	Aluminum vs. Sulfate for Spring 39 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-35	Fluoride vs. Sulfate for Spring 39 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-36	Manganese vs. Sulfate for Spring 39 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-37	Zinc vs. Sulfate for Spring 39 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-38	pH vs. Sulfate for Spring 39 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-39	Map of Spring 13 Area
Figure 4.4-40	Historical Chemistry of Spring 13
Figure 4.4-41	Composition of Stable Isotopes of Oxygen and Hydrogen for Spring 13 and Surrounding Waters (February and April 2004)
Figure 4.4-42	Aluminum vs. Sulfate for Spring 13 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-43	Fluoride vs. Sulfate for Spring 13 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-44	Manganese vs. Sulfate for Spring 13 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-45	Zinc vs. Sulfate for Spring 13 and Surrounding Waters (Fall 2002 through Spring 2004)

Figure 4.4-46	pH vs. Sulfate for Spring 13 and Surrounding Waters (Fall 2002 through Spring 2004)
Figure 4.4-47	Concentrations of Detected Constituents in Spring 13 Pump and Spring 13 P-1
Figure 4.4-48	Economic Mineralized Molybdenum District
Figure 4.4-49	Comparison between Bedrock and Alluvial Concentrations Near Spring 13 (January 2004)
Figure 4.4-50	Piper Diagram for Mine Site Colluvial Water (April 2004)
Figure 4.4-51	Composition of Stable Isotopes of Oxygen and Hydrogen in Colluvial Wells and Springs (February and April 2004)
Figure 4.4-52	Piper Diagram for Mine Site Bedrock Water (April 2004)
Figure 4.4-53	Aluminum (Total) Concentrations in the Bedrock Water-Bearing Unit (April 2004)
Figure 4.4-54	Fluoride (Total) Concentrations in the Bedrock Water-Bearing Unit (April 2004)
Figure 4.4-55	Manganese (Total) Concentrations in the Bedrock Water-Bearing Unit (April 2004)
Figure 4.4-56	Molybdenum (Total) Concentrations in the Bedrock Water-Bearing Unit (April 2004)
Figure 4.4-57	Nickel (Total) Concentrations in the Bedrock Water-Bearing Unit (April 2004)
Figure 4.4-58	Sulfate (Total) Concentrations in the Bedrock Water-Bearing Unit (April 2004)
Figure 4.4-59	Zinc (Total) Concentrations in the Bedrock Water-Bearing Unit (April 2004)
Figure 4.4-60	pH Values in the Bedrock Water-Bearing Unit (April 2004)
Figure 4.4-61	Compositions of Stable Isotopes of Oxygen and Hydrogen in Bedrock Wells and Underground Mine Locations (February and April 2004)
Figure 4.4-62	Piper Diagram for Reference Alluvial, Colluvial, and Bedrock Waters Upstream of the Mine Site (April 2004)
Figure 4.4-63	Constituent Concentrations in Straight Creek Wells along Flow Path (April 2004)
Figure 4.4-64	Sulfate Concentrations in Straight Creek Wells along Flow Path (April 2004)
Figure 4.4-65	pH in Straight Creek Wells along Flow Path (April 2004)
Figure 4.4-66	Results of Statistical Comparison of Mine Site Groundwater Concentrations to Reference Concentrations – Aluminum

Figure 4.4-67	Results of Statistical Comparison of Mine Site Groundwater Concentrations to Reference Concentrations – Fluoride
Figure 4.4-68	Results of Statistical Comparison of Mine Site Groundwater Concentrations to Reference Concentrations – Manganese
Figure 4.4-69	Results of Statistical Comparison of Mine Site Groundwater Concentrations to Reference Concentrations – Sulfate
Figure 4.5-1	Map of Soil Exposure Areas and Other Areas Evaluated
Figure 4.5-2	Mine Site Soil Exposure Areas and Soil Sampling Locations
Figure 4.5-3	Soil Exposure Area 1 - Relative Concentrations of PAHs for Human Health Evaluation
Figure 4.5-4	Soil Exposure Area 2 - Relative Concentrations of Molybdenum and Vanadium for Human Health Evaluation
Figure 4.5-5	Soil Exposure Area 2 - Relative Concentrations of PCBs for Human Health Evaluation
Figure 4.5-6	Soil Exposure Area 2 - Relative Concentrations of PAHs for Human Health Evaluation
Figure 4.5-7	Soil Exposure Area 3 - Relative Concentrations of Molybdenum and PCBs for Human Health Evaluation
Figure 4.5-8	Soil Exposure Area 3 - Relative Concentrations of PCBs for Human Health Evaluation
Figure 4.5-9	Soil Exposure Area 3 - Relative Concentrations of Chromium and Copper for Ecological Evaluation
Figure 4.5-10	Soil Exposure Area 3 - Relative Concentrations of Manganese and Nickel for Ecological Evaluation
Figure 4.5-11	Soil Exposure Area 3 - Relative Concentrations of Molybdenum and Thallium for Ecological Evaluation
Figure 4.5-12	Soil Exposure Area 3 - Relative Concentrations of Phenanthrene for Ecological Evaluation
Figure 4.5-13	Soil Exposure Area 4 - Relative Concentrations of Lead for Human Health Evaluation
Figure 4.5-14	Soil Exposure Area 4 - Relative Concentrations of Copper and Thallium for Ecological Evaluation
Figure 4.6-1	Comparison of Mine Site Ecological Area and Reference Vegetation Cover

Figure 4.6-2	Comparison of Mine Site Ecological Area and Reference Number of Plant Species
Figure 4.6-3	Comparison of Mine Site Ecological Area and Reference Bioassay Plant Survival
Figure 4.6-4	Comparison of Mine Site Ecological Area and Reference Bioassay Plant Height
Figure 4.6-5	Comparison of Mine Site Ecological Area and Reference Bioassay Shoot Biomass
Figure 4.6-6	Comparison of Mine Site Ecological Area and Reference Bioassay Root Biomass
Figure 4.6-7	Comparison of Mine Site Ecological Area and Reference Bioassay Total Biomass
Figure 4.6-8	Comparison of Mine Site Ecological Area and Reference Aluminum Concentrations in Vegetation
Figure 4.6-9	Comparison of Mine Site Ecological Area and Reference Antimony Concentrations in Vegetation
Figure 4.6-10	Comparison of Mine Site Ecological Area and Reference Arsenic Concentrations in Vegetation
Figure 4.6-11	Comparison of Mine Site Ecological Area and Reference Barium Concentrations in Vegetation
Figure 4.6-12	Comparison of Mine Site Ecological Area and Reference Boron Concentrations in Vegetation
Figure 4.6-13	Comparison of Mine Site Ecological Area and Reference Cadmium Concentrations in Vegetation
Figure 4.6-14	Comparison of Mine Site Ecological Area and Reference Chromium Concentrations in Vegetation
Figure 4.6-15	Comparison of Mine Site Ecological Area and Reference Cobalt Concentrations in Vegetation
Figure 4.6-16	Comparison of Mine Site Ecological Area and Reference Copper Concentrations in Vegetation
Figure 4.6-17	Comparison of Mine Site Ecological Area and Reference Iron Concentrations in Vegetation
Figure 4.6-18	Comparison of Mine Site Ecological Area and Reference Lead Concentrations in Vegetation
Figure 4.6-19	Comparison of Mine Site Ecological Area and Reference Manganese Concentrations in Vegetation

Figure 4.6-20	Comparison of Mine Site Ecological Area and Reference Mercury Concentrations in Vegetation
Figure 4.6-21	Comparison of Mine Site Ecological Area and Reference Molybdenum Concentrations in Vegetation
Figure 4.6-22	Comparison of Mine Site Ecological Area and Reference Nickel Concentrations in Vegetation
Figure 4.6-23	Comparison of Mine Site Ecological Area and Reference Selenium Concentrations in Vegetation
Figure 4.6-24	Comparison of Mine Site Ecological Area and Reference Silver Concentrations in Vegetation
Figure 4.6-25	Comparison of Mine Site Ecological Area and Reference Thallium Concentrations in Vegetation
Figure 4.6-26	Comparison of Mine Site Ecological Area and Reference Vanadium Concentrations in Vegetation
Figure 4.6-27	Comparison of Mine Site Ecological Area and Reference Zinc Concentrations in Vegetation
Figure 4.6-28	Comparison of Aluminum Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-29	Comparison of Aluminum Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-30	Comparison of Arsenic Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-31	Comparison of Barium Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-32	Comparison of Barium Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-33	Comparison of Boron Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-34	Comparison of Boron Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-35	Comparison of Chromium Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-36	Comparison of Chromium Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-37	Comparison of Cobalt Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-38	Comparison of Copper Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-39	Comparison of Copper Concentrations in Mine Site and Reference Soils and Below Ground Vegetation

Figure 4.6-40	Comparison of Iron Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-41	Comparison of Iron Concentrations in Mine Site and Reference Soils and
F: 4 < 40	Below Ground Vegetation
Figure 4.6-42	Comparison of Lead Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-43	Comparison of Manganese Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-44	Comparison of Manganese Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-45	Comparison of Molybdenum Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-46	Comparison of Molybdenum Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-47	Comparison of Nickel Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-48	Comparison of Vanadium Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.6-49	Comparison of Zinc Concentrations in Mine Site and Reference Soils and Aboveground Vegetation
Figure 4.6-50	Comparison of Zinc Concentrations in Mine Site and Reference Soils and Below Ground Vegetation
Figure 4.7-1	Box and Whisker Plot of Soil Invertebrate Density by Mine Site Exposure Area
Figure 4.7-2	Box and Whisker Plot of Earthworm Survival by Mine Site Exposure Area
Figure 4.7-3	Box and Whisker Plot of Earthworm Average Body Weight by Mine Site Exposure Area
Figure 4.7-4	Box and Whisker Plot of Proportion of Earthworm Samples Showing Reproduction by Mine Site Exposure Area
Figure 4.7-5	Box and Whisker Plot of Sum of Cocoons by Mine Site Exposure Area
Figure 4.7-6	Box and Whisker Plot of Sum of Juveniles by Mine Site Exposure Area
Figure 4.7-7	Aluminum Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-8	Antimony Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-9	Arsenic Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-10	Barium Concentrations in Mine Site Ecological Area and Reference Area –

Figure 4.7-11	Boron Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-12	Cadmium Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-13	Chromium Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-14	Cobalt Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-15	Copper Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-16	Iron Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-17	Lead Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-18	Manganese Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-19	Mercury Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-20	Molybdenum Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-21	Nickel Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-22	Selenium Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-23	Silver Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-24	Thallium Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-25	Vanadium Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-26	Zinc Concentrations in Mine Site Ecological Area and Reference Area – Small Mammals
Figure 4.7-27	Aluminum Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-28	Antimony Concentrations in Mine Site Ecological Area and Reference Area – Earthworms

Figure 4.7-29	Arsenic Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-30	Barium Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-31	Boron Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-32	Cadmium Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-33	Chromium Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-34	Cobalt Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-35	Copper Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-36	Iron Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-37	Lead Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-38	Manganese Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-39	Mercury Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-40	Molybdenum Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-41	Nickel Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-42	Selenium Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-43	Silver Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-44	Thallium Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-45	Vanadium Concentrations in Mine Site Ecological Area and Reference Area – Earthworms
Figure 4.7-46	Zinc Concentrations in Mine Site Ecological Area and Reference Area – Earthworms

Figure 4.7-47	COPC Concentrations by Tissue Type for BOC Animals
Figure 4.7-48	Comparison of Median COPC Concentrations in Small Mammals from Mine Site Upland Areas
Figure 5.1-1	Potential Sources at the Tailing Facility
Figure 5.4-1	Tailing Facility Soil Exposure/Evaluation Areas and Soil Sampling Locations
Figure 5.4-2	Soil Exposure Area 7 Relative Concentrations of Arsenic and Iron for Human Health Evaluation
Figure 5.4-3	Soil Exposure Area 7 Relative Concentrations for Benzo(a)pyrene for Human Health Evaluation
Figure 5.4-4	Soil Exposure Area 7 Relative Concentrations of Cadmium and Lead for Ecological Evaluation
Figure 5.4-5	Soil Exposure Area 7 Relative Concentrations of Molybdenum and Selenium for Ecological Evaluation
Figure 5.4-6	Soil Exposure Area 7 Relative Concentrations of Zinc for Ecological Evaluation
Figure 5.5-1	Piper Diagram for Tailing Facility Upper Alluvial Aquifer (April 2004)
Figure 5.5-2	Map of Stiff Diagrams for Upper and Basal Alluvial Aquifers and Basal Bedrock Aquifer at the Tailing Facility (April 2004)
Figure 5.5-3	Isoconcentration Contour Map of Molybdenum in the Upper Alluvial Aquifer (April 2004)
Figure 5.5-4	Isoconcentration Contour Map of Manganese in the Upper Alluvial Aquifer (April 2004)
Figure 5.5-5	Isoconcentration Contour Map of Sulfate in the Upper Alluvial Aquifer (April 2004)
Figure 5.5-6	Piper Diagram for Tailing Facility Basal Alluvial Aquifer (April 2004)
Figure 5.5-7	Comparison of Groundwater Chemistry for MW-7A and MW-7C
Figure 5.5-8	Isoconcentration Contour Map of Molybdenum in the Basal Alluvial and Bedrock Aquifers (April 2004)
Figure 5.5-9	Isoconcentration Contour Map of Manganese in the Basal Alluvial and Bedrock Aquifers (April 2004)
Figure 5.5-10	Isoconcentration Contour Map of Sulfate in the Basal Alluvial and Bedrock Aquifers (April 2004)
Figure 5.5-11	Piper Diagram for Tailing Facility Basal Bedrock Aquifer (April 2004)

Figure 5.5-12	Piper Diagram for Tailing Facility Reference Wells (April 2004)
Figure 5.5-13	Results of Statistical Comparison of Tailing Facility Groundwater Concentrations to Reference Concentrations – Molybdenum
Figure 5.5-14	Results of Statistical Comparison of Tailing Facility Groundwater Concentrations to Reference Concentrations – Manganese
Figure 5.6-1	Comparison of Tailing Facility and Reference Vegetation Cover
Figure 5.6-2	Comparison of Tailing Facility and Reference Number of Plant Species
Figure 5.6-3	Comparison of Tailing Facility and Reference Bioassay Plant Survival
Figure 5.6-4	Comparison of Tailing Facility and Reference Bioassay Plant Height
Figure 5.6-5	Comparison of Tailing Facility and Reference Bioassay Shoot Biomass
Figure 5.6-6	Comparison of Tailing Facility and Reference Bioassay Root Biomass
Figure 5.6-7	Comparison of Tailing Facility and Reference Bioassay Total Biomass
Figure 5.6-8	Comparison of Tailing Facility and Reference Antimony Concentrations in Vegetation
Figure 5.6-9	Comparison of Tailing Facility and Reference Barium Concentrations in Vegetation
Figure 5.6-10	Comparison of Tailing Facility and Reference Boron Concentrations in Vegetation
Figure 5.6-11	Comparison of Tailing Facility and Reference Cadmium Concentrations in Vegetation
Figure 5.6-12	Comparison of Tailing Facility and Reference Chromium Concentrations in Vegetation
Figure 5.6-13	Comparison of Tailing Facility and Reference Copper Concentrations in Vegetation
Figure 5.6-14	Comparison of Tailing Facility and Reference Iron Concentrations in Vegetation
Figure 5.6-15	Comparison of Tailing Facility and Reference Lead Concentrations in Vegetation
Figure 5.6-16	Comparison of Tailing Facility and Reference Manganese Concentrations in Vegetation
Figure 5.6-17	Comparison of Tailing Facility and Reference Mercury Concentrations in Vegetation
Figure 5.6-18	Comparison of Tailing Facility and Reference Molybdenum Concentrations in Vegetation

Figure 5.6-19	Comparison of Tailing Facility and Reference Selenium Concentrations in Vegetation
Figure 5.6-20	Comparison of Mine Site Ecological Area Tailing Facility and Reference Vanadium Concentrations in Vegetation
Figure 5.6-21	Comparison of Tailing Facility and Reference Zinc Concentrations in Vegetation
Figure 5.6-22	Comparison of Tailing Facility and Reference (WIS Data) Antimony Concentrations in Vegetation
Figure 5.6-23	Comparison of Tailing Facility and Reference (WIS Data) Barium Concentrations in Vegetation
Figure 5.6-24	Comparison of Tailing Facility and Reference (WIS Data) Boron Concentrations in Vegetation
Figure 5.6-25	Comparison of Tailing Facility and Reference (WIS Data) Cadmium Concentrations in Vegetation
Figure 5.6-26	Comparison of Tailing Facility and Reference (WIS Data) Chromium Concentrations in Vegetation
Figure 5.6-27	Comparison of Tailing Facility and Reference (WIS Data) Copper Concentrations in Vegetation
Figure 5.6-28	Comparison of Tailing Facility and Reference (WIS Data) Iron Concentrations in Vegetation
Figure 5.6-29	Comparison of Tailing Facility and Reference (WIS Data) Lead Concentrations in Vegetation
Figure 5.6-30	Comparison of Tailing Facility and Reference (WIS Data) Manganese Concentrations in Vegetation
Figure 5.6-31	Comparison of Tailing Facility and Reference (WIS Data) Mercury Concentrations in Vegetation
Figure 5.6-32	Comparison of Tailing Facility and Reference (WIS Data) Molybdenum Concentrations in Vegetation
Figure 5.6-33	Comparison of Tailing Facility and Reference (WIS Data) Selenium Concentrations in Vegetation
Figure 5.6-34	Comparison of Tailing Facility and Reference (WIS Data) Vanadium Concentrations in Vegetation
Figure 5.6-35	Comparison of Tailing Facility and Reference (WIS Data) Zinc Concentrations in Vegetation
Figure 5.6-36	Comparison of Barium Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation

Figure 5.6-37	Comparison of Barium Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-38	Comparison of Boron Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 5.6-39	Comparison of Boron Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-40	Comparison of Chromium Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 5.6-41	Comparison of Chromium Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-42	Comparison of Copper Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 5.6-43	Comparison of Copper Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-44	Comparison of Iron Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 5.6-45	Comparison of Iron Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-46	Comparison of Lead Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 5.6-47	Comparison of Lead Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-48	Comparison of Manganese Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 5.6-49	Comparison of Manganese Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-50	Comparison of Molybdenum Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 5.6-51	Comparison of Molybdenum Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-52	Comparison of Vanadium Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 5.6-53	Comparison of Vanadium Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-54	Comparison of Zinc Concentrations in Tailing Facility and Reference Soils and Aboveground Vegetation

Figure 5.6-55	Comparison of Zinc Concentrations in Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 5.6-56	Results of Wildlife Impact Study Comparison of Barium Concentrations in Tailing Facility and Reference Vegetation and Root-Zone Soils
Figure 5.6-57	Results of Wildlife Impact Study Comparison of Cadmium Concentrations in Tailing Facility and Reference Vegetation and Root-Zone Soils
Figure 5.6-58	Results of Wildlife Impact Study Comparison of Copper Concentrations in Tailing Facility and Reference Vegetation and Root-Zone Soils
Figure 5.6-59	Results of Wildlife Impact Study Comparison of Lead Concentrations in Tailing Facility and Reference Vegetation and Root-Zone Soils
Figure 5.6-60	Results of Wildlife Impact Study Comparison of Molybdenum Concentrations in Tailing Facility and Reference Vegetation and Root-Zone Soils
Figure 5.6-61	Results of Wildlife Impact Study Comparison of Zinc Concentrations in Tailing Facility and Reference Vegetation and Root-Zone Soils
Figure 5.7-1	Box and Whisker Plot of Soil Invertebrate Density by Tailing Facility Exposure Area
Figure 5.7-2	Box and Whisker Plot of Earthworm Survival by Tailing Facility Exposure Area
Figure 5.7-3	Box and Whisker Plot of Earthworm Average Body Weight by Tailing Facility Exposure Area
Figure 5.7-4	Box and Whisker Plot of Proportion of Earthworm Samples Showing Reproduction by Tailing Facility Exposure Area
Figure 5.7-5	Box and Whisker Plot of Sum of Cocoons by Tailing Facility Exposure Area
Figure 5.7-6	Box and Whisker Plot of Sum of Juveniles by Tailing Facility Exposure Area
Figure 5.7-7	Barium Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-8	Boron Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-9	Cadmium Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-10	Chromium Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-11	Copper Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals

Figure 5.7-12	Iron Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-13	Lead Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-14	Manganese Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-15	Mercury Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-16	Molybdenum Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-17	Selenium Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-18	Vanadium Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-19	Zinc Concentrations in Tailing Facility and Tailing Facility Reference Small Mammals
Figure 5.7-20	Barium Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-21	Boron Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-22	Cadmium Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-23	Chromium Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-24	Copper Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-25	Iron Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-26	Lead Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-27	Manganese Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-28	Mercury Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-29	Molybdenum Concentrations in Tailing Facility and Tailing Facility Reference Earthworms

Figure 5.7-30	Selenium Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-31	Vanadium Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.7-32	Zinc Concentrations in Tailing Facility and Tailing Facility Reference Earthworms
Figure 5.8-1	Wind Rose for Site 1
Figure 5.8-2	Wind Rose for Site 2
Figure 5.8-3	Wind Rose for Site 3
Figure 5.8-4	2006 Monthly Dust Averages
Figure 6.1-1	Riparian Soil Exposure Areas and Soil Sampling Locations
Figure 6.1-2	Soil Exposure Area 5 Relative Concentrations of Arsenic and Iron for Human Health Evaluation
Figure 6.1-3	Soil Exposure Area 5 Relative Concentrations of Barium and Copper for Ecological Evaluation
Figure 6.1-4	Soil Exposure Area 5 Relative Concentrations of Lead and Molybdenum for Ecological Evaluation
Figure 6.1-5	Soil Exposure Area 5 Relative Concentrations of Selenium and Zinc for Ecological Evaluation
Figure 6.1-6	Soil Exposure Area 6 Relative Concentrations of Iron for Human Health Evaluation
Figure 6.1-7	Soil Exposure Area 6 Relative Concentrations of Barium and Copper for Ecological Evaluation
Figure 6.1-8	Soil Exposure Area 6 Relative Concentrations of Lead and Manganese for Ecological Evaluation
Figure 6.1-9	Soil Exposure Area 6 Relative Concentrations of Molybdenum for Ecological Evaluation
Figure 6.1-10	Soil Exposure Area 8 Relative Concentrations of Iron and Molybdenum for Human Health Evaluation
Figure 6.1-11	Soil Exposure Area 9 Relative Concentrations of Barium, Boron, Cadmium, and Chromium for Ecological Evaluation
Figure 6.1-12	Soil Exposure Area 9 Relative Concentrations of Copper, Lead, Manganese, and Molybdenum for Ecological Evaluation

Figure 6.1-13	Soil Exposure Area 9 Relative Concentrations of Vanadium for Ecological Evaluation
Figure 6.2-1	Comparison of Vegetation Cover for Red River Riparian Along the Mine Site and Reference Riparian for Mine Site
Figure 6.2-2	Comparison of Vegetation Cover for Red River Riparian Along the Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-3	Comparison of Number of Plant Species for Red River Riparian Along the Mine Site and Reference Riparian for Mine Site
Figure 6.2-4	Comparison of Number of Plant Species for Red River Riparian Along the Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-5	Comparison of Bioassay Plant Survival for Riparian and Reference Riparian Areas
Figure 6.2-6	Comparison of Bioassay Plant Height for Riparian and Reference Riparian Areas
Figure 6.2-7	Comparison of Bioassay Shoot Biomass for Riparian and Reference Riparian Areas
Figure 6.2-8	Comparison of Bioassay Root Biomass for Riparian and Reference Riparian Areas
Figure 6.2-9	Comparison of Bioassay Total Biomass for Riparian and Reference Riparian Areas
Figure 6.2-10	Comparison of Aluminum Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-11	Comparison of Antimony Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-12	Comparison of Arsenic Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-13	Comparison of Barium Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-14	Comparison of Boron Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-15	Comparison of Cadmium Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-16	Comparison of Chromium Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site

Figure 6.2-17	Comparison of Cobalt Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-18	Comparison of Copper Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-19	Comparison of Iron Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-20	Comparison of Lead Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-21	Comparison of Manganese Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-22	Comparison of Mercury Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-23	Comparison of Molybdenum Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-24	Comparison of Nickel Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-25	Comparison of Selenium Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-26	Comparison of Silver Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-27	Comparison of Thallium Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-28	Comparison of Vanadium Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-29	Comparison of Zinc Concentrations in Vegetation for Red River Riparian Along Mine Site and Reference Riparian for Mine Site
Figure 6.2-30	Comparison of Antimony Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-31	Comparison of Barium Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-32	Comparison of Boron Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-33	Comparison of Cadmium Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-34	Comparison of Chromium Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility

Figure 6.2-35	Comparison of Copper Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-36	Comparison of Iron Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-37	Comparison of Lead Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-38	Comparison of Manganese Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-39	Comparison of Mercury Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-40	Comparison of Molybdenum Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-41	Comparison of Selenium Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-42	Comparison of Vanadium Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-43	Comparison of Zinc Concentrations in Vegetation for Red River Riparian Along Tailing Facility and Reference Riparian for Tailing Facility
Figure 6.2-44	Comparison of Aluminum Concentrations in Red River Riparian Along Mine Site and Reference Soils and Aboveground Vegetation
Figure 6.2-45	Comparison of Aluminum Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-46	Comparison of Arsenic Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-47	Comparison of Barium Concentrations in Red River Riparian Along Mine Site and Reference Soils and Aboveground Vegetation
Figure 6.2-48	Comparison of Barium Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-49	Comparison of Cadmium Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-50	Comparison of Chromium Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-51	Comparison of Copper Concentrations in Red River Riparian Along Mine Site and Reference Soils and Aboveground Vegetation
Figure 6.2-52	Comparison of Copper Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation

Figure 6.2-53	Comparison of Iron Concentrations in Red River Riparian Along Mine Site and Reference Soils and Aboveground Vegetation
Figure 6.2-54	Comparison of Iron Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-55	Comparison of Lead Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-56	Comparison of Manganese Concentrations in Red River Riparian Along Mine Site and Reference Soils and Aboveground Vegetation
Figure 6.2-57	Comparison of Manganese Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-58	Comparison of Molybdenum Concentrations in Red River Riparian Along Mine Site and Reference Soils and Aboveground Vegetation
Figure 6.2-59	Comparison of Molybdenum Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-60	Comparison of Nickel Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-61	Comparison of Vanadium Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-62	Comparison of Zinc Concentrations in Red River Riparian Along Mine Site and Reference Soils and Aboveground Vegetation
Figure 6.2-63	Comparison of Zinc Concentrations in Red River Riparian Along Mine Site and Reference Soils and Below Ground Vegetation
Figure 6.2-64	Comparison of Barium Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 6.2-65	Comparison of Barium Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.2-66	Comparison of Cadmium Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.2-67	Comparison of Chromium Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 6.2-68	Comparison of Chromium Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.2-69	Comparison of Copper Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 6.2-70	Comparison of Copper Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation

Figure 6.2-71	Comparison of Iron Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 6.2-72	Comparison of Iron Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.2-73	Comparison of Lead Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 6.2-74	Comparison of Lead Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.2-75	Comparison of Manganese Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 6.2-76	Comparison of Manganese Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.2-77	Comparison of Molybdenum Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 6.2-78	Comparison of Molybdenum Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.2-79	Comparison of Vanadium Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.2-80	Comparison of Zinc Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Aboveground Vegetation
Figure 6.2-81	Comparison of Zinc Concentrations in Red River Riparian Along Tailing Facility and Reference Soils and Below Ground Vegetation
Figure 6.3-1	Box and Whisker Plot of Soil Invertebrate Density by Riparian Exposure Area
Figure 6.3-2	Box and Whisker Plot of Earthworm Survival by Riparian Exposure Area
Figure 6.3-3	Box and Whisker Plot of Earthworm Average Body Weight by Riparian Exposure Area
Figure 6.3-4	Box and Whisker Plot of Proportion of Earthworm Samples Showing Reproduction by Riparian Exposure Area
Figure 6.3-5	Box and Whisker Plot of Sum of Cocoons by Riparian Exposure Area
Figure 6.3-6	Box and Whisker Plot of Sum of Juveniles by Riparian Exposure Area
Figure 6.3-7	Aluminum Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-8	Antimony Concentrations in Riparian Area and Riparian Reference Area Small Mammals

Figure 6.3-9	Arsenic Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-10	Barium Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-11	Boron Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-12	Cadmium Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-13	Chromium Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-14	Cobalt Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-15	Copper Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-16	Iron Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-17	Lead Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-18	Manganese Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-19	Mercury Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-20	Molybdenum Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-21	Nickel Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-22	Selenium Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-23	Silver Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-24	Vanadium Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-25	Zinc Concentrations in Riparian Area and Riparian Reference Area Small Mammals
Figure 6.3-26	Aluminum Concentrations in Riparian Area and Riparian Reference Area Earthworms

Figure 6.3-27	Arsenic Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-28	Barium Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-29	Boron Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-30	Cadmium Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-31	Chromium Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-32	Cobalt Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-33	Copper Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-34	Iron Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-35	Lead Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-36	Manganese Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-37	Mercury Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-38	Molybdenum Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-39	Nickel Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-40	Selenium Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-41	Vanadium Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.3-42	Zinc Concentrations in Riparian Area and Riparian Reference Area Earthworms
Figure 6.4-1	Ecological and Human Health Exposure Areas for Red River Surface Water
Figure 6.4-2	pH Values in Red River for the Four RI Sampling Events
Figure 6.4-3	Specific Conductance Values in Red River for the Four RI Sampling Events

Figure 6.4-4	Piper Diagram of Red River Surface Water (September 2003)
Figure 6.4-5	Hardness Values in Red River for the Four RI Sampling Events
Figure 6.4-6	Aluminum Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-7	Barium Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-8	Boron Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-9	Cadmium Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-10	Cobalt Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-11	Copper Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-12	Fluoride Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-13	Iron Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-14	Manganese Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-15	Molybdenum Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-16	Nickel Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-17	Sulfate Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-18	Zinc Concentrations in Red River for the Four RI Sampling Events
Figure 6.4-19	Aluminum Concentrations in Red River During USGS Tracer-Dilution Studies
Figure 6.4-20	Fluoride Concentrations in Red River During USGS Tracer-Dilution Studies
Figure 6.4-21	Manganese Concentrations in Red River During USGS Tracer-Dilution Studies
Figure 6.4-22	Sulfate Concentrations in Red River During USGS Tracer-Dilution Studies
Figure 6.4-23	Zinc Concentrations in Red River During USGS Tracer-Dilution Studies
Figure 6.4-24	Aluminum Concentrations in Red River for the DP-1055 Permit Locations
Figure 6.4-25	Fluoride Concentrations in Red River for the DP-1055 Permit Locations
Figure 6.4-26	Manganese Concentrations in Red River for the DP-1055 Permit Locations
Figure 6.4-27	Sulfate Concentrations in Red River for the DP-1055 Permit Locations
Figure 6.4-28	Zinc Concentrations in Red River for the DP-1055 Permit Locations
Figure 6.4-29	Concentrations of Constituents in Red River During Focused Sampling at 1,000-Foot Transects (September 2004)
Figure 6.4-30	Concentrations of Constituents in Red River During the Radon Study Focused Sampling (October 2004)
Figure 6.4-31	Concentrations of Constituents in Red River at RR-7 (Mill Area)

Figure 6.4-32	Concentrations of Constituents in Red River at RR-10 (Upstream of Columbine Creek Confluence)
Figure 6.4-33	Concentrations of Constituents in Red River at RR-11C (Near Goathill Gulch Confluence)
Figure 6.4-34	Concentrations of Constituents in Red River at RR-14 (At Downstream Mine Boundary)
Figure 6.4-35	Concentrations of Constituents in Red River at RR-16 (USGS Gage at Questa Ranger Station)
Figure 6.4-36	Aluminum (Total) Load in Red River for the Four RI Sampling Events
Figure 6.4-37	Fluoride Load in Red River for the Four RI Sampling Events
Figure 6.4-38	Manganese (Dissolved) Load in Red River for the Four RI Sampling Events
Figure 6.4-39	Sulfate Load in Red River for the Four RI Sampling Events
Figure 6.4-40	Zinc (Dissolved) Load in Red River for the Four RI Sampling Events
Figure 6.4-41	Aluminum (Total) Load in the Red River During USGS Tracer-Dilution Studies
Figure 6.4-42	Difference in Aluminum (Total) Load Between the USGS August 2001 and March 2002 Tracer-Dilution Studies at Common Sample Locations
Figure 6.4-43	Fluoride Load in Red River During USGS Tracer-Dilution Studies
Figure 6.4-44	Manganese (Dissolved) Load in the Red River During USGS Tracer-Dilution Studies
Figure 6.4-45	Sulfate Load in Red River During USGS Tracer-Dilution Studies
Figure 6.4-46	Zinc (Dissolved) Load in Red River During USGS Tracer-Dilution Studies
Figure 6.4-47	pH Values in Cabresto Creek for the Four RI Sampling Events
Figure 6.4-48	Specific Conductance in Cabresto Creek for the Four RI Sampling Events
Figure 6.4-49	Piper Diagram of Cabresto Creek Surface Water (September 2003)
Figure 6.4-50	Hardness Values in Cabresto Creek for the Four RI Sampling Events
Figure 6.4-51	Aluminum Concentrations in Cabresto Creek for the Four RI Sampling Events
Figure 6.4-52	Fluoride Concentrations in Cabresto Creek for the Four RI Sampling Events
Figure 6.4-53	Manganese Concentrations in Cabresto Creek for the Four RI Sampling Events
Figure 6.4-54	Sulfate Concentrations in Cabresto Creek for the Four RI Sampling Events
Figure 6.4-55	Zinc Concentrations in Cabresto Creek for the Four RI Sampling Events
Figure 6.4-56	Sulfate Load in Cabresto Creek for the Four RI Sampling Events

Figure 6.4-57	Red River Sulfate Loading (September 2003 Low Flow)
Figure 6.4-58	pH Values in Eagle Rock Lake for the Four RI Sampling Events
Figure 6.4-59	Specific Conductance Values in Eagle Rock Lake for the Four RI Sampling Events
Figure 6.4-60	Hardness Values in Eagle Rock Lake for the Four RI Sampling Events
Figure 6.4-61	Aluminum Concentrations in Eagle Rock Lake for the Four RI Sampling Events
Figure 6.4-62	Fluoride Concentrations in Eagle Rock Lake for the Four RI Sampling Events
Figure 6.4-63	Manganese Concentrations in Eagle Rock Lake for the Four RI Sampling Events
Figure 6.4-64	Sulfate Concentrations in Eagle Rock Lake for the Four RI Sampling Events
Figure 6.4-65	Zinc Concentrations in Eagle Rock Lake for the Four RI Sampling Events
Figure 6.4-66	Values of pH in Upper Fawn Lake for the Four RI Sampling Events
Figure 6.4-67	Specific Conductance Values in Upper Fawn Lake for the Four RI Sampling Events
Figure 6.4-68	Hardness Values in Upper Fawn Lake for the Four RI Sampling Events
Figure 6.4-69	Aluminum Concentrations in Upper Fawn Lake for the Four RI Sampling Events
Figure 6.4-70	Fluoride Concentrations in Upper Fawn Lake for the Four RI Sampling Events
Figure 6.4-71	Manganese Concentrations in Upper Fawn Lake for the Four RI Sampling Events
Figure 6.4-72	Sulfate Concentrations in Upper Fawn Lake for the Four RI Sampling Events
Figure 6.4-73	Zinc Concentrations in Upper Fawn Lake for the Four RI Sampling Events
Figure 6.4-74	Red River Flow at the USGS Questa Ranger Station Gage Near the Time of Snowmelt Runoff Sampling in April 2003
Figure 6.4-75	Comparison of pH in Red River During Snowmelt Runoff and Low-Flow Sampling Events
Figure 6.4-76	Comparison of Specific Conductance in Red River During Snowmelt Runoff and Low-Flow Sampling Events
Figure 6.4-77	Comparison of Hardness in Red River During Snowmelt Runoff and Low- Flow Sampling Events
Figure 6.4-78	Comparison of Total Aluminum in Red River During Snowmelt Runoff and Low-Flow Sampling Events

Figure 6.4-79	Comparison of Dissolved Aluminum in Red River During Snowmelt Runoff and Low-Flow Sampling Events
Figure 6.4-80	Comparison of Fluoride in Red River During Snowmelt Runoff and Low- Flow Sampling Events
Figure 6.4-81	Comparison of Dissolved Manganese in the Red River During Snowmelt Runoff and Low-Flow Sampling Events
Figure 6.4-82	Comparison of Sulfate in the Red River During Snowmelt Runoff and Low- Flow Sampling Events
Figure 6.4-83	Comparison of Dissolved Zinc in the Red River During Snowmelt Runoff and Low-Flow Sampling Events
Figure 6.4-84	Stream Flow and Sulfate Concentration at USGS Questa Ranger Station Gage (1979-1981)
Figure 6.4-85	Sampled Storm Events Showing Rainfall and Stream Flow at the USGS Questa Gage (Summer 2003)
Figure 6.4-86	RR-6 pH and Specific Conductance Values During Storm Event No. 1 (July 27, 2003)
Figure 6.4-87	RR-12 pH and Specific Conductance Values During Storm Event No. 1 (July 27, 2003)
Figure 6.4-88	LR-16 pH and Specific Conductance Values During Storm Event No. 1 (July 27, 2003)
Figure 6.4-89	Profile of pH Values at Automatic Samplers for Storm Event No. 1
Figure 6.4-90	RR-6 Constituent Concentrations During Storm Event No. 1 (July 27, 2003)
Figure 6.4-91	RR-12 Constituent Concentrations During Storm Event No. 1 (July 27, 2003)
Figure 6.4-92	LR-16 Constituent Concentrations During Storm Event No. 1 (July 27, 2003)
Figure 6.4-93	Profile of Aluminum (Total) Concentrations at Automatic Samplers for Storm Event No. 1
Figure 6.4-94	RR-6 pH and Specific Conductance Values During Storm Event No. 2 (August 13, 2003)
Figure 6.4-95	RR-8 pH and Specific Conductance Values During Storm Event No. 2 (August 13, 2003)
Figure 6.4-96	RR-12 pH and Specific Conductance Values During Storm Event No. 2 (August 13, 2003)
Figure 6.4-97	RR-15 pH and Specific Conductance Values During Storm Event No. 2 (August 13, 2003)
Figure 6.4-98	LR-16 pH and Specific Conductance Values During Storm Event No. 2 (August 13, 2003)

Figure 6.4-99	Profile of pH Values at Automatic Samplers for Storm Event No. 2
Figure 6.4-100	RR-6 Constituent Concentrations During Storm Event No. 2 (August 13, 2003)
Figure 6.4-101	RR-8 Constituent Concentrations During Storm Event No. 2 (August 13, 2003)
Figure 6.4-102	RR-12 Constituent Concentrations During Storm Event No. 2 (August 13, 2003)
Figure 6.4-103	RR-15 Constituent Concentrations During Storm Event No. 2 (August 13, 2003)
Figure 6.4-104	LR-16 Constituent Concentrations During Storm Event No. 2 (August 13, 2003)
Figure 6.4-105	Profile of Aluminum (Total) Concentrations at Automatic Samplers for Storm Event No. 2
Figure 6.4-106	RR-6 pH and Specific Conductance Values During Storm Event No. 3 (September 3, 2003)
Figure 6.4-107	RR-8 pH and Specific Conductance Values During Storm Event No. 3 (September 3, 2003)
Figure 6.4-108	RR-12 pH and Specific Conductance Values During Storm Event No. 3 (September 3, 2003)
Figure 6.4-109	Profile of pH Values at Automatic Samplers for Storm Event No. 3
Figure 6.4-110	RR-6 Constituent Concentrations During Storm Event No. 3 (September 3, 2003)
Figure 6.4-111	RR-8 Constituent Concentrations During Storm Event No. 3 (September 3, 2003)
Figure 6.4-112	RR-12 Constituent Concentrations During Storm Event No. 3 (September 3, 2003)
Figure 6.4-113	Profile of Aluminum (Total) Concentrations at Automatic Samplers During Storm Event No. 3
Figure 6.4-114	RR-6 pH and Specific Conductance Values During Storm Event No. 4 (September 5, 2003)
Figure 6.4-115	RR-8 pH and Specific Conductance Values During Storm Event No. 4 (September 5, 2003)
Figure 6.4-116	RR-12 pH and Specific Conductance Values During Storm Event No. 4 (September 5, 2003)
Figure 6.4-117	RR-15 pH and Specific Conductance Values During Storm Event No. 4 (September 5, 2003)

Figure 6.4-118	LR-16 pH and Specific Conductance Values During Storm Event No. 4 (September 5, 2003)
Figure 6.4-119	Profile of pH Values at Automatic Samplers for Storm Event No. 4
Figure 6.4-120	RR-6 Constituent Concentrations During Storm Event No. 4 (September 5, 2003)
Figure 6.4-121	RR-8 Constituent Concentrations During Storm Event No. 4 (September 5, 2003)
Figure 6.4-122	RR-12 Constituent Concentrations During Storm Event No. 4 (September 5, 2003)
Figure 6.4-123	RR-15 Constituent Concentrations During Storm Event No. 4 (September 5, 2003)
Figure 6.4-124	LR-16 Constituent Concentrations During Storm Event No. 4 (September 5, 2003)
Figure 6.4-125	Profile of Aluminum (Total) Concentrations at Automatic Samplers for Storm Event No. 4
Figure 6.4-126	RR-6 pH and Specific Conductance Values During Post-Storm Sampling (September 10, 2003)
Figure 6.4-127	RR-6 Constituent Concentrations During Post-Storm Sampling (September 10, 2003)
Figure 6.4-128	Comparison of Selected Constituent Concentrations in Hansen Creek Storm Water Runoff to Other Waters in the Hansen Creek Drainage
Figure 6.4-129	Comparison of Selected Constituent Concentrations in Hottentot Creek Storm Water Runoff to Colluvial Groundwater in the Hottentot Creek Drainage
Figure 6.5-1	Ecological and Human Health Exposure Areas for Sediments
Figure 6.5-2	Aluminum Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-3	Arsenic Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-4	Barium Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-5	Beryllium Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-6	Boron Concentrations in Red River Sediment for the Four RI Sampling Events

Figure 6.5-7	Cadmium Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-8	Chromium Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-9	Cobalt Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-10	Copper Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-11	Iron Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-12	Lead Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-13	Manganese Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-14	Mercury Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-15	Molybdenum Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-16	Nickel Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-17	Selenium Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-18	Silver Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-19	Thallium Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-20	Zinc Concentrations in Red River Sediment for the Four RI Sampling Events
Figure 6.5-21	Concentrations of Constituents in Red River Sediment During Focused Sampling at 1,000-Foot Transects (September 2004)
Figure 6.5-22	Aluminum Concentrations in Cabresto Creek Sediment for the Four RI Sampling Events
Figure 6.5-23	Cadmium Concentrations in Cabresto Creek Sediment for the Four RI Sampling Events
Figure 6.5-24	Copper Concentrations in Cabresto Creek Sediment for the Four RI Sampling Events
Figure 6.5-25	Manganese Concentrations in Cabresto Creek Sediment for the Four RI Sampling Events
Figure 6.5-26	Molybdenum Concentrations in Cabresto Creek Sediment for the Four RI Sampling Events

Figure 6.5-27	Nickel Concentrations in Cabresto Creek Sediment for the Four RI Sampling Events
Figure 6.5-28	Zinc Concentrations in Cabresto Creek Sediment for the Four RI Sampling Events
Figure 6.6-1	Mean Fish Density 1997-2005 ± 2 SE
Figure 6.6-2	Mean Fish Biomass 1997-2005 ± 2 SE
Figure 6.6-3	Speciated Arsenic Concentrations (mg/kg) in Rainbow Trout Fillet Samples
Figure 6.6-4	Fall Mean Macroinvertebrate Density 1997-2005 \pm 2 SE
Figure 6.6-5	Spring Mean Macroinvertebrate Density 2000-2005 \pm 2 SE
Figure 6.6-6	Fall Mean Number of Total Taxa 1997-2005 ± 2 SE
Figure 6.6-7	Spring Mean Number of Total Taxa 2000-2005 \pm 2 SE
Figure 6.6-8	Fall Mean Number of EPT Taxa 1997-2005 ± 2 SE
Figure 6.6-9	Spring Mean Number of EPT Taxa 2000-2005 ± 2 SE
Figure 6.6-10	Fall Mean Percent of EPT Taxa 1997-2005 ± 2 SE
Figure 6.6-11	Spring Mean Percent of EPT Taxa 2000-2005 ± 2 SE
Figure 6.6-12	Fall Mean Percent of Ephemeroptera Taxa 1997-2005 \pm 2 SE
Figure 6.6-13	Spring Mean Percent of Ephemeroptera Taxa 2000-2005 ± 2 SE
Figure 6.6-14	Percent of Total Taxa for Periphyton 2002-2003
Figure 6.6-15	Number of Total Taxa for Periphyton 2002-2003
Figure 6.6-16	Total Invertebrate Abundance for the Focused Transect Study
Figure 6.6-17	Number of EPT Taxa for the Focused Transect Study
Figure 6.6-18	EPT as Percent of Total Density for the Focused Transect Study
Figure 6.6-19	Ephemeroptera as Percent of Total Density for the Focused Transect Study
Figure 7.3-1	Change in Groundwater Levels in Alluvial Monitoring Wells with Pumping from Mill 1 and Mill 1A Wells
Figure 7.3-2	Relationship between Pumping of Mill 1 and 1A Wells and Chemistry of MMW-28A
Figure 7.3-3	Chambers Springs Flow
Figure 7.3-4	Mean Monthly Flows at USGS Gage on Red River near Questa, NM
Figure 7.3-5a	Pumping from Columbine Wells 1 and 2
Figure 7.3-5b	Changes in Chemistry of Cabin Springs

Figure 7.3-6a	Iron in Soil/Rock from MMW-50A
Figure 7.3-6b	Major Elements in Soils from MMW-50A
Figure 7.3-6c	Zinc, Molybdenum, Sodium, and Sulfate in Soil/Rock from MMW-50A
Figure 7.3-6d	Net Acid Neutralization Potential (tCaCO $_3$ /kt) and Paste pH (SU) in Soils from MMW-50A
Figure 7.3-6e	Metals in Soil/Rock from MMW-50A
Figure 7.3-6f	Trace Metals in Soil/Rock from MMW-50A
Figure 7.4-1	Pumping Rates for the Groundwater Withdrawal System (February 2003 through 2006)
Figure 7.4-2	Constituent Concentrations in GWW-1
Figure 7.4-3	Constituent Concentrations in GWW-2
Figure 7.4-4	Constituent Concentrations in GWW-3
Figure 7.4-5	Comparison between Average Load Removed by Groundwater Withdrawal System and Estimated Load from Rock Piles

List of Appendices

Appendix 1.0-1	Results of Additional Data Collected at the Mine Site
Appendix 1.0-2	Results of Additional Data Collected at the Tailing Facility
Appendix 1.0-3	2006 Operational Water Balance for the Tailing Facility
Appendix 2.1-1	Change of Procedure/Location Forms
Appendix 2.1-2	Changes to Procedures or Locations for Soil Areas
Appendix 2.2-1	Photographs of Surface Water Data Collection
Appendix 2.4-1	Borehole Logs and Well Completion Information
Appendix 2.4-2	Photographs of Groundwater Data Collection
Appendix 2.4-3	Interpretive Report on Molycorp Mine Tritium and Helium Isotope Data
Appendix 2.4-4	Hydraulic Testing of Select Monitoring Wells at the Mine Site
Appendix 2.4-5	Colloidal Borescope Investigation at the Molycorp Mine, Questa, New Mexico
Appendix 2.5-1	Photographs of Vegetation Sampling
Appendix 2.8-1	Photographs of Roadside Rock Pile and Debris Fan Sample Collection
Appendix 2.9-1	Geophysical Investigations
Appendix 2.9-2	High Resolution Seismic Reflection Survey
Appendix 2.10-1	Photographs of GSI Study
Appendix 2.10-2	Summary of Historical Documents
Appendix 2.10-3	Previous Investigations
Appendix 2.11-1	Data Validation
Appendix 2.11-2	Molycorp RI/FS Database

Appendix 3.3-1	Photographs of Surface Water Hydrology
Appendix 3.3-2	EPA Focused Sampling – Radon 222 Study, October 2004
Appendix 3.4-1	Geologic Map of the Red River Basin
Appendix 3.5-1	Photographs for Hydrogeology
Appendix 3.5-2	Hydrographs for Monitoring Wells at the Mine Site and Reference Areas
Appendix 3.5-3	Hydrographs for Monitoring Wells at the Tailing Facility and Reference Areas
Appendix 3.6-1	Photographs of Vegetation at the Mine Site and Tailing Facility
Appendix 4.2-1	X-ray Diffraction Analysis Results
Appendix 4.2-2	Petrographic Analysis of Thin Section Samples
Appendix 4.2-3	Heavy Mineral Analysis Results
Appendix 4.2-4	Rock Pile Geochemical Characterization Methods and Data
Appendix 4.4-1	Summary Table of Chemical Analyses for Mine Site and Reference Monitoring Wells and Seeps/Springs
Appendix 4.4-2	Time Series Graphs for Select Constituents for Mine Site and Reference Wells and Seeps/Springs
Appendix 4.4-3	Statistics Usage Methodologies
Appendix 4.4-4	Memorandum: Identification of Reference Wells that will be used for Statistical Comparison to Mine Site Wells, Molycorp RI/FS, dated August 23, 2006
Appendix 4.4-5	Excerpt from USGS Professional Paper 1728 on Pre-Mining Groundwater Chemistry at Molycorp Questa Mine Site (Nordstrom 2008)
Appendix 4.5-1	Summary of COPC Analytical Results for Each Soil EA and Comparison to SLC
Appendix 4.5-2	Results of Mine Site Soil Statistical Evaluation for Human Health and Ecological COPCs
Appendix 4.5-3	Statistical Usage Methodology for Incorporating Focused Samples with Random Samples in the Statistical Analysis
Appendix 4.7-1	Results of Statistical Evaluation of Terrestrial Animal Data

Appendix 5.4-1	Summary of COPC Analytical Results for Each Soil EA and Comparison to SLC
Appendix 5.4-2	Results of Tailing Facility Statistics for Human Health and Ecological COPCs
Appendix 5.5-1	Summary Table of Chemical Analyses for Tailing and Reference Monitoring Wells and Seeps/Springs
Appendix 5.5-2	Time Series Graphs for Select Constituents for Tailing Facility and Reference Wells and Seeps/Springs
Appendix 6.1-1	Summary of COPC Results for Each Soil EA and Comparison to SLC
Appendix 6.1-2	Results of Riparian Area Statistical Evaluation for Human Health and Ecological COPCs in Soil
Appendix 6.1-3	Draft Final Report on Historical Tailing Spills, September 30, 2004
Appendix 6.4-1	Photographs of Surface Water Storm Events
Appendix 6.5-1	Summary of Sediment COPC Concentrations for Red River and Eagle Rock Lake Exposure Areas and Reference Areas
Appendix 6.5-2	Summary of Statistical Evaluation for Sediment Particle Size Distribution
Appendix 6.6-1	Fish Tissue Summary – RI/FS Sites Fall 2002
Appendix 6.6-2	Fish Tissue Summary – RI/FS Sites Fall 2003
Appendix 6.6-3	Benthic Invertebrate Tissue Summary – RI/FS Sites Fall 2002
Appendix 6.6-4	Benthic Invertebrate Tissue Summary – RI/FS Sites Spring and Fall 2003
Appendix 6.6-5	Macrophyte/Bryophyte Tissue Summary – RI/FS Sites Fall 2002
Appendix 6.6-6	Macrophyte/Bryophyte Tissue Summary– RI/FS Sites Spring and Fall 2003
Appendix 7.3-1	Geochemical Modeling of Potential Sources of Waters Entering the Red River: Factor Analysis
Appendix 7.3-2	Input Files for MMW-28A, Roadside Rock-Pile Wells, and Neighboring Red River Water PHREEQC Simulations
Appendix 7.3-3	Input Files for Cabin Springs and Neighboring Wells and Red River Water PHREEQC Simulations

Appendix 7.3-4	Input Files for Spring 39, Neighboring Wells, and Red River Water PHREEQC Simulations
Appendix 7.3-5	Input Files for MMW-50A, Spring 13, MMW-45A, and Neighboring Wells and Red River Water PHREEQC Simulations

<	less than
>	greater than
°C	degrees Celsius
°F	degrees Fahrenheit
ABA	acid-base accounting
AGP	acid generating potential
aka	also known as
Al	aluminum
ANFO	ammonium nitrate/fuel oil
ANOVA	analyses of variance
ANP	acid neutralizing potential
APHA	American Public Health Association
ARD	acid rock drainage
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Diseases Registry
AVS/SEM	acid volatile sulfides/simultaneously extracted metals
Ba	barium
BAF	bioaccumulation factor
BERA	Baseline Ecological Risk Assessment
BLM	Bureau of Land Management
BOD	biological oxygen demand
C&A	Chadwick & Associates, Inc.
Ca	calcium
CCR	California Code of Regulations
CEC	Chadwick Ecological Consultants, Inc.
cfs	cubic feet per second
Cl	chloride
CLP	Contract Laboratory Program



cm	centimeter(s)
COC	chain of custody
COD	chemical oxygen demand
COPC	chemical of potential concern
CV	coefficient of variation
DBSM	Database Management System
DCM	DCM Science Laboratory, Inc.
DO	dissolved oxygen
DOC	dissolved organic carbon
DP	discharge permit
DRC	dynamic reaction cell
DRO	diesel range organics
DVR	data validation report
EA	exposure area
EBAM	Environmental Beta Attenuation Monitor
EDD	electronic data deliverables
EEA	ecological exposure area
Eh	reduction-oxidation potential
EPA	U.S. Environmental Protection Agency
EPT taxa	Ephemeroptera, Plecoptera, Trichoptera
ESI	EnviroSystems, Incorporated
ET	evapotranspiration
ETO taxa	Ephemeroptera, Trichoptera, Odonates
F	fluoride
FA	Factor Analysis
Fe	iron
FEM	federal equivalent method
FGS	Frontier Geosciences, Inc.
FLT	field leachate test

FRM	federal reference method
FS	Feasibility Study
FSP	Field Sampling Plan
Golder	Golder Associates, Inc.
g/L	grams per liter
gpm	gallons per minute
GPS	Global Positioning System
GRO	gasoline range organics
GSI	groundwater/surface water interaction
GWQB	Ground Water Quality Bureau
2 H	stable isotope of hydrogen (or deuterium)
HCl	hydrochloric acid
НСТ	humidity cell test
HDPE	high-density polyethylene
HF	hydrofluoric
HH	Human Health
HNO ₃	nitric acid
HRSR	high-resolution seismic reflection
Hz	hertz
IC ₂₅	inhibition (of growth) concentration at 25%
ICP	inductively coupled plasma
IDL	instrument detection limit
IDW	investigation-derived waste
ISCO	International Soil Conservation Organization
ISE	ion-selective electrode
К	potassium
km	kilometer
L/min	liter per minute
lbs/day	pounds per day

LC ₅₀	50% lethal concentration
LMWL	local meteoric water line
M&E	maintenance and electrical
m	meter
µg/m	micrograms per meter
μL	microliter
μm	micrometer(s)
µS/cm	microSiemens per centimeter
meq/L	milliequivalents per liter
mg	milligram
ml	milliliter
mm	millimeter
mv	millivolt
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MAP	mean annual precipitation
MAY	mean annual yield
MDL	method detection level
MECS	Mining Environmental Compliance Section
MMD	Mining and Minerals Division
Mg	magnesium
Mn	manganese
Mo	molybdenum
MoS_2	molybdenite
mph	miles per hour
MS/MSD	matrix spike/matrix spike duplicate
Na	sodium
NAAQS	National Ambient Air Quality Standards
NaCl	sodium chloride

NANP	net acid neutralization potential
NASC	North American Shale Composite
NMAC	New Mexico Administrative Code
NMAQB	New Mexico Air Quality Bureau
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NNP	net neutralization potential
NOAEL	no observed adverse effect level
NOEC	no observed effects concentration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	nephelometric turbidity unit
¹⁸ O	stable isotopes of oxygen
PAG	potentially acid generating
РАН	polynuclear aromatic hydrocarbon
PCA	Principal Components Analysis
PCB	polychlorinated biphenyls
PCDDs	polychlorinated dibenzo-p-dioxins
PCDFs	polychlorinated dibenzofurans
pdf	portable document format
pCi/L	pico Curies per liter
PID	photoionization detector
PHREEQC (version 2)	PHREEQC version 2 – computer program for simulating chemical reactions and transport processes in natural or polluted water
PHREEQE	pH redox equilibrium equations
PHREEQCI	USGS-developed computer code based on Fortran program PHREEQE
PM ₁₀	particulate matter 10 microns in size or smaller
PMSD	percent minimum significant difference

PSCR	Preliminary Site Characterization Report
psi	pounds per square inch
PST	petroleum storage tank
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RBC	risk-based concentration
redox	oxidation-reduction
RGC	Robertson GeoConsultants Inc.
RI	Remedial Investigation
RL	Reporting Limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SAR	sodium adsorption ratio
SC	specific conductance
SE	standard error
Si	silica
SI	Slope Inclinometer
SIS	Seepage Interception System
SLC	Screening Level Criteria
SMA	Souder, Miller & Associates
SOP	Standard Operating Procedure
SPLP	Synthetic Precipitation Leaching Procedure
SPRI	South Pass Resources, Inc.
SRK	SRK Consulting
STL	Severn Trent Laboratories
SU	standard unit
SVL	SVL Laboratories

SVOC	semivolatile organic compound
t/kt	tons per kiloton (of rock)
TAL	target analyte list
TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TMDL	total maximum daily load
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TRV	toxicity reference value
TSN	Taxonomic Serial Number
TSS	total suspended solids
UPL	Upper Prediction Limit
URS	URS Corporation
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U. S. Geological Survey
UST	underground storage tank
UTL	Upper Tolerance Limit
VOA	volatile organic analysis
VOC	volatile organic compound
WDC	WDC Exploration and Wells
WIS	Wildlife Impact Study
WQCC	New Mexico Water Quality Control Commission
WRCC	Western Regional Climate Center
XRD	x-ray diffraction
YOY	young-of-the-year
YCT	yeast-Cerophyl-trout chow
Zn	zinc



TABLE OF CONVERSION FACTORS		
English measurement	Metric measurement (SI units)	
Length		
inches	2.54 E+01 millimeters (mm)	
inches	2.54 centimeter (cm)	
inches	2.54 E-02 meters (m)	
feet	3.05 E+01 cm	
feet	3.05 E-01 m	
feet	3.05 E-04 kilometers (km)	
yards	9.14 E+01 cm	
yards	9.14 E-01 m	
yards	9.14 E-04 km	
mile (statute) (5,280 feet)	1.61 E+03 m	
mile (statute) (5,280 feet)	1.61 km	
Encod		
Speed miles per hour	1.61 km/hour	
lines per nour		
Area		
square feet	9.29 E+02 square cm	
square feet	9.29 E-02 square m	
square yards	8.36 E-01 square m	
square mile	2.59 square km	
acres	4.05 E+03 square m	
acres	4.05 E-03 square km	
Volume		
acre-feet	1.23 E+03 cubic m	
cubic feet	2.83 E+04 cubic cm	
cubic feet	2.83 E-02 cubic m	
gallons	3.79 liters	
Mass		
ounce	28.3 grams	
pound (16 ounces)	4.54 E-01 kilograms (kg)	
ton (short = $2,000$ pounds)	9.07 E+02 kg	
ton (long = $2,240$ pounds)	1.02 E+03 kg	
ton (metric = 2,205 pounds)	1 E+03 kg	

TABLE OF CONVERSION FACTORS		
English measurement	Metric measurement (SI units)	
Pressure		
pounds/square inch	6.89 E+03 pascal (Pa)	
pounds/square inch	6.89 kilopascal (kPa)	
Flow Rate		
cubic feet/second (cfs)	2.83 E-02 cubic meters/second	
cubic feet/minute (cfm)	2.83 E+04 cubic cm/minute	
gallons/minute (gpm)	3.79 liters/minute	
gallons/day (gpd)	3.79 liters/day	
Loading		
pounds/day (lbs/day)	4.54 E-01 kg/day	
Hydraulic Units		
hydraulic conductivity (ft/day)	3.05 E-01 m/day	
hydraulic conductivity (ft/day)	3.53 E-04 cm/s	
transmissivity (ft ² /day)	$9.29 \text{ E-}02 \text{ m}^2/\text{day}$	
transmissivity (gpd/ft)	$1.24 \text{ E-02 m}^2/\text{day}$	
Temperature		
temperature (°F)	$(^{\circ}F - 32)/1.8 = ^{\circ}C$	