TABLES

Table 1-1 Current Groundwater Protection Standards, Other Agency Standards and Screening Criteria

Consitiuents	NRC STANDARDS															10 CFR 40 Appendix A, Criterion 5C	Other Agency Standards and Criteriia Referenced						
	Alluvial Aquifer			Chinle Mixing Zone			Upper Chinle Non-Mixing Zone			Middle Chinle Non-Mixing Zone			Lower Chinle Non-Mixing Zone										
	Background[1]	NRC License	NMED	Background[1]	NRC License	NMED	Background[1]	NRC License	NMED	Background[1]	NRC License	NMED	Background[1]	NRC License	NMED		NMAC 20.6.2.3103.A Human Health	NMAC 20.6.2.3103.B Other Domestic	NMAC 20.6.2.3103.C Irrigation	EPA 40 CFR 192.32(a)(2)	EPA MCLs 40 CFR 141.23	EPA Tapwater Screening Level	Lowest Promulgated Standard
Metals (mg/L)																							
Silver (Ag)																0.05	**0.05**	-	-	0.05	-	-	0.05
Aluminum (Al)																	-	-	5.0	-	-	2.00	5
Arsenic (As)																0.05	0.01	-	-	0.05	0.010	-	0.01
Boron (B)																	-	-	0.75	-	-	0.4	0.75
Barium (Ba)																1.0	2	-	-	1	2	-	1
Beryllium (Be)																	0.004	-	-	-	0.004	-	0.004
Cadmium (Cd)																0.01	0.005	-	-	0.01	0.005	-	0.005
Cobalt (Co)																	-	-	0.05	-	-	0.0006	0.05
Chromium (Cr)																0.05	0.05	-	-	0.05	0.1	-	0.05
Copper (Cu)																	-	1.0	-	-	-	-	1
Fluorine (F)																	1.6	-	-	-	-	-	1.6
Iron (Fe)																	-	1.0	-	-	-	1.4	1
Mercury (Hg)																0.002	0.002	-	-	0.002	0.002	-	0.002
Lithium (Li)																	-	-	-	-	-	0.004	NA
Manganese (Mn)																	-	0.2	-	-	-	-	0.2
Molybdenum (Mo)	0.04	0.1	1	0.1	0.1	1	0.08	0.1	1	0.05	0.1	1	0.03	0.1	1		-	-	1.0	-	-	-	0.1
Nickel (Ni)																	-	-	0.2	-	-	0.039	0.2
Lead (Pb)																0.05	0.015	-	-	0.05	-	-	0.015
Antimony (Sb)																	0.006	-	-	-	0.006	-	0.006
Selenium (Se)	0.32	0.32	0.32	0.14	0.14	0.14	0.06	0.06	0.06	0.07	0.07	0.07	0.32	0.32	0.32	0.01	0.05	-	-	0.01	0.05	-	0.01
Tin (Sn)																	-	-	-	-	-	1.2	NA
Strontium (Sr)																	-	-	-	-	-	1.2	NA
Thallium (Tl)																	0.002	-	-	-	0.002	-	0.002
Uranium (U)	0.16	0.16	0.16	0.18	0.18	0.18	0.09	0.09	0.09	0.07	0.07	0.07	0.02	0.03	0.03	0.03	0.03	-	-	-	0.03	-	0.03
Vanadium (V)		0.02	*		0.01	*			*		*	*		*	*		-	-	-	-	-	-	0.01
Zinc (Zn)																	-	-	-	-	-	0.6	NA
Zirconium (Zr)																	-	-	-	-	-	0.00016	NA
Other Compounds/Parameters (mg/L unless noted otherwise)																							
pH (s.u.)																	-	6 to 9	-	-	-	-	NA
Chloride (Cl)[1]	71	250	250	96	250	250	412	412	412	63	250	250	634	634	634		-	250	-	-	-	-	250
Cyanide (CN)																	0.2	-	0.2	-	-	-	0.20
Ammonia (NH3-N)																	-	-	-	-	-	**NA**	NA
Nitrite (NO2-N)																	1	-	-	-	1	-	1
Nitrate (NO3-N)		12	12	15	15	15		*	10	4	*	10	3	*	10		10	-	-	-	10	-	10
Sulfate (SO4)[1]	1500	1,500	1,500	1,750	1,750	1,750	914	914	914	857	857	857	2,002	2,000	2,000		-	600	-	-	-	-	600
Sulfide																	-	-	-	-	-	NA	NA
Total Dissolved Solids[1]	2,734	2,734	2,734	3,140	3,140	3,140	2,010	2,010	2,010	1,557	1,560	1,560	4,140	4,140	4,140		-	1,000	-	-	-	-	1000
Radionuclides - Dissolved (pCi/L)																							
Adjusted Gross Alpha (GA)																15	-	-	-	-	-	-	15
Lead-210 (Pb-210)																	-	-	-	-	-	NA	NA
Thorium-230 (Th-230)		0.3	*		*	*		*	*		*	*		*	*		-	-	-	-	-	-	0.3
Radium-226+228 (Ra-226+228)		5	30		*	30		*	30		*	30		*	30	5	5	-	-	-	-	-	5

*No current standard specified.

[1]Grants Reclamation Project Background Water Quality Evaluation Of The Chinle Aquifers, HMC 2003, revised June 2004.

[2]Constituent is not a hazardous constituent per 10 CFR 40 Appendix A, Criterion 5B(2).

Table 1-2 Large Tailings Pile Dewatering Toe Drain Summary

Year	Toe Drain Volume Pumped			Sulfate		Uranium		Molybdenum		Selenium	
				Concentration	Amount	Concentration	Amount	Concentration	Amount	Concentration	Amount
	Increase (gal)	gpm	Cumulative (gal)	(mg/L)	(lb)	(mg/L)	(lb)	(mg/L)	(lb)	(mg/L)	(lb)
1992	8,544,670	16	8,544,670	12,117	864,006	53	3,793	107	7,595	2	123
1993	18,357,680	35	26,902,350	12,117	1,856,262	53	8,150	107	16,315	2	265
1994	18,337,680		45,240,030	12,117	1,854,240	53	8,141	107	16,299	2	264
1995	17,711,370	34	62,951,400	11,370	1,680,500	55	8,069	94	13,952	2	332
1996	15,431,810	29	78,383,210	11,537	1,484,295	46	5,970	105	13,509	1	166
1997	12,029,390	23	90,412,600	11,094	1,113,808	42	419	100	10,040	1	81
1998	10,321,780	20	100,734,380	9,870	850,257	43	3,665	95	8,203	1	63
1999	8,809,890	17	109,544,270	11,560	849,976	54	3,993	106	7,794	0	34
2000	8,032,870	15	117,577,140	9,734	652,590	59	3,929	118	7,911	0	23
2001	9,606,280	18	127,183,420	9,935	796,529	43	3,455	96	7,673	1	63
2002	17,975,520	34	145,158,940	9,210	1,381,718	33	5,011	89	13,307	1	114
2003	28,418,871	54	173,577,811	9,457	2,243,048	36	8,444	79	18,714	4	1,032
2004	26,720,928	51	200,298,739	8,007	1,787,722	32	7,115	68	15,102	3	622
2005	20,704,320	39	221,003,059	8,228	1,421,784	44	7,517	88	15,120	3	454
2006	20,374,782	39	241,377,841	7,432	1,263,796	38	6,462	76	12,958	1	185
2007	25,037,779	48	266,415,620	6,829	1,427,024	32	6,666	67	14,063	1	251
2008	26,140,850	50	292,556,470	7,847	1,711,992	32	6,894	69	14,945	2	345
2009	27,238,830	52	319,795,300	7,792	1,771,396	35	7,957	70	15,891	1	184
2010	18,444,330	35	338,239,630	6,848	1,054,156	33	5,065	52	8,020	1	79
2011	14,777,020	28	353,016,650	6,747	832,101	30	3,688	53	6,561	0	54
2012	12,201,316	23	365,217,966	6,476	659,465	27	2,729	49	4,980	0	44
2013	9,211,575	18	374,429,541	6,453	496,105	27	2,053	53	4,098	0	27
2014	9,427,490	18	383,857,031	5,683	447,149	21	1,668	46	3,619	0	12
2015	10,222,310	19	394,079,341	5,252	448,076	21	1,766	41	3,515	0	26
2016	7,553,090	14	401,632,431	4,756	299,809	17	1,085	37	2,310	0	9
2017	5,455,170	10	407,087,601	3,305	150,473	14	633	27	1,225	0	10
2018	--	--	--	--	--	--	--	--	--	--	--
2019	3,024,380	5.8	410,111,981	4,959	125,172	15	389	42	1,070	0	5
2020	2,152,800	4.1	412,264,781	4,952	88,974	16	289	40	713	1	9
		Total Tailings Toe Drains:	412,264,781		29,612,425		125,013		265,501		4,875
		Total Tailings Wells:	456,922,272		20,155,515		76,460		211,831		725
		Total from Tailings:	869,187,053		49,767,939		201,473		477,332		5,600

Pre-Tailings Flushing

Post-Tailings Flushing

Table 1-3 Large Tailings Pile Dewatering Well Summary

Year	Well Volume Pumped			Sulfate		Uranium		Molybdenum		Selenium	
				Concentration	Amount	Concentration	Amount	Concentration	Amount	Concentration	Amount
	Increase (gal)	gpm	Cumulative (gal)	(mg/L)	(lb)	(mg/L)	(lb)	(mg/L)	(lb)	(mg/L)	(lb)
1995	5,905,740	11	5,905,740	8,191	403,680	36	1,778	89.7	4,420	0.15	7.0
1996	9,181,390	17	15,087,130	9,434	722,129	40	3,077	108.0	8,236	0.18	14
1997	21,292,900	41	36,380,030	10,284	1,827,575	46	8,139	92.4	16,420	0.14	25
1998	--	--	--	--	--	--	--	--	--	--	--
1999	120,550	0.2	120,550	9,420	9,478	41	41	111.5	112	0.19	0.2
2000	12,446,810	24	12,567,360	9,710	1,008,685	38	3,927	127.0	13,193	0.30	31
2001	31,465,370	60	44,032,730	8,688	2,281,555	35	9,086	89.2	23,425	0.19	50
2002	17,817,840	34	61,850,570	7,670	1,140,588	24	3,495	40.8	6,067	0.12	18
2003	8,890,076	17	70,740,646	9,800	727,126	28	2,078	92.0	6,826	0.30	22
2004	44,745,696	85	115,486,342	6,360	2,377,848	23	8,637	60.9	22,769	0.20	75
2005	45,685,786	87	161,172,128	4,389	1,673,497	19	7,130	56.3	21,467	0.18	69
2006	43,707,760	83	204,879,888	4,278	1,560,550	18	6,420	51.9	18,932	0.14	51
2007	24,561,680	47	229,441,568	4,130	846,616	20	4,079	61.1	12,525	0.15	31
2008	5,950,324	11	235,391,892	4,671	231,968	16	795	42.8	2,126	0.24	12
2009	29,403,070	56	264,794,962	3,850	944,782	14	3,362	38.6	9,472	0.24	59
2010	12,953,960	25	277,748,922	3,018	326,287	9.4	1,016	33.5	3,622	0.19	21
2011	54,713,150	104	332,462,072	2,887	1,318,308	10.5	4,795	33.5	15,297	0.18	82
2012	56,486,600	107	388,948,672	2,632	1,240,823	8.9	4,196	26.2	12,352	0.17	80
2013	31,489,800	60	420,438,472	2,448	643,368	7.5	1,958	23.6	6,202	0.12	32
2014	24,487,100	47	444,925,572	2,788	569,782	7.8	1,594	27.1	5,538	0.16	33
2015	8,644,000	16	453,569,572	2,891	208,565	8.2	592	28.0	2,020	0.11	7.9
2016	2,678,400	5.1	456,247,972	2,891	64,625	8.2	183	28.0	626	0.11	2.5
2017	674,300	1.3	456,922,272	4,918	27,677	14.7	83	32.5	183	0.70	3.9
2018	--	--	--	--	--	--	--	--	--	--	--
2019	--	--	--	--	--	--	--	--	--	--	--
2020	--	--	--	--	--	--	--	--	--	--	--
		Total Tailings Wells:	456,922,272		20,155,515		76,460		211,831		725

Pre-Tailings Flushing Post-Tailings Flushing

Table 1-4 Groundwater Restoration Corrective Action System Performance

Year	Ponds							RO System								Zeolite System							Land Application System				
									RO Input (gpm)				RO Output (gpm)					Zeolite Input (gpm)			Zeolite Output (gpm)					Total Annual Treatment Rate (gpm)	Total Annual Treatment Rate without Land Application (gpm)	Total Annual Waste Water Production Rate (gpm)
	Element	Total Annual Pumping Rate (gpm)	Evaporation Pond Storage Capacity (gallons)	Total Storage Capacity (gallons)	Pond Area for Evaporation (sq. ft.)	Total Area for Evaporation (sq. ft.)	Annual Average Evaporation Rate (gpm)	Element	On-Site Groundwater Collection Wells	Tailings Dewatering Wells	Tailings Sumps	Total	Compliant Effluent	Non-Compliant Effluent	Total	Annual Non-Compliant Effluent (gallons)	Element	300Z Zeolite	1200Z Zeolite	Total	Compliant Effluent	Non-Compliant Effluent	Annual Non-Compliant Effluent (gallons)	Applied Volume (gallons)	Average Annual Rate (gpm)			
1978	LTP/Mill	53																								53	53	
1979		88																								88	88	
1980		75																								75	75	
1981		174																								174	174	
1982		304																								304	304	
1983		318																								318	318	
1984		387																								387	387	
1985		369																								369	369	
1986	ECP/WCP	379	11,404,008	11,404,008	217,800	217,800	13																			379	379	
1987		344				217,800	13																			344	344	
1988		317				217,800	13																			317	317	
1989		334				217,800	13																			334	334	
1990	EP1	313	171,092,703	171,092,703	1,084,208	1,302,008	87																			313	313	
1991		326		171,092,703		1,302,008	87																			326	326	
1992		244		171,092,703		1,302,008	87				16															244	244	
1993		220		171,092,703		1,302,008	87				35															220	220	
1994		187		171,092,703		1,302,008	87																			187	187	
1995		206		171,092,703		1,302,008	87			11	34															206	206	
1996	EP2	232	99,963,408	271,056,111	744,646	2,046,654	152			17	29															232	232	
1997		180		271,056,111		2,046,654	171			41	23															180	180	
1998		142		271,056,111		2,046,654	188				20															142	142	
1999		224		271,056,111		2,046,654	167			0.2	17															224	224	
2000		No		271,056,111		2,046,654	180	Original RO	279	24	15	318	204	70	274	36,792,000									232,967,592	443	761	318	70
2001		Direct		271,056,111		2,046,654	159		276	60	18	354	222	59	281	31,010,400									226,451,016	431	785	354	59
2002		Pumping		271,056,111		2,046,654	158	RO Expansion 1	383	34	34	451	288	100	388	52,560,000									324,199,656	617	1068	451	100
2003		To		271,056,111		2,046,654	169		338	17	54	409	266	76	342	39,945,600									309,211,531	588	997	409	76
2004		Evap Ponds		271,056,111		2,046,654	170		294	85	51	430	249	64	313	33,638,400									334,952,006	637	1067	430	64
2005		All		271,056,111		2,046,654	181		249	87	39	375	198	49	247	25,754,400									336,906,979	641	1016	375	49
2006		Influent		271,056,111		2,046,654	194		252	83	39	374	184	48	232	25,228,800									272,718,706	519	893	374	48
2007		To		271,056,111		2,046,654	186		262	47	48	356	204	55	259	28,908,000									257,078,923	489	845	356	55
2008		Other		271,056,111		2,046,654	169		261	11	50	322	194	60	254	31,536,000									343,423,555	653	975	322	60
2009		Treatment		271,056,111		2,046,654	152		250	56	52	358	171	60	231	31,536,000	Pilot 1								238,180,853	453	811	358	60
2010	EP3	Systems.	78,035,998	349,092,109	1,154,340	3,200,994	146		239	25	35	299	166	59	225	31,010,400	up to 50 gpm								65,491,589	125	424	299	59
2011				349,092,109		3,200,994	223		252	104	28	384	170	58	228	30,484,800									69,401,534	132	516	384	58
2012				349,092,109		3,200,994	221		273	107	23	403	182	50	232	26,280,000									101,006,928	192	596	403	50
2013				349,092,109		3,200,994	153		234	60	18	311	148	47	195	24,703,200	Pilot 2										311	311	47
2014				349,092,109		3,200,994	188	2nd Clarifier	236	47	18	301	165	47	212	24,703,200	Added 300Z										301	301	47
2015				349,092,109		3,200,994	184	Microfiltration	208	16	19	244	112	52	164	27,331,200	Pilot 3										244	244	52
2016				349,092,109		3,200,994	168	RO Expansion 2	595	5	14	614	449	141	590	74,109,600	Added 1200Z	115	152	267	233	34	17,870,400			881	881	175
2017				349,092,109		3,200,994	225		497	1	10	508	407	108	515	56,764,800		56	247	303	253	50	26,280,000			811	811	158
2018				349,092,109		3,200,994	200		436	0	0	436	350	85	435	44,676,000		37	259	296	267	29	15,242,400			732	732	114
2019				349,092,109		3,200,994	174		324	0	6	330	236	57	293	29,959,200	Approved	0	160	160	126	34	17,870,400			490	490	91
2020				349,092,109		3,200,994	201		298	0	4	302	205	58	263	30,484,800		0	42	42	26	8	4,204,800			344	344	66

Table 1-5 Environmental Monitoring Excluding Groundwater

Media	Number	Locations	Area	Method	Frequency	Analytical Parameters
Air Particulates	4	HMC-1, HMC-1A, HMC-2, HMC-3	At or near the License boundary in sectors that have the highest predicted concentrations of radioactive airborne particulates	Continuous (High Volume)	Weekly fiter change or more frequently as required. Samples composited and analyzed quarterly.	Natural Uranium, Radium-226, Thorium-230
	2	HMC-4 and HMC-5	License boundary nearest occupied residences	Continuous (High Volume)		
	1	HMC-6	Background	Continuous (High Volume)		
Radon Gas	2 at each loctation for a total of 20	HMC-1, HMC-1A, HMC-2, HMC-3	At or near the License boundary in sectors that have the highest predicted concentrations of radioactive airborne particulates	Continuous Track-etch	Quarterly	Radon-222
		HMC-4 and HMC-5	License boundary nearest occupied residences			
		HMC-6	Background			
		HMC-1OFF and HMC-6OFF	Offsite			
		HMC-7	South License boundary			
		HMC-16	Background			
Direct Radiation	4	HMC-1, HMC-1A, HMC-2, HMC-3	At or near the License boundary in sectors that have the highest predicted concentrations of radioactive airborne particulates	Continuous OSL	Quarterly	Gamma Dose Rate
	2	HMC-4 and HMC-5	License boundary nearest occupied residences			
	1	HMC-6	Background			
	2	HMC-1OFF and HMC-6OFF	Offsite			
	1	HMC-16	Background			

OSL - optically stimulated luminescence

Table 1-6 Groundwater Monitoring Requirements		
Well	**Parameter List Code**	**Frequency of Monitoring**
Alluvial Background Wells		
P, Q, 921	B, F	Annual
Operational Monitoring		
Collection system wells Injection system wells	Total Volume Total Volume	Monthly Monthly
Reversal wells B, BA, KZ, DZ, SM, SN, S2, S5	Water Level	Weekly
San Andres Wells		
Deep #1R, Deep #2R, 943M, 951R	B, F H	Annual Semiannual
Alluvial Compliance Monitoring Wells		
On-Site Monitoring Wells (Evap. Ponds) DD, DD2, X	B, F plus Mn H	Annual Quarterly
Additonal On-Site Monitoring Wells 1A, 1K, 639, 802, B11, D1, F, FB, GH, GN, L, L5, K9, M3, MX, MB, MQ, NC, S4, SUB3, T2, T19, T23, T41, T54	B, F	Annual
South Off-Site Wells 490, 497, 540, 631, 643#, 644, 864, 869, Q5, R3, SUB2	B, F	Annual
Section 34 Land application wells 555, 556, 557, 844, 845, 846	B, F	Annual
North Off-Site Wells(includes Section 28 Land application wells) 688, 881, 882, 883, 884, 886, 888, 893, 659, H2A, MR, H55, MO	B, F	Annual
Western Portion of North Off-Site Wells (Includes Section 33 Land application wells) 541, 551, 647, 649, 654, 899, 996	B, F	Annual
Chinle Compliance Monitoring Wells		
Upper Chinle Wells 494, CE2, CE8, CE9, CE15, CF4, CW3, CW13#, CW18, CW25#	B, F	Annual
Middle Chinle Wells 493, ACW, CW17, CW2, CW28, CW45, CW55, CW62, CW76, R3, Y7	B, F	Annual
Lower Chinle Wells CW29, CW32, CW41, CW42, CW43, V6	B, F	Annual

Note: # Monitoring will start after well ceasing to be used for injection

Table 1-7 GRP Water Analytical Suites

Parameter List Code	Included Parameters (Dissolved)	Method	Reporting Limits	Units
B	Water level			
	pH	A4500-HB	0.01	s.u.
	Total dissolved solids (TDS)	A2540 C	20	mg/L
	Sulfate (SO_4)	E300.0	4	mg/L
	Chloride (Cl)	E300.0	1	mg/L
	Bicarbonate (HCO_3)	A2320 B	5	mg/L
	Carbonate (CO_3)	A2320 B	5	mg/L
	Sodium (Na)	E200.7	0.9	mg/L
	Calcium (Ca)	E200.7	0.5	mg/L
	Magnesium (Mg)	E200.7	0.5	mg/L
	Potassium (K)	E200.7	0.5	mg/L
	Nitrate (NO_3)	E353.2	0.1	mg/L
	Uranium (U)	E200.8	0.0003	mg/L
	Selenium (Se)	E200.8	0.005	mg/L
	Molybdenum (Mo)	E200.8	0.03	mg/L
	Radium-226 (Ra-226)	E903.0	Precision Variable	pCi/L
F	Vanadium (V)	E200.8	0.01	mg/L
	Radium-228 (Ra-228)	RA-05	Precision Variable	pCi/L
	Thorium-230 (Th-230)	E908.0	Precision Variable	pCi/L
H	Water Level			
	TDS	A2540 C	20	mg/L
	SO_4	E300.0	4	mg/L
	U	E200.8	0.0003	mg/L
	Se	E200.8	0.005	mg/L
	Mo	E200.8	0.03	mg/L
	Cl	E300.0	1	mg/L

Table 1-8 Large Tailings Pile Well Water Quality

Well	Year		Uranium (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)		Well	Year		Uranium (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
CS1	2000-2019	Max	33.10	85.20	3.61		CS2	1999-2019	Max	53.90	125.00	22.40
		Min	0.61	1.35	0.01				Min	0.30	0.57	0.00
		Avg	14.10	28.21	0.35				Average	12.25	30.25	2.97
ES4	2005-2020	Max	16.10	44.30	0.12		ES6	1997-2019	Max	52.10	104.00	0.25
		Min	3.87	10.40	0.03				Min	7.64	24.00	0.04
		Average	7.89	21.50	0.06				Average	15.46	52.13	0.11
WW3	2016-2019	Max	7.35	12.40	0.35		WME1	2016-2018	Max	13.00	52.00	0.10
		Min	2.57	8.58	0.01				Min	9.84	39.30	0.05
		Average	4.88	10.60	0.10				Average	11.21	43.06	0.07
WME3	2018-2019	Max	2.40	7.10	0.04		SW3	2016-2019	Max	3.52	14.80	0.06
		Min	1.45	3.69	0.01				Min	1.45	2.50	0.04
		Average	1.80	4.78	0.02				Average	2.33	6.94	0.05
E1	1996-2020	Max	92.50	173.00	7.04		W1	1995-2020	Max	59.90	141.00	6.57
		Min	0.44	0.94	0.01				Min	12.20	10.10	0.09
		Average	38.79	85.40	1.44				Average	26.48	49.35	0.79
N1	1995-2020	Max	67.55	118.00	5.33		S1	1996-2020	Max	39.82	135.00	5.71
		Min	16.20	31.80	0.08				Min	0.94	2.62	0.01
		Average	32.70	67.15	1.11				Average	17.71	39.64	0.52
W010	2006-2019	Max	24.00	83.40	0.71		W021	2009-2019	Max	1.70	6.12	0.11
		Min	2.56	9.99	0.02				Min	0.11	1.09	0.02
		Average	10.80	35.31	0.27				Average	0.61	2.87	0.06
WP10	2016-2019	Max	5.27	11.10	0.05		WME4	2018-2020	Max	58.00	170.00	0.25
		Min	2.96	3.79	0.02				Min	37.40	128.00	0.06
		Average	4.30	7.90	0.04				Average	42.48	141.63	0.16
WME5	2018-2020	Max	19.6	68	0.485		WME6	2018-2020	Max	11	34	0.09
		Min	6.9	29.7	0.031				Min	6.13	19.1	0.011
		Average	13.6375	50.9	0.1425				Average	7.67125	23.1	0.039375
CN1	2000-2017	Max	75.6	91.5	9.4		CN2	2000-2016	Max	60	102	0.932
		Min	20.5	7.44	0.044				Min	0.3	0.37	0.016
		Average	41.80714	59.57928571	1.856071429				Average	16.51425	22.7575833	0.19991667
EN1	2005-2017	Max	46	112	7.1		EN2	2000-2017	Max	56	188.9	0.392
		Min	15	40.7	0.18				Min	1.27	5.23	0.026
		Average	27.925	76.14166667	1.417333333				Average	19.0725	69.603125	0.1976875
WN1	2006-2017	Max	21.6	62.1	1.7		WN2	2008-2017	Max	29.8	75.5	0.119
		Min	1.4	5.32	0.01				Min	0.357	2.31	0.0025
		Average	8.306364	25.22545455	0.502818182				Average	6.3398	19.654	0.04995
WS1	2011-2018	Max	12.7	19	0.114		WS2	2010-2016	Max	12.6	29.2	0.7
		Min	3.68	0.7	0.022				Min	1.44	4.02	0.081
		Average	9.54	8.162	0.0586				Average	4.54333333	9.64833333	0.3095
WW1	2005-2018	Max	62.6	67.1	24.9		WW3	2016-2019	Max	7.35	12.4	0.348
		Min	12.2	25.8	1.17				Min	2.57	8.58	0.013
		Average	27.325	39.75833333	5.444166667				Average	4.8775	10.595	0.1035
WME2	2018-2019	Max	0.75	7.9	0.183		CS7	2000-2019	Max	21	64.5	0.386
		Min	0.465	4.94	0.005				Min	1.64	4.57	0.022
		Average	0.555143	6.152857143	0.039142857				Average	12.22	29.2911111	0.15077778
EI4	2016-2018	Max	1.4	1.23	0.025		ET20	2016-2019	Max	3.64	6.25	0.136
		Min	0.801	1.19	0.021				Min	1.45	1.42	0.085
		Average	1.1005	1.21	0.023				Average	2.82	4.58	0.113
EP23	2016-2019	Max	12.9	21.7	0.09		EP31	2016-2018	Max	6.93	11.2	0.123
		Min	6.7	12.2	0.061				Min	6.82	10.1	0.092
		Average	10.6	17.23333333	0.076666667				Average	6.875	10.65	0.1075
WE9	2009-2019	Max	3.1	10.7	0.152		WF2	2008-2019	Max	3.7	15.8	1.72
		Min	0.467	2.09	0.006				Min	0.478	2.19	0.004
		Average	1.037043	4.71	0.057608696				Average	1.66325	7.06107143	0.17842857
WF9	2009-2019	Max	2.5	7.4	0.173		WF11	2009-2019	Max	0.712	6.16	0.142
		Min	0.466	1.01	0.0025				Min	0.21	1.04	0.007
		Average	1.467483	3.961034483	0.038982759				Average	0.4535	2.33038462	0.02565385
WT6	2008-2016	Max	2.98	12.9	0.141		WT18	2016-2018	Max	3.99	4.89	0.09
		Min	0.795	0.97	0.0025				Min	3.4	4.13	0.049
		Average	1.522667	6.3375	0.03375				Average	3.695	4.51	0.0695

Tailings Wells Summary

		Uranium (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
Pre-Flushing				
	Max	53.90	125.00	0.31
	Min	46.70	86.40	0.04
	Average	50.90	105.13	0.14
	Wells CS1, CS, ES4, ES6			
Post Flushing	Max	58.00	170.00	3.61
	Min	0.21	1.19	0.003
	Average	7.18	21.10	0.14
% of Pre-Flushing Average:		14%	20%	103%

Wells CS1, CS2, ,ES4, ES6, EE2, SE2, EE2, SE2, WW3, WME1, WME3, SW3, WO10, WO21, WP10, WME4, WME5, WME6, CN1, CN2, EN1, EN2, WN1. WN2, WS1, WS2, WW1, WW3, WME2, CS7, EI4, ET20, EP23, EP31, WE9, WF2, WF9, WF11, WT6, WT18

Tailings Sump Summary

		Uranium (mg/L)	Molybdenum (mg/L)	Selenium (mg/L)
Pre-Flushing				
	Max	67.55	118.00	2.86
	Min	27.80	75.80	0.34
	Average	43.45	102.29	0.93
	Sumps E1, W1, N1, S1			
Post Flushing	Max	30.40	63.30	0.48
	Min	6.99	10.10	0.02
	Average	16.46	34.38	0.20
% of Pre-Flushing Average:		38%	34%	22%

Sumps E1, W1, N1, S1

Table 2-1 Summary of Base-Case Predictive Modeling by Alternative

Alternative 1: Base-Case Groundwater Uranium Concentrations For Collection and Injection Predictive Model

	Alluvial Aquifer	Upper Chinle	Middle Chinle	Lower Chinle Non-Mixing	Lower Chinle Mixing	San Andres-Glorieta Aquifer
POE Protective Limit (mg/L)	0.16	0.09	0.07	0.03	0.18	0.03
Maximum POE 1 Concentration (mg/L)	NA	NA	0.0200	0.0200	NA	0.0056
Maximum POE 2 Concentration (mg/L)	0.0228	0.0205	0.0209	0.0200	NA	0.0056
Maximum POE 3 Concentration (mg/L)	0.0192	0.0202	0.0197	0.0200	NA	0.0056
Maximum POE 4 Concentration (mg/L)	0.1462	0.0207	0.0201	0.0200	NA	0.0056
Maximum POE 5 Concentration (mg/L)	0.0720	0.0201	0.0201	0.0200	NA	0.0057
Maximum POE 6 Concentration (mg/L)	NA	NA	0.0350	0.0204	NA	0.0057
Maximum POE 7 Concentration (mg/L)	NA	NA	NA	NA	0.1032	0.0068
Maximum POE 8 Concentration (mg/L)	NA	NA	NA	NA	0.0422	0.0076
Maximum POE 9 Concentration (mg/L)	0.0754	NA	NA	NA	NA	0.0100
Maximum POE 10 Concentration (mg/L)	0.0577	NA	NA	NA	NA	0.0133
Maximum POE 11 Concentration (mg/L)	0.0145	NA	NA	NA	NA	0.0065
Maximum POE 12 Concentration (mg/L)	NA	NA	NA	NA	NA	0.0056
Maximum POE Concentration	0.1462	0.0207	0.0350	0.0204	0.1032	0.0133

Alternative 2: Base-Case Groundwater Uranium Concentrations For Collection and Injection with PRB Predictive Model

	Alluvial Aquifer	Upper Chinle	Middle Chinle	Lower Chinle Non-Mixing	Lower Chinle Mixing	San Andres-Glorieta Aquifer
POE Protective Limit (mg/L)	0.16	0.09	0.07	0.03	0.18	0.03
Maximum POE 1 Concentration (mg/L)	NA	NA	0.0200	0.0200	NA	0.0055
Maximum POE 2 Concentration (mg/L)	0.0232	0.0243	0.0209	0.0200	NA	0.0055
Maximum POE 3 Concentration (mg/L)	0.0191	0.0204	0.0194	0.0200	NA	0.0055
Maximum POE 4 Concentration (mg/L)	0.0187	0.0210	0.0201	0.0200	NA	0.0055
Maximum POE 5 Concentration (mg/L)	0.0214	0.0201	0.0201	0.0200	NA	0.0056
Maximum POE 6 Concentration (mg/L)	NA	NA	0.0201	0.0200	NA	0.0056
Maximum POE 7 Concentration (mg/L)	NA	NA	NA	NA	0.0436	0.0057
Maximum POE 8 Concentration (mg/L)	NA	NA	NA	NA	0.0200	0.0060
Maximum POE 9 Concentration (mg/L)	0.0567	NA	NA	NA	NA	0.0097
Maximum POE 10 Concentration (mg/L)	0.0198	NA	NA	NA	NA	0.0133
Maximum POE 11 Concentration (mg/L)	0.0145	NA	NA	NA	NA	0.0057
Maximum POE 12 Concentration (mg/L)	NA	NA	NA	0.0200	NA	0.0055
Maximum POE Concentration	0.0567	0.0210	0.0209	0.0200	0.0436	0.0133

Alternative 3: Base-Case Groundwater Uranium Concentrations For Natural Attenuation Predictive Model

	Alluvial Aquifer	Upper Chinle	Middle Chinle	Lower Chinle Non-Mixing	Lower Chinle Mixing	San Andres-Glorieta Aquifer
POE Protective Limit (mg/L)	0.16	0.09	0.07	0.03	0.18	0.03
Maximum POE 1 Concentration (mg/L)	NA	NA	0.0200	0.0200	NA	0.0055
Maximum POE 2 Concentration (mg/L)	0.0231	0.0243	0.0209	0.0200	NA	0.0055
Maximum POE 3 Concentration (mg/L)	0.0191	0.0204	0.0194	0.0200	NA	0.0055
Maximum POE 4 Concentration (mg/L)	0.0142	0.0213	0.0201	0.0200	NA	0.0055
Maximum POE 5 Concentration (mg/L)	0.0214	0.0201	0.0201	0.0200	NA	0.0055
Maximum POE 6 Concentration (mg/L)	NA	NA	0.0200	0.0200	NA	0.0056
Maximum POE 7 Concentration (mg/L)	NA	NA	NA	NA	0.0250	0.0057
Maximum POE 8 Concentration (mg/L)	NA	NA	NA	NA	0.0200	0.0059
Maximum POE 9 Concentration (mg/L)	0.0188	NA	NA	NA	NA	0.0089
Maximum POE 10 Concentration (mg/L)	0.0198	NA	NA	NA	NA	0.0128
Maximum POE 11 Concentration (mg/L)	0.0145	NA	NA	NA	NA	0.0057
Maximum POE 12 Concentration (mg/L)	NA	NA	NA	0.0200	NA	0.0055
Maximum POE Concentration	0.0214	0.0213	0.0209	0.0200	0.0250	0.0128

NA = Saturated conditions in unit not present at this location

Excluded, value reflects upgradient inputs, not mill-related source

[1]Attenuation Factor = Source groundwater concentration ÷ maximum predicted POE concentration

Table 2-2 Summary of Areas of Affected Groundwater and Areas of Restoration

	Square Feet	Acres	Square Miles
2019 Uranium	61,139,707	1,404	2.19
Alternative 1 200 Year Uranium	25,065,816	575	0.90
Area Restored	36,073,891.6	828	1.29
Alternative 1 1000 Year Uranium	101,334,741	2,326	3.63
Area Restored	(40,195,034)	(923)	(1.44)
Alternative 2 200 Year Uranium	65,283,048	1,499	2.34
Area Restored	(4,143,340.6)	(95)	(0.15)
Alternative 2 1000 Year Uranium	77,617,892	1,782	2.78
Area Restored	(16,478,185)	(378)	(0.59)
Alternative 3 200 Year Uranium	77,896,416	1,788	2.79
Area Restored	(16,756,708.8)	(385)	(0.60)
Alternative 3 1000 Year Uranium	82,851,612	1,902	2.97
Area Restored	(21,711,905)	(498)	(0.78)

[1]Areas with groundwater above License groundwater protection standards in one or more aquifers.
Negative value in parentheses means total area over which groundwater is not below License groundwater protection standard has increased since 2019.

@ 200 years

Alternative 1 restores 1.29 sq mi, compared to current (2019) modeled conditions

Alternative 2: non-compliant area expands 0.15 sq. mi, compared to current (2019) modeled conditions

Alternative 3: non-compliant area expands 0.60 sq. mi, compared to current (2019) modeled conditions

@ 1,000 years

Alternative 1: non-compliant area expands 1.44 sq. mi, compared to current (2019) modeled conditions

Alternative 2: non-compliant area expands 0.95 sq. mi, compared to current (2019) modeled conditions

Alternative 3: non-compliant area expands 0.78 sq. mi, compared to current (2019) modeled conditions

Table 2-3 Maximum Uranium POE Concentrations Between Alternatives

	Alluvial Aquifer	Upper Chinle	Middle Chinle	Lower Chinle	
				Non-Mixing	Mixing
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Protective Limit	0.16	0.09	0.07	0.03	0.18
Alternative 1 Maximum Groundwater Uranium Concentration at POE	0.1462	0.0207	0.0350	0.0204	0.1032
Alternative 2 Maximum Groundwater Uranium Concentration at POE	0.0567	0.0210	0.0209	0.0200	0.0436
Alternative 3 Maximum Groundwater Uranium Concentration at POE	0.0214	0.0213	0.0209	0.0200	0.0250
Difference Alternative 2 to Alternative 1 (mg/L)	0.0895	(0.0003)	0.0141	0.0004	(0.0017)
Percent difference	61%	-1%	40%	2%	-2%
Difference Alternative 3 to Alternative 1 (mg/L)	0.1193	(0.0006)	0.0141	0.0004	(0.0643)
Percent difference	82%	-3%	40%	2%	-62%
Difference Alternative 3 to Alternative 2 (mg/L)	0.0298	(0.0003)	(0.0000)	(0.0000)	(0.0625)
Percent difference	53%	-1%	0%	0%	-143%

Percent Difference = Difference ÷ Maximum POE concentration of reference alternativ
(-) = Alternative increase concentration relative to reference alternative

Table 2-4 Alternative 3 Base-Case Predictive Modeling for Uranium and Molybdenum

Alternative 3: Base-Case Groundwater Uranium Concentrations For Natural Attenuation Predictive Model

	Alluvial Aquifer	Upper Chinle	Middle Chinle	Lower Chinle Non-Mixing	Lower Chinle Mixing	San Andres-Glorieta Aquifer
POE Protective Limit (mg/L)	0.16	0.09	0.07	0.03	0.18	0.03
Maximum POE 1 Concentration (mg/L)	NA	NA	0.0200	0.0200	NA	0.0055
Maximum POE 2 Concentration (mg/L)	0.0231	0.0243	0.0209	0.0200	NA	0.0055
Maximum POE 3 Concentration (mg/L)	0.0191	0.0204	0.0194	0.0200	NA	0.0055
Maximum POE 4 Concentration (mg/L)	0.0142	0.0213	0.0201	0.0200	NA	0.0055
Maximum POE 5 Concentration (mg/L)	0.0214	0.0201	0.0201	0.0200	NA	0.0055
Maximum POE 6 Concentration (mg/L)	NA	NA	0.0200	0.0200	NA	0.0056
Maximum POE 7 Concentration (mg/L)	NA	NA	NA	NA	0.0250	0.0057
Maximum POE 8 Concentration (mg/L)	NA	NA	NA	NA	0.0200	0.0059
Maximum POE 9 Concentration (mg/L)	0.0188	NA	NA	NA	NA	0.0089
Maximum POE 10 Concentration (mg/L)	0.0198	NA	NA	NA	NA	0.0128
Maximum POE 11 Concentration (mg/L)	0.0145	NA	NA	NA	NA	0.0057
Maximum POE 12 Concentration (mg/L)	NA	NA	NA	0.0200	NA	0.0055
Maximum POE Concentration	0.0214	0.0213	0.0209	0.0200	0.0250	0.0128

Alternative 3: Base-Case Groundwater Molybdenum Concentrations For Natural Attenuation Predictive Model

	Alluvial Aquifer	Upper Chinle	Middle Chinle	Lower Chinle Non-Mixing	Lower Chinle Mixing	San Andres-Glorieta Aquifer
POE Protective Limit (mg/L)	0.1	0.1	0.1	0.1	0.1	0.1
Maximum POE 1 Concentration (mg/L)	NA	NA	0.0050	0.0050	NA	0.0050
Maximum POE 2 Concentration (mg/L)	0.0141	0.0051	0.0050	0.0050	NA	0.0050
Maximum POE 3 Concentration (mg/L)	0.0050	0.0052	0.0050	0.0050	NA	0.0050
Maximum POE 4 Concentration (mg/L)	0.0080	0.0128	0.0050	0.0050	NA	0.0050
Maximum POE 5 Concentration (mg/L)	0.0050	0.0071	0.0050	0.0050	NA	0.0050
Maximum POE 6 Concentration (mg/L)	NA	NA	0.0050	0.0050	NA	0.0050
Maximum POE 7 Concentration (mg/L)	NA	NA	NA	NA	0.0050	0.0050
Maximum POE 8 Concentration (mg/L)	NA	NA	NA	NA	0.0050	0.0052
Maximum POE 9 Concentration (mg/L)	0.0195	NA	NA	NA	NA	0.0074
Maximum POE 10 Concentration (mg/L)	0.0050	NA	NA	NA	NA	0.0109
Maximum POE 11 Concentration (mg/L)	0.0086	NA	NA	NA	NA	0.0055
Maximum POE 12 Concentration (mg/L)	NA	NA	NA	0.0050	NA	0.0050
Maximum POE Concentration	0.0195	0.0128	0.0050	0.0050	0.0050	0.0109

NA = Saturated conditions not present at this location

Excluded, value reflects upgradient inputs, not mill-related source

[a]Maximum concentration in predictive groundwater model source area

Table 2-5 Groundwater Compliance Monitoring Plan Summary

Monitoring Area/Unit	Constituents	ACLs	Methods	Reporting Limit	Frequency
Tailings	Arsenic (mg/L)	0.483	E200.8	0.005 mg/L	**Water Quality Sampling and Analysis for all Constituents:**
East 1 Sump, East 2 Sump, North 1 Sump, North 3 Sump, South 1 Sump, West 1 Sump	Boron (mg/L)	0.970	E200.7 or E200.8	0.1 mg/L	Annually (all listed wells)
Alluvial Aquifer	Cadmium (mg/L)	0.020	E200.8	0.001 mg/L	
POC Wells:	Molybdenum (mg/L)	80.8	E200.7 or E200.8	0.03 mg/L	**Water Levels:**
C2, D1, M3, SB, SZ, X	Selenium (mg/L)	4.40	E200.8	0.005 mg/L	Quarterly for first year, annually, thereafter (all listed wells)
	Uranium (mg/L)	57.7	E200.8	0.02 mg/L	
Upgradient Monitoring Wells:	Vanadium (mg/L)	0.404	E200.8	0.005 mg/L	Wells monitoring groundwater under the Large Tailings Pile
P, Q	Chloride (mg/L)	1,489	E300.0	1 mg/L	will be sampled until construction of the Large Tailings Pile final cover is initiated (CE7, T2, T4, T19, T23, T41, T54)
	Fluoride (mg/L)	9.65	4500-F	1 mg/L	
On-Site Monitoring Wells	Nitrate+Nitrite (mg/L)	210	E353.2	1 mg/L	
1A, 1K, 0639, 0802, B11, F, FB, GH, GN, L, L5, K9, MB, MQ, MX,	Sulfate (mg/L)	12,300	E300.0	4 mg/L	
NC, S4, SUB3, T2, T19, T23, T41, T54	Thorium-230 (pCi/L)	15.2	E908.0	0.3 pCi/L	
	Radium-226+228 (pCi/L)	114	E903.0	0.2 pCi/L	
Off-Site Monitoring Wells	Total Dissolved Solids	NA	A2540 C	20 mg/L	
0490, 0497, 0540, 0541, 0551, 0555, 0556, 0557, 0631, 0643, 0644,					
0647, 0649, 0654, 0659, 0688, 844, 0845, 0846, 0864, 0869, 0881,	Field Measurements[1]				
0882, 0883, 0884, 0886, 0888, 0893, 0899, 0996, H2A, MR, H55, MO, Q5, SUB2	Static Water Level*				
Upper Chinle	pH				
0494, CE2, CE7, CE8, CE9, CE15, CW3, CW13, CW18, CW25	Temperature				
Middle Chinle	Conductivity				
0493, ACW, CW2, CW17, CW28, CW45, CW55, CW62, CW76, R3, Y7	Dissolved Oxygen				
Lower Chinle	ORP				
CW29, CW32, CW41, CW42, CW43, V6					
San Andres					
Deep Well 1R, Deep Well 2R					

pCi/L - picocuries per liter, POC - point of compliance; POE - point of exposure

E - EPA

[1] Water quality indicator constituents only.

*Note: Water level measurements will be taken at each well prior to well purging and sampling.

Table 3-1 Land Cover within Five Miles of the GRP

Land Cover Type	Area (square meters)	Area (acres)	Percent of Total Area
Madrean Encinal	295,200	73	0.12
Madrean Pinyon-Juniper Woodland	900	0	0.00
Southern Rocky Mountain Ponderosa Pine Woodland	508,500	126	0.21
Great Basin Pinyon-Juniper Woodland	3,600	1	0.00
Inter-Mountain Basins Juniper Savanna	61,200	15	0.03
Colorado Plateau Pinyon-Juniper Woodland	971,015	240	0.41
Colorado Plateau Pinyon-Juniper Shrubland	56,169,000	13880	23.49
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	194,400	48	0.08
Mogollon Chaparral	86,400	21	0.04
Rocky Mountain Subalpine-Montane Riparian Shrubland	146,572	36	0.06
Inter-Mountain Basins Greasewood Flat	6,667,886	1648	2.79
Inter-Mountain Basins Playa	25,200	6	0.01
Madrean Juniper Savanna	900	0.2	0.00
Inter-Mountain Basins Mat Saltbush Shrubland	24,912,975	6156	10.42
Inter-Mountain Basins Mixed Salt Desert Scrub	10,394,043	2568	4.35
Inter-Mountain Basins Big Sagebrush Steppe	616,991	152	0.26
Inter-Mountain Basins Semi-Desert Grassland	111,013,155	27432	46.43
Inter-Mountain Basins Semi-Desert Shrub Steppe	7,666,513	1894	3.21
Rocky Mountain Cliff, Canyon and Massive Bedrock	900	0.2	0.00
North American Warm Desert Bedrock Cliff and Bedrock	367,200	91	0.15
Colorado Plateau Mixed Bedrock Canyon and Tableland	15,300	4	0.01
Inter-Mountain Basins Volcanic Rock and Cinder Land	392,400	97	0.16
Cultivated Cropland	2,788,200	689	1.17
Disturbed/Successional - Grass/Forb Regeneration	76,500	19	0.03
Disturbed/Successional - Shrub Regeneration	1,940,400	479	0.81
Open Water (Fresh)	1,130,358	279	0.47
Developed, Open Space	5,861,863	1448	2.45
Developed, Low Intensity	5,930,474	1465	2.48
Developed, Medium Intensity	826,399	204	0.35
Developed, High Intensity	31,500	8	0.01

Table 3-2 Land Use within Five Miles of the GRP

Land Use	Percentage
Shrubland	87
Grassland/Pasture	3
Evergreen Forest	3
Developed/Open Space	3
Developed/Low Density	2
Developed/Medium Density	1
Open Water	1

NRCS, 2022

Table 3-3 Land Occupancy in Subdivisions near GRP

Subdivision	Number of Lots	Vacant	Percent Occupied
Broadview Acres	56	17	70%
Felice Acres	22	7	68%
Murray Acres	30	10	67%
Pleasant Valley Acres	36	14	61%
Valle Verde	109	83	24%

Table 3-4 Wildlife Species Known to Occur in the GRP Area

Mammals	
Desert Cottontail	*Sylvilagus audubonii*
Black-tailed jackrabbit	*Lepus californicus*
Silky pocket mouse	*Perognathus flavus*
Botta's pocket gopher	*Thomomys bottae*
Deer mouse	*Peromyscus maniculatus*
Ord's kangaroo rat	*Dipodomys ordii*
White-throated woodrat	*Neotoma abigula*
Mexican woodrat	*Neotoma mexicana*
Spotted ground squirrel	*Spermophilus spilosoma*
Rock squirrel	*Spermophilus verigatus*
Black-tailed prairie dog	*Cynomys ludovicianus*
Coyote	*Canis latrans*
Mule deer	*Ordocoileus hemionus*
Birds	
American robin	*Turdus migratorius*
American kestrel	*Falco sparverius*
Barn swallow	*Hirundo rustica*
Bewick's wren	*Thryomanes bewickii*
Brewer's sparrow	*Spizella breweri*
Brown-headed cowbird	*Molothrus ater*
Bullock's oriole	*Icterus bullockii*
Burrowing owl	*Athene cunicularia*
Common raven	*Corvus corax*
Eastern meadowlark	*Sturnella magna*
Eurasian collared-dove	*Streptopelia decaocto*
Europeran starling	*Sturnus vulgaris*
Ferruginous hawk	*Buteo regalis*
Golden eagle	*Aquila chrysaetos*
Great blue heron	*Ardea herodias*
Hermit thrush	*Catharus guttatus*
Horned lark	*Eremophila alpestris*
House finch	*Haemorhous mexicanus*
House sparrow	*Passer domesticus*
Loggerhead shrike	*Lanius ludovicianus*
Mourning dove	*Zanaida macroura*
Northern mockingbird	*Mimus polyglottos*
Olive-sided flychatcher	*Contopus cooperi*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Sage thrasher	*Orescoptes montanus*
Sagebrush sparrow	*Artemisiospiza nevadensis*
Say's phoebe	*Syornis saya*
Scaled quail	*Callipepla squamata*
Turkey vulture	*Cathartes aura*
Vesper sparrow	*Pooecetes gramineus*
Violet-green swallow	*Tachycineta thalassina*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
White-crowned sparrow	*Zonotrichia leucophrys*
Yellow-rumped warbler	*Setophaga coronata*
Reptiles	
Western rattlesnake	*Crotalus oreganus*
Lesser earless lizard	*Holbrookia maculata*
Horned lizard	*Phrynosoma spp.*

Source: HDR, 2016

Table 3-5 Plant Species of Interest

Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Flowering Period	Likelihood of Occurrence
Cinder Phacelia	*Phacelia serrata*		NM rare	Primarily in deep volcanic cinders associated with volcanic cones, but also roadcuts and abandoned quarries in open, exposed, sunny locations; near ponderosa pine and piñon-juniper woodlands; 1,800-2,200 m (5,900-7,200 ft).	Flowers July to October, primarily late August and early September.	**Low** - More typical of coarse, rocky, highly well drained substrates; though limited potential may occur in areas of roadcuts, presence is unlikely in survey parcels.
Laguna Fame Flower	*Talinum brachypodum*		NM rare	Very shallow pockets of calcareous silt to clay soils overlying limestone or travertine, or fine silty sand overlying calcareous sandstones; open piñon-juniper woodland with little understory and scattered cacti and shrubs or Chihuahuan desert scrub. Preference for substrates of fine-grained non-calcareous iron rich red sandstone of the "Rimrock Country" of the Colorado Plateau.	Flowers June to August.	**Low** - Iron rich red sandstone typical of habitat areas not present, and vegetation associations are lacking (Chihauhuan desert scrub and cacti areas lacking).
New Mexico Sunflower	*Helianthus praetermissus*		NM rare	This species is known only from the type specimen collected in 1851. The locality was the head of the Rio Laguna (now Rio San Jose) at Ojo de la Gallina, on the north side of the Zuni Mountains. This species may have been named from a depauperate specimen of Helianthus paradoxus. Based on limited information, habitats may include perhaps wet ground.	Flowers in September.	**Low** - Species has not been observed since 1851.
Parish's Alkali Grass	*Puccinellia parishii*		E	Alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes at 800-2,200 m (2,600-7,200 ft) range-wide. The species requires continuously damp soils during its late winter to spring growing period. It frequently grows with Distichlis stricta (salt grass), Sporobolus airoides (alkali sacaton), Carex spp. (sedges), Scirpus spp. (bulrushes), Juncus spp. (rushes), Eleocharis spp. (spike rushes), and Anemopsis californica (yerba mansa).	Flowers May to June.	**Low to Medium** -Localized areas of wetted soils occur where piping and pumping persists and contain similar plant associations.
Pecos Sunflower (Puzzle Sunflower)	*Helianthus paradoxus*	T	E	Saturated saline soils of desert wetlands. Usually associated with desert springs (cienegas) or the wetlands created from modifying desert springs; 1,000-2,000 m (3,300-6,600 ft). Helianthus paradoxus is a true wetland species that requires saturated soils; adult plants still grow well when inundated	Flowers August to October.	**Low to Medium** - Localized areas of wetted soils occur where piping and pumping persists; however, likelihood of occurrence even in these areas is extremely low due to dominance of thick cattails.

Table 3-5 Plant Species of Interest (Concluded)

Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Flowering Period	Likelihood of Occurrence
Todilto Stickleaf	*Mentzelia todiltoensis*		NM rare	Outcrops of gypsum in the Todilto Formation; 1,700-1,910 m (5,600-5,840 ft).	Flowers open in the evening hours, late June through September.	**Low** - No gypsum outcrops occur in the study area.
Yeso Twinpod	*Physaria newberryi var. yesicola*		NM rare	The habitat is nearly barren badlands and canyon sides of various slopes and exposures between the elevations of 1700 and 2100 m. It occurs on sandy gypsum and other silty strata in short grass steppe and juniper savanna; in the Permian age Yeso Formation. The Yeso formation is comprised of a soft, silty sandstone interbedded with gypsum, limestone, shale and siltstone strata of various thickness.	Flowers April and May.	**Low** - May occur in shortgrass steppe, however Yeso formation not known to occur underlying area. Other ecological information indicates this species occurs in barren badlands and canyon sides.
Zuni Fleabane (Acoma Fleabane)	*Erigeron acomanus*	T	E	Steep, sandy slopes and benches beneath sandstone cliffs of the Entrada Sandstone Formation in piñon-juniper woodland; 2,100-2,170 m (6,900-7,100 ft). Vegetation cover is usually high; prefers north facing slopes. Typical of high selenium soils.	Flowers in July.	**Low -** No suitable habitat in survey areas.
Zuni Milkvetch	*Astragalus missouriensis var. accumbens*		NM rare	Habitats include gravelly clay banks and knolls, in dry, alkaline soils derived from sandstone, in piñon-juniper woodlands; 1,890-2,410 m (6,200-7,900 ft).	Flowers (March) May through June (August).	**Medium** - May be locally abundant within its limited range. Alkaline soils derived from sandstone occur in study area parcels.

Notes: Queried from NMNHP, http://nmrareplants.unm.edu/rarelist.php, January 2018, and USFWS IPAC for Cibola County, https://ecos.fws.gov/ipac/, January 2018.

T = threatened; E = endangered; NM = New Mexico

Table 3-6 Wildlife Species of Interest

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bat	Big Free-tailed Bat	*Nyctinomops macrotis*		NM sensitive	Seasonal migrant through much of its range. Found in urban areas, dry forests, and pine forests.	**Low** - May forage or pass through on a seasonal basis, but no suitable habitat is present.
Bat	Fringed Myotis	*Myotis thysanodes*		NM sensitive	Found at middle elevations of 1,200-2,150 m in desert, grassland, and woodland habitats. Roosts in caves, mines, rock crevices, buildings, and other protected sites.	**Low** - Study area is outside species elevation range.
Bat	Long-eared Myotis	*Myotis evotis*		NM sensitive	Widespread throughout the western U.S. in a wide range of habitats but most commonly found in coniferous forests. Prefer snags that reach high into or above the forest canopy and roost in crevices of sandstone boulders, stumps of clear-cut stands, abandoned buildings, cracks in the ground, caves, mines, and loose bark on living and dead trees.	**Low** - May forage or pass through on a seasonal basis.
Bat	Long-legged Myotis	*Myotis volans*		NM sensitive	Found in forested regions and roost in trees, rock crevices, fissures in stream banks, and buildings.	**Low** - May forage or pass through, but no suitable habitat in the study area.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bat	Pale Townsend's Big-eared Bat	*Corynorhinus townsendii*		NM sensitive	Occurs in semi-desert shrublands, desert scrub, sagebrush, chaparral, piñon-juniper woodlands, and open montane forests. Roosts mostly in caves or mines; at night may roost in abandoned buildings. Will also use rock crevices and hollow trees as roost sites. In summer, this species occurs widely across the state.	**Medium** - Suitable habitat within study area. Species occurs widely in New Mexico during summer months over desert scrub and other habitats.
Bat	Southwestern Little Brown Myotis	*Myotis occultus*		NM sensitive	Found in a variety of habitats including urban and agricultural areas, riparian habitats, grasslands, and forests. Hibernates in caves and mines, and roosts in buildings in New Mexico. Typically found near lakes or streams as they prefer to forage over water, but will also forage among trees in open areas.	**Low** - May forage over ponds or roost in abandoned structures near study area.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bat	Spotted Bat	*Euderma maculatum*		T	Forages in forest openings, piñon-juniper woodlands, riparian habitats, meadows, and agricultural fields. It is a broad-ranging species; however, its distribution is highly associated with prominent rock features. Rocky cliffs with suitable roosting substrate (e.g., crevices, cracks) are critical to this species. Perennial water sources also are important for this species.	**Low** - No suitable habitat in study area. May be found in forests or rocky cliffs outside study area.
Bat	Western Small-footed Myotis	*Myotis ciliolabrum*		NM sensitive	Common in arid desert, badland, and semiarid habitats. Occurs at low to moderate elevations as high as 9,500 ft in New Mexico. Wide ecological range from rock outcrops in open grasslands to canyons and woodlands. Roosts include cracks and crevices in cliffs, behind tree bark, mines, caves, tunnels, and other man-made structures.	**Medium** - Potential habitat for foraging within study area.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bat	Yuma Myotis	*Myotis yumanensis*		NM sensitive	Found in a variety of habitats from juniper and riparian woodlands to desert regions near open water. Almost guaranteed to find near rivers, streams, ponds, and lakes. Roost in caves, attics, buildings, mines, underneath bridges, and other similar structures.	**Low** - No suitable aquatic habitat present. May roost in abandoned structures near study area.
Bird - MBTA	Bendire's Thrasher	*Toxostoma bendirei*	BCC		Desert species found in various dry, semi-open habitats, particularly areas of tall vegetation, cholla cactus, creosote bush and yucca, and in juniper woodlands.	**Medium -** Potential for breeding and foraging habitat to be present.
Bird - MBTA	Black-chinned Sparrow	*Spizella atrogularis*	BCC		Occupies brushy mountain slopes, open chaparral, and sagebrush habitats. Found mostly in arid scrub on hillsides from low foothills to 7,000 ft elevation.	**Medium -** Potential for breeding and foraging habitat to be present.
Bird - MBTA	Brewer's Sparrow	*Spizella breweri*	BCC		Occurs in the arid intermountain western U.S. Breeds on sagebrush flats and open scrubby areas. Sometimes found in stands of saltbush, on open prairie, or in pinyon-juniper woodland.	**High** - Suitable habitat present and within the common breeding range of the species.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - MBTA	Chestnut-collared Longspur	*Calcarius ornatus*	BCC		Found along the plains and prairies, breeding in shortgrass prairies containing slightly longer grass and scattered taller weeds. Overwinters in shortgrass prairies and fields.	**Medium** - Habitat present for overwintering and migration route.
Bird - MBTA	Grace's Warbler	*Dendroica graciae*	BCC		Occupies pine-oak forests of mountain regions. Breeds in the tops of pine trees, spruce, fir, and oak thickets. Overwinters in pine-oak woodlands in the mountains.	**Low** - Potential to occur in nearby forests, not likely within project area due to lack of suitable habitat in the study area.
Bird - MBTA	Gray Vireo	*Vireo vicinior*	BCC	T	Open woodlands/shrublands, mountain slopes, mesas, open chaparral, scrub oak, and junipers; occurs in New Mexico only in warmer months (April-September). Found in elevations between 3,000 to 6,500 ft.	**Medium** - Habitat present for breeding during spring and summer.
Bird - MBTA	Lesser Yellowlegs	*Tringa flavipes*	BCC		Migrates through New Mexico and found in marshes, mudflats, shores, ponds, and open boreal woods.	**Medium** - Potential to pass through during migration.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - MBTA	Lewis's Woodpecker	*Melanerpes lewis*	BCC		Prefers scattered or logged forests, river groves, burns, and foothills. During the summer requires open country for foraging so is often found in Cottonwood groves, open pine-oak woods, burned or cut-over woods. Overwinters in oak groves and orchards.	**Low -** No suitable habitat present within the study area. Likely present in forests outside the study area so may pass through incidentally.
Bird - MBTA	Loggerhead Shrike	*Lanius ludovicianus*	BCC	NM sensitive	Found in semi-open country with lookout posts, wires, trees, and scrub. Breeds in semi-open terrain from large clearings in wooded regions to open grasslands or desert with a few scattered trees or large shrubs.	**High/Confirmed** - Species observed and identified within the study area.
Bird - MBTA	Long-billed Curlew	*Numenius americanus*	BCC		Migrates through New Mexico and breeds only in the northeastern corner of New Mexico. Found on the high plains, and breeds in native dry grassland and sagebrush prairie.	**Medium** - Potential to pass through during migration.
Bird - MBTA	Marbled Godwit	*Limosa fedoa*	BCC		Migrates through New Mexico. Found in prairies, pools, shores, and tideflats. Breeds in the northern Great Plains in native prairies containing marshes or ponds.	**Low -** Potential for species to occur within the study area during migration.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - MBTA	Mountain Plover	*Charadrius montanus*		NM sensitive	This species is a native of the short-grass prairie. Breeds on open plains at moderate elevations and overwinters in short-grass plains and fields, plowed fields, and sandy deserts.	**Medium** - Suitable habitat present for breeding and overwintering.
Bird - MBTA	Olive-sided Flycatcher	*Contopus cooperi*	BCC		Occupies coniferous forests, burns, and clearings. Breeds in coniferous forests in the mountains, particularly around the edges of open areas including bogs, ponds, and clearings.	**None** - No suitable habitat within the study area. Only suitable habitat is in the nearby forests.
Bird - MBTA	Pinyon Jay	*Gymnorhinus cyanocephalus*	BCC		Found in New Mexico year-round in pinyon pines and junipers. Seldom found outside of pinyon pines in pinyon-juniper woods, but may be seen in streamside groves, oak woods, or other habitats if the pinyon cone crop fails.	**None** - No suitable habitat within the study area. Only suitable habitat is in the forests outside the study area.
Bird - MBTA	Rufous Hummingbird	*Selasphorus rufus*	BCC		Migrates through New Mexico. Found along forest edges, streamsides, and mountain meadows. Occur at all elevations but more common in lowlands during spring, and mountain meadows during late summer and fall.	**Medium** - Potential to pass through during migration.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - MBTA	Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E	E	Riparian habitat consisting primarily of native trees such as willow; nest in shrubs and small trees in willow thickets, shrubby mountain meadows and deciduous woodlands along streams. Habitat patches must be at least 0.25 acres in size and at least 30 ft wide (USFWS 2014).	**Low** - No suitable riparian habitat is present for nesting or foraging. However, species known to use habitat patches so area containing willows should be assessed.
Bird - MBTA	Virginia's Warbler	*Vermivora virginiae*	BCC		Occupies oak canyons, brushy slopes, and pinyons. Breeds in New Mexico in dry mountainsides in scrub oak, chaparral, pinyon-juniper woods, or other low brushy habitats.	**Medium** - Suitable habitat present and project area within common breeding range for species.
Bird - MBTA	Yellow-billed Cuckoo (western pop)	*Coccyzus americanus occidentalis*	T	T	Mature riparian habitats most commonly associated with cottonwood or other native forests; associated with lowland deciduous woodlands, willow and alder thickets, second-growth woods, deserted farmlands and orchards.	**None** - No suitable riparian habitat is present within the study area.
Bird - Raptor	Arctic Peregrine Falcon	*Falco peregrinus tundrius*		T	Hunting habitats include croplands, meadows, riverbottoms, marshes and lakes; breeds in the Arctic tundra.	**Low** - Hunting habitat may be present during migration.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - Raptor	Bald Eagle	*Haliaeetus leucocephalus*		T	Forested areas along coasts, large lakes, and rivers. Year-round occurrence	**Low** - May hunt or pass through incidentally, but study area does not contain suitable aquatic habitat preferred by species.
Bird - Raptor	Burrowing Owl	*Athene cunicularia*	BCC		Found in open grasslands, prairies, farmland, deserts, steppe environments, and airfields. Favors areas of flat, open ground with very short grass or bare soil. Most often associated with high densities of burrowing mammals, such as prairie dogs, but also airports, golf courses, vacant lots, industrial parks, and other open areas when prairie dog colonies are not present.	**High** - Suitable habitat present in prairie dog colonies within the study area.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - Raptor	Golden Eagle	*Aquila chrysaetos*	BCC		Found in open mountains, foothills, plains, and open country. Require open terrain for hunting. Avoid developed areas and primarily found in the mountains up to 12,000 ft, canyonlands, rimrock terrain, and riverside cliffs and bluffs. Nest on cliffs and steep escarpments near open grasslands, chaparral, shrubland, and forests.	**High/Confirmed** - Suitable hunting habitat present within the study area, and nesting habitat present along cliffs outside of the study area. Incidental observations of this species have were noted previously.
Bird - Raptor	Long-eared Owl	*Asio otus*	BCC		Inhabit woodlands and conifer groves, favoring dense trees for nesting and roosting, and open country for hunting. Found in forests with extensive meadows, groves of conifers or deciduous trees in prairie country, or streamside groves in the desert. Typically avoids unbroken forests.	**Low** - May hunt or pass through, but will predominately nest and hunt outside study area in forested areas.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Bird - Raptor	Mexican Spotted Owl	*Strix occidentalis lucida*	T		Inhabits canyon and montane forests and rocky canyons from southern Utah, Colorado, Arizona, New Mexico, and western Texas. The highest densities of this species occur in mixed-conifer forests with minimal human disturbance.	**Low** - May hunt or pass through, but will predominately nest and hunt outside study area in forested, undisturbed areas.
Bird - Raptor	Northern Goshawk	*Accipiter gentilis*			Occupy coniferous and mixed forests, and are generally restricted to wooded areas but may also be found in open woods or edges. In the western U.S. they are found in the forest along riparian corridors and in more open habitat such as sagebrush steppes. Nest in mature, old-growth forests with more than 60% closed canopy throughout their entire range.	**Low** - May hunt or pass through incidentally, but will predominately nest and hunt outside study area in dense, forested areas.
Bird - Raptor	Peregrine Falcon	*Falco peregrinus*		T	Breeding territories located on cliffs in wooded/forested habitats; hunting habitats include croplands, meadows, riverbottoms, marshes and lakes.	**High** - Suitable hunting habitat present within the study area, and nesting habitat present along cliffs outside of the study area.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Fish	Rio Grande Chub	*Gila pandora*		NM sensitive	Most commonly found in flowing pools of headwaters, creeks, and small rivers near inflow of riffles, undercut banks, aquatic vegetation, and plant debris. Can also occur in impoundments.	**None -** No suitable habitat present within the study area.
Fish	Zuni Bluehead Sucker	*Catostomus discobolus yarrowi*	E	E	Most frequently occurs in stream reaches with cobble and bedrock substrates with slow- to moderate-velocity water. In New Mexico, the sucker currently is limited to the headwaters of the Zuni River drainage.	**None -** No suitable habitat present within the study area.
Invertebrate	Socorro Mountainsnail	*Oreohelix neomexicana*		NM sensitive	Occupies a variety of habitats from lush forested canyons to extreme conditions. Found in New Mexico in scant cover under loose stones, limestone rocks, and other single stones in areas of rich leaf litter.	**None -** No suitable habitat present within the study area.
Mammal	Cebolleta Pocket Gopher	*Thomomys bottae paguatae*		NM sensitive	Currently known only from a small area in Cibola County. Prefers perennial riparian vegetation including willow, cottonwood, alder, and maple. Surrounding uplands in known locality include large sandstone cliffs with juniper, piñon, and sage.	**Low** - Evidence of gophers identified in the project area, but unlikely this species due to its preference for riparian habitat.

Table 3-6 Wildlife Species of Interest (Continued)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Mammal	Common Hog-nosed Skunk	*Conepatus leuconotus*		NM sensitive	Inhabits a variety of habitats including sycamore, cottonwood, and rabbitbrush riparian habitats, pinion-juniper woodlands, and montane shrublands. Prefers rocky areas. Uses rock crevices, hollow logs, underground burrows, caves, mines, woodrat houses, or buildings as dens.	**Medium -** Potential for habitat to be present.
Mammal	Gunnison's prairie dog (prairie subspecies)	*Cynomys gunnisoni zuniensis*		NM sensitive	Found in plains and desert grassland, and to a lesser extent the Great Basin desert scrub. Occurs in low valleys, but also is common in parks and meadows in the montane forests up to at least 10,000 feet.	**Medium** - Potential for habitat to be present as there are numerous prairie dog colonies. Species needs to be confirmed.
Mammal	Northern Pocket Gopher	*Thomomys talpoides taylori*		NM sensitive	Found in a wide variety of habitats ranging from sagebrush steppe, mountain meadows, tundra, agricultural fields, grasslands, and gardens or lawns. Prefer deep soils along streams, meadows, and cultivated fields. Also found in rocky soils and clay.	**High** - Evidence of gophers identified in the project area.

Table 3-6 Wildlife Species of Interest (Concluded)

Type of Wildlife	Common Name	Scientific Name	Federal Status	State Status	Habitat/Seasonal Occurrence	Likelihood of Occurrence
Mammal	Red Fox	*Vulpes vulpes*		NM sensitive	Occupies a wide range of habitats including grasslands, deserts, mountains, forests, and suburban areas. Prefer wooded areas but can adapt to different environments.	**Medium -** Potential for habitat to be present.
Mammal	Ringtail	*Bassariscus astutus*		NM sensitive	Found in a variety of habitats such as semi-arid oak forests, pinyon pine or juniper woodlands, montane conifer forests, chaparral, desert, dry tropical habitats, and rocky or cliff areas. This species adapts well to disturbed areas and frequently found in human populated areas.	**Medium -** Potential for habitat to be present.
Reptile	Southwestern Fence Lizard	*Sceloporus cowlesi*		NM sensitive	Found in a variety of habitats including semidesert grasslands, woodlands, rocky canyons, and forested slopes. Usually encountered in open, sunlit areas with plenty of basking sites such as rock piles, wood piles, and fallen logs.	**Medium -** Potential for habitat to be present.

Notes: Queried from Bison-M, http://bison-m.org/index.aspx, January 2018, and USFWS IPAC for Cibola County, https://ecos.fws.gov/ipac/, January 2018.

T = threatened; E = endangered; BCC= bird of conservation concern; NM = New Mexico

Source: Lone-Mountain, 2018

Table 3-7 Grants-Milan Municipal Airport Temperature and Precipitation

Month	Maximum Average Temperature	Minimum Average Temperature	Mean Total Precipitation Inches
	Degrees Fahrenheit		
January	56.1	2.15	0.6
February	58.3	5.93	0.7
March	66.2	10.4	0.76
April	71.7	17.03	0.85
May	80.5	25.1	0.75
June	89.6	36.47	0.66
July	89.5	45.2	2.62
August	85.5	43.57	2.63
September	81.2	33.47	1.47
October	73.5	19.97	1.11
November	63.9	7.8	0.69
December	56.9	0.1	0.7
Annual Average 1986-2018	73.1	20.97	13.6

Source: WRCC, 2019

Table 3-8 Grants Reclamation Project Meteorological Data 2020

Month		Wind Speed	Air Temperature	Relative Humidity	Monthly Precipitation	Average Daily Temperature
		(m/s)	(Degrees Celsius)	(%)	(in)	(Degrees Celsius)
January	maximum	11.1	12.8	93.9	0.5	0
	minimum	0.2	-15.1	9.5		
	average	3.0	-0.3	58.2		
February	maximum	15.9	17.0	94.6	0.81	1.45
	minimum	0.3	-15.9	10.2		
	average	3.4	1.5	52.1		
March	maximum	15.8	18.2	93.0	0.86	6.49
	minimum	0.2	-7.8	7.8		
	average	3.5	6.5	45.2		
April	maximum	12.5	26.5	88.2	0.29	10.69
	minimum	0.4	-7.8	6.8		
	average	3.8	10.7	30.4		
May	maximum	12.3	29.0	70.2	0.02	16.76
	minimum	0.3	-0.4	4.1		
	average	3.7	16.8	21.5		
June	maximum	14.8	31.7	80.6	0.16	21.16
	minimum	0.5	3.0	4.9		
	average	3.9	21.2	20.7		
July	maximum	8.1	34.6	94.7	1.36	22.3
	minimum	0.2	10.1	7.7		
	average	2.8	22.3	38.9		
August	maximum	10.7	33.3	90.4	1.19	23.12
	minimum	0.0	10.2	8.1		
	average	2.7	23.1	30.8		
September	maximum	13.2	31.8	92.0	0.66	16.98
	minimum	0.1	0.0	5.2		
	average	2.9	17.0	32.3		
October	maximum	13.0	27.0	95.2	0.92	11.08
	minimum	0.1	-7.9	5.2		
	average	2.3	11.1	30.1		
November	maximum	1.8	22.0	93.8	0.34	5.19
	minimum	0.1	-9.6	10.4		
	average	2.9	5.2	50		
December	maximum	12.5	15.8	90.2	0.44	0
	minimum	0.1	-13.9	9.3		
	average	2.8	-2.1	51.5		

Source: HMC and Hydro-Engineering, 2021

Table 3-9 Demographics

Population Groups	New Mexico		Cibola County		McKinley County	
	Population	Percentage	Population	Percentage	Population	Percentage
Population	2,059,179.00		26,746		71,492	
Under 5 years		5.8		6.3		6.5
Under 18 years		22.7		23.6		28.1
65 years and over		18		16.1		12.9
Population per square mile	17		6		13	

	New Mexico		Cibola County		McKinley County		Grants		Milan		San Rafael	
	Population	Percentage	Population	Percentage			Population	Percentage	Population	Percentage	Population	Percentage
Total population (5-Year Estimate)	2,059,179.00		26,746		71,492		9094		3644		892	
Hispanic or Latino				38		14.2	4533	50	2584	71	671	75
White alone		81.9		52		16.3	5785	64	2371	65	575	64
Black or African American alone		2.6		1		0.7	163	2	69	2		
American Indian and Alaska Native alone		11		44		79.6	1749	19	511	14		
Asian alone		1.8		1		1.1	46	1	21	1		
Native Hawaiian and Other Pacific Islander alone		0.2		0		0.1	0		0			
White alone not Hispanic or Latino.		36.8		19		8.3	2562	28	636	17	221	25
Two or More Races		2.6		2		2.3	291	3	46	1		

Labor	New Mexico		Cibola County		McKinley County	
In civilian labor force, total percent of population over 16years (2014-2018)		57.3		52.6		51.3
In civilian labor force, female percent of population over 16years (2014 -2018)		53.6		52.1		50.5

Income and Poverty	New Mexico		Cibola County	McKinley County		Grants	Milan	San Rafael
Median household income (in 2018 dollars)	$49,754		$37,368	$33,834		$35,671	$35,648	$64,470
Individuals below the poverty line		16.8	27.6		33.4	26.7%	37.3%	2.4%

2010 Census Data, Census, 2019

Table 4-1 Basis for Impacts Analyses

Alternative Element and Action	Alternative 1 No Action Alternative	Alternative 2 Groundwater Collection/Injection and PRB	Alternative 3 Approval of ACLs + ICs
Source Control	Large Tailings Pile Cover	Large Tailings Pile Cover	Large Tailings Pile & Small Tailings Pile Covers
Groundwater Control	Groundwater Collection/Injection	Groundwater Collection/Injection and hydroxyapatite PRB	Current corrective action until ACLs are approved
Water Treatment	Move zeolite system Reverse Osmosis, existing evaporation ponds	Move zeolite system Reverse Osmosis, existing evaporation ponds	Current System
CONSTRUCTION ELEMENTS			
Areas of New Disturbance	**Acres**	**Acres**	**Acres**
Zeolite Relocation	4	4	NA
Permeable Reactive Barrier Installation	NA	5 (80 ft wide x 2,750 ft length) 3 (Road access 5,280 ft x 25ft)	NA
Well Drilling/Operation & Maintentance	Existing Disturbed Land	Existing Disturbed Land	Existing Disturbed Land
Task Duration	**Work Days**	**Work Days**	**Work Days**
Zeolite Relocation			
Decommission Existing	80 (4 mo)	80 (4 mo)	NA
New Site Prep	10 (0.5 mo)	10 (0.5 mo)	NA
Construction	120 (6 mo)	120 (6 mo)	NA
Permeable Reactive Barrier Installation			
New Site Prep	NA	10 (0.5 mo)	NA
Well Drilling	NA	40 (2 mo)	NA
Construction	NA	20 (1 mo)	NA
Staffing Requirements	**FTE**	**FTE**	**FTE**
Zeolite Relocation			
Decommission Existing	4	4	NA
New Site Prep	2	2	NA
Construction	4	4	NA
Permeable Reactive Barrier Installation			
New Site Prep	NA	1	NA
Well Drilling	NA	4	NA
Construction	NA	4	NA
Traffic	**Vehicles/day**	**Vehicles/day**	**Vehicles/day**
Zeolite Relocation			
Decommission Existing	2	2	NA
New Site Prep	1	1	NA
Construction	2	2	NA
Permeable Reactive Barrier Installation			
New Site Prep	NA	1	NA
Well Drilling	NA	2	NA
Construction	NA	4	NA
OPERATION ELEMENTS			
Areas of New Disturbance	**Acres**	**Acres**	**Acres**
Water Treatment Plant Operation & Maintentance	No Additional Disturbance	No Additional Disturbance	NA
Well Drilling/Operation & Maintentance	No Additional Disturbance	No Additional Disturbance	NA
Permeable Reactive Barrier Installation	NA	96 (80 ft wide x 2,750 ft length) x 19 replacements, one every 50 yrs	NA
Pond Liner Replacement	No Additional Disturbance	No Additional Disturbance	NA
Task Duration	**Work Days**	**Work Days**	**Work Days**
Water Treatment Plant Operation & Maintentance	365,000 (over 1,000 yrs)	54,750 (365 days/yr over 150 yrs)	1,300 (260 days/yr, 5 yrs)
Well Drilling/Operation & Maintentance	10,000 (10 days/yr over 1,000 yrs)	1,500 (10 days/yr over 150 yrs)	NA
Permeable Reactive Barrier Installation	NA	(see Construction)	NA
Pond Liner Replacement			
Old Liner Decommissioning	400 (20 days x 20 replacement, one every 50 yrs)	400 (20 days x 20 replacement, one every 50 yrs)	NA
New Liner Replacement	1,200 (60 days x 20 replacement, one every 50 yrs)	1,200 (60 days x 20 replacement, one every 50 yrs)	NA
Water Collection/Injection Line Replacement			
Old Line Decommissioning	400 (20 days/repl, 20 events over 1,000 yrs)	400 (20 days/repl, 20 events over 1,000 yrs)	NA
New Line Replacement	1,200 (60 days/repl, 20 events over 1,000 yrs)	1,200 (60 days/repl, 20 events over 1,000 yrs)	NA
Monitoring and Reporting	260,000 (260 days/yr for 1,000 yrs)	64,500 (260 days/yr for 150 yrs; 30 days/yr for 850 yrs)	1,300 (260 days/yr, 5 yrs)
Administration & Management	260,000 (260 days/yr for 1,000 yrs)	64,500 (260 days/yr for 150 yrs; 30 days/yr for 850 yrs)	1,300 (260 days/yr, 5 yrs)
Staffing Requirements	**FTE**	**FTE**	**FTE**
Water Treatment Plant Operation & Maintentance	2	2	2
Well Drilling/Operation & Maintentance	2	4	NA
Permeable Reactive Barrier Installation	NA	(See Construction Elements)	NA
Pond Liner Replacement			
Old Liner Decommissioning	6	6	NA
New Liner Replacement	6	6	NA
Water Collection/Injection Line Replacement			NA
Old Line Decommissioning	6	6	NA
New Line Replacement	6	6	NA
Monitoring and Reporting	3	3	3
Administration & Management	2	2	2
Traffic	**Vehicles/day**	**Vehicles/day**	**Vehicles/day**
Water Treatment Plant Operation & Maintentance	2	2	2
Well Drilling/Operation & Maintentance	2	2	2
Permeable Reactive Barrier Installation	NA	(See Construction Elements)	NA
Pond Liner Replacement			
Old Liner Decommissioning	3	3	NA
New Liner Replacement	3	3	NA
Water Collection/Injection Line Replacement			
Old Line Decommissioning	3	3	NA
New Line Replacement	3	3	NA
Monitoring and Reporting	2	2	3
Administration & Management	2	2	2
DECOMMISSIONING AND RECLAMATION ELEMENTS			
Areas of New Disturbance	**Acres**	**Acres**	**Acres**
Water Treatment Plant Zeolite System Evaporation Ponds Well Abandonment Water Collection/Injection Line Decommissioning	Existing Disturbed Land	Existing Disturbed Land	Existing Disturbed Land
Task Duration	**Work Days**	**Work Days**	**Work Days**
Water Treatment Plant	NA (decommissiong does not occur, perpetual action)	80 (4 mo)	80 (4 mo)
Zeolite System		40 (2 mo)	40 (2 mo)
Evaporation Ponds		80 (4 mo)	80 (4 mo)
Well Abandonment		520 (24 mo)	520 (24 mo)
Water Collection/Injection Line Decommissioning		80 (4 mo)	80 (4 mo)
Monitoring and Reporting		1,300 (260 days/yr, 5 yrs)	(see Operations)
Administration & Management		1,300 (260 days/yr, 5 yrs)	(see Operations)
Staffing Requirements	**FTE**	**FTE**	**FTE**
Water Treatment Plant	NA (decommissiong does not occur, perpetual action)	8	8
Zeolite System		4	4
Evaporation Ponds		8	8
Well Abandonment		4	4
Water Collection/Injection Line Decommissioning		4	4
Monitoring and Reporting		3	(see Operations)
Administration & Management		2	(see Operations)
Traffic	**Vehicles/day**	**Vehicles/day**	**Vehicles/day**
Water Treatment Plant	NA (decommissiong does not occur, perpetual action)	4	4
Zeolite System		2	2
Evaporation Ponds		4	4
Well Abandonment		2	2
Water Collection/Injection Line Decommissioning		2	2
Monitoring and Reporting		3	3
Administration & Management		2	2

FTE - Full-time Equivalent

Table 4-2 Alternative Impacts

Affected Environment	Alternative 1 No Action	Alternative 2 Extraction and Injection with Permeable Reactive Barrier	Alternative 3 Proposed Action
Land Use Impacts	Additional disturbance within License boundary, reduced residential population due to HMC acquisition of lands	Additional disturbance within License boundary, reduced residential population due to HMC acquisition of lands	Purchase of additional property inside the control boundary, reduced residential population due to HMC acquisition of lands
Transportation Impacts	Vehicle trips would continue. Additional trips for zeolite relocation, well reinstallation, and evaporation pond relining.	Vehicle trips would continue. Additional trips for zeolite relocation, well reinstallation, and evaporation pond relining.	No additional vehicle trips
Geology and Soil Impacts	Additional disturbance within License boundary and near wells in areas previously disturbed. No additional impacts to soil would occur.	Additional disturbance within License boundary and near wells in areas previously disturbed. No additional impacts to soil would occur.	None
Water Resource Impacts	85.8 billion gallons of groundwater removed from the groundwater system	9.8 billion gallons of groundwater removed from the groundwater system	No additional groundwater removed from the groundwater system after approval of ACLs,
Ecological Resource Impacts	Risk to wildlife from 1,000 year operation of evaporation ponds. Ecological exposures mitigated by best management practices. No ecological hazards indicated from POE exposures to groundwater.	Risk to wildlife from 150 year operation of evaporation ponds. Ecological exposures mitigated by best management practices. No ecological hazards indicated from POE exposures to groundwater.	No pathway for wildlife exposure to groundwater.
Air Quality Impacts	Release of radon gas from the Large Tailings Pile until covered and odors from the evaporation ponds	Release of radon gas from the Large Tailings Pile until covered and odors from the evaporation ponds	None
Noise Impacts	Potential additional noise from zeolite relocation, evaporation pond relining, and well replacement every 50 years.	Potential additional noise from zeolite relocation, evaporation pond relining, permeable reactive barrier installation and well replacement every 50 years.	None
Historic and Cultural Resource Impacts	Areas of potential disturbance previously surveyed for historic and cultural resources and none identified.	Areas of potential disturbance previously surveyed for historic and cultural resources and none identified.	No additional disturbance
Visual/Scenic Resource Impacts	Ponds would remain open with no additional visual/scenic resource impacts	Permeable Reactive Barrier in area of previous disturbance. No additional visual/scenic resource impacts.	None
Socioeconomic Impacts	No sensitive populations in the area of the groundwater constituent plume. Property will be aquired at or above market rates. No socioeconomic impact as no residents will be in the area. Replacement water provided.	No sensitive populations in the area of the groundwater constituent plume. Property will be aquired at or above market rates. No socioeconomic impact as no residents will be in the area. Replacement water provided.	No sensitive populations in the area of the groundwater constituent plume. Property will be aquired at or above market rates. No socioeconomic impact as no residents will be in the area. Replacement water provided.
Environmental Justice	No sensitive populations in the groundwater constituent plume area. Property will be aquired at or above market rates.	No sensitive populations in the groundwater constituent plume area. Property will be aquired at or above market rates.	No sensitive populations in the groundwater constituent plume area. Property will be aquired at or above market rates.
Public and Occupational Health Impacts	Low overall risk, mitigated by use of SOPs, PPE, training, and monitoring. Public exposure pathway eliminated through alternate water supply, land ownership, long-term active containment. Highest potential for occupational exposure due to 1,000 year duration of action.	Low overall risk, mitigated by use of SOPs, PPE, training, and monitoring. Public exposure pathway eliminated through alternate water supply, land ownership long-term active containment. Intermediate potential for occupational exposure due to 150 year duration of active pumping and periodic PRB replacement over 1,000 years.	Low overall risk, mitigated by use of SOPs, PPE, training, and monitoring. Occupational exposures related to one-time decomissioning and reclaiming of corrective action infrastructure. Public exposure pathway eliminated through alternate water supply, land ownership, long-term active containment
Nonradiological Impacts	No systemic effects to resident gardener. The estimated excess lifetime cancer risk from hazardous constituents in groundwater is less than that posed by the primary drinking water standard.	No systemic effects to resident gardener. The estimated excess lifetime cancer risk from hazardous constituents in groundwater is less than that posed by the primary drinking water standard.	No systemic effects to resident gardener. The estimated excess lifetime cancer risk from hazardous constituents in groundwater is less than that posed by the primary drinking water standard.
Radiological Impacts	The modeled maximum POE concentrations of radionuclides originating from the GRP pose risks that fall below limits deemed protective of the public. Similarly, the maximum modeled POE concentrations in groundwater are less than calculated derived concentration guideline levels.	The modeled maximum POE concentrations of residual radionuclides originating from the GRP pose risks that fall below limits deemed protective of the public. Similarly, the maximum modeled POE concentrations in groundwater are less than calculated derived concentration guideline levels.	The modeled maximum POE concentrations of residual radionuclides originating from the GRP pose risks that fall below limits deemed protective of the public. Similarly, the maximum modeled POE concentrations in groundwater are less than calculated derived concentration guideline levels.
Waste Management Impacts	All wastes generated would be licensed and managed in existing facilities on-site under existing procedures, monitoring, reporting and radiation protection plans.	All wastes generated would be licensed and managed in existing facilities on-site under existing procedures, monitoring, reporting and radiation protection plans.	No additional waste streams

Table 4-3 Summary of Total Water Collection, Injection, and Waste Water Production Rates and Volumes

Collect/Injection Round	Model Years	Off-Site Collection Rate (gpm)	Off-Site Waste Production Rate[1] (gpm)	Off-Site Injection Rate (gpm)	On-Site Collection Rate (gpm)	On-Site Waste Production Rate[2] (gpm)	On-Site Injection Rate (gpm)	Total Collection Rate (gpm)	Total Treatment Volume (gallons)	Total Injection Rate[3] (gpm)	Total Injection Volume (gallons)	Total Waste Production Rate (gpm)	Total Waste Water Volume (gallons)
Alternative 1													
1	1 through 3	-600	-90	556	-600	-150	700	-1200	1,892,160,000	1256	(1,980,460,800)	-240	378,432,000
2	4 through 6	-600	-90	553	-600	-150	700	-1200	1,892,160,000	1253	(1,975,730,400)	-240	378,432,000
3	7 through 9	-600	-90	560	-600	-150	700	-1200	1,892,160,000	1260	(1,986,768,000)	-240	378,432,000
4	10 through 12	-600	-90	560	-600	-150	700	-1200	1,892,160,000	1260	(1,986,768,000)	-240	378,432,000
5	13 through 15	-600	-90	560	-600	-150	700	-1200	1,892,160,000	1260	(1,986,768,000)	-240	378,432,000
6	16 through 18	-554	-83.1	530	-600	-150	700	-1154	1,819,627,200	1230	(1,939,464,000)	-233.1	367,552,080
7	19 through 36	-596	-89.4	558	-600	-150	700	-1196	82,348,905,600	1258	(86,617,828,800)	-239.4	2,264,915,520
8	37 through 150	-596	-89.4	558	-600	-150	700	-1196	82,348,905,600	1258	(86,617,828,800)	-239.4	14,218,636,320
9	151 through 1,000	0	0	0	-600	-150	700	-600	267,740,640,000	700	(312,364,080,000)	-150	67,014,000,000
									443,718,878,400		**(497,455,696,800)**		**85,757,263,920**
Alternative 2													
1	1 through 3	-600	-90	556	-600	-150	700	-1200	1,892,160,000	1256	(1,980,460,800)	-240	378,432,000
2	4 through 6	-600	-90	553	-600	-150	700	-1200	1,892,160,000	1253	(1,975,730,400)	-240	378,432,000
3	7 through 9	-600	-90	560	-600	-150	700	-1200	1,892,160,000	1260	(1,986,768,000)	-240	378,432,000
4	10 through 12	-600	-90	560	-600	-150	700	-1200	1,892,160,000	1260	(1,986,768,000)	-240	378,432,000
5	13 through 15	-600	-90	560	-600	-150	700	-1200	1,892,160,000	1260	(1,986,768,000)	-240	378,432,000
6	16 through 18	-554	-83.1	530	-600	-150	700	-1154	1,819,627,200	1230	(1,939,464,000)	-233.1	367,552,080
7	19 through 36	-596	-89.4	558	-600	-150	700	-1196	1,885,852,800	1258	(1,983,614,400)	-239.4	2,264,915,520
8	37 through 150	-596	-89.4	558	0	0	700	-596	35,398,108,800	1258	(74,716,142,400)	-89.4	5,309,716,320
9	151 through 1,000	0	0	0	0	0	0	0	-	0	-	0	-
									48,564,388,800		**(88,555,716,000)**		**9,834,343,920**
Alternative 3													
NA	1 through 1,000	None	None	None	None	None	None	None	None	None		None	None

Groundwater collection represents a withdrawal and is assigned a negative value (-) while injection adds water to the groundwater and is assigned a positive (+) value

[1]Off-Site water treated with zeolite, zeolite treatment efficacy: 85% (15 % of collected water as waste)

[2]On-Site water treated with RO, RO treatment efficacy: 75% (25 % of collected water as waste)

[3]Injection rates exceed collection rates to support containment

Table 4-4 Biota Concentration Guide Results from RESRAD-BIOTA Water

Radionuclide	Well water concentration (pC/L)	Biota Concentration Guide (pCi/L)	Ratio	Potential Radiation Effect?
Deer Mouse				
Radium-226	1.73E+00	8.16E+03	2.12E-04	no
Radium-228	1.73E+00	7.49E+03	2.31E-04	no
Thorium-230	2.31E-01	4.55E+05	5.08E-07	no
Uranium-234	2.40E+01	4.06E+05	5.91E-05	no
Uranium-235	1.10E+01	4.36E+05	2.52E-05	no
Uranium-238	2.40E+01	4.51E+05	5.32E-05	no
		Total	5.81E-04	no
Kit Fox				
Radium-226	1.73E+00	8.16E+03	2.12E-04	no
Radium-228	1.73E+00	7.49E+03	2.31E-04	no
Thorium-230	2.31E-01	4.55E+05	5.08E-07	no
Uranium-234	2.40E+01	4.06E+05	5.91E-05	no
Uranium-235	1.10E+01	4.38E+05	2.51E-05	no
Uranium-238	2.40E+01	4.55E+05	5.27E-05	no
Total			5.80E-04	no

BCG - Biota Concentration Guide

Table 4-5 Comparison of Maximum Predicted Well Water and Soil Concentrations to RESLs

Radionuclide	RESL Water (pCI/L)	Maximum Well Water Concentration (pCI/L)*	Hazard Quotient	RESL Soil (pCI/g)	Maximum Calculated Soil Concentration (pCi/g)**	Hazard Quotient
Radium-226	8.00E+03	1.73E+00	2.16E-04	5.00E+01	1.38E-02	2.76E-04
Radium-228	7.00E+03	1.73E+00	2.47E-04	4.00E+01	1.38E-02	3.45E-04
Thorium-230	4.13E+02	2.31E-01	5.59E-04	3.96E+04	9.60E-04	2.42E-08
Uranium-234	4.00E+05	2.40E+01	6.00E-05	5.00E+03	2.07E+00	4.14E-04
Uranium-235	4.00E+05	1.10E+00	2.75E-06	3.00E+03	9.52E-02	3.17E-05
Uranium-238	4.00E+05	2.40E+01	6.00E-05	2.00E+03	2.07E+00	1.04E-03
Sum of Fractions			1.15E-03			2.10E-03

* uranium concentrations apportioned assuming equilibrium

** soil values represent equilibrium after buildup from irrigation with well water

RESL = radioecological screening level

Table 4-6 Summary of Intakes and Predicted Hazard Quotients from Predicted Maximum Well Water Concentration for Inorganic Constituents

Consituent	Reference Dose (mg/kg/day)	Maximum Modeled Concentration (mg/L)	Intake (mg/day)			Average Daily Intake per 70 kg Adult (mg/kg/day) *	Hazard Quotient (unitless)
			Water	Vegetables	Total		
Arsenic	3.0E-04	7.4E-03	9.4E-03	3.7E-03	1.3E-02	1.9E-04	6.3E-01
Boron	2.0E-01	1.5E-02	1.9E-02	9.4E-04	2.0E-02	2.8E-04	1.4E-03
Cadmium	5.0E-04	3.1E-04	3.9E-04	9.8E-04	1.4E-03	2.0E-05	3.9E-02
Molybdenum	5.0E-03	6.7E-02	8.6E-02	4.3E-02	1.3E-01	1.8E-03	3.7E-01
Selenium	5.0E-03	6.7E-02	8.6E-02	4.3E-02	1.3E-01	1.8E-03	3.7E-01
Uranium	3.0E-03	7.2E-02	9.2E-02	9.1E-04	9.2E-02	1.3E-03	4.4E-01
Vanadium	7.0E-03	6.2E-03	7.9E-03	7.8E-05	7.9E-03	1.1E-04	1.6E-02
Fluoride	4.0E-02	1.5E-01	1.9E-01	1.9E-02	2.1E-01	2.9E-03	7.4E-02
Nitrate *	7.0E+00	3.2E+00	4.1E+00	1.5E+02	1.6E+02	2.2E+00	3.2E-01

* RfD is 1.6 mg nitrogen /kg/day, which converts to 7 mg/kg/day for nitrate
RfD - Reference Dose

Table 6-1 Occupational Monitoring Program Requirements

Type of Sample	Number of Samples	Locations	Frequency	Analytical Parameters
Lapel Personal Air Sample	As required by the Radiation Work Permit or at Radiation Safety Officer discretion	As required by the Radiation Work Permit (2-3 L/min or equivalent)	As required by the Radiation Work Permit or at Radiation Safety Officer discretion	Alpha, Natural Uranium
Lapel Air Sampler Calibration	All units in use	NA	As required by the Radiation Work Permit	Flow rate
Release of Equipment	As required by Radiation Work Permit	Potentially Contaminated Equipment and Material	As required by the Radiation Work Permit	Alpha, Beta, Gamma
ALARA	NA	As required by the Radiation Safety Officer	NA	As required by Radiation Safety Officer
Respiratory Protection [A]	As required by Radiation Work Permit	As required by the Radiation Work Permit	NA	NA
Bioassay	Entry/exit samples and as required by Radiation Work Permit	As required by the Radiation Work Permit	Entry/exit samples and as required by Radiation Work Permit	Natural Uranium in urine
Instrument Calibration	Variable	Radiation Detection Instruments in use	Annually	NA
Dosimetry	As required by the Radiation Work Permit or at Radiation Safety Officer discretion	Personnel	As required by the Radiation Work Permit or at Radiation Safety Officer discretion	Gamma
Personnel Contamination	As required by Radiation Work Permit	As required by the Radiation Work Permit	As required by the Radiation Work Permit	Alpha
Radiation Protection Training	As required	GRP	Initial and annual refresher for personnel that work in Controlled Areas	Training class and written test

A- Respiratory protection not expected to be necessary for current GRP decommissioning and reclamation activities.

modified from ERG, 2018

Table 7-1 Private Wells Not Currently Owned by HMC

Use Code	Use Description	Quantity
DOL	Domestic and Livestock Watering	0
DOM	Domestic One Household	18
EXP	Exploration	0
IND	Industrial	0
IRR	Irrigation	2
MUL	Multiple Domestic Households	1
MUN	Municipal - City or County Supplied Water	0
SAN	Sanitary In Conjunction With A Commercial Use	2
STK	Livestock Watering	0
SUB	Subdivision	0
	Total:	**23**

All properties have access to existing muncipal water lines

Table 7-2 Groundwater Application Rates and Bases of Estimates

Water Use	Application or Use Rate	Assumptions	Basis of Estimate	Source
Irrigation				
Alfalfa	34.2 inches/yr (2.85 ft/yr)		Water Application and Requirements for Crops, New Mexico.	https://nmwrri.nmsu.edu/wp-content/uploads/2015/watcon/proc2/Diebold.pdf
Carrots	55 inches/yr (4.58 ft/yr)		Commercial Production and Management of Carrots, Bulletin 1175, University of Georgia	https://extension.uga.edu/publications/detail.html?number=B1175&title=Commercial%20Production%20and%20Management%20of%20Carrots
Stock Watering				
No Permitted Wells	None			
Domestic Well				
Full Domestic Use	100 gpd/person	Supports one household of three people. Assume groundwater use for outdoor use only. Assume indoor water use (cooking, bathing, etc.) are supplied by municipal water	EPA: How We use Water; Domestic Water Use in Gallons Per day Per Person and Percent Population Growth from 2000 to 2015	https://www.epa.gov/watersense/how-we-use-water
Outdoor Use Only	50 gpd/person (50% of total use)	Assume groundwater use for outdoor use only	New Mexico Water Use by Categories Supplemental Report 2005	https://www.nrc.gov/docs/ML1030/ML103080984.pdf
Industrial//Commercial Sanitary				
10 staff per well	86 gpd/per staff	This groundwater use is considered for sanitary water associated with bathrooms and sinks for the light commercial properties in this area. A use rate of 86 gallon per day per employee is assumed (Pacific Institute, 2003).	Industrial and Commercial Water Use: Table C-1 Misc. manufacturing industries (SIC 39)	Pacific Institute, 2003, Appendix C
Exploration				
No diversion allocation	None		Exploration wells for natural resources are not used for groundwater diversion and are not considerd a current or projected future point of groundwater diversion.	

AMU = Animal Management Unit, 1,000 lb cow ft = feet gal = gallon gpd = gallons per day yr = year lb = pounds

Table 7-3 Projected Groundwater Use Demand and Groundwater Resource Value

Population Growth Rate	Current Demand Rate Estimate (gpm)	1,000-year Projected Water Use				Nominal Water Use Cost ($)		Present Value of Water Use Cost ($)		Demand		Present Value	
		High Growth Rate (3.76%/yr)		Low Growth Rate (-0.25%/yr)		High Growth Rate (3.76%/yr)	Low Growth Rate (-0.25%/yr)	High Growth Rate (3.76%/yr)	Low Growth Rate (-0.25%/yr)				
		(gallons)	(gpm)	(gallons)	(gpm)†					High	Low	High	Low
Domestic	2.1	21,702,243,000	41	244,951,500	0.5	$ 615,239,665	$ 1,613,107	$ 226,384	$ 149,548	2%	1%	3%	5%
Commercial	1.2	12,411,091,593	24	114,547,444	0.2	$ 21,558,562,382	$ 11,527,969	$ 902,885	$ 168,155	1%	0%	13%	5%
Irrigation	399.3	861,669,528,408	1,639	23,747,396,722	45	$ 2,762,661,210	$ 22,649,689	$ 5,613,413	$ 2,793,877	96%	99%	83%	90%
Total	402.6	895,782,863,001	1,704	24,106,895,665	46	$ 24,936,463,257	$ 35,790,765	$ 6,742,682	$ 3,111,580				

1.5% annual inflation rate for water rates

Discounted Cash Flow basis for present value

7% Discount Rate for first 100 years per NUREG-1757, Vol. 2, Appendix N, Section N.1.1.

3% Discount Rate after 100 years per NUREG-1757, Vol. 2, Appendix N, Section N.1.1.

†Domestic demand ceases after 140 years

†Commercial demand ceases after 356 years

†Irrgation demand ceases after 214 years

Table 7-4 Dose, Present Worth, and Value of Averted Dose for Each Alternative (Resident Gardener)

Constituent	Alternative 1	Alternative 2	Alternative 3
Maximum Base-Case Modeled POE Concentrations			
CONC (mg/L)	0.050	0.172	0.49
Uranium* (pCi/L)	33.97	116.42	332.69
Thorium-230 (pCi/L)	background	background	background
mbined Radium-226+228 (pCi/L)	background	background	background
Dose at base-case concentrations from all pathways (mrem/yr)			
Dose at Unit Concentration		3.41	
Uranium (person-mrem/yr)	4.28	14.68	41.96
Total person-rem/yr	0.004	0.015	0.042
†Total Present Worth of Averted Dose for 1,000 Years (person-rem)			
	11.63	39.84	113.86
†Benefit of Averted Dose for 1,000 Years ($)			
	$ 72,660	$ 249,030	$ 711,648

* converted from mg/L using 677 pCi/mg

† Based on Alluvial Aquifer Background of 0.16 mg/L

††27 pCi/Bq

CONC = average exposure concentration for all existing domestic wells in proposed control boundary, over 1,000 yrs

†Calculated per NUREG-1757, Vol.2, Rev. 1, Appendix N (NRC, 2006c), See Appenidx 4.4-B

Table 7-5 Summary of Groundwater Corrective Action Alternative Costs and Benefits

	Alternative 1	Alternative 2	Alternative 3
	Removal & Containment (No Action)	**Removal and Containment with Permeable Reative Barrier**	**Alternative Concentration Limits with Institutional Controls**
MONETIZED COSTS/BENEFITS RATIO (high)	**48**	**37**	**4**
MONETIZED COSTS/BENEFITS RATIO (low)	**102**	**76**	**8**
COSTS			
Total Monetized Costs (Present Value)	**$323,971,324**	**$256,572,463**	**$28,943,053**
Present Value of Total Direct Remedial Action Cost	$318,548,475	$251,753,065	$28,943,053
Total Direct Remedial Action Cost (nominal)	$8,289,052,313	$3,223,266,894	$31,403,259
Capital Costs	$925,355,010	$195,624,060	$0
Operating and Maintenance Costs	$7,343,552,534	$3,007,461,514	$11,595,420
Decomissioning Costs	$20,144,769	$20,181,320	$19,807,839
Monetized Indirect Costs	$5,422,849	$4,819,398	$0
Present Value of Irretrievable Waste Water	$5,422,849	$4,819,398	$0
Non-Monetized Indirect Costs	Low (highest cost)	Low (intermediate costs)	Low (lowest cost)
Occupational Non-radiological and Transportation Risks	Low (highest)	Low	Low (Lowest)
Environmental Impact	2 - Low/moderate	2 - Low/moderate	3- Low, lowest
Loss of Economic Use	3-Low	3-Low	3-Low
BENEFITS			
Monetized Benefits (Present Value-high)	**$6,815,342**	**$6,991,712**	**$7,454,330**
Monetized Benefits (Present Value-low)	**$3,184,240**	**$3,360,610**	**$3,823,228**
Monetized Direct Benefits - [a]Present Value of Water Resource (1,000 yrs - high)	$6,742,682	$6,742,682	$6,742,682
[1]Hypothetical High Population Growth (3.76%/yr)	$6,742,682		
[1]Hypothetical Low Population Growth (-0.25%/yr)	$3,111,580		
Monetized Indirect Benefits	$72,660	$249,030	$711,648
Benefit of Avoided Dose (B_{AD}) ($)	$72,660	$249,030	$711,648
Non-Monetized Indirect Benefits	Moderate (lowest benefit)	Moderate	Moderate (highest benefit)
Land Value Depreciation	Moderate	Moderate	Moderate
Timeliness of Remedy Completion	>1,000 years	>1,000 years	5-10 years
Aesthetics	Minor: Most Impact	Minor	Minor: Least Impact

[a]Based on replacing potential future groundwater demand with water from municipal water supply

Table 8-1 Summary of Environmental Consequences

Affected Environment	Alternative 1 - No Action Alternative			Alternative 2 - Extraction and Injection with Permeable Reactive Barrier			Alternative 3 - Proposed Action		
	Impacts	Actions to Mitigate Impacts	Unavoidable Adverse/Irreversible and Irretrievable Commitments of Resources/Short-and Long-Term Impacts	Adverse Impacts	Actions to Mitigate Impacts	Unavoidable Adverse/Irreversible and Irretrievable Commitments of Resources/Short-and Long-Term Impacts	Adverse Impacts	Actions to Mitigate Impacts	Unavoidable Adverse/Irreversible and Irretrievable Commitments of Resources/Short-and Long-Term Impacts
Water Resource Impacts	85.8 billion gallons of groundwater removed from the groundwater system	None	Loss of 85.8 billion gallons of groundwater from the groundwater system.	9.8 billion gallons of groundwater removed from the groundwater system	None	Loss of 9.8 billion gallons of groundwater from the groundwater system.	None	NA	NA
Ecological Resource Impacts	Risk to wildlife from 1,000 year operation of evaporation ponds. Ecological exposures mitigated by best management practices. No ecological hazards indicated from exposures to POE groundwater.	Best management practices and potential mitigation measures include placement of reflective ribbon on T-posts and placement of predatory decoy birds (i.e., falcons and owls) around the pond perimeters to create visual deterrents for bird use of the ponds.	None	Risk to wildlife from 1,000 year operation of evaporation ponds. Ecological exposures mitigated by best management practices. No ecological hazards indicated from exposures to POE groundwater.	Best management practices and potential mitigation measures include placement of reflective ribbon on T-posts and placement of predatory decoy birds (i.e., falcons and owls) around the pond perimeters to create visual deterrents for bird use of the ponds.	None	No pathway for wildlife exposure to groundwater after ACLs are approved.	Until ACL Approval, best management practices and potential mitigation measures include placement of reflective ribbon on T-posts and placement of predatory decoy birds (i.e., falcons and owls) around the pond perimeters to create visual deterrents for bird use of the ponds.	None
Occupational Health Impacts	Overall low occupational risks from decommissioning activities, construction, operations and maintenance activities Highest potential for occupational exposure due to 1,000 year duration of action.	Use personal protective equipment, training, and monitoring.	None	Overall low occupational risks from decommissioning activities, construction, operations and maintenance activities. Intermediate potential for occupational exposure due to 150 year duration of active pumping and periodic permeable reactive barrier replacement over 1,000 years.	Use personal protective equipment, training, and monitoring.	None	Occupational exposures related to one-time decomissioning and reclaiming of corrective action infrastructure which has previously been identified in the approved Reclamation Plan. Public exposure pathway eliminated through alternate water supply, land ownership, long-term active containment	Use personal protective equipment, training, and monitoring.	None