

APPENDIX A UNPATENTED MINING AND MILL SITE CLAIMS

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Table A.1 Unpatented Mining and Mill Site Claims

Claim Name	BLM Serial No.	Claim Type	Claim Name	BLM Serial No.	Claim Type
CYPRUS NO. 5	AMC 062897	Lode	PMB 30	AMC 403470	Mill Site
CYPRUS #15	AMC 062907	Lode	PMB 31	AMC 403471	Mill Site
PLYMOUTH	AMC 062915	Lode	PMB 32	AMC 403472	Mill Site
COMBINE NO. 2	AMC 079989	Lode	PMB 37	AMC 403477	Mill Site
JWH #24	AMC 308496	Lode	PMB 38	AMC 403478	Mill Site
JWH #25	AMC 308497	Lode	PMB 39	AMC 403479	Mill Site
JWH #33	AMC 308505	Lode	PMB 40	AMC 403480	Mill Site
JWH #34	AMC 308506	Lode	PMB 41	AMC 403481	Mill Site
JWH #44	AMC 308516	Lode	PMB 45	AMC 403485	Mill Site
JWH #45	AMC 308517	Lode	PMB 46	AMC 403486	Mill Site
KIM-31	AMC 362100	Mill Site	PMB 47	AMC 403487	Mill Site
KIM-32	AMC 362101	Mill Site	MPC 1	AMC 413793	Mill Site
KIM-33	AMC 362102	Mill Site	MPC 2	AMC 413794	Mill Site
LTB-16	AMC 397209	Mill Site	MPC 3	AMC 413795	Mill Site
LTB-17	AMC 397210	Mill Site	MPC 4	AMC 413796	Mill Site
LTB-21	AMC 397214	Mill Site	MPC 5	AMC 413797	Mill Site
LTB-27	AMC 397220	Mill Site	MPC 6	AMC 413798	Mill Site
PMB 1	AMC 403441	Mill Site	MPC 7	AMC 413799	Mill Site
PMB 2	AMC 403442	Mill Site	MPC 8	AMC 413800	Mill Site
PMB 3	AMC 403443	Mill Site	MPC 9	AMC 413801	Mill Site
PMB 4	AMC 403444	Mill Site	MPC 10	AMC 413802	Mill Site
PMB 5	AMC 403445	Mill Site	MPC 11	AMC 413803	Mill Site
PMB 6	AMC 403446	Mill Site	MPC 12	AMC 413804	Mill Site
PMB 7	AMC 403447	Mill Site	MPC 13	AMC 413805	Mill Site
PMB 8	AMC 403448	Mill Site	MPC 14	AMC 413806	Mill Site
PMB 10	AMC 403450	Mill Site	MPC 15	AMC 413807	Mill Site
PMB 11	AMC 403451	Mill Site	MPC 16	AMC 413808	Mill Site
PMB 12	AMC 403452	Mill Site	MPC 17	AMC 413809	Mill Site
PMB 13	AMC 403453	Mill Site	MPC 18	AMC 413810	Mill Site
PMB 14	AMC 403454	Mill Site	MPC 19	AMC 413811	Mill Site
PMB 15	AMC 403455	Mill Site	MPC 20	AMC 413812	Mill Site
PMB 16	AMC 403456	Mill Site	MPC 21	AMC 413813	Mill Site
PMB 17	AMC 403457	Mill Site	MPC 22	AMC 413814	Mill Site
PMB 18	AMC 403458	Mill Site	MPC 23	AMC 413815	Mill Site
PMB 19	AMC 403459	Mill Site	MPC 24	AMC 413816	Mill Site
PMB 20	AMC 403460	Mill Site	MPC 25	AMC 413817	Mill Site
PMB 21	AMC 403461	Mill Site	MPC 26	AMC 413818	Mill Site
PMB 24	AMC 403464	Mill Site	MPC 27	AMC 413819	Mill Site
PMB 25	AMC 403465	Mill Site	MPC 28	AMC 413820	Mill Site
PMB 26	AMC 403466	Mill Site	MPC 29	AMC 413821	Mill Site
PMB 27	AMC 403467	Mill Site	MPC 30	AMC 413822	Mill Site
PMB 28	AMC 403468	Mill Site	MPC 31	AMC 413823	Mill Site
PMB 29	AMC 403469	Mill Site	MPC 32	AMC 413824	Mill Site

Claim Name	BLM Serial No.	Claim Type
MPC 33	AMC 413825	Mill Site
MPC 34	AMC 413826	Mill Site
MPC 35	AMC 413827	Mill Site
MPC 36	AMC 413828	Mill Site
MPC 37	AMC 413829	Mill Site
MPC 38	AMC 413830	Mill Site
MPC 39	AMC 413831	Mill Site
MPC 40	AMC 413832	Mill Site
MPC 41	AMC 413833	Mill Site
MPC 42	AMC 413834	Mill Site
MPC 43	AMC 413835	Mill Site
MPC 44	AMC 413836	Mill Site
MPC 45	AMC 413837	Mill Site
MPC 46	AMC 413838	Mill Site
MPC 47	AMC 413839	Mill Site
MPC 48	AMC 413840	Mill Site
MPC 49	AMC 413841	Mill Site
MPC 50	AMC 413842	Mill Site
MPC 51	AMC 413843	Mill Site
MPC 52	AMC 413844	Mill Site
MPC 53	AMC 413845	Mill Site
MPC 54	AMC 413846	Mill Site
MPC 55	AMC 413847	Mill Site
MPC 56	AMC 413848	Mill Site
MPC 57	AMC 413849	Mill Site
MPC 58	AMC 413850	Mill Site
MPC 59	AMC 413851	Mill Site
MPC 60	AMC 413852	Mill Site
MPC 61	AMC 413853	Mill Site
MPC 62	AMC 413854	Mill Site
MPC 63	AMC 413855	Mill Site
MPC 64	AMC 413856	Mill Site
MPC 65	AMC 413857	Mill Site
MPC 66	AMC 413858	Mill Site
MPC 67	AMC 413859	Mill Site
MPC 68	AMC 413860	Mill Site
MPC 69	AMC 413861	Mill Site
MPC 70	AMC 413862	Mill Site
MPC 71	AMC 413863	Mill Site
MPC 72	AMC 413864	Mill Site
MPC 73	AMC 413865	Mill Site
MPC 74	AMC 413866	Mill Site
MPC 75	AMC 413867	Mill Site
MPC 76	AMC 413868	Mill Site

Claim Name	BLM Serial No.	Claim Type
MPC 77	AMC 413869	Mill Site
MPC 78	AMC 413870	Mill Site
MPC 79	AMC 413871	Mill Site
MPC 80	AMC 413872	Mill Site
MPC 81	AMC 413873	Mill Site
MPC 82	AMC 413874	Mill Site
MPC 83	AMC 413875	Mill Site
MPC 84	AMC 413876	Mill Site
MPC 85	AMC 413877	Mill Site
MPC 86	AMC 413878	Mill Site
MPC 87	AMC 413879	Mill Site
MPC 88	AMC 413880	Mill Site
MPC 89	AMC 413881	Mill Site
MPC 90	AMC 413882	Mill Site
MPC 91	AMC 413883	Mill Site
MPC 92	AMC 413884	Mill Site
MPC 93	AMC 413885	Mill Site
MPC 94	AMC 413886	Mill Site
MPC 95	AMC 413887	Mill Site
MPC 96	AMC 413888	Mill Site
MPC 97	AMC 413889	Mill Site
MPC 98	AMC 413890	Mill Site
MPC 99	AMC 413891	Mill Site
MPC 100	AMC 413892	Mill Site
MPC 101	AMC 413893	Mill Site
MPC 102	AMC 413894	Mill Site
MPC 103	AMC 413895	Mill Site
MPC 104	AMC 413896	Mill Site
MPC 105	AMC 413897	Mill Site
MPC 106	AMC 413898	Mill Site
MPC 107	AMC 413899	Mill Site
MPC 108	AMC 413900	Mill Site
MPC 109	AMC 413901	Mill Site
MPC 110	AMC 413902	Mill Site
MPC 111	AMC 413903	Mill Site
MPC 112	AMC 413904	Mill Site
MPC 113	AMC 413905	Mill Site
MPC 114	AMC 413906	Mill Site
MPC 115	AMC 413907	Mill Site
MPC 116	AMC 413908	Mill Site
MPC 117	AMC 413909	Mill Site
MPC 118	AMC 413910	Mill Site
MPC 119	AMC 413911	Mill Site
MPC 120	AMC 413912	Mill Site

Claim Name	BLM Serial No.	Claim Type
MPC 121	AMC 413913	Mill Site
MPC 122	AMC 413914	Mill Site
MPC 123	AMC 413915	Mill Site
MPC 124	AMC 413916	Mill Site
MPC 125	AMC 413917	Mill Site
MPC 126	AMC 413918	Mill Site
BULL 028	AMC 423245	Mill Site
BULL 029	AMC 423246	Mill Site
BULL 030	AMC 423247	Mill Site
BULL 031	AMC 423248	Mill Site
BULL 032	AMC 423249	Mill Site
BULL 033	AMC 423250	Mill Site
BULL 034	AMC 423251	Mill Site
BULL 035	AMC 423252	Mill Site
BULL 036	AMC 423253	Mill Site
BULL 037	AMC 423254	Mill Site
BULL 038	AMC 423255	Mill Site
BULL 039	AMC 423256	Mill Site
BULL 040	AMC 423257	Mill Site
BULL 041	AMC 423258	Mill Site
BULL 042	AMC 423259	Mill Site
BULL 043	AMC 423260	Mill Site
BULL 044	AMC 423261	Mill Site
BULL 045	AMC 423262	Mill Site
BULL 046	AMC 423263	Mill Site
BULL 047	AMC 423264	Mill Site
BULL 048	AMC 423265	Mill Site
BULL 049	AMC 423266	Mill Site
BULL 050	AMC 423267	Mill Site
BULL 051	AMC 423268	Mill Site
BULL 052	AMC 423269	Mill Site
BULL 053	AMC 423270	Mill Site
BULL 054	AMC 423271	Mill Site
BULL 055	AMC 423272	Mill Site
BULL 056	AMC 423273	Mill Site
BULL 057	AMC 423274	Mill Site
BULL 058	AMC 423275	Mill Site
BULL 059	AMC 423276	Mill Site
BULL 060	AMC 423277	Mill Site
BULL 061	AMC 423278	Mill Site
BULL 062	AMC 423279	Mill Site
BULL 063	AMC 423280	Mill Site
BULL 064	AMC 423281	Mill Site
BULL 065	AMC 423282	Mill Site

Claim Name	BLM Serial No.	Claim Type
BULL 066	AMC 423283	Mill Site
BULL 067	AMC 423284	Mill Site
BULL 068	AMC 423285	Mill Site
BULL 069	AMC 423286	Mill Site
BULL 070	AMC 423287	Mill Site
BULL 071	AMC 423288	Mill Site
BULL 072	AMC 423289	Mill Site
BULL 073	AMC 423290	Mill Site
BULL 074	AMC 423291	Mill Site
BULL 075	AMC 423292	Mill Site
BULL 076	AMC 423293	Mill Site
BULL 077	AMC 423294	Mill Site
BULL 078	AMC 423295	Mill Site
BULL 079	AMC 423296	Mill Site
BULL 080	AMC 423297	Mill Site
BULL 081	AMC 423298	Mill Site
BULL 082	AMC 423299	Mill Site
BULL 083	AMC 423300	Mill Site
BULL 084	AMC 423301	Mill Site
BULL 085	AMC 423302	Mill Site
BULL 086	AMC 423303	Mill Site
BULL 087	AMC 423304	Mill Site
BULL 088	AMC 423305	Mill Site
BULL 089	AMC 423306	Mill Site
BULL 090	AMC 423307	Mill Site
BULL 091	AMC 423308	Mill Site
BULL 092	AMC 423309	Mill Site
BULL 093	AMC 423310	Mill Site
BULL 094	AMC 423311	Mill Site
BULL 095	AMC 423312	Mill Site
STEP 027	AMC 423339	Mill Site
STEP 028	AMC 423340	Mill Site
STEP 029	AMC 423341	Mill Site
STEP 030	AMC 423342	Mill Site
STEP 031	AMC 423343	Mill Site
STEP 032	AMC 423344	Mill Site
STEP 038	AMC 423350	Mill Site
STEP 039	AMC 423351	Mill Site
STEP 040	AMC 423352	Mill Site
STEP 041	AMC 423353	Mill Site
STEP 042	AMC 423354	Mill Site
STEP 043	AMC 423355	Mill Site
STEP 044	AMC 423356	Mill Site
STEP 051	AMC 423363	Mill Site

Claim Name	BLM Serial No.	Claim Type
STEP 052	AMC 423364	Mill Site
STEP 053	AMC 423365	Mill Site
STEP 054	AMC 423366	Mill Site
STEP 055	AMC 423367	Mill Site
STEP 056	AMC 423368	Mill Site
STEP 057	AMC 423369	Mill Site

Claim Name	BLM Serial No.	Claim Type
STEP 058	AMC 423370	Mill Site
STEP 059	AMC 423371	Mill Site
STEP 060	AMC 423372	Mill Site
STEP 061	AMC 423373	Mill Site

Table A.2 Unpatented Mining and Mill Site Claims

Claim Name	BLM Serial No.	Claim Type
BEV 1	AMC 305766	Mill Site
BEV 2	AMC 305767	Mill Site
BEV 3	AMC 305768	Mill Site
BEV 4	AMC 305769	Mill Site
BEV 5	AMC 305770	Mill Site
BEV 6	AMC 305771	Mill Site
BEV 7	AMC 305772	Mill Site
BEV 8	AMC 305773	Mill Site
BEV 9	AMC 305774	Mill Site
BEV 10	AMC 305775	Mill Site
BEV 11	AMC 305776	Mill Site
BEV 12	AMC 305777	Mill Site
BEV 13	AMC 305778	Mill Site
BEV 14	AMC 305779	Mill Site
BEV 15	AMC 305780	Mill Site
BEV 16	AMC 305781	Mill Site
BEV 17	AMC 305782	Mill Site
BEV 18	AMC 305783	Mill Site
BEV 19	AMC 305784	Mill Site
BEV 20	AMC 305785	Mill Site
BEV 21	AMC 305786	Mill Site
BEV 22	AMC 305787	Mill Site
BEV 23	AMC 305788	Mill Site
BEV 24	AMC 305789	Mill Site
BEV 25	AMC 305790	Mill Site
BEV 26	AMC 305791	Mill Site
BEV 27	AMC 305792	Mill Site
BEV 28	AMC 305793	Mill Site
BEV 29	AMC 305794	Mill Site
BEV 30	AMC 305795	Mill Site

Claim Name	BLM Serial No.	Claim Type
BEV 31	AMC 305796	Mill Site
BEV 32	AMC 305797	Mill Site
BEV 33	AMC 305798	Mill Site
BEV 34	AMC 305799	Mill Site
BEV 35	AMC 305800	Mill Site
BEV 36	AMC 305801	Mill Site
BEV 37	AMC 305802	Mill Site
BEV 38	AMC 305803	Mill Site
BEV 39	AMC 305804	Mill Site
BEV 40	AMC 305805	Mill Site
BEV 41	AMC 305806	Mill Site
BEV 42	AMC 305807	Mill Site
BEV 43	AMC 305808	Mill Site
BEV 44	AMC 305809	Mill Site
BEV 45	AMC 305810	Mill Site
BEV 46	AMC 305811	Mill Site
BEV 47	AMC 305812	Mill Site
BEV 48	AMC 305813	Mill Site
BEV 49	AMC 305814	Mill Site
BEV 50	AMC 305815	Mill Site
BEV 51	AMC 305816	Mill Site
BEV 52	AMC 305817	Mill Site
BEV 53	AMC 305818	Mill Site
BEV 54	AMC 305819	Mill Site
JWH #1	AMC 308473	Lode
JWH #4	AMC 308476	Lode
JWH #5	AMC 308477	Lode
JWH #10	AMC 308482	Lode
JWH #11	AMC 308483	Lode
JWH #16	AMC 308488	Lode

Claim Name	BLM Serial No.	Claim Type
JWH #17	AMC 308489	Lode
JWH 81	AMC 322632	Lode
JWH 83	AMC 322634	Lode
KIM-1	AMC 362070	Mill Site
KIM-2	AMC 362071	Mill Site
KIM-3	AMC 362072	Mill Site
KIM-4	AMC 362073	Mill Site
KIM-5	AMC 362074	Mill Site
KIM-6	AMC 362075	Mill Site
KIM-7	AMC 362076	Mill Site
KIM-8	AMC 362077	Mill Site
KIM-9	AMC 362078	Mill Site
KIM-10	AMC 362079	Mill Site
KIM-11	AMC 362080	Mill Site
KIM-12	AMC 362081	Mill Site
KIM-13	AMC 362082	Mill Site
KIM-14	AMC 362083	Mill Site
KIM-15	AMC 362084	Mill Site
KIM-16	AMC 362085	Mill Site
KIM-17	AMC 362086	Mill Site
KIM-18	AMC 362087	Mill Site
KIM-19	AMC 362088	Mill Site
KIM-20	AMC 362089	Mill Site
KIM-21	AMC 362090	Mill Site
KIM-24	AMC 362093	Mill Site
KIM-25	AMC 362094	Mill Site
KIM-26	AMC 362095	Mill Site
KIM-27	AMC 362096	Mill Site
KIM-28	AMC 362097	Mill Site
KIM-31	AMC 362100	Mill Site
KIM-32	AMC 362101	Mill Site
KIM-33	AMC 362102	Mill Site
WP-1	AMC 364582	Mill Site
WP-2	AMC 364583	Mill Site
WP-3	AMC 364584	Mill Site
WP-4	AMC 364585	Mill Site
WP-5	AMC 364586	Mill Site
WP-6	AMC 364587	Mill Site
WP-7	AMC 364588	Mill Site
WP-14	AMC 364595	Mill Site
WP-16	AMC 364597	Mill Site
WP-25	AMC 366984	Mill Site
WP-28	AMC 366987	Mill Site
LTB-7	AMC 397200	Mill Site

Claim Name	BLM Serial No.	Claim Type
LTB-9	AMC 397202	Mill Site
LTB-11	AMC 397204	Mill Site
LTB-12	AMC 397205	Mill Site
LTB-13	AMC 397206	Mill Site
LTB-14	AMC 397207	Mill Site
LTB-15	AMC 397208	Mill Site
LTB-16	AMC 397209	Mill Site
LTB-17	AMC 397210	Mill Site
PMB 47	AMC 403487	Mill Site
MPC 112	AMC 413904	Mill Site
MPC 113	AMC 413905	Mill Site
MPC 114	AMC 413906	Mill Site
MPC 115	AMC 413907	Mill Site
MPC 116	AMC 413908	Mill Site
MPC 117	AMC 413909	Mill Site
MPC 118	AMC 413910	Mill Site
MPC 119	AMC 413911	Mill Site
MPC 120	AMC 413912	Mill Site
MPC 121	AMC 413913	Mill Site
MPC 122	AMC 413914	Mill Site
MPC 123	AMC 413915	Mill Site
MPC 124	AMC 413916	Mill Site
MPC 125	AMC 413917	Mill Site
MPC 126	AMC 413918	Mill Site
GAP 1	AMC 418824	Mill Site
GAP 2	AMC 418825	Mill Site
GAP 3	AMC 418826	Mill Site
GAP 4	AMC 418827	Mill Site
BULL 001	AMC 423218	Mill Site
BULL 002	AMC 423219	Mill Site
BULL 003	AMC 423220	Mill Site
BULL 004	AMC 423221	Mill Site
BULL 005	AMC 423222	Mill Site
BULL 006	AMC 423223	Mill Site
BULL 007	AMC 423224	Mill Site
BULL 008	AMC 423225	Mill Site
BULL 009	AMC 423226	Mill Site
BULL 010	AMC 423227	Mill Site
BULL 011	AMC 423228	Mill Site
BULL 012	AMC 423229	Mill Site
BULL 013	AMC 423230	Mill Site
BULL 014	AMC 423231	Mill Site
BULL 015	AMC 423232	Mill Site
BULL 016	AMC 423233	Mill Site

Claim Name	BLM Serial No.	Claim Type
BULL 017	AMC 423234	Mill Site
BULL 018	AMC 423235	Mill Site
BULL 019	AMC 423236	Mill Site
BULL 020	AMC 423237	Mill Site
BULL 021	AMC 423238	Mill Site
BULL 022	AMC 423239	Mill Site
BULL 023	AMC 423240	Mill Site
BULL 024	AMC 423241	Mill Site
BULL 025	AMC 423242	Mill Site
BULL 026	AMC 423243	Mill Site
BULL 027	AMC 423244	Mill Site
STEP 011	AMC 423323	Mill Site
STEP 012	AMC 423324	Mill Site
STEP 013	AMC 423325	Mill Site
STEP 014	AMC 423326	Mill Site
STEP 015	AMC 423327	Mill Site
STEP 016	AMC 423328	Mill Site
STEP 017	AMC 423329	Mill Site
STEP 018	AMC 423330	Mill Site
STEP 019	AMC 423331	Mill Site
STEP 020	AMC 423332	Mill Site
STEP 021	AMC 423333	Mill Site

Claim Name	BLM Serial No.	Claim Type
STEP 022	AMC 423334	Mill Site
STEP 023	AMC 423335	Mill Site
STEP 024	AMC 423336	Mill Site
STEP 025	AMC 423337	Mill Site
STEP 026	AMC 423338	Mill Site
STEP 032	AMC 423344	Mill Site
STEP 033	AMC 423345	Mill Site
STEP 034	AMC 423346	Mill Site
STEP 035	AMC 423347	Mill Site
STEP 036	AMC 423348	Mill Site
STEP 037	AMC 423349	Mill Site
STEP 038	AMC 423350	Mill Site
STEP 039	AMC 423351	Mill Site
STEP 044	AMC 423356	Mill Site
STEP 045	AMC 423357	Mill Site
STEP 046	AMC 423358	Mill Site
STEP 047	AMC 423359	Mill Site
STEP 048	AMC 423360	Mill Site
STEP 049	AMC 423361	Mill Site
STEP 050	AMC 423362	Mill Site
STEP 051	AMC 423363	Mill Site

APPENDIX B CURRENT AQUIFER PROTECTION PERMIT

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SEP 12 2013

Freeport McMoRan Bagdad Inc.
Environmental Department

AQUIFER PROTECTION PERMIT NO. P-105258

p. 1 of 45

STATE OF ARIZONA
AQUIFER PROTECTION PERMIT NO. P-105258
SIGNIFICANT AMENDMENT
PLACE ID 1390, LTF 57247

1.0 AUTHORIZATION

In compliance with the provisions of Arizona Revised Statutes (A.R.S.) Title 49, Chapter 2, Articles 1, 2 and 3, Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Articles 1 and 2, A. A. C. Title 18, Chapter 11, Article 4 and amendments thereto, and the conditions set forth in this permit, Freeport-McMoRan Bagdad Inc. is hereby authorized to operate the discharging facilities located at the Freeport-McMoRan Bagdad Inc. Bagdad Mine near Bagdad, Yavapai County, Arizona, over groundwater of the Burro Creek groundwater basin, in Township 14 North, Range 9 West and 10 West; and Township 15 North, Range 9 West and 10 West of the Gila and Salt River Base Line and Meridian.

This permit becomes effective on the date of the Water Quality Division Director's signature and shall be valid for the life of the facility (operational, closure, and post-closure periods), unless suspended or revoked pursuant to A.A.C. R18-9-A213. The permittee shall construct, operate and maintain the permitted facilities:

1. Following all the conditions of this permit including the design and operational information documented or referenced below, and
2. Such that Aquifer Water Quality Standards (AWQS) are not violated at the applicable point(s) of compliance (POC) set forth below, or if an AWQS for a pollutant has been exceeded in an aquifer at the time of permit issuance, that no additional degradation of the aquifer relative to that pollutant, and as determined at the applicable POC, occurs as a result of the discharge from the facility.

1.1 PERMITTEE INFORMATION

Facility Name: Freeport-McMoRan Bagdad Inc.

Permittee:	Mailing Address:	Facility's Street Address:
Freeport-McMoRan Bagdad Inc.	P.O. Box 245 Bagdad, AZ 86321	None
Facility Contact: Mike Sanders	Senior Environmental Engineer	(928) 633-3486
Emergency Telephone Number:	(928) 633-3211	
Latitude: 34° 35' 14" North	Longitude: 113° 14' 10" West	
Legal Description: Township 14 North, Range 9 West and 10 West; and Township 15 North, Range 9 West and 10 West of the Gila and Salt River Base Line and Meridian		

1.2 AUTHORIZING SIGNATURE



 Michael A. Fulton, Director
 Water Quality Division
 Arizona Department of Environmental Quality

Signed this 28th day of August, 2013

THIS AMENDMENT SUPERCEDES ALL PREVIOUS AMENDMENTS

2.0 SPECIFIC CONDITIONS [A.R.S. §§ 49-203(4), 49-241(A)]**2.1 Facility / Site Description [A.R.S. § 49-243(K)(8)]**

The site includes the following permitted discharging facilities:

Table 2.1 Discharging Facilities

Copper Creek PLS Pond System (pond and conveyance channel) (D-10)	34° 36' 12" N	113° 13' 46" W
Boulder Flood Basin (D-11)	34° 36' 19" N	113° 13' 48" W
Raffinate Pond (D-13)	34° 36' 05" N	113° 13' 00" W
PLS Surge Pond (D-14)	34° 36' 04" N	113° 12' 58" W
Strong PLS Pond (D-20)	34° 35' 46" N	113° 14' 03" W
Upper Niagara Leach Dump (D-6)	34° 35' 04" N	113° 13' 53" W
Plan IX Leach Dump (D-15)	34° 34' 36" N	113° 13' 30" W
Mineral Creek Leach Dump (D-18)	34° 34' 30" N	113° 12' 52" W
Copper Creek Leach Dump (D-7)	34° 35' 56" N	113° 13' 31" W
Crystal Mountain Leach Dump (D-19)	34° 35' 48" N	113° 13' 42" W
Mulholland Tailings Pond (D-1)	34° 35' 34" N	113° 15' 11" W
Mulholland Seepage Collection Pond (D-2)	34° 35' 51" N	113° 15' 26" W
Last Chance Pond (D-3)	34° 35' 39" N	113° 14' 20" W
Mammoth Tailings Impoundment (D-23)	34° 35' 04" N	113° 16' 11" W

Upper Mammoth Tailings Impoundment (D-24)	34° 34' 10" N	113° 14' 41" W
Mammoth Tailings Seepage Collection Pond (D-25)	34° 35' 19" N	113° 17' 50" W
South Waste Rock Disposal Facility (D-26)	34° 34' 07" N	113° 12' 10" W
Catchments within the PCCZ (D-27)	See Table 4.1.1	See Table 4.1.1

The permit authorizes the operation of the discharging facilities described below:

2.1.1 Copper Creek PLS Pond System (D-10)(Process Solution Impoundment)

The facility is a process solution pond system consisting of an 80-mil HDPE-lined channel leading from the toe of the Copper Creek Leach Dump to the Copper Creek PLS Pond. The PLS pond system is constructed on Quaternary gravels of moderate hydraulic conductivity underlain by Precambrian granite. The pond has a design capacity of 4.5 million gallons, with a depth of 20 feet. Process solution from the pond is pumped to the SX-EW Plant for processing.

2.1.2 Boulder Flood Basin (D-11)(Non-stormwater Impoundment)

The facility is a double lined impoundment equipped with a Leak Collection and Removal System (LCRS) that receives stormwater run-off and contains process solution overflow due to process upsets in the Copper Creek leach system. The primary liner is an 80-mil HDPE geomembrane and the secondary liner consisting of a compacted, amended soil liner. The primary 80-mil HDPE liner is secured in an engineered anchor trench. The overflow ditch from the Copper Creek PLS Pond leading to the Boulder Flood Basin is lined with an 80-mil HDPE geomembrane. The impoundment is located in a Quaternary alluvium consisting of gravelly silts and clays partially underlain by Precambrian Alaskite Porphyry. The impoundment has a solution holding capacity of 37 million gallons. The impoundment has a 30 ft. deep by 12 ft. wide soil cutoff wall down gradient of the facility with an 80-mil HDPE lined face designed to intercept subsurface flows. The cutoff wall is equipped with a sump and pump-back system to capture any seepage from the cutoff wall. The impoundment receives stormwater run-off and contains process solution overflow due to process upsets in the Copper Creek leach system. The facility is designed with pumping system capability to divert solution to the Bagdad open pit, the Mulholland Tailings Pond, Mammoth Tailings Pond, or the Copper Creek PLS Pond System. Potential discharges from the Boulder Flood Basin to Boulder Creek are addressed under the terms and provisions of an individual AZPDES permit (AZ0022268).

2.1.3 Raffinate Pond (D-13)(Process Solution Impoundment)

The facility is a double-lined process solution impoundment equipped with LCRS. The liner system consists of an 80-mil HDPE primary geomembrane, with the secondary liner consisting of compacted two feet thick Gila Formation (rhyolite tuff and clay). The geomembrane is secured in an engineered anchor trench around the pond perimeter. The impoundment has a maximum solution holding capacity of approximately 0.5 million gallons, at a depth of approximately 6 feet. To avoid potential overflow, the impoundment is equipped with an automatic, high level alarm system. The raffinate solution is used in the leach process.

2.1.4 PLS Surge Pond (D-14)(Process Solution Impoundment)

The facility is a double-lined process solution impoundment equipped with LCRS. The liner system

consists of an 80-mil HDPE primary geomembrane, with the secondary liner consisting of compacted two feet thick Gila Formation (rhyolite tuff and clay). The geomembrane and the geonet/geotextile composite used in the LCRS are secured in an engineered anchor trench around the pond perimeter. The pond is constructed on non-mineralized material of the Mine Shop Overburden Dump. The pond has a maximum solution holding capacity of approximately 1.5 million gallons, with a depth of 8 feet. The pond receives process solution from various PLS collection facilities from where it is pumped to the SX-EW Plant for processing. To avoid potential overflow, the PLS Surge Pond is equipped with an automatic, high level alarm system.

2.1.5 Strong PLS Pond (D-20)(Process Solution Impoundment)

The facility is a double-lined impoundment equipped with LCRS. The double liner consists of a 60-mil HDPE primary and secondary liner, with a 200-mil HDPE geonet between the two liners for drainage. The lower liner is a composite liner underlain by a minimum of 6-inch minus low hydraulic conductivity compacted soil. The pond is designed to contain maximum fluid volume of 3.86 million gallons plus direct precipitation from the 100-year, 24-hour storm event while maintaining 2 feet of freeboard. The total depth of the pond is 26 feet.

2.1.6 Upper Niagara Leach Dump (D-6)(Leach Dump)

The facility is a low grade leach dump located on alluvial valley-fill, underlain primarily by the Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected at the downstream toe of the dump and gravity flows to the Upper Niagara PLS Pond (D-5).

2.1.7 Copper Creek Leach Dump (D-7)(Leach Dump)

The facility is a low grade leach dump located on alluvial valley-fill, underlain primarily by the Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected at the concrete cutoff wall constructed at the downstream toe of the dump and gravity flows to the Copper Creek PLS Pond System.

2.1.8 Plan IX Leach Dump (D-15)(Leach Dump)

The facility is a low grade leach dump located on alluvial valley-fill, underlain primarily by the Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected at the downstream toe of the dump and gravity flows to the Alum Sump PLS Pond, Mineral Creek Sump and Kimberly Pond. Diversion ditches located up gradient of the dump divert the stormwater run-on away from the facility.

2.1.9 Mineral Creek Leach Dump (D-18)(Leach Dump)

The facility is a low grade leach dump located within a well-defined canyon, underlain primarily by the Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected at the downstream toe of the dump and gravity flows to the Mineral Creek Sump. Diversion ditches are located up gradient of the dump to divert stormwater run-on away from the facility.

2.1.10 Crystal Mountain Leach Dump (D-19)(Leach Dump)

This facility is located within the footprint of the existing Copper Creek Leach dump. The ore material (mixed sulfide and oxide ore) is placed over existing leached ore that is underlain by Precambrian crystalline bedrock. The leach dump is constructed over steeply sloping natural terrain using end dumping method of construction. The leachate (PLS) from the dump is collected by the Copper Creek PLS Pond System.

2.1.11 Mulholland Tailings Pond (D-1)(Tailings Impoundment)

The facility is a tailings dam used primarily as a recycled water storage facility for site-wide water

management purposes and, as needed, as a secondary tailings disposal impoundment. The facility is constructed employing centerline dam construction method, using a combination of spigotting and cycloning of tailings material. The impoundment is located over predominantly Precambrian crystalline rocks. The tailings dam and pond cover an area of approximately 500 acres and contain approximately 120 million dry tons of tailings. The water in the tailings pond has an alkaline pH, reflecting the large volume of alkaline tailings that are stored within the impoundment. The Mulholland Tailings Pond includes a saddle dam to the south of the primary tailings embankment. Drainage from the saddle dam reports to the Mammoth Tailings Pond. At times, Bagdad Pit water and stormwater runoff and process solutions from the Boulder flood Basin (D-11) that is transferred to the Bagdad Pit will be directed to the Mulholland Tailings Pond. Before being discharged, these waters, and any other potentially acidic waters, are tested and the pH is adjusted, as necessary, to ensure compatibility with the impoundment and for operational reuse of the water. Upset flows from the concentrator area are also discharged to the impoundment. The facility receives effluent from the Concentrator Waste Water Treatment Plant (WWTP) and Bagdad Townsite WWTP. Downstream of the tailings impoundment is a seepage collection pond and pumpback system.

2.1.12 Mulholland Tailings Seepage Collection Pond (D-2)(Non-stormwater Impoundment)

The facility is a lined impoundment formed by a seepage collection dam constructed adjacent to the downstream toe of the Mulholland tailings embankment. The dam is a compacted rock-fill dam with a reinforced gunnite facing on its entire surface and has a concrete lined basin. The seepage pond is located over predominantly Precambrian crystalline rocks. The impoundment has an approximate storage capacity of 531,000 gallons, with an average depth of approximately 6 feet. Collected seepage is pumped back to the Mulholland Tailings Pond using two vertical turbine pumps. Both pumps are equipped with automatic level controls and have a combined design capacity of 1,175 gpm. The impoundment receives seepage of approximately 300 to 400 gpm from the Mulholland Tailings Pond. Potential discharges from the Mulholland Seepage Pond to Mulholland Wash are addressed under the terms and provisions of an individual AZPDES permit (AZ0022268).

2.1.13 Last Chance Pond (D-3)(Non-stormwater Impoundment)

The facility is a concrete-lined impoundment, located within the Mulholland Tailings Pond. The Mulholland Tailings Pond is located over predominantly Precambrian crystalline rocks (with minor Quaternary alluvium underlying Mulholland Impoundment). The pond solution is strongly alkaline (pH 11.1 SU), with a trace of metal concentrations and elevated sulfate. The pond is equipped with an automatic pumpback system to return solution to the concentrator circuit for re-use. The impoundment is used as a containment pond for runoff from the concentrator area and emergency process overflows from the concentrator circuit.

2.1.14 Mammoth Tailings Impoundment (D-23)(Tailings Storage Facility)

The facility is a tailing dam constructed using the centerline dam construction method, via a combination of spigotting and cycloning of tailings material. The maximum areal extent of the tailings impoundment is described in Figure 1 of the approved design plans provided in the July 18, 2007, *Site Characterization & Design Studies*. Process fluids include: water from the Freeport-McMoRan Bagdad water supply system; water pumped from the tailings seepage collection system and the tailings water reclaim and return system; wastewater effluent from the Bagdad Townsite Wastewater Treatment Plant (WWTP) and reagents that are manufactured, processed, and used in compliance with the federal Toxic Substances Control Act. The facility has a maximum capacity of 900,000,000 tons of tailings and a maximum permitted dam crest elevation of 3,600 feet above mean sea level. Tailings are delivered to the tailings impoundment at a rate not exceeding 200,000 dry tons per day.

2.1.15 Upper Mammoth Tailings Impoundment (D-24)(Tailings Storage Facility)

The facility is a tailing dam constructed using the centerline dam construction method, via a combination of spigotting and cycloning of tailings material. The maximum areal extent of the tailings impoundment is depicted in Figure 1 of the approved design plans provided in the July 18, 2007, *Site Characterization & Design Studies*. Process fluids include: water from the Freeport-McMoRan

Bagdad water supply system; water pumped from the tailings seepage collection system and the tailings water reclaim and return system; wastewater effluent from the Bagdad Townsite WWTP and reagents that are manufactured, processed, and used in compliance with the federal Toxic Substances Control Act. The facility has a maximum capacity of 600,000,000 tons of tailings and a maximum permitted dam crest elevation of 4,050 feet above mean sea level. Tailings are delivered to the tailings impoundment at a rate not exceeding 200,000 dry tons per day during ore processing.

2.1.16 Mammoth Tailings Seepage Collection Pond (D-25)(Non-stormwater Impoundment)

The facility is constructed with a gunite liner and has a normal operating capacity of approximately 350,000 gallons. The facility is located at an elevation of 2,740 feet above sea level. The dam, constructed upon crystalline bedrock, is a compacted rock fill dam with a 12-inch concrete facing on its entire surface. In addition, a seepage sump is located at an elevation of 2,730 feet above sea level immediately downstream from the dam. The seepage sump is a 1-foot-diameter well, extending to a depth of 11 feet in the gravels of Mammoth Wash. The seepage is pumped back to the Mammoth Tailings Impoundment.

2.1.17 South Waste Rock Disposal Facility (D-26)

The facility is a waste rock pile and has a maximum capacity of 660,000,000 tons of mining overburden. Maximum permitted elevation of the facility is 4,800 feet above mean sea level. The maximum areal extent of the waste rock disposal facility is described in Figure 4 of the revised Life of Mine (LOM) design plans provided in the February, 2010, *Request for Other Amendment to APP 101353 South Waste Rock Disposal Facility Expansion*.

2.1.18 Catchments within the PCCZ (D-27)

This group of facilities includes all existing (Upper Niagara Pond (D-4), Upper Niagara PLS Pond (D-5), Alum Sump PLS Pond (D-21), and Kimberly Pond (D-22)) and future collection and diversion points, including sumps and impoundments, for the process solution/stormwater within the passive containment capture zone (PCCZ) created by the mine open pit.

Upper Niagara Pond (D-4) (Process Solution Pond)

The facility is an impoundment located on top of the Upper Niagara Leach Dump (D-6) confined in a valley. The pond is lined with a 2-foot thick compacted clay liner, underlain by leach dump material placed on the Precambrian crystalline bedrock of relatively low hydraulic conductivity. The pond receives process solution and stormwater and has a design capacity of approximately 20 million gallons. Accumulated fluid in the impoundment is pumped back into the leach circuit. The pond is situated within the passive containment capture zone of the existing open pit. Consequently, any discharge from the pond will be captured by the open pit.

Upper Niagara PLS Pond (D-5) (Process Solution Pond)

The facility is an impoundment consisting of an earthen dam and 2-foot thick compacted clay liner underlain by Precambrian crystalline bedrock of relatively low hydraulic conductivity. The pond receives process solution and stormwater from the Upper Niagara Leach Dump which is conveyed by gravity through an HDPE pipeline to N5/N6 pumping station. Process solution from the N5/N6 pumping station is pumped to the SX/EW Plant, or when not actively leaching, residual flow can be diverted inot Copper Creek Leach Dump (D-19). The pond operating volume is approximately 10,000 gallons and the average operating depth is 3 feet. Excess solution overflow is contained within the Copper Creek Leach Dump. The pond is situated within the passive containment capture zone of the existing open pit. Consequently, any discharge from the pond will be captured by the open pit.

Alum Sump PLS Pond (D-21) (Process Solution Impoundment)

The facility is a lined impoundment designed to receive leachate from the Plan IX Leach Dump. The impoundment has a total solution capacity of approximately 774,000 gallons, including approximately 414,000 gallons at the normal operating level, and an approximate total depth of 12 feet, including 8 feet at the normal operating level. Accumulated process solution is pumped through an HDPE pipeline

to the SX-EW Plant. The pond is situated within the passive containment zone of the existing open pit. Consequently, any discharge from the pond will be captured by the open pit.

Kimberly Pond (D-22) (Process Solution Impoundment)

The facility receives leachate and stormwater runoff from the Plan IX leach stockpile. The base of Kimberly Pond is comprised of a 2-foot-thick layer of compacted Gila Conglomerate. The area is underlain by crystalline bedrock that is covered with approximately 150-feet of historic Kimberly tailings. The pond has an operating solution holding capacity of approximately 17.9-million gallons. The pond is protected from stormwater run-on by ditches and berms and is surrounded on all sides by leach stockpiles. A slope stability analysis for Kimberly Pond has determined acceptable factors of safety for both static and pseudostatic loading conditions. The pond is situated within the passive containment zone of the existing open pit. Consequently, any discharge from the pond will be captured by the open pit.

Annual Registration Fee [A.R.S. § 49-242]

The Annual Registration Fee for this permit is established by A.R.S. § 49-242 and is payable to ADEQ each year. The design flow is greater than 10,000,000 gallons per day.

Financial Capability [A.R.S. § 49-243(N) and A.A.C. R18-9-A203]

The permittee shall maintain financial capability throughout the life of the facility. The financial assurance mechanism was demonstrated through A.A.C. R18-9-A203(C)(8) using a corporate guarantee in the amount of \$68,844,193 to cover the financial assurance obligations of APPs P-105258 (consolidated with P-101353 [\$67,650,193]), P-102896 (\$746,000), and P50007300A (\$448,000) at the Bagdad mine site.

2.2 Best Available Demonstrated Control Technology

[A.R.S. § 49-243(B) and A.A.C. R18-9-A202(A)(5)]

All of the discharging facilities listed in Table 2.1 employs the BADCT requirements as set forth in Arizona Revised Statutes (A.R.S.) § 49-243.B.1. All permitted facilities shall be constructed, operated, and maintained in accordance with BADCT requirements, as outlined in the application and permit Section 4.0, Table 4.1.1. The operational requirements for BADCT are presented in Table 4.2.1. The mine open pit passive containment capture zone (PCCZ) shall be evaluated every five years in accordance with permit Section 2.5.3.6.

2.2.1 Engineering Design

The facilities list, with BADCT descriptions, is included in Section 4, Table 4.1.1.

2.2.2 Site-specific Characteristics

Site-specific characteristics such as foundation rock of low hydraulic conductivity and within the PCCZ support the BADCT demonstration for several regulated facilities. The passive containment created by the Bagdad Mine Open Pit is used as an integral part of BADCT (A.R.S. § 49-243[G]) for the following facilities:

Catchments within PCCZ (D-27) currently consist of existing facilities (Kimberly Pond [D-22], Upper Niagara Pond [D-4], Upper Niagara PLS Pond [D-5], and Alum Sump PLS Pond [D-21]) and future facilities. These facilities have specific BADCT requirements. This permit allows catchments to be constructed and decommissioned in accordance with the following:

The proposed BADCT for new catchments includes:

- Catchments will be unlined excavations in foundation rock of low hydraulic conductivity;
- Catchments will be located within the PCCZ;
- An acceptable slope stability analysis (BADCT, Appendix E, embankments) of the pit walls, adjacent slopes, and stockpiles will be completed prior to the installation of a new catchment. A copy of the stability analysis will be provided to ADEQ in the biennial report.
- Slope stability of pit walls or stockpiles will be assessed prior to installation of each new

catchment. Construction will include such methods as waterstop sealing, keying into bedrock, etc., as necessary, to reduce the possibility for slope/berm failure;

- Catchments will be sized to accommodate the maximum flow that would occur if PLS flow from leaching activities were contained with the runoff from a 100-year, 24-hour storm event;
- Pumps will be installed in the catchments, as necessary, to maintain a controlled ponded surface elevation and minimize the risk of overtopping during storm events;
- Should overtopping occur for catchments within the pit area, the overflow solution will be contained within the confines of the mine pit (within the PCCZ); and
- For new catchments constructed outside the pit, but within the PCCZ, freeboard will be maintained to reduce the possibility of overflow. Pumps and piping will be on hand to direct excess PLS to the SX-EW plant, leach circuit, or other APP-regulated facility, as needed.

In addition to ongoing operational monitoring and maintenance, BADCT requirements for decommissioning will include:

- Reduction or cessation of inflow into the catchment;
- Routing of any remaining inflow to another facility regulated by the APP or allowing gravity flow over unfractured bedrock into the bottom of the pit for collection and recovery;
- Filling the catchment with rock material; and
- Conducting additional excavation at the bench for stabilization, as needed.

Other site-specific BADCT has been demonstrated for the following facilities within the PCCZ and incorporating additional controls to minimize discharge pursuant to A.R.S. § 49-243(G): South Waste Rock Disposal Facility (D-26); Upper Niagara Leach Dump (D-6); Plan IX Leach Dump (D-15); Mineral Creek Leach Dump (D-18); Raffinate Pond (D-13); and PLS Surge Pond (D-14).

2.2.3 Pre-operational Requirements
Not applicable

2.2.4 Operational Requirements
A description of required inspections and operational monitoring is included in Section 4, Table 4.2.1.

If damage is identified during an inspection that could cause or contribute to a discharge, proper repairs shall be promptly performed. A summary of the repairs, including a description of the procedures and materials used shall be maintained with the inspection records according to Section 2.7.2.

TABLE 2.2.4
Leak Collection and Removal System Monitoring

Note: The Action Leakage Rate (ALR) or Rapid and Large Leakage Rate (RLLR) is exceeded when the amount of leakage pumped from the sump for the pond is greater than the applicable quantity below. An exceedance of the ALR or the RLLR is not a violation of the permit unless the permittee fails to perform as required under Section 2.6.2.4 or Section 2.6.2.5, as applicable.

Raffinate Pond (D-13)	Liquid Pumped	223	670	Weekly
PLS Surge Pond (D-14)	“	279	836	Weekly
Strong PLS Pond (D-20)	“	515	1,545	Weekly

2.3 Discharge Limitations [A.R.S. §§ 49-201(14), 49-243 and A.A.C. R18-9-A205(B)]

The permittee shall operate and maintain all permitted facilities listed below to prevent unauthorized discharges pursuant to A.R.S. § 49-201(12) resulting from failure or bypassing of BADCT pollutant control technologies including liner failure¹, uncontrollable leakage, overtopping (e.g., exceeding the maximum storage capacity, defined as a fluid level exceeding the crest elevation of a permitted impoundment), berm breaches that result in an unexpected loss of fluid, accidental spills, or other unauthorized discharges. The discharge limitations in this section are not applicable to any discharge caused by precipitation in excess of a single 100-year, 24-hour storm event or process overflow during a power outage exceeding 24 hours in duration.

2.3.1 Leaching Facilities

The Leaching Facilities are designed and authorized for use in leaching ore. The Leaching Facilities shall be constructed and operated in accordance with the BADCT outlined in Section 4, Table 4.1.1, and the ultimate heights shall not exceed those set forth in the approved permit application and engineering study.

2.3.2 Pregnant Leach Solution Ponds and Impoundments

The Pregnant Leach Solution (PLS) Ponds and Impoundments are designed and authorized to receive pregnant leach solution, stormwater, process water and process upset events.

2.3.3 Non-stormwater Impoundments

The permitted non-stormwater impoundments are authorized to receive stormwater runoff and run-on, and process solutions as a result of storm events or process upset events.

2.4 Points of Compliance [A.R.S. § 49-244]

The POCs are established by the following monitoring location(s):

CMW-609	34° 36' 25" N	113° 13' 57" W	55-537609
CMW-610	34° 36' 25" N	113° 13' 56" W	55-537610
CMW-611	34° 35' 51" N	113° 15' 26" W	55-906854
020 (A01HB)	34° 35' 47" N	113° 16' 57" W	55-562020
803 (AH13HB)	34° 35' 41" N	113° 17' 08" W	55-543803
283	34° 35' 36" N	113° 17' 57" W	55-588283
613 (A22HB)	34° 35' 17" N	113° 17' 30" W	55-546613
810 (A10HB)	34° 34' 55" N	113° 17' 31" W	55-543810

Monitoring requirements for each POC are listed in Section 4, Tables 4.2.2 through 4.2.4.

The Director may amend this permit to designate additional POCs, if information on groundwater gradients or groundwater usage indicates the need.

2.5 Monitoring Requirements [A.R.S. § 49-243(K)(1), A.A.C. R18-9-A206(A)]

All monitoring required in this permit shall continue for the duration of the permit, regardless of the status of the facility. All sampling, preservation and holding times shall be in accordance with currently accepted standards of professional practice. Trip blanks, equipment blanks and duplicate samples shall also be obtained, and chain of custody procedures shall be followed, in accordance with currently accepted standards of professional practice. The permittee shall consult the most recent version of the ADEQ Quality Assurance Project Plan (QAPP) and EPA 40 CFR PART 136 for guidance in this regard. Copies of laboratory analyses and chain of

¹ Liner failure in a single-lined impoundment is any condition that would result in a leakage exceeding 550 gallons per acre per day.

custody forms shall be maintained at the permitted facility. Upon request these documents shall be made immediately available for review by ADEQ personnel.

2.5.1 Discharge Monitoring

Not applicable for this permit.

2.5.2 Facility / Operational Monitoring

The operational monitoring requirements for the facilities referenced in Section 4, Table 4.1.1 are listed in Section 4, Table 4.2.1.

2.5.3 Groundwater Monitoring and Sampling Protocols

Static water levels shall be measured and recorded prior to sampling. Wells shall be purged of at least three borehole volumes (as calculated using the static water level) or until field parameters (pH, temperature, conductivity) are stable, whichever represents the greater volume. If evacuation results in the well going dry, the well shall be allowed to recover to 80% of the original borehole volume, or for 24 hours, whichever is shorter, prior to sampling. If after 24 hours there is not sufficient water for sampling, the well shall be recorded as "dry" for the monitoring event. An explanation for reduced pumping volumes, a record of the volume pumped, and modified sampling procedures shall be reported and submitted with the Self-monitoring Report Form (SMRF).

Alternatively, the permittee may conduct sampling using the low-flow purging method as described in the ASTM International Standard D 6771-02, and EPA Groundwater Issue 540/S-95/504 Low-Flow (Minimal Drawdown) Groundwater Sampling Procedures. The well must be purged until indicator parameters stabilize. Indicator parameters shall include pH, temperature, specific conductance, oxidation-reduction potential, dissolved oxygen and turbidity.

2.5.3.1 POC Well Replacement

In the event that one or more of the designated POC wells should become unusable or inaccessible due to damage, insufficient water in the well for more than two (2) sampling events, or any other event, a replacement POC well shall be constructed and installed upon approval by ADEQ. If the replacement well is 50 feet or less from the original well, the ALs and/or AQLs calculated for the designated POC well shall apply to the replacement well. Otherwise, the ALs and/or AQLs shall be set following the provisions in Section 2.5.3.4 and Section 2.5.3.5 of this permit.

2.5.3.2 Ambient Groundwater Quality Monitoring for POC Wells

Ambient monitoring requirements for new or replacement POC wells are detailed in Section 4, Table 4.2.2. The ambient monitoring program for all POC wells currently located at the facility has been completed.

2.5.3.3 Alert Levels for POC Wells

The AQLs and ALs shall be established and calculated by the following formula or another valid statistical method submitted to the Groundwater Section (GWS) in writing and approved for this permit by the GWS:

$$AL = M + K\Phi$$

Where M = mean, Φ = standard deviation, and K = one-sided normal tolerance interval with a 95% confidence level (Lieberman, G.J. (1958) Tables for One-sided Statistical Tolerance Limits: Industrial Quality Control, Vol. XIV, No. 10). Obvious outliers should be excluded from the data used in the AL calculation.

The following criteria shall be met in establishing ALs in the permit:

1. The AL shall be calculated for a parameter using the analyses from eight (8) consecutive sample rounds.
2. Any data where the PQL exceeds 80% of the AWQS shall not be included in the AL calculation.
3. If a parameter is below the detection limit, the permittee must report the value as “less than” the numeric value for the PQL or detection limit for the parameter, not just as “non-detect”. For those parameters, the permittee shall use a value of one-half the reported detection limit for the AL calculation.
4. If the analytical results from more than 50% of the samples for a specific parameter are non-detect, then the AL shall be set at 80% of the AWQS.
5. If the calculated AL for a specific constituent and well is less than 80% of the AWQS, the AL shall be set at 80% of the AWQS for that constituent in that well.

2.5.3.4 Aquifer Quality Limits for POC Well

For each of the monitored analytes for which a numeric AWQS has been adopted, the AQL shall be established as follows:

1. If the calculated AL is less than the AWQS, then the AQL shall be set equal to the AWQS.
2. If the calculated AL is greater than the AWQS, then the AQL shall be set equal to the calculated AL value, and no AL shall be set for that constituent at that monitoring point.

2.5.3.5 Compliance Groundwater Quality Monitoring for POC Wells

For quarterly compliance monitoring, the permittee shall analyze groundwater samples for the parameters listed in Section 4, Table 4.2.3. In addition to quarterly compliance groundwater monitoring, every 2 years (biennial) the permittee shall analyze samples from the POC wells for an expanded list of parameters listed in Section 4, Table 4.2.4. The biennial sampling event shall replace the regularly scheduled quarterly sampling event. The permittee may submit a written request to GWS to modify, reduce, or delete a monitoring parameter in the quarterly or biennial compliance groundwater monitoring tables (Section 4, Tables 4.2.3 and 4.2.4)..

2.5.3.6 Passive Containment Demonstration

Based on supporting documentation provided in the Application, the permittee has satisfactorily predicted that the Bagdad open pit mine will create a “passive containment capture zone” (PCCZ), as per A.R.S. § 49-243(G). The water balance in the numerical model for the Bagdad open pit predicts that static equilibrium will be maintained in the pit lake following closure at a maximum elevation of 2410 feet above mean sea level (amsl). Passive containment of the hydraulic capture zone will be maintained if the pit lake elevation remains below 2750 feet amsl. The model estimates that static equilibrium in the pit lake will not be reached for approximately 500 years. Demonstration of passive containment shall be based solely on natural or engineered topographical, geological or hydrological control measures that can operate without continuous maintenance.

A post-audit of the approved groundwater flow model shall be conducted 5 years from the effective date of this permit. Every 5 years thereafter, the permittee shall compare the current groundwater data to the previous model predictions. Factors to be evaluated in the post-audit include groundwater inflow, the estimated static water level in the pit, the estimated time to reach static water level, and any potential for the water level in the pit to rise to an elevation where the hydraulic gradient reverses and the pit ceases to function as a passive containment.

The assumptions about mine development and infiltration shall be revised in terms of the actual changes in the pit configuration, leaching areas, leach rates, sump locations, water balance, annual precipitation and storm events. The resulting compilation shall be compared to predictions provided by the groundwater flow model for the previous calibration period.

A report summarizing the original passive containment demonstration and the revisions made to the model shall be submitted to the GWS for review. The report shall include a table listing groundwater elevations from piezometer and monitor wells current at the time of the post-audit used to demonstrate the configuration of the hydraulic containment, and a potentiometric contour map based on groundwater elevations used in the post-audit demonstration. ADEQ will determine whether a full model recalibration is required. If a recalibration is necessary, a report describing the model output and the revisions and/or changes to the model shall be submitted to the GWS.

2.5.4 Surface Water Monitoring and Sampling Protocols

Not applicable for this permit.

2.5.5 Analytical Methodology

All samples collected for compliance monitoring shall be analyzed using Arizona state approved methods. If no state approved method exists, then any appropriate EPA approved method shall be used. Regardless of the method used, the detection limits must be sufficient to determine compliance with the regulatory limits of the parameters specified in this permit. Analyses shall be performed by a laboratory licensed by the Arizona Department of Health Services, Office of Laboratory Licensure and Certification. For results to be considered valid, all analytical work shall meet quality control standards specified in the approved methods. A list of Arizona-State certified laboratories can be obtained at the address below:

Arizona Department of Health Services
Office of Laboratory Licensure and Certification
250 North 17th Avenue
Phoenix, AZ 85007
Phone: (602) 364-0720

2.5.6 Installation and Maintenance of Monitoring Equipment

Monitoring equipment required by this permit shall be installed and maintained so that representative samples required by the permit can be collected. If new groundwater wells are determined to be necessary, the construction details shall be submitted to the ADEQ GWS for approval prior to installation and the permit shall be amended to include any new points.

2.6 Contingency Plan Requirements

[A.R.S. § 49-243(K)(3), (K)(7) and A.A.C. R18-9-A204 and R18-9-A205]

2.6.1 General Contingency Plan Requirements

At least one copy of the approved contingency and emergency response plan(s) submitted in response to the Compliance Schedule, Section 3, shall be maintained at the location where day-to-day decisions regarding the operation of the facility are made. The permittee shall be aware of and follow the contingency and emergency plans.

Any alert level (AL) that is exceeded or any violation of an aquifer quality limit (AQL), discharge limit (DL), or other permit condition shall be reported to ADEQ following the reporting requirements in Section 2.7.3.

Some contingency actions involve verification sampling. Verification sampling shall consist of the first follow-up sample collected from a location that previously indicated a violation or the exceedance of an AL. Collection and analysis of the verification sample shall use the same protocols and test methods to analyze for the pollutant or pollutants that exceeded an AL or violated an AQL. The permittee is subject to enforcement action for the failure to comply with any contingency actions in this permit. Where verification sampling is specified in this permit, it is the option of the permittee to

perform such sampling. If verification sampling is not conducted within the timeframe allotted, ADEQ and the permittee shall presume the initial sampling result to be confirmed as if verification sampling has been conducted. The permittee is responsible for compliance with contingency plans relating to the exceedance of an AL or violation of a DL, AQL or any other permit condition.

2.6.2 Exceeding of Alert Levels/Performance Levels

2.6.2.1 Exceeding of Performance Levels Set for Operational Conditions

1. Performance Levels Set for Freeboard

In the event that freeboard performance levels in a surface impoundment are not maintained, the permittee shall:

- a. As soon as practicable, cease or reduce discharging to the impoundment to prevent overtopping. Remove and properly dispose or recycle to other operations the excess fluid in the reservoir until the water level is restored at or below the permitted freeboard limit.
- b. Within 5 days of discovery, evaluate the cause of the incident and adjust operational conditions as necessary to avoid future occurrences.
- c. Record in the facility log, the amount of fluid removed, a description of the removal method, and the disposal arrangements. The facility log shall be maintained according to Section 2.7.2 (Operational Inspection / Log Book Recordkeeping).
- d. The facility is no longer on alert status once the operational indicator no longer indicates that the freeboard performance level is being exceeded. The permittee shall, however, complete all tasks necessary to return the facility to its pre-alert operating condition.

2. Performance Levels, Other Than Freeboard

- a. If an operational performance level (PL) listed in Section 4, Table 4.2.1 has been observed or noted during required inspection and operational monitoring, such that the result could cause or contribute to an unauthorized discharge, the permittee shall immediately investigate to determine the cause of the condition. The investigation shall include the following:
 - i. Inspection, testing, and assessment of the current condition of all treatment or pollutant discharge control systems that may have contributed to the operational performance condition.
 - ii. Review of recent process logs, reports, and other operational control information to identify any unusual occurrences.
- b. The PL exceedance, results of the investigation, and any corrective action taken shall be reported to the Water Quality Compliance Section (WQCS), within 30 days of the discovery of the condition. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.
- c. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5 and any specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation which may have led to a PL being exceeded. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6.

2.6.2.2 Exceeding of Alert Levels Set for Discharge Monitoring

Not applicable for this permit.

2.6.2.3 Exceeding of Alert Levels in Groundwater Monitoring

2.6.2.3.1 Alert Levels for Indicator Parameters

Not applicable for this permit.

2.6.2.3.2 Alert Levels for Pollutants with Numeric Aquifer Water Quality Standards

1. If an AL for a pollutant set in Section 4, Tables 4.2.3, or 4.2.4 has been exceeded, the permittee may conduct verification sampling within 5 days of becoming aware of an AL being exceeded. The permittee may use the results of another sample taken between the date of the last sampling event and the date of receiving the result as verification.
2. If verification sampling confirms the AL being exceeded or if the permittee opts not to perform verification sampling, then the permittee shall increase the frequency of monitoring to monthly. In addition, the permittee shall immediately initiate an investigation of the cause of the AL being exceeded, including inspection of all discharging units and all related pollution control devices, review of any operational and maintenance practices that might have resulted in an unexpected discharge, and hydrologic review of groundwater conditions including upgradient water quality.
3. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5.0 and specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation which may have led to an AL being exceeded. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6. Alternatively, the permittee may submit a technical demonstration, subject to written approval by the GWS, that although an AL is exceeded, pollutants are not reasonably expected to cause a violation of an AQL. The demonstration may propose a revised AL or monitoring frequency for approval in writing by the GWS.
4. Within 30 days after confirmation of an AL being exceeded, the permittee shall submit the laboratory results to the WQCS along with a summary of the findings of the investigation, the cause of the AL being exceeded, and actions taken to resolve the problem.
5. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.
6. The increased monitoring required as a result of ALs being exceeded may be reduced to the regularly scheduled frequency if the results of 3 monthly sequential sampling events demonstrate that no parameters exceed the AL.
7. If the increased monitoring required as a result of an AL exceedance continues for more than three sequential sampling events, the permittee shall submit a second report documenting an investigation of the continued AL exceedance within 30 days of the receipt of laboratory results of the third sampling event.

2.6.2.3.3 Alert Levels to Protect Downgradient Users from Pollutants Without Numeric Aquifer Water Quality Standards

Not applicable for this permit.

2.6.2.4 Exceedance of Action Leakage Rate (ALR)

If an ALR as specified in Table 2.2.4, has been exceeded, the permittee shall take the following actions:

1. Within 5 days of discovery, determine if the fluid in the LCRS is operational/process solution from the impoundment by measuring the pH and conductivity of fluids in the impoundment and in the LCRS to allow direct comparison of solution characteristics.
2. Within 15 days, assess the condition of the liner system using visual methods for visible

portions of the liner.

3. Repair all identified areas of leakage within 90 days of discovery.
4. Assess the potential for migration of liquids out of the containment system.
5. Within 30 days of discovery of exceeding an ALR, submit the results of the liner assessment, the suspected cause of the exceedance and actions taken or planned to resolve the exceedance in a report to the ADEQ WQCS.

2.6.2.5 Exceedance of Rapid and Large Leakage Rate (RLLR)

If an RLLR as specified in Table 2.2.4, has been exceeded, the permittee shall:

1. As soon as practicable, cease all discharge to the impoundment.
2. Within 24 hours of becoming aware of the exceedance, determine if the fluid in the LCRS is operational/process solution from the impoundment by measuring the pH and conductivity of fluids in the impoundment and in the LCRS to allow direct comparison of solution characteristics.
3. Within 24 hours of becoming aware of the exceedance, notify ADEQ's WQCS and include an assessment regarding the type of solution in the LCRS.
4. Within 15 days, assess the condition of the liner system using visual methods for visible portions of the liner.
5. Repair all identified areas of leakage within 90 days of discovery. Discharges to the impoundment shall not be re-initiated until the leak(s) have been identified and repaired.
6. Within 30 days of discovery of exceeding an RLLR, submit the results of the liner assessment, the suspected cause of the exceedance and actions taken or planned to resolve the exceedance in a report to the ADEQ WQCS. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
7. If the RLLR continues to be exceeded following completion of repairs, submit for approval to ADEQ, a corrective action plan including a re-assessment of liner system integrity and a schedule to complete the corrective actions to address all problems identified from the assessment of the liner system within 60 days of completion of repairs conducted in response to Item No. 5 above. Upon ADEQ's approval, the permittee shall implement the approved plan and schedule of corrective actions.
8. Within 30 days of completion of corrective actions initiated from Item No. 7, submit to ADEQ, a written report as specified in Section 2.6.6 (Corrective Actions).

2.6.3 Discharge Limitations Violations

2.6.3.1 Liner Failure, Containment Structure Failure, or Unexpected Loss of Fluid

In the event of liner failure, containment structure failure, or unexpected loss of fluid as described in Section 2.3, the permittee shall take the following actions:

1. As soon as practicable, cease all discharges to the surface impoundment as necessary to prevent any further releases to the environment.
2. Within 24 hours of discovery, notify ADEQ WQCS.
3. Within 5 days of discovery of a failure that resulted in a release to the subsurface, collect representative samples of the fluid remaining in the surface impoundment. Samples shall be analyzed for the parameters specified in Section 4, Table 4.2.3. Within 30 days of the incident, submit a copy of the analytical results to ADEQ WQCS.
4. Within 15 days of discovery, initiate an evaluation to determine the cause for the incident. Identify the circumstances that resulted in the failure and assess the condition of the surface impoundment and liner system. Implement corrective actions as necessary to resolve the problems identified in the evaluation. Initiate repairs to any failed liner, system, structure, or other component as needed to restore proper functioning of the surface impoundment. The permittee shall not resume discharging to the surface impoundment until repairs of any failed liner or structure are performed. Repair procedures, methods, and materials used to restore the system(s) to proper operating

condition shall be described in the facility log/recordkeeping file and available for ADEQ review.

5. As soon as practicable, remove fluid remaining in the surface impoundment as necessary to prevent further releases to the subsurface and/or to perform repairs. Record in the facility log/recordkeeping file the amount of fluid removed, a description of the removal method, and other disposal arrangements. The facility log/recordkeeping file shall be maintained according to Section 2.7.2 (Operation Inspection / Log/Recordkeeping File).
6. Within 30 days of discovery of the incident, submit a report to ADEQ as specified in Section 2.7.3.2 (Permit Violation and AL Status Reporting). Include a description of the actions performed in Subsections 1 through 5 listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
7. Within 60 days of discovery, conduct an assessment of the impacts to the subsoil and/or groundwater resulting from the incident. If soil or groundwater is impacted such that it could cause or contribute to an exceedance of an AQL at the applicable point of compliance, submit to ADEQ, for approval, a corrective action plan to address such impacts, including identification of remedial actions and/or monitoring, and a schedule for completion of activities. At the direction of ADEQ, the permittee shall implement the approved plan.
8. Within 30 days of completion of corrective actions, submit to ADEQ, a written report as specified in section 2.6.6 (Corrective Actions). Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.3.2 Overtopping of a Surface Impoundment

If overtopping of fluid from a permitted surface impoundment occurs, and results in a discharge pursuant to A.R.S. §§ 49-201(12), the permittee shall:

1. As soon as practicable, cease all discharges to the surface impoundment to prevent any further releases to the environment.
2. Within 24 hours of discovery, notify ADEQ WQCS.
3. Within 5 days, collect representative samples of the fluid contained in the surface impoundment. Samples shall be analyzed for the parameters specified in Section 4, Table 4.2.3. Within 30 days of the incident, submit a copy of the analytical results to ADEQ WQCS.
4. As soon as practicable, remove and properly dispose of excess water in the impoundment until the water level is restored at or below the appropriate freeboard as described in Table 4.2.1. Record in the facility log, the amount of fluid removed, a description of the removal method, and the disposal arrangements. The facility log/recordkeeping file shall be maintained according to Section 2.7.2 (Operation Inspection / Log/Recordkeeping File).
5. Within 30 days of discovery, evaluate the cause of the overtopping and identify the circumstances that resulted in the incident. Implement corrective actions and adjust operational conditions as necessary to resolve the problems identified in the evaluation. Repair any systems as necessary to prevent future occurrences of overtopping.
6. Within 30 days of discovery of overtopping, submit a report to ADEQ as specified in section 2.7.3.2 (Permit Violation and AL Status Reporting). Include a description of the actions performed in Subsections 1 through 5 listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
7. Within 60 days of discovery, and based on sampling in Subsection 3 above, conduct an assessment of the impacts to the subsoil and/or groundwater resulting from the incident.
8. If soil or groundwater is impacted such that it could cause or contribute to an exceedance of an AQL at the applicable point of compliance, submit to ADEQ for approval, a corrective action plan to address such impacts, including identification of remedial

actions and/or monitoring, and a schedule for completion of activities. At the direction of ADEQ, the permittee shall implement the approved plan.

9. Within 30 days of completion of corrective actions, submit to ADEQ, a written report as specified in Section 2.6.6 (Corrective Actions). Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.3.3 Inflows of Unexpected Materials to a Surface Impoundment

The types of materials that are expected to be placed in the permitted surface impoundments are specified in Section 2.3 (Discharge Limitations). If any unexpected materials flow to a permitted surface impoundment, the permittee shall:

1. As soon as practicable, cease all unexpected inflows to the surface impoundment(s).
2. Within 24 hours of discovery, notify ADEQ WQCS.
3. Within 5 days of the incident, identify the source of the material and determine the cause for the inflow. Characterize the unexpected material and contents of the affected impoundment, and evaluate the volume and concentration of the material to determine if it is compatible with the surface impoundment liner. Based on the evaluation of the incident, repair any systems or equipment and/or adjust operations, as necessary to prevent future occurrences of inflows of unexpected materials.
4. Within 30 days of an inflow of unexpected materials, submit a report to ADEQ as specified in section 2.7.3.2 (Permit Violation and AL Status Reporting). Include a description of the actions performed in Subsections 1 through 3 listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
5. Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.4 Aquifer Quality Limit Violation

1. If an AQL set in Section 4, Tables 4.2.3 or 4.2.4 has been exceeded, the permittee may conduct verification sampling within 5 days of becoming aware of an AQL being exceeded. The permittee may use the results of another sample taken between the date of the last sampling event and the date of receiving the result as verification.
2. If verification sampling confirms that the AQL is violated for any parameter or if the permittee opts not to perform verification sampling, then the permittee shall increase the frequency of monitoring to monthly. In addition, the permittee shall immediately initiate an evaluation for the cause of the violation, including inspection of all discharging units and all related pollution control devices, and review of any operational and maintenance practices that might have resulted in unexpected discharge.

The permittee also shall submit a report according to Section 2.7.3, which includes a summary of the findings of the investigation, the cause of the violation, and actions taken to resolve the problem. A verified exceedance of an AQL will be considered a violation unless the permittee demonstrates within 30 days that the exceedance was not caused or contributed to by pollutants discharged from the facility. Unless the permittee has demonstrated that the exceedance was not caused or contributed to by pollutants discharged from the facility, the permittee shall consider and ADEQ may require corrective action that may include control of the source of discharge, cleanup of affected soil, surface water or groundwater, and mitigation of the impact of pollutants on existing uses of the aquifer. Corrective actions shall either be specifically identified in this permit, included in an ADEQ approved contingency plan, or separately approved according to Section 2.6.6.

3. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.
4. The permittee shall notify any downstream or downgradient users who may be directly affected by

the discharge.

5. The permittee shall continue monitoring at the increased frequency until the contaminant(s) is below the AQL and AL for three consecutive months.

2.6.5 Emergency Response and Contingency Requirements for Unauthorized Discharges pursuant to A.R.S. §49-201(12) and pursuant to A.R.S. § 49-241

2.6.5.1 Duty to Respond

The permittee shall act immediately to correct any condition resulting from a discharge pursuant to A.R.S. § 49-201(12) if that condition could pose an imminent and substantial endangerment to public health or the environment.

2.6.5.2 Discharge of Hazardous Substances or Toxic Pollutants

In the event of any unauthorized discharge pursuant to A.R.S. § 49-201(12) of suspected hazardous substances (A.R.S. § 49-201(19)) or toxic pollutants (A.R.S. § 49-243(I)) on the facility site, the permittee shall promptly isolate the area and attempt to identify the discharged material. The permittee shall record information, including name, nature of exposure and follow-up medical treatment, if necessary, on persons who may have been exposed during the incident. The permittee shall notify the ADEQ WQCS at (602) 771-4497 and Northern Regional Office (NRO) at (928) 779-0313 within 24-hours upon discovering the discharge of hazardous material which: a) has the potential to cause an AWQS or AQL to be exceeded; or b) could pose an endangerment to public health or the environment.

2.6.5.3 Discharge of Non-hazardous Materials

In the event of any unauthorized discharge pursuant to A.R.S. § 49-201(12) of non-hazardous materials from the facility, the permittee shall promptly attempt to cease the discharge and isolate the discharged material. Discharged material shall be removed and the site cleaned up as soon as possible. The permittee shall notify the ADEQ WQCS at (602) 771-4497 within 24-hours upon discovering the discharge of non-hazardous material which: a) has the potential to cause an AQL to be exceeded; or b) could pose an endangerment to public health or the environment.

2.6.5.4 Reporting Requirements

The permittee shall submit a written report for any unauthorized discharges reported under Sections 2.6.5.2 and 2.6.5.3 to ADEQ WQCS within thirty days of the discharge or as required by subsequent ADEQ action. The report shall summarize the event, including any human exposure, and facility response activities and include all information specified in Section 2.7.3. If a notice is issued by ADEQ subsequent to the discharge notification, any additional information requested in the notice shall also be submitted within the time frame specified in that notice. Upon review of the submitted report, ADEQ may require additional monitoring or corrective actions.

A post-audit report regarding the passive containment demonstration is required within five years of the effective date of this permit, and every five years thereafter, in accordance with Section 2.5.3.6 of this permit.

2.6.6 Corrective Actions

Specific contingency measures identified in Section 2.6 and actions identified in the approved contingency plan referenced in Section 5.0 have already been approved by ADEQ and do not require written approval to implement.

With the exception of emergency response actions taken under Section 2.6.5, the permittee shall obtain written approval from the GWS prior to implementing a corrective action to accomplish any of the following goals in response to exceeding an AL or violation of an AQL, DL, or other permit condition:

1. Control of the source of an unauthorized discharge;

2. Soil cleanup;
3. Cleanup of affected surface waters;
4. Cleanup of affected parts of the aquifer;
5. Mitigation to limit the impact of pollutants on existing uses of the aquifer.

Within 30 days of completion of any corrective action, the operator shall submit to the ADEQ WQCS, a written report describing the causes, impacts, and actions taken to resolve the problem.

2.7 Reporting and Recordkeeping Requirements

[A.R.S. § 49-243(K)(2) and A.A.C. R18-9-A206(B) and R18-9-A207]

2.7.1 Self-monitoring Report Form

1. The permittee shall complete the SMRFs provided by ADEQ, and submit them to the WQCS, Data Unit.
2. The permittee shall complete the SMRF to the extent that the information reported may be entered on the form. If no information is required during a quarter, the permittee shall enter "not required" on the SMRF and submit the report to ADEQ. The permittee shall use the format devised by ADEQ.
3. Tables 4.2.2, 4.2.3 and, 4.2.4 list the parameters to be monitored and the frequency for reporting results for groundwater compliance monitoring. Analytical methods shall be recorded on the SMRFs.

2.7.2 Operation Inspection / Log Book Recordkeeping

A signed copy of this permit shall be maintained at all times at the location where day-to-day decisions regarding the operation of the facility are made. A log book (paper copies, forms or electronic data) of the inspections and measurements required by this permit shall be maintained at the location where day-to-day decisions are made regarding the operation of the facility. The log book shall be retained for ten years from the date of each inspection, and upon request, the permit and the log book shall be made immediately available for review by ADEQ personnel. The information in the log book shall include, but not be limited to, the following information as applicable:

1. Name of inspector;
2. Date and shift inspection was conducted;
3. Condition of applicable facility components;
4. Any damage or malfunction, and the date and time any repairs were performed;
5. Documentation of sampling date and time;
6. Any other information required by this permit to be entered in the log book, and
7. Monitoring records for each measurement shall comply with R18-9-A206(B)(2).

2.7.3 Permit Violation and Alert Level Status Reporting

1. The permittee shall notify the WQCS in writing within five days (except as provided in Section 2.6.5) of becoming aware of a violation of any permit condition, discharge limitation or of an Alert Level being exceeded.
2. The permittee shall submit a written report to the WQCS within 30 days of becoming aware of the violation of any permit condition or discharge limitation. The report shall document all of the following:
 - a. Identification and description of the permit condition for which there has been a violation and a description of its cause.
 - b. The period of violation including exact date(s) and time(s), if known, and the anticipated time period during which the violation is expected to continue.
 - c. Any corrective action taken or planned to mitigate the effects of the violation, or to eliminate or prevent a recurrence of the violation.
 - d. Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an Aquifer Water Quality Standard.
 - e. Proposed changes to the monitoring which include changes in constituents or increased

- frequency of monitoring.
- f. Description of any malfunction or failure of pollution control devices or other equipment or processes.

2.7.4 Operational, Other or Miscellaneous Reporting

The permittee shall, upon completion of the biennial sampling described in Table 4.2.4, submit a monitoring summary report to the GWS. This report shall be due at the same time as the SMRF form for the biennial sampling event. The report shall include, but not be limited to the following:

1. A description of any deviations from standard sampling protocols during the reporting period.
2. A summary of all exceedances of ALs, AQLs, Action Levels, or operational limits that occurred during the reporting period.
3. Graphical time versus concentration plots of field pH, sulfate, total dissolved solids, and any parameter which exceeded an applicable AL or AQL in the past eight quarters at each POC well, and tabulated sampling data for all wells required to be sampled by this permit during the last eight quarters.
4. An updated table of all monitor wells and piezometers in the Discharge Impact Area including, but not limited to, location of well, depth of well, depth to water, and water level elevation.
5. A summary of any groundwater monitor wells replaced in the reporting period including, but not limited to, location of well, depth of well, depth to water, water level elevation, and screened interval.
6. A list of any new sumps, impoundments, or vehicle washes constructed within the passive containment, unless exempt or covered by a general APP.
7. A summary of new Catchments within PCCZ (D-27) including location, and a description of the BADCT/installation.
8. A list of any catchments within the PCCZ decommissioned during the past 2 years.

2.7.5 Reporting Location

All SMRFs shall be submitted to:

Arizona Department of Environmental Quality
Water Quality Compliance Section, Data Unit
Mail Code: 5415B-1
1110 W. Washington Street
Phoenix, AZ 85007
Phone (602) 771-4513

All documents required by this permit to be submitted to the WQCS shall be directed to:

Arizona Department of Environmental Quality
Water Quality Compliance Section
Mail Code: 5415B-1
1110 W. Washington Street
Phoenix, AZ 85007
Phone (602) 771-4497

All documents required by this permit to be submitted to the GWS shall be directed to:

Arizona Department of Environmental Quality
Groundwater Section
Mail Code: 5415B-3
1110 W. Washington Street
Phoenix, AZ 85007
Phone (602) 771-4428

2.7.6 Reporting Deadline

The following table lists the quarterly report due dates:

January-March	April 30
April-June	July 30
July-September	October 30
October-December	January 30

January-December	January 30 of the following year
PCCZ post-audit every 5 years from the date of permit issuance (March 25, 2009)	30 days after the end of each 5 year cycle

2.7.7 Changes to Facility Information in Section 1.0

The GWS and WQCS shall be notified within 10 days of any change of facility information including Facility Name, Permittee Name, Mailing or Street Address, Facility Contact Person or Emergency Telephone Number.

2.8 Temporary Cessation [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A209(A)]

The permittee shall give written notice to the WQCS before ceasing operation of the facility for a period of 60 days or greater. At the time of notification the permittee shall submit for ADEQ approval a plan for maintenance of discharge control systems and for monitoring during the period of temporary cessation. Immediately following ADEQ’s approval, the permittee shall implement the approved plan. If necessary, ADEQ shall amend permit conditions to incorporate conditions to address temporary cessation. During the period of temporary cessation, the permittee shall provide written notice to the WQCS of the operational status of the facility every three years. If the permittee intends to permanently cease operation of any facility, the permittee shall submit closure notification, as set forth in Section 2.9 below.

2.9 Closure [A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9-A209(B)]

For a facility addressed under this permit, the permittee shall give written notice of closure to the WQCS of the permittee’s intent to cease operation without resuming activity for which the facility was designed or operated. Notice of decommissioning of Catchments within the PCCZ (D-27) shall comply with the requirements of Section 2.7.4.

2.9.1 Closure Plan

Within 90 days following notification of closure, the permittee shall submit for approval to the GWS, a Closure Plan which meets the requirements of A.R.S. § 49-252 and A.A.C. R18-9-A209(B)(3). If the closure plan achieves clean closure immediately, ADEQ shall issue a letter of approval to the permittee. If the closure plan contains a schedule for bringing the facility to a clean closure configuration at a future date, ADEQ may incorporate any part of the schedule as an amendment to this permit.

2.9.2 Closure Completion

Upon completion of closure activities, the permittee shall give written notice to the GWS indicating that the approved Closure Plan has been implemented fully and providing supporting documentation to demonstrate that clean closure has been achieved (soil sample results, verification sampling results, groundwater data, as applicable). If clean closure has been achieved, ADEQ shall issue a letter of approval to the permittee at that time. If any of the following conditions apply, the permittee shall follow the terms of post-closure stated in this permit:

1. Clean closure cannot be achieved at the time of closure notification or within one year thereafter under a diligent schedule of closure actions;
2. Further action is necessary to keep the facility in compliance with aquifer water quality standards at the applicable point of compliance;
3. Continued action is required to verify that the closure design has eliminated discharge to the extent intended;
4. Remedial or mitigative measures are necessary to achieve compliance with Title 49, Ch. 2;
5. Further action is necessary to meet property use restrictions.

2.9.3 Decommissioned Facilities

The following facilities were originally listed in the APP, issued March 25, 2009. They have been decommissioned, and closure shall be addressed at final mine closure.

Tucker Pond	34° 35' 35" N	113° 13' 44" W
EW Catchment Basin	34° 36' 10" N	113° 12' 57" W
Mineral Creek Sump	34° 34' 39" N	113° 12' 58" W

2.10 Post-closure [A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9-A209(C)]

Post-closure requirements shall be established based on a review of facility closure actions and will be subject to review and approval by the GWS.

In the event clean closure cannot be achieved pursuant to A.R.S. § 49-252, the permittee shall submit for approval to the GWS a Post-closure Plan that addresses post-closure maintenance and monitoring actions at the facility. The Post-closure Plan shall meet all requirements of A.R.S. §§ 49-201(30) and 49-252 and A.A.C. R18-9-A209(C). Upon approval of the Post-closure Plan, this permit shall be amended or a new permit shall be issued to incorporate all post-closure controls and monitoring activities of the Post-closure Plan.

2.10.1 Post-closure Plan

Reserved

2.10.2 Post-closure Completion

Reserved

3.0 COMPLIANCE SCHEDULE [A.R.S. § 49-243(K)(5) and A.A.C. R18-9-A208]

For each compliance schedule item listed below, the permittee shall submit the required information, including a cover letter that lists the compliance schedule items, to the GWS. A copy of the cover letter must also be submitted to the WQCS.

COMPLIANCE SCHEDULE		
ITEM DESCRIPTION	COMPLETION/SUBMITTAL DATE	REQUIREMENTS
COPPER CREEK POINT OF COMPLIANCE (POC) AREA		
Tucker Pond (D-9)	Received 3/25/2011 (LTF 53994)	Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual.
Copper Creek PLS Pond System (PLS Pond and Conveyance Channel) (D-10)		
Boulder Flood Basin (D-11)		
BLACK MESA POINT OF COMPLIANCE (POC) AREA		
EW Catchment Basin (D-12)	Received 3/25/2011 (LTF 53994)	Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade, for review and comments. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual.
MULHOLLAND TAILINGS POINT OF COMPLIANCE (POC) AREA		
Mulholland Tailings Pond (D-1)	Received 3/25/2011 (LTF 53994)	Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual. Submit also two copies of stability analysis -- static and pseudostatic, based on facility's final configuration. The analysis shall define a minimum beach distance between the outer edge of the ponded water and the adjacent tailings embankment to ensure safe operation of the tailings impoundment. The results of the stability analysis shall be consistent with the Arizona Mining BADCT Guidance Manual, Appendix E.

<p>Mulholland Seepage Pond (D-2)</p>	<p>Received 3/25/2011 (LTF 53994)</p>	<p>Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual.</p>
<p>Last Chance Pond (D-3)</p>	<p>Received 3/26/2012</p>	<p>Submit an amendment that includes an updated BADCT approach, including two copies of facility design or as-built drawings and operational details of the BADCT design, and identifying any necessary upgrade. The BADCT submittal, including any necessary upgrade, shall satisfy the requirements of A.R.S. §49-243(B) consistent with the Arizona Mining BADCT Guidance Manual.</p>
<p>Mineral Creek Sump (D-8)</p>	<p>Received 12/3/12</p>	<p>Submit an other amendment application to remove the decommissioned Mineral Creek Sump from the list of discharging facilities.</p>

For additional details on existing facilities BADCT demonstration, refer to Arizona Mining BADCT Guidance Manual.

4.0 TABLES OF MONITORING REQUIREMENTS

4.1 FACILITY AND POC TABLES

Table 4.1.1 Permitted Facilities and BADCT

4.2 COMPLIANCE AND OPERATIONAL MONITORING TABLES

Table 4.2.1 Required Inspections and Operational Monitoring

Table 4.2.2 Parameters for Ambient Groundwater Monitoring for All POC Wells

Table 4.2.3 Quarterly Compliance Groundwater Monitoring Requirements for POC Wells

Table 4.2.4 Biennial Compliance Groundwater Monitoring Requirements for POC Wells

**TABLE 4.1.1
FACILITIES LIST AND BADCT**

Facility Name (#)	Lat./Long.	Facility BADCT
PROCESS SOLUTION IMPOUNDMENTS:		
Catchments within PCCZ (D-27)	N/A	<p>Individual BADCT: These facilities consist of existing (Upper Niagara Pond (D-4), Upper Niagara PLS Pond (D-5), Alum Sump PLS Pond (D-21), and Kimberly Pond (D-22)) and future collection and diversion points including catchments, sumps and impoundments, for process solution/stormwater within the PCCZ. This permit allows catchments within the PCCZ to be constructed, operated, maintained, and decommissioned without requiring any permit amendments in accordance with the following:</p> <p>The facilities will be equipped with pumps, as necessary, to maintain a controlled ponded surface elevation and minimize the risk of overtopping during storm events. Should overtopping occur for catchments within the pit area, the overflow solution will be contained within the confines of the mine pit (within the PCCZ). For new catchments constructed outside the pit, but within the PCCZ, freeboard will be maintained to reduce the possibility of overflow. Pumps and piping will be on hand to direct excess PLS to the SX-EW plant, leach circuit, or other APP-regulated facility, as needed. The slope stability of pit walls and stockpiles shall be assessed for new catchments prior to installation.</p> <p>Facilities will be decommissioned by (1) reducing or ceasing inflow, (2) routing of remaining inflow to another facility regulated by the APP or allowing gravity flow over unfractured bedrock into the bottom of the pit for collection and recovery, and (3) filling with rock material.</p>
Copper Creek PLS Pond System (PLS pond and conveyance channel) (D-10)	34 ° 36' 12" N 113 ° 13' 46" W	The facility is a process solution pond system consisting of an 80-mil HDPE-lined channel leading from the toe of the Copper Creek Leach Dump to the Copper Creek PLS Pond. The PLS pond system is constructed on Quaternary gravels of moderate hydraulic conductivity underlain by Precambrian granite. The pond has a design capacity of 4.5 million gallons, with a depth of 20 feet. Process solution from the pond is pumped to the SX-EW Plant for processing. During process upset or severe storm events, overflow shall report to Boulder Flood Basin (D-11) via a lined overflow channel.
Boulder Flood Basin (D-11)	34 ° 36' 19" N 113 ° 13' 48" W	The facility is a double-lined, impoundment equipped with a Leak Collection and Removal System (LCRS). The primary liner is an 80-mil HDPE geomembrane, secured in an engineered anchor trench, and a secondary liner consisting of a compacted, amended soil liner. The overflow channel from the Copper Creek PLS Pond leading to the Boulder Flood Basin is lined with an 80-mil HDPE geomembrane. The impoundment has a solution holding capacity of 37 million gallons. The impoundment receives stormwater runoff and contains process solution overflow due to process upsets in the Copper Creek leach system. The facility is designed with pumping system capability to divert solution to the Bagdad open pit, the Mulholland Tailings Pond, Mammoth Tailings Pond, or the Copper Creek PLS Pond System. Potential discharges from the Boulder Flood Basin to Boulder Creek are addressed under the terms and provisions of an individual AZPDES permit (AZ0022268).

<p>Raffinate Pond (D-13)</p>	<p>34 ° 36' 05" N 113 ° 13' 00" W</p>	<p>Facility is located within the passive containment zone of the open pit. The facility is a double-lined process solution impoundment equipped with LCRS. The liner system consists of an 80-mil HDPE primary geomembrane, with the secondary liner consisting of compacted two feet thick Gila Formation (rhyolite tuff and clay). The geomembrane is secured in an engineered anchor trench around the pond perimeter. The impoundment has a maximum solution holding capacity of approximately 0.5 million gallons, at a depth of approximately 6 feet. To avoid potential overflow, the impoundment is equipped with an automatic, high-level alarm system. The raffinate solution is used in the leach process. To minimize the potential for discharge, surface water run-on is diverted away from the facility. The ALR and RLLR for the pond are established at 223 gpd and 670 gpd respectively. During process upset or severe storm events, the piped overflow reports to the Copper Creek Leach Dump.</p>
<p>PLS Surge Pond (D-14)</p>	<p>34 ° 36' 04" N 113 ° 12' 58" W</p>	<p>Facility is located within the passive containment zone of the open pit. The facility is a double-lined process solution impoundment equipped with LCRS. The liner system consists of an 80-mil HDPE primary geomembrane, with the secondary liner consisting of compacted two feet thick Gila Formation (rhyolite tuff and clay). The geomembrane and the geonet/geotextile composite used in the LCRS are secured in an engineered anchor trench around the pond perimeter. The pond is constructed on non-mineralized material of the Mine Shop Overburden Dump. The pond has a maximum solution holding capacity of approximately 1.5 million gallons, with a depth of 8 feet. The pond receives process solution from various PLS collection facilities from where it is pumped to the SX-EW Plant for processing. To avoid potential overflow, the PLS Surge Pond is equipped with an automatic, high-level alarm system. To minimize the potential for discharge, surface water run-on is diverted away from the facility. The ALR and RLLR for the pond are established at 279 gpd and 836 gpd respectively.</p>
<p>Strong PLS Pond (D-20)</p>	<p>34 ° 35' 46" N 113 ° 14' 03" W</p>	<p>Prescriptive BADCT: The facility (D20) is a double-lined impoundment equipped with a leak detection and removal system (LCRS). The double liner consists of a 60-mil HDPE primary and secondary liner, with a 200-mil HDPE geonet between the two liners for drainage. The lower liner is a composite liner underlain by a minimum of 6-inch minus low permeability soil compacted to achieve a saturated hydraulic conductivity of no greater than 1×10^{-6} cm/sec. The pond is designed to contain maximum fluid volume of 3.86 million gallons plus direct precipitation from the 100-year, 24-hour storm event while maintaining 2 feet of freeboard. The total depth of the pond is 26 feet. Berms and diversion channels are designed to prevent surface stormwater from entering the pond. The ALR and RLLR for the pond are established at 515 gpd and 1,545 gpd, respectively (Ref. Area-wide APP Application Addendum, July 2002).</p>
<p>LEACH DUMPS:</p>		
<p>Upper Niagara Leach Dump (D-6)</p>	<p>34 ° 35' 04" N 113 ° 13' 53" W</p>	<p>Facility is located within the passive containment zone of the open pit. To minimize discharge, surface water run-on is diverted away from the facility.</p>

Plan IX Leach Dump (D-15)	34 ° 34' 36" N 113 ° 13' 30" W	Facility is located within the passive containment zone of the open pit. To minimize discharge, surface water run-on is diverted away from the facility
Mineral Creek Leach Dump (D-18)	34 ° 34' 30" N 113 ° 12' 52" W	Facility is located within the passive containment zone of the open pit. To minimize discharge, surface water run-on is diverted into the open pit.
Copper Creek Leach Dump (D-7)	34 ° 35' 56" N 113 ° 13' 31" W	The stability analysis, water balance and aquifer loading analysis, as well as solution, ore and waste characterization, sighting considerations, design, construction and operational measures received in submittals dated March 25, 2010 and July 1, 2010 have satisfied the requirements of A.R.S. 49-243 and R-18-9-A202
Crystal Mountain Leach Dump (D-19)	34 ° 35' 48" N 113 ° 13' 42" W	The stability analysis, water balance and aquifer loading analysis, as well as solution, ore and waste characterization, sighting considerations, design, construction and operational measures received in submittals dated March 25, 2010 and July 1, 2010 have satisfied the requirements of A.R.S. 49-243 and R-18-9-A202.
TAILINGS IMPOUNDMENTS:		
Mulholland Tailings Pond (D-1)	34 ° 35' 34" N 113 ° 15' 11" W	The facility is a tailings dam used primarily as a recycled water storage facility for site-wide water management purposes and, as needed, as a secondary tailings disposal impoundment. The facility is constructed employing centerline dam construction method, using a combination of spigotting and cycloning of tailings material. The impoundment is located over predominantly Precambrian crystalline rocks. The tailings dam and pond cover an area of approximately 500 acres and contain approximately 120 million dry tons of tailings.
Mulholland Seepage Pond (D-2)	34 ° 35' 51" N 113 ° 15' 26" W	The facility is a lined impoundment formed by a seepage collection dam constructed adjacent to the downstream toe of the Mulholland tailings embankment. The dam is a compacted rock-fill dam with a reinforced gunnite facing on its entire surface and has a concrete lined basin. The impoundment has an approximate storage capacity of 531,000 gallons, with an average depth of approximately 6 feet. Collected seepage is pumped back to the Mulholland Tailings Pond using two vertical turbine pumps. Both pumps are turbine pumps. Both pumps are equipped with automatic level controls and have a combined design capacity of 1,175 gpm. Potential discharges from the Mulholland Seepage Pond to Mulholland Wash are addressed under the terms and provisions of an individual AZPDES permit (AZ0022268).
Mammoth Tailings Impoundment (D-23)	34° 35' 04" N 113° 16' 11" W	The facility has a maximum capacity of 900,000,000 tons of tailings and a maximum permitted dam crest elevation of 3,600 feet above mean sea level. Tailings are delivered to the tailings impoundment at a rate not exceeding 200,000 dry tons per day. Process fluids include: water from the Freeport-McMoRan Bagdad water supply system; water pumped from the tailings seepage collection system and the tailings water reclaim and return system; wastewater effluent from the Bagdad Townsite Wastewater Treatment Plant (WWTP) and reagents that are manufactured, processed, and used in compliance with the federal Toxic Substances Control Act.

Mammoth Tailings Seepage Collection Pond (D-24)	34° 35' 19" N 113° 17' 50" W	The tailings seepage collection pond (SCP) is constructed with a gunite liner and has a normal operating capacity of 350,000 with a minimum freeboard of 1 foot. The facility is located at an elevation of 2,740 feet above sea level. The pump-back dam, constructed upon crystalline bedrock, is a compacted rock fill dam with a 12-inch concrete facing on its entire surface. In addition, a seepage sump (SS) is located at an elevation of 2,730 feet above sea level immediately downstream from the facility. The SS is a 1-foot-diameter well, extending to a depth of 11 feet in the gravels of Mammoth Wash, immediately downstream from the SCP.
Upper Mammoth Tailings Impoundment (D-24)	34° 34' 10" N 113° 14' 41" W	The Upper Mammoth Tailings Impoundment shall be constructed, operated, and maintained according to Plans and Specifications provided in the March 24, 1995 titled <i>Site Characterization & Design Studies</i> , the December 2010 Upper Mammoth Tailing Feasibility Level Design, and amendments and supplements referenced in Section 5 of this Permit. The Upper Mammoth Tailings impoundment has a maximum capacity of 600,000,000 tons of tailings. The maximum permitted dam crest elevation shall not exceed 4,050 feet above mean sea level, and the maximum areal extent of the tailings impoundment shall not exceed the footprint shown in Figure 1 of the approved design plans provided in the July 18, 2007, <i>Site Characterization & Design Studies</i> . Tailings shall be delivered to the tailings impoundment at a rate not to exceed 200,000 dry tons per day during ore processing.
Last Chance Pond (D-3)	34 ° 35' 39" N 113 ° 14' 20" W	Facility BADCT shall be determined by the Compliance Schedule (see Section 3.0 Compliance Schedule).
WASTE ROCK STORAGE FACILITY		
South Waste Rock Storage Facility (D-26)	34° 34' 07" N 113° 12' 10" W	The South Waste Rock Disposal Facility has a maximum capacity of 660,000,000 tons of mining overburden with a maximum permitted elevation of 4,800 feet above mean sea level. Maximum areal extent of the waste rock disposal facility shall not exceed the footprint shown in Figure 4 of the revised Life of Mine (LOM) design plans provided in the February, 2010, <i>Request for Other Amendment to APP 101353 South Waste Rock Disposal Facility Expansion</i> . The facility shall consist of angle of repose slopes interrupted approximately every 300 feet in elevation by an approximately 115-foot wide bench. This configuration shall be documented as required in Section 2.7.4 of this Permit.

Notes:

1. Prescriptive BADCT design involves a prescribed engineering approach that utilizes pre-approved discharge control technologies or engineering equivalents to meet the requirements of A.R.S. 49-243(B)(1).
2. Individual BADCT requirements are described in the ADEQ Arizona Mining BADCT Guidance Manual. For existing facilities, consideration of additional factors as listed in A.R.S. §§ 49-243(B)(1)(a) through (h) and 49-243(G) apply.
3. Abbreviations:

BADCT	Best Available Demonstrated Control Technology	ALR	Action Leakage Rate
HDPE	High-density Polyethylene	RLLR	Rapid and Large Leakage Rate

TABLE 4.2.1 REQUIRED INSPECTIONS AND OPERATIONAL MONITORING	
Facility Name (#)	Operational Requirements
LEACH DUMPS	
Upper Niagara Leach Dump (D-6) Copper Creek Leach Dump (D-7) Plan IX Leach Dump (D-15) Mineral Creek Leach Dump (D-18) Crystal Mountain Leach Dump (D-19)	<p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access.
PROCESS SOLUTION IMPOUNDMENTS – DOUBLE-LINED; OUTSIDE THE PCCZ	
Boulder Flood Basin (D-11) Strong PLS Pond (D-20)	<p>Daily: Check and take appropriate action if any evidence of blockages of overflow pipes/spillway structures Visually inspect and maintain applicable freeboard in impoundment – Strong PLS Pond – 2 feet</p> <p>Weekly: Strong PLS Pond Measure flow rate in the LCRS: confirm that it is less than specified ALR (See Section 2.6.2.4 and Table 2.2.4) and less than the specified rate for RLLR (See Section 2.6.2.5 and Table 2.2.4); and take appropriate action if exceedance is observed in the values.</p> <p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access.

	<p>At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.</p> <p>Annually: Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of design capacity.</p>
PROCESS SOLUTION IMPOUNDMENTS – LINED; OUTSIDE THE PCCZ	
<p>Copper Creek PLS Pond System (PLS Pond and Conveyance Channel (D-10))</p>	<p>Daily: Check and take appropriate action if any evidence of blockages of overflow pipes/spillway structures or conveyance channel.</p> <p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -perforated cut, tear of damaged liner and impairment of anchor trench integrity of the Conveyance Channel; -impairment of embankment integrity; -excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access.</p> <p>At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.</p> <p>Annually: Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of design capacity.</p>
TAILINGS IMPOUNDMENTS	
<p>Mulholland Tailings Pond (D-1)</p>	<p>Daily: Check and take appropriate action if any evidence of blockages of overflow pipes/spillway structures or conveyance channel.</p> <p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -perforated cut, tear of damaged liner and impairment of anchor trench integrity of the Conveyance Channel; -impairment of embankment integrity; -excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access.</p> <p>At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.</p> <p>Annually: Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of design capacity.</p>

PROCESS SOLUTION IMPOUNDMENTS WITHIN THE PCCZ	
Catchments within PCCZ (D-27)	<p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements):</p> <p>Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access. <p>At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.</p>

TABLE 4.2.1 REQUIRED INSPECTIONS AND OPERATIONAL MONITORING	
Facility Name (#)	Operational Requirements
LEACH DUMPS	
Upper Niagara Leach Dump (D-6)	<p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements):</p> <p>Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access.
Copper Creek Leach Dump (D-7)	
Plan IX Leach Dump (D-15)	
Mineral Creek Leach Dump (D-18)	
Crystal Mountain Leach Dump (D-19)	
PROCESS SOLUTION IMPOUNDMENTS WITHIN THE PCCZ	
Catchments within PCCZ (D-27)	<p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements):</p> <p>Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -instability, including surface cracks, slides, sloughs or unusual differential settlement; -excessive erosion in conveyances and diversions;

	<p>-excessive accumulation of debris in conveyances and diversions; and -impairment of access.</p> <p>At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.</p>
PROCESS SOLUTION IMPOUNDMENTS – DOUBLE-LINED; OUTSIDE THE CAPTURE ZONE OF THE HYDROLOGIC SINK	
<p>Boulder Flood Basin (D-11)</p> <p>Strong PLS Pond (D-20)</p>	<p>Daily: Check and take appropriate action if any evidence of: -blockages of overflow pipes/spillway structures.</p> <p>Visually inspect and maintain applicable freeboard in impoundment: -Strong PLS Pond - 2 feet</p> <p>Weekly: Strong PLS Pond Measure flow rate in the LCRS; confirm that it is less than specified ALR (See Section 2.6.2.4 and Table 2.2.4) and less than specified rate for RLLR (See Section 2.6.2.5 and Table 2.2.4); and take appropriate action if exceedance is observed in the values.</p> <p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -perforated cut, tear or damaged liner and impairment of anchor trench integrity; -impairment of embankment integrity; - excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access.</p> <p>At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.</p> <p>Annually: Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of designed capacity.</p>
PROCESS SOLUTION IMPOUNDMENTS – DOUBLE-LINED; WITHIN THE CAPTURE ZONE OF THE HYDROLOGIC SINK	
<p>Raffinate Pond (D-13)</p>	<p>Daily: Check and take appropriate action if any evidence of: -blockages of overflow pipes/spillway structures.</p>

<p>PLS Surge Pond (D-14)</p>	<p>Weekly: Raffinate Pond and PLS Surge Pond Measure flow rate in the LCRS; confirm that it is less than specified ALR (See Section 2.6.2.4 and Table 2.2.4) and less than specified rate for RLLR (See Section 2.6.2.5 and Table 2.2.4); and take appropriate action if exceedance is observed in the values.</p> <p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements):</p> <p>Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -perforated cut, tear or damaged liner and impairment of anchor trench integrity; -impairment of embankment integrity; - excessive erosion in conveyances and diversions; -excessive accumulation of debris in conveyances and diversions; and -impairment of access. <p>At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.</p> <p>Annually: Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of designed capacity.</p>
PROCESS SOLUTION IMPOUNDMENT –LINED; OUTSIDE THE CAPTURE ZONE OF THE HYDROLOGIC SINK	
<p>Copper Creek PLS Pond System (PLS Pond and Conveyance Channel) (D-10)</p>	<p>Daily: Check and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -blockages of overflow pipes/spillway structures or Conveyance Channel. <p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements):</p> <p>Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> - perforated cut, tear or damaged liner and impairment of anchor trench integrity of the Conveyance Channel; -impairment of embankment integrity; - excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access. <p>At pump locations, inspect pumps, valves and structures for pump operation and structural integrity.</p> <p>Annually: Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of designed capacity.</p>

TAILINGS IMPOUNDMENTS	
<p>Mulholland Tailings Pond (D-1)</p>	<p>Daily during operational use (disposal of tailings, recycled water or process solution during upset conditions), and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and maintain a minimum of 4 feet of freeboard.</p> <p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -tailings dam deformation, including surface cracks, slides, sloughs, seeps, erosion features or differential settlement -affecting dam stability; - excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access; At pump installations, inspect pumps, valves and structures for pump operation and structural integrity.</p> <p><u>REQUIREMENTS SPECIFIC TO WATER QUALITY</u> Insure that the pH of all potentially acidic waters directed to the Mulholland Tailings Pond shall be tested and adjusted upward as needed to a pH greater than 4.5 SU before being discharged to the impoundment.</p>
<p>Mammoth Tailings Impoundment (D-23)</p>	<p>Daily: Tailings Dam(s) Integrity- -Check for erosion beyond that due to normal deposition -Check for evidence of unexpected seepage, header damage, or excessive construction water flows</p>
<p>Upper Mammoth Tailings Impoundment (D-24)</p>	<p>Tailings Impoundments- - Check tailing water reclaim pumps - Check for minimum ten feet of freeboard</p>
NON STORM WATER IMPOUNDMENTS	
<p>Mulholland Seepage Collection Pond (D-2)</p>	<p>Weekly: Visually inspect and take appropriate action if: -seepage from the Mulholland Tailings Pond into the seepage pond exceeds the pumping capacity of 1,175 gpm</p> <p>Monthly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of: -instability, including surface cracks or unusual differential settlement;</p>

	<ul style="list-style-type: none"> -seepage through surface cracks along the embankment; -excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access; <p>At pump installations, inspect pumps, valves and structures for pump operation and structural integrity.</p>
<p>Last Chance Pond (D-3)</p>	<p>Quarterly and following precipitation events measuring at least 1-inch in a 24-hour period: (precipitation shall be measured based on readings obtained from the mine weather station used for such measurements): Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -excessive erosion or accumulation of debris in conveyances and diversions; and -impairment of access; <p>At pump installations, inspect pumps, valves and structures for pump operation and structural integrity.</p> <p>Annually: Remove excess sediments/sludge from the impoundment as needed to maintain at least 80 percent of designed capacity.</p>
<p>Mammoth Tailings Seepage Collection Pond (D-25)</p>	<p>Daily: Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -visible leaks or seepage -Check seepage return pumps for proper function -Check for water level below weir -Check for minimum 1 foot of freeboard -Check for evidence of seepage -Inspect Seepage Collection Pumpback Dam for visible leaks or structural failure -Inspect Seepage Sump (below Pumpback dam) for overflow and check down-hole pump operation
WASTE ROCK STORAGE FACILITY	
<p>South Waste Rock Disposal Facility (D-26)</p>	<p>Monthly: Visually inspect and take appropriate action if any evidence of:</p> <ul style="list-style-type: none"> -dump or stockpile deformation, including surface cracks, slides, sloughs, or differential settlement affecting slope stability.

**TABLE 4.2.2
PARAMETERS FOR AMBIENT GROUNDWATER MONITORING FOR ALL POC WELLS⁴**

Depth to Water Level (feet)	Potassium ¹	Nickel ¹
Water Level Elevation (feet amsl)	Sodium ¹	Selenium ¹
Temperature – field (°F)	Iron ¹	Thallium ¹
pH – field and lab (S.U.)	Aluminum ¹	Zinc ¹
Field Specific Conductance (µmhos/cm)	Antimony ¹	Free Cyanide
Total Dissolved Solids – lab	Arsenic ¹	Adjusted Gross Alpha Activity (pCi/L) ³
Total Alkalinity	Barium ¹	Radium 226 (pCi/L)
Bicarbonate	Beryllium ¹	Radium 228 (pCi/L)
Carbonate	Cadmium ¹	Uranium (mg/L) ¹
Hydroxide	Chromium ¹	Carbon Disulfide
Sulfate	Cobalt ¹	Benzene
Chloride	Copper ¹	Toluene
Fluoride	Lead ¹	Ethylbenzene
Nitrate+Nitrite	Manganese ¹	Total Xylenes
Calcium ¹	Mercury ¹	TPH
Magnesium ¹	Molybdenum ¹	

1. Metals must be analyzed as dissolved metals.
2. All parameters are in milligrams per liter (mg/L) unless otherwise noted.
3. The adjusted gross alpha particle activity is the gross alpha particle activity, including radium 226, minus radon and total uranium activity (the sum of the uranium 238, uranium 235 and uranium 234 isotopes).
4. This table is being provided in the event that it becomes necessary to install additional POC wells

**TABLE 4.2.3
QUARTERLY COMPLIANCE GROUNDWATER MONITORING AND REPORTING REQUIREMENTS
FOR POC WELLS**

PARAMETER	CMW-609		CMW-610		CMW-611		020	
	AQL	AL	AQL	AL	AQL	AL	AQL	AL
Depth to Water (in feet)	Monitor							
Water Level Elevation (in feet amsl)	Monitor							
Field pH (S.U.)	Monitor							
Field Specific Conductance (µmhos/cm)	Monitor							
Temperature – field (°F)	Monitor							
Total Dissolved Solids	Monitor							
Sulfate	Monitor							
Fluoride	6.0	None	7.45	None	4.0	3.2	4.0	3.2
Nitrate+Nitrite	10	8	10	8	10	8	10	8
Arsenic	0.050	0.040	0.360	None	0.050	0.040	0.050	0.040
Cadmium	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Chromium	0.10	0.08	0.40	None	0.10	0.08	0.10	0.08
Copper	Monitor							
Nickel	0.10	0.08	1.58	None	0.10	0.08	0.10	0.08
Selenium	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04
Zinc	Monitor							

Monitor = Monitoring is required, but no AQL or AL is established in the permit.
AQL = Aquifer Quality Limit
AL = Alert Level

All concentrations are in milligrams per liter (mg/L) unless otherwise specified.

Metals will be analyzed as dissolved metals

Use Table 4.2.4 parameter list for biennial sampling events.

**TABLE 4.2.3
QUARTERLY COMPLIANCE GROUNDWATER MONITORING AND REPORTING REQUIREMENTS
FOR POC WELLS (CONTINUED)**

PARAMETER	803		283		613		810	
	AQL	AL	AQL	AL	AQL	AL	AQL	AL
Depth to Water (in feet)	Monitor							
Water Level Elevation (in feet amsl)	Monitor							
Field pH (S.U.)	Monitor							
Field Specific Conductance (µmhos/cm)	Monitor							
Temperature – field (°F)	Monitor							
Total Dissolved Solids	Monitor							
Sulfate	Monitor							
Fluoride	4.0	3.2	4.0	3.2	4.0	3.2	4.0	3.2
Nitrate+Nitrite	10	8	10	8	10	8	10	8
Arsenic	0.050	0.040	0.050	0.04	0.050	0.040	0.050	0.040
Cadmium	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Chromium	0.10	0.08	0.10	0.08	0.10	0.08	0.10	0.08
Copper	Monitor							
Nickel	0.10	0.08	0.10	0.08	0.10	0.08	0.12	None
Selenium	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Zinc	Monitor							

Monitor = Monitoring is required, but no AQL or AL is established in the permit.

AQL = Aquifer Quality Limit

AL = Alert Level

All concentrations are in milligrams per liter (mg/L) unless otherwise specified.

Metals will be analyzed as dissolved metals

Use Table 4.2.4 parameter list for biennial sampling events.

**Table 4.2.4
BIENNIAL COMPLIANCE GROUNDWATER MONITORING AND
REPORTING REQUIREMENTS FOR POC WELLS**

PARAMETER	CMW-609		CMW-610		CMW-611		020	
	AQL	AL	AQL	AL	AQL	AL	AQL	AL
Depth to Water (in feet)	Monitor							
Water Level Elevation (feet amsl)	Monitor							
Field pH (S.U.)	Monitor							
Field Specific Conductance (µmhos/cm)	Monitor							
Temperature (°F)	Monitor							
Total Dissolved Solids	Monitor							
Total Alkalinity	Monitor							
Bicarbonate	Monitor							
Carbonate	Monitor							
Hydroxide	Monitor							
Chloride	Monitor							
Sulfate	Monitor							
Sodium	Monitor							
Potassium	Monitor							
Calcium	Monitor							
Magnesium	Monitor							
Nitrate+Nitrite	10	8	10	8	10	8	10	8
Fluoride	6.00	None	7.45	None	4.0	3.2	4.0	3.2
Aluminum	Monitor							
Antimony	0.006	0.0048	0.006	0.0048	0.006	0.0048	0.006	0.0048
Arsenic	0.050	0.040	0.360	None	0.050	0.040	0.050	0.040
Barium	2.0	1.6	2.0	1.6	2.0	1.6	2.0	1.6
Beryllium	0.004	0.0032	0.004	0.0032	0.004	0.0032	0.004	0.0032
Cadmium	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Chromium	0.10	0.08	0.40	None	0.10	0.08	0.10	0.08
Iron	Monitor							
Lead	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Mercury	0.002	0.0016	0.002	0.0016	0.002	0.0016	0.002	0.0016
Nickel	0.10	0.08	1.58	None	0.10	0.08	0.10	0.08
Selenium	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Thallium	0.002	0.0016	0.002	0.0016	0.002	0.0016	0.002	0.0016
Copper	Monitor							
Cobalt	Monitor							
Manganese	Monitor							
Molybdenum	Monitor							
Zinc	Monitor							
Adjusted Gross Alpha Activity (pCi/L)	15	12	15	14	15	12	15	12

Calcium	Monitor							
Magnesium	Monitor							
Nitrate+Nitrite	10	8	10	8	10	8	10	8
Fluoride	4.0	3.2	4.0	3.2	4.0	3.2	4.0	3.2
Aluminum	Monitor							
Antimony	0.006	0.0048	0.006	0.0048	0.006	0.0048	0.006	0.0048
Arsenic	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Barium	2.0	1.6	2.0	1.6	2.0	1.6	2.0	1.6
Beryllium	0.004	0.0032	0.004	0.0032	0.004	0.0032	0.004	0.0032
Cadmium	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Chromium	0.10	0.08	0.10	0.08	0.10	0.08	0.10	0.08
Iron	Monitor							
Lead	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Mercury	0.002	0.0016	0.002	0.0016	0.002	0.0016	0.002	0.0016
Nickel	0.10	0.08	0.10	0.08	0.10	0.08	0.12	None
Selenium	0.050	0.040	0.050	0.040	0.050	0.040	0.050	0.040
Thallium	0.002	0.0016	0.002	0.0016	0.002	0.0016	0.002	0.0016
Copper	Monitor							
Cobalt	Monitor							
Manganese	Monitor							
Molybdenum	Monitor							
Zinc	Monitor							
Adjusted Gross Alpha Activity (pCi/L)	15	12	20.4	None	28.7	None	42.1	None
Radium226+Radium228 (pCi/L)	5.0	4.0	5.0	4.0	5.0	4.0	5.2	None
Uranium (mg/L)	Monitor							
Free Cyanide	0.2	0.16	0.2	0.16	0.2	0.16	0.2	0.16
Carbon Disulfide	Monitor							
TPH	Monitor							
Benzene	0.005	0.004	0.005	0.004	0.005	0.004	0.005	0.004
Toluene	1	0.8	1	0.8	1	0.8	1	0.8
Ethylbenzene	0.7	0.56	0.7	0.56	0.7	0.56	0.7	0.56
Total Xylenes	10	8	10	8	10	8	10	8

Monitor = Analysis required but no AQL or AL established in the permit.

AQL = Aquifer Quality Limit

AL = Alert Level

All concentrations are in milligrams per liter (mg/L) unless otherwise specified.

Metals will be analyzed as dissolved metals.

If the gross alpha particle activity is greater than the AL or AQL, then test for and report adjusted gross alpha particle activity. The adjusted gross alpha particle activity is the gross alpha particle activity including radium226, minus radon and total uranium (the sum of the uranium 238, 235 and 234 isotopes).

Use Table 4.2.3 parameters for quarterly sampling events between biennial events.

5.0 REFERENCES AND PERTINENT INFORMATION

The terms and conditions set forth in this permit have been developed based upon the information contained in the following, which are on file with the Department:

APP P-105258

1. APP Application dated November 1, 1993.
2. Public Notice, dated March 23, 2006.
3. Responsiveness Summary, dated July 2006.
4. Aquifer Protection Permit file, Inventory Numbers 101353 and 105258.
5. Permit Issuance, dated March 25, 2009
6. Minor Amendment, dated April 30, 2009.
7. Other Amendment, dated October 1, 2010 (LTF-51739).
8. Other Amendment, dated November 19, 2010 (LTF-52305).
9. Other Amendment application, dated June 23, 2009 (LTF-50325).
10. Other Amendment application, dated March 25, 2011 (LTF-53994).
11. Other Amendment application, dated March 26, 2012.

APP P-101353

1. APP Application dated July 7, 1993.
2. Public Notice, dated April 7, 1996.
3. Inventory File No. 101353 including all correspondence, maps, drawings, engineering reviews, hydrologic reviews and compliance schedule submittals.
4. Previous Amendments to the APP:
 - Minor Amendment to the APP; May, 1997.
 - Significant Amendment to the APP; January, 2001.
 - Other Amendment to the APP; August, 2001.
 - Significant Amendment to the APP; November, 2001.
 - Other Amendment to the APP, June 2009.
5. Other Amendment Application received March 2, 2010.
6. Other Amendment Application received August 9, 2011.

6.0 NOTIFICATION PROVISIONS**6.1 Annual Registration Fees**

The permittee is notified of the obligation to pay an Annual Registration Fee to ADEQ. The Annual Registration Fee is based upon the amount of daily influent or discharge of pollutants in gallons per day as established by A.R.S. § 49-242.

6.2 Duty to Comply [A.R.S. §§ 49-221 through 49-263]

The permittee is notified of the obligation to comply with all conditions of this permit and all applicable provisions of Title 49, Chapter 2, Articles 1, 2 and 3 of the Arizona Revised Statutes, Title 18, Chapter 9, Articles 1 through 4, and Title 18, Chapter 11, Article 4 of the Arizona Administrative Code. Any permit non-compliance constitutes a violation and is grounds for an enforcement action pursuant to Title 49, Chapter 2, Article 4 or permit amendment, suspension, or revocation.

6.3 Duty to Provide Information [A.R.S. §§ 49-243(K)(2) and 49-243(K)(8)]

The permittee shall furnish to the Director, or an authorized representative, within a time specified, any information which the Director may request to determine whether cause exists for amending or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

6.4 Compliance with Aquifer Water Quality Standards [A.R.S. §§ 49-243(B)(2) and 49-243(B)(3)]

The permittee shall not cause or contribute to a violation of an aquifer water quality standard at the applicable point of compliance for the facility. Where, at the time of issuance of the permit, an aquifer already exceeds an aquifer water quality standard for a pollutant, the permittee shall not discharge that pollutant so as to further degrade, at the applicable point of compliance for the facility, the water quality of any aquifer for that pollutant.

6.5 Technical and Financial Capability

[A.R.S. §§ 49-243(K)(8) and 49-243(N) and A.A.C. R18-9-A202(B) and R18-9-A203(E) and (F)]

The permittee shall have and maintain the technical and financial capability necessary to fully carry out the terms and conditions of this permit. Any bond, insurance policy, trust fund, or other financial assurance mechanism provided as a demonstration of financial capability in the permit application, pursuant to A.A.C. R18-9-A203(D), shall be in effect prior to any discharge authorized by this permit and shall remain in effect for the duration of the permit.

6.6 Reporting of Bankruptcy or Environmental Enforcement [A.A.C. R18-9-A207(C)]

The permittee shall notify the Director within five days after the occurrence of any one of the following:

1. The filing of bankruptcy by the permittee.
2. The entry of any order or judgment not issued by the Director against the permittee for the enforcement of any environmental protection statute or rule.

6.7 Monitoring and Records [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A206]

The permittee shall conduct any monitoring activity necessary to assure compliance with this permit, with the applicable water quality standards established pursuant to A.R.S. §§ 49-221 and 49-223 and §§ 49-241 through 49-252.

6.8 Inspection and Entry [A.R.S. §§ 41-1009, 49-203(B) and 49-243(K)(8)]

In accordance with A.R.S. §§ 41-1009 and 49-203(B), the permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to enter and inspect the facility as reasonably necessary to ensure compliance with Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes, and Title 18, Chapter 9, Articles 1 through 4 of the Arizona Administrative Code and the terms and conditions of this permit.

6.9 Duty to Modify [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A211]

The permittee shall apply for and receive a written amendment before deviating from any of the designs or

operational practices specified by this permit.

6.10 Permit Action: Amendment, Transfer, Suspension & Revocation

[A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]

This permit may be amended, transferred, renewed, or revoked for cause, under the rules of the Department.

The permittee shall notify the Groundwater Section in writing within 15 days after any change in the owner or operator of the facility. The notification shall state the permit number, the name of the facility, the date of property transfer, and the name, address, and phone number where the new owner or operator can be reached. The operator shall advise the new owner or operators of the terms of this permit and the need for permit transfer in accordance with the rules.

7.0 ADDITIONAL PERMIT CONDITIONS

7.1 Other Information [A.R.S. § 49-243(K)(8)]

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit the correct facts or information.

7.2 Severability

[A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby. The filing of a request by the permittee for a permit action does not stay or suspend the effectiveness of any existing permit condition.

7.3 Permit Transfer

This permit may not be transferred to any other person except after notice to and approval of the transfer by the Department. No transfer shall be approved until the applicant complies with all transfer requirements as specified in A.A.C. R18-9-A212(B) and (C).

APPENDIX C TYPICAL CONFIGURATION OF DISTRIBUTED FACILITIES

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The distributed facilities proposed in this MPO Modification fulfill the need for future, support facilities that are typically associated with mining operations to meet safety, environmental, operational, closure, and post-closure requirements. The basic description and typical configuration of possible distributed facilities are summarized in Table C-1. In addition to the conceptual configuration of power lines and access roadways/pipelines presented in Figures C-1 and C-2, Figures C-3 and C-4 present the conceptual configuration of drill sites and geotechnical/slope stability monitoring equipment. Typically, pipelines would parallel access roadways, but segments of a pipeline may run independently. Access roadways may or may not be accompanied by a pipeline.

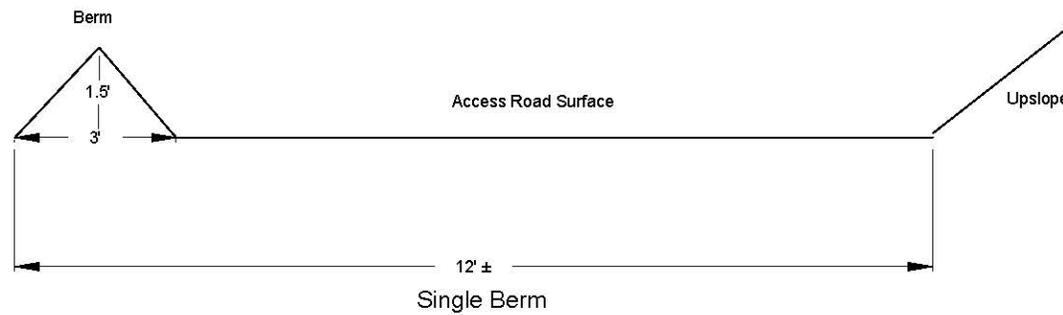
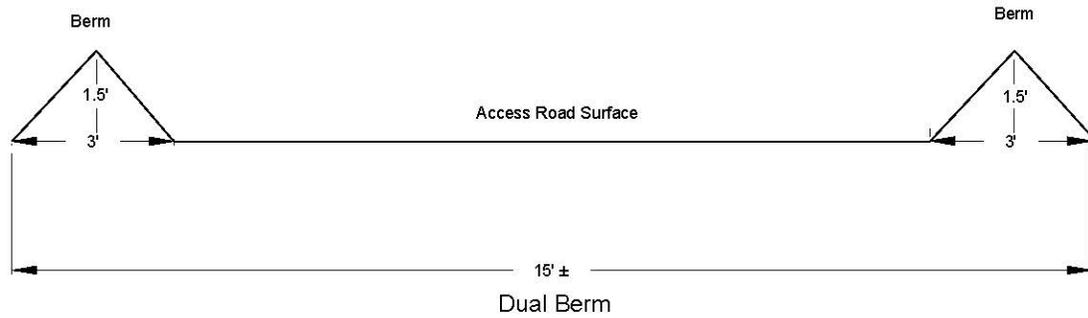
FMBI anticipates that a condition of the approval of this MPO would require the submittal of final engineering plans to the BLM prior to ground disturbing activities related to the distributed facilities.

Table C-1 Typical Distributed Facilities

Description of Surface Disturbing Activity	Anticipated Number of Items	Anticipated Size of Items¹	Anticipated Surface Disturbance¹
Future power line and associated access roads (Figure C-1)	Up to one power line in addition to the APS power line (by others); multiple road segments	Approximately 20,000 linear feet of power line and roughly 24,000 linear feet of new access roads have been proposed in association with the APS power line; minimal additional access roads may be required for construction of a second power line.	Approximately 20 to 30 acres of disturbance for APS power line access and maintenance roads may be anticipated; minimal additional disturbance area may be required for construction of a second power line.
Future pipeline (water or process fluid; Figure C-2)	0 to 5 ±	Pipe diameter may range from approximately 4 to 48 inches, reflecting the range of pipe sizes currently in use at the Bagdad Mine.	Unknown
Future pipeline (gas; Figure C-2)	None anticipated	Unknown	None anticipated
Future access roads (Figure C-2)	Multiple segments possible, generally associated with other proposed disturbance	Access roads would accommodate passenger vehicles/ light-duty trucks; If possible, new access roads would be planned for the minimum width needed and would follow natural contours where practicable to minimize cut and fill. Anticipated up to approximately 20' wide, including dual berms.	Unknown
Monitoring wells/ drill sites (Figure C-3)	0 to 10 ±	Each site may be anticipated to be up to roughly 200 feet by 200 feet.	Each site would be anticipated to be less than an acre of disturbance
Communications equipment and apparatus	None anticipated	Generally less than 15'x15' footprint.	Generally less than 0.01 acre per location

Description of Surface Disturbing Activity	Anticipated Number of Items	Anticipated Size of Items ¹	Anticipated Surface Disturbance ¹
Water management facilities	Multiple possible, generally associated with other proposed disturbance	May include erosion control measures/BMPs such as waddles, hay bales, vegetated swales, erosion control blankets, silt fences, <i>etc.</i>	Minimal
Wildlife monitoring stations	None anticipated	If needed, may consist of a camera strapped to a tree or similar.	Minimal
Signage, barriers, or berms	None anticipated		Minimal
Scientific monitoring equipment	0 to 2 ±	May include such equipment as a weather station; generally less than 15'x15' footprint.	Generally less than 0.01 acre per location
Geotechnical/slope stability monitoring equipment (Figure C-4)	0 to 5 ±	May include such equipment as total station monument or temporary robot shacks; generally less than 15'x15' footprint.	Generally less than 0.01 acre per location

¹ Lengths and areas delineated within Sections 16 and 17 of Township 14 North, Range 9 West of the GSRB&M. Distributed facilities may also be located within the proposed limit of Stockpile extension.



Note: This figure represents a typical access road.
Actual configuration may vary.

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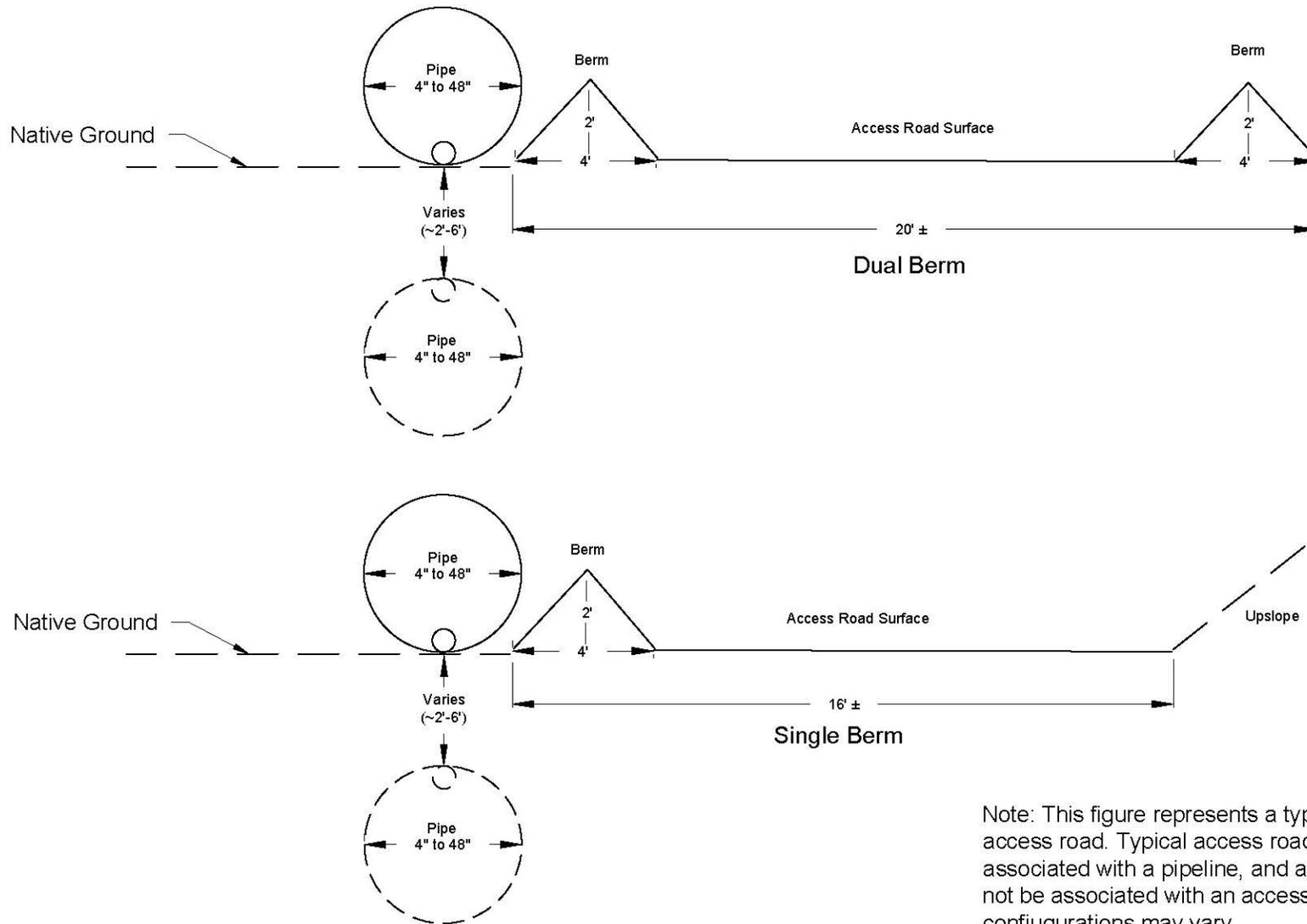
PROJECT: 210204	TASK:
PREPARED BY: TELESTO SOLUTIONS INCORPORATED	

FIGURE C-1
TYPICAL ACCESS ROAD - NTS

PREPARED FOR:

FREEPORT-McMoRAN
COPPER & GOLD

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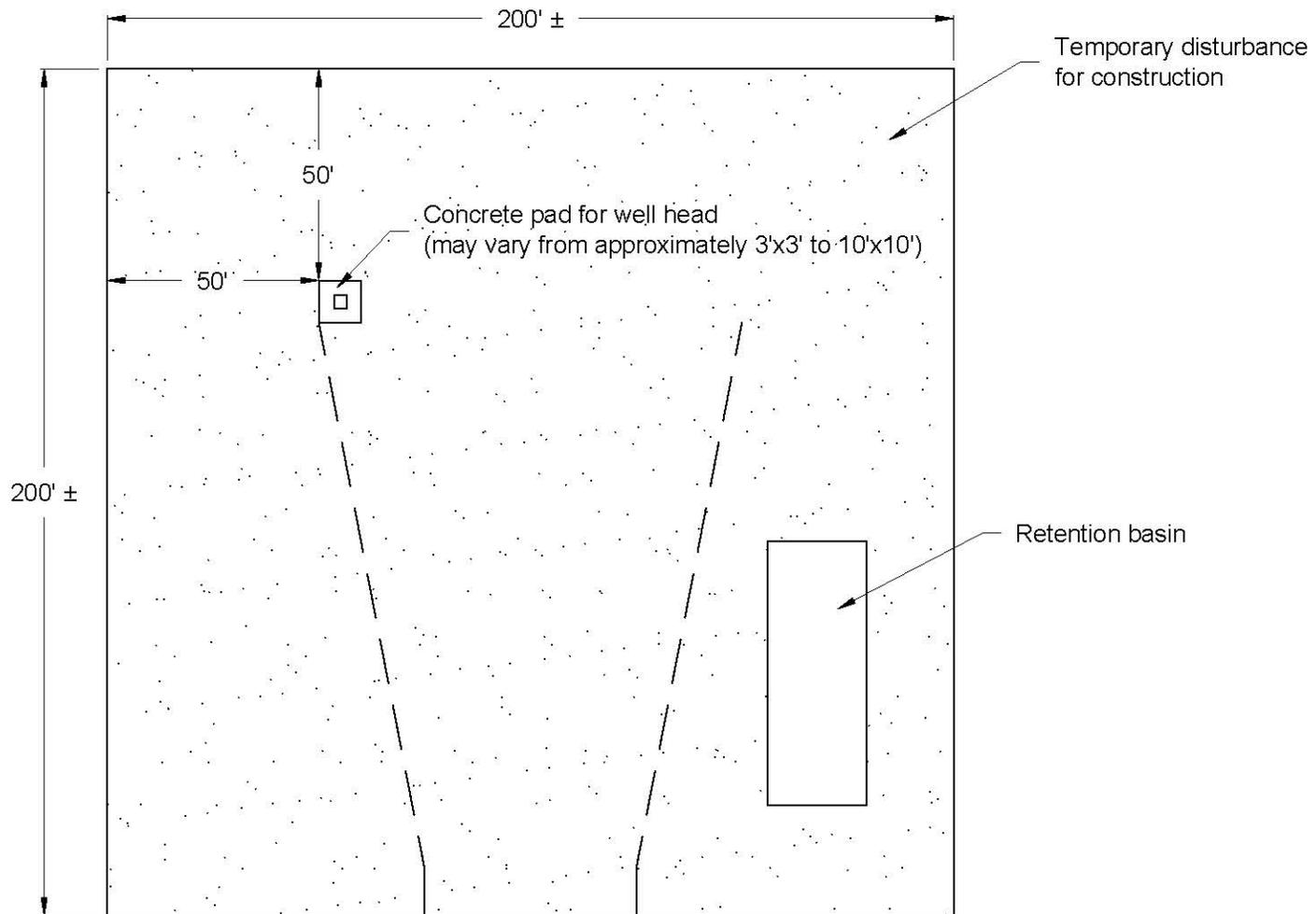


Note: This figure represents a typical pipeline with an access road. Typical access road may or may not be associated with a pipeline, and a pipeline may or may not be associated with an access road. Actual configurations may vary.

PROJECT: 210204	TASK:
PREPARED BY: TELESTO SOLUTIONS INCORPORATED	

FIGURE C-2
TYPICAL ACCESS ROAD AND PIPELINE - NTS

PREPARED FOR:
FREEMPORT-McMORAN
COPPER & GOLD



Note: This figure represents a typical monitoring well site or drill site. Actual configuration may vary.

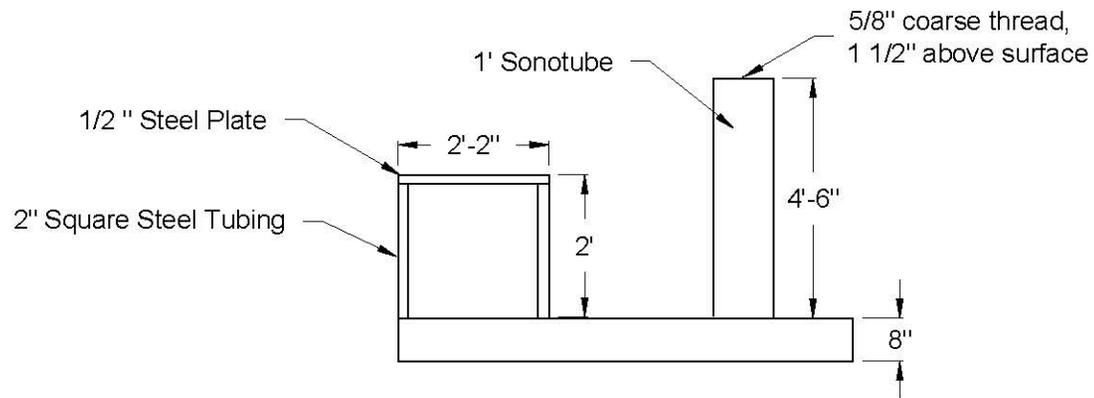
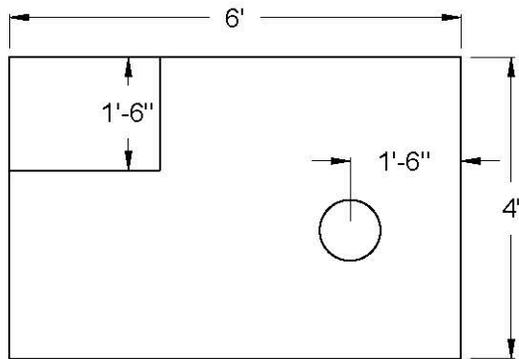
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PROJECT: 210204	TASK:
PREPARED BY: TELESTO SOLUTIONS INCORPORATED	

FIGURE C-3
TYPICAL DESIGN OF MONITORING WELLS/DRILL SITES
PLAN VIEW - NTS

PREPARED FOR:

FREEPORT-McMoRAN
COPPER & GOLD



Note: This figure represents a typical pre-cast total station monument as one type of geotechnical/slope stability monitoring equipment. Actual configuration or equipment type may vary.

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PROJECT: 210204	TASK:
PREPARED BY: TELESTO SOLUTIONS INCORPORATED	

FIGURE C-4
TYPICAL GEOTECHNICAL/SLOPE STABILITY MONITORING EQUIPMENT
PRE-CAST TOTAL STATION MONUMENT - NTS

PREPARED FOR:
FMC FREEPORT-McMORAN
COPPER & GOLD

**APPENDIX D ACID-GENERATING POTENTIAL ANALYSIS FROM 1995
CLOSURE PLAN**

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3.2.2 Acid-Generating Potential Evaluation

The purpose of the evaluation of acid-generating potential of the waste rock was to ascertain whether rock samples representative of the material to be placed in the SWRDF exhibit characteristics that may generate ARD. The evaluation is summarized in Tables 3 and 4. Some of the rock to be placed in the SWRDF exhibit uncertain or possible acid-generating potential. Table 3 presents the most conservative evaluation based on total sulfur content. Table 4 presents the evaluation based on pyritic sulfur. Appendix C presents the existing database of acid-generating potential evaluations performed on numerous waste rock and pit area samples.

Acid Base Accounting (ABA) results were used to evaluate the ARD potential of representative waste rock samples based on empirical guidelines presented in the EPA's Technical Document on Acid Mine Drainage Prediction (EPA, 1994). ABA analyses use data on total and pyritic sulfur content, neutralization potential (NP) and acid potential (AP) of the rock sample. NP and AP are

then compared to determine whether a material is likely to generate acid. A summary of both the data and analyses performed is presented in Tables 3 and 4.

In addition to the ABA analysis, a limited number of humidity cell tests have been performed on some of the local waste rock types. These test results are presented in Appendix C. Humidity cell tests attempt to estimate the long-term chemical weathering of the waste rock in a seven day period. The humidity cell testing process involves crushing the rock to a diameter less than 2.38 millimeters. The sample is then placed in a container and inoculated with bacteria. Dry air is passed through the closed container for the first three days, followed by humidified air for the next three days. On the seventh day, the sample is rinsed with distilled water. The rinseate is then analyzed for pH, acidity, alkalinity, specific conductance, sulfate and dissolved metals. The rate of acid-generating potential is approximated from the results produced by these analyses. More than half of the CBCC samples tested exhibited characteristics of material likely to generate acid.

The humidity cell test is extremely aggressive and is, therefore, a very conservative means of evaluating ARD potential. The particle size used in testing is considerably smaller than that of the waste rock that will be deposited in the SWRDF. Therefore, the surface area to volume ratio of the sample is high. The resulting leachate quality data generated by the humidity cell test are enhanced due to increased surface area exposed to the water and air.

The steep slope configuration of the SWRDF which encourages runoff rather than infiltration, and capping of the top and benches where most infiltration would otherwise occur, will limit the potential for ARD-impacted water. Seepage that does occur will flow through the toe of the SWRDF on the north side of the facility due to the natural slope and lower permeability of the soils and rock below the SWRDF. Seepage will be collected in existing or new surface water diversion channels and directed to surface water retention ponds or the open pit. If retention ponds are used, water will either evaporate or infiltrate and flow toward the open pit where it will be contained permanently. Therefore, no ARD-impacted water potentially generated by the SWRDF will leave the mine site.

Table 3
Acid Generating Potential of Waste Rock (1)
Total Sulfur Evaluation
South Waste Rock Disposal Facility
Closure Plan

Sample No.	Rock Type	Total Sulfur						Status (7)	Status (8)
		Total Sulfur (%)	NP (2) (%)	NP (3) (T/1000T)	AP (4) (T/1000T)	ABP (5) (T/1000T)	Ratio of NP:AP (6)		
AO1QM	Quartz Monzonite	1.19	2.4	24	37.19	13	1	uncertain	potentially
AO2QM	Quartz Monzonite	0.37	3.5	35	11.56	23	3	non-generating	non-generating
AO1GC	Gila Conglomerate	0.01	28.8	288	0.31	288	922	non-generating	non-generating
AO2GC	Gila Conglomerate	0.01	15.7	157	0.31	157	502	non-generating	non-generating
AO3GC	Gila Conglomerate	0.01	6.4	64	0.31	64	205	non-generating	non-generating
AO4GC	Gila Conglomerate	0.01	5.3	53	0.31	53	170	non-generating	non-generating
CBCC-D-1	Upper Butte Creek Dump	0.01	3	30	0.31	30	96	non-generating	non-generating
CBCC-D-2	Upper Butte Creek Dump	0.01	6.7	67	0.31	67	214	non-generating	non-generating
CBCC-D-3	Upper Butte Creek Dump	0.01	3.8	38	0.31	38	122	non-generating	non-generating
CBCC-D-4	Upper Mine Shop Dump	0.07	0.2	2	2.19	1	1	uncertain	potentially
CBCC-D-5	Upper Mine Shop Dump	0.01	5.3	53	0.31	53	170	non-generating	non-generating
CBCC-D-6	Upper Mine Shop Dump	0.19	4.8	48	5.94	48	8	non-generating	non-generating
AO1AP	Alaskite Porphyry	0.09	3	30	2.81	27	11	non-generating	non-generating
AO2AP	Alaskite Porphyry	0.01	2.5	25	0.31	25	80	non-generating	non-generating
AO1GBR	Gabbro	0.33	2.6	26	10.31	16	3	uncertain	uncertain
AO2GBR	Gabbro	0.91	3.1	31	28.44	3	1	uncertain	uncertain
AO3GBR	Gabbro	0.01	5.7	57	0.31	57	182	non-generating	non-generating
AO1GD	Granodiorite	0.01	3.4	34	0.31	34	109	non-generating	non-generating
AO2GD	Granodiorite	0.01	5.7	57	0.31	57	182	non-generating	non-generating
AO1KPR	King Peak Rhyolite	0.09	1.5	15	2.81	12	5	uncertain	non-generating
AO2KPR	King Peak Rhyolite	0.03	2.4	24	0.94	23	26	non-generating	non-generating
AO1YS	Yavapai Series	0.25	4.8	48	7.81	40	6	non-generating	non-generating
AO2YS	Yavapai Series	0.01	6.5	65	0.31	65	208	non-generating	non-generating
AO1SR	Sulfitic Rock	0.72	3.3	33	22.50	11	1	uncertain	uncertain
AO2SR	Sulfitic Rock	0.43	3	30	13.44	17	2	uncertain	uncertain
AO3SR	Sulfitic Rock	0.03	2.1	21	0.94	20	22	uncertain	non-generating
AO1SB	Sanders Basalt	0.01	16.1	161	0.31	161	515	non-generating	non-generating
AO2SB	Sanders Basalt	0.01	14.7	147	0.31	147	470	non-generating	non-generating
AO1WB	Wilder Basalt	0.01	13.6	136	0.31	136	435	non-generating	non-generating
AO2WB	Wilder Basalt	0.01	14.3	143	0.31	143	458	non-generating	non-generating

Table 3 (continued)
Acid Generating Potential of Waste Rock (1)
Total Sulfur Evaluation
South Waste Rock Disposal Facility
Closure Plan

Sample No.	Rock Type	Total Sulfur							Status (7)	Status (8)
		Total Sulfur (%)	NP (2) (%)	NP (3) (T/1000T)	AP (4) (T/1000T)	ABP (5) (T/1000T)	Ratio of NP:AP (6)			
AO1TF	Tuff	0.01	4	40	0.31	40	128	non-generating	non-generating	
AO2TF	Tuff	0.01	5.8	58	0.31	58	186	non-generating	non-generating	
AO1BTF	Baked Tuff	0.01	2.6	26	0.31	26	83	non-generating	non-generating	
AO2BTF	Baked tuff	0.01	38.8	388	0.31	388	1242	non-generating	non-generating	
CBCC-RPB-10	Pit Area	0.35	5	50	10.94	39	5	Non-generating	Non-generating	
CBCC-LP-110X	Pit Area	0.01	2.6	26	0.31	26	83	Non-generating	Non-generating	
CBCC-QM-5P	Pit Area	1.66	1.8	18	51.88	-34	0	potentially	potentially	
CBCC-QM-90X	Pit Area	0.02	1.5	15	0.63	14	24	uncertain	Non-generating	
CBCC-LPG-6S	Pit Area	0.65	2	20	20.31	0	1	uncertain	potentially	
CBCC-BFT-7S	Pit Area	1.65	2.7	27	51.56	-25	1	potentially	potentially	
CBCC-PQM-80X	Pit Area	0.01	1.1	11	0.31	11	35	uncertain	Non-generating	
CBCC-QM-1S	Pit Area	0.66	1.9	19	20.63	-2	1	uncertain	potentially	
CBCC-AP-30X	Pit Area	0.11	0.1	1	3.44	-2	0	uncertain	potentially	
CBCC-AP-2S	Pit Area	2.16	1.2	12	67.50	-56	0	potentially	potentially	
CBCC-QM-4S	Pit Area	1.09	2.8	28	34.06	-6	1	uncertain	potentially	

Analytical results provided by ACZ Laboratories

Notes:

- (1) Reference: Acid Mine Drainage Prediction, Technical Document, US EPA, August 1994.
- (2) NP = Neutralization Potential in %.
- (3) NP = Neutralization Potential in T/1000T. Calculated by multiplying % NP by 10.
- (4) AP = Acid Potential in T/1000T. Calculated using $AP = 31.25 * \% \text{ sulfur}$
- (5) ABP = Acid Base Potential in T/1000T
- (6) Ratio of NP to AP helps predict acid generating potential based on:
 - Ratios greater 3:1 indicate a lower risk for acid drainage to develop
 - Ratios between 3:1 and 1:1 are referred to as a zone of uncertainty.
 - Ratios of 1:1 or less are more likely to generate acid.
- (7) Status based on :
 - Values of ABP >20T/1000T are non-generating
 - Values of ABP between -20 and 20 are uncertain
 - Values of ABP <-20 are potentially acid generating
- (8) Status based on:
 - Values of NP >3AP are non-generating
 - Values of NP between AP and 3AP are uncertain
 - Values of NP < AP are potentially acid generating

Table 4
Acid Generating Potential of Waste Rock (1)
Pyritic Sulfur Evaluation
South Waste Rock Disposal Facility
Closure Plan

Sample No.	Rock Type	Pyritic Sulfur						Status (7)	Status (8)
		Pyritic Sulfur (%)	NP (2) (%)	NP (3) (T/1000T)	AP (4) (T/1000T)	ABP (5) (T/1000T)	Ratio of NP:AP (6)		
AO1QM	Quartz Monzonite	0.19	2.4	24	5.94	18.06	4	Nongenerating	Nongenerating
AO2QM	Quartz Monzonite	0.08	3.5	35	2.50	32.50	14	Nongenerating	Nongenerating
AO1GC	Gila Conglomerate	0.01	28.8	288	0.31	287.69	922	Nongenerating	Nongenerating
AO2GC	Gila Conglomerate	0.01	15.7	157	0.31	156.69	502	Nongenerating	Nongenerating
AO3GC	Gila Conglomerate	0.01	6.4	64	0.31	63.69	205	Nongenerating	Nongenerating
AO4GC	Gila Conglomerate	0.01	5.3	53	0.31	52.69	170	Nongenerating	Nongenerating
CBCC-D-1	Upper Butte Creek Dump	0.01	3	30	0.31	29.69	96	Nongenerating	Nongenerating
CBCC-D-2	Upper Butte Creek Dump	0.01	6.7	67	0.31	66.69	214	Nongenerating	Nongenerating
CBCC-D-3	Upper Butte Creek Dump	0.01	3.8	38	0.31	37.69	122	Nongenerating	Nongenerating
CBCC-D-4	Upper Mine Shop Dump	0.02	0.2	2	0.63	1.38	3	uncertain	uncertain
CBCC-D-5	Upper Mine Shop Dump	0.01	5.3	53	0.31	52.69	170	Nongenerating	Nongenerating
CBCC-D-6	Upper Mine Shop Dump	0.01	4.8	48	0.31	47.69	154	Nongenerating	Nongenerating
AO1AP	Alaskite Porphyry	0.02	3	30	0.63	29.38	48	non-generating	non-generating
AO2AP	Alaskite Porphyry	0.01	2.5	25	0.31	24.69	80	non-generating	non-generating
AO1GBR	Gabbro	0.06	2.6	26	1.88	24.13	14	non-generating	non-generating
AO2GBR	Gabbro #	0.47	3.1	31	14.69	16.31	2	uncertain	uncertain
AO3GBR	Gabbro	0.01	5.7	57	0.31	56.69	182	non-generating	non-generating
AO1GD	Granodiorite	0.01	3.4	34	0.31	33.69	109	non-generating	non-generating
AO2GD	Granodiorite	0.01	5.7	57	0.31	56.69	182	non-generating	non-generating
AO1KPR	King Peak Rhyolite	0.01	1.5	15	0.31	14.69	48	uncertain	non-generating
AO2KPR	King Peak Rhyolite	0.01	2.4	24	0.31	23.69	77	non-generating	non-generating
AO1YS	Yavapai Series	0.06	4.8	48	1.88	46.13	26	non-generating	non-generating
AO2YS	Yavapai Series	0.01	6.5	65	0.31	64.69	208	non-generating	non-generating
AO1SR	Sulfitic Rock	0.36	3.3	33	11.25	21.75	3	nongenerating	uncertain
AO2SR	Sulfitic Rock	0.13	3	30	4.06	25.94	7	non-generating	non-generating
AO3SR	Sulfitic Rock	0.01	2.1	21	0.31	20.69	67	non-generating	non-generating
AO1SB	Sanders Basalt	0.01	16.1	161	0.31	160.69	515	non-generating	non-generating
AO2SB	Sanders Basalt	0.01	14.7	147	0.31	146.69	470	non-generating	non-generating
AO1WB	Wilder Basalt	0.01	13.6	136	0.31	135.69	435	non-generating	non-generating
AO2WB	Wilder Basalt	0.01	14.3	143	0.31	142.69	458	non-generating	non-generating

Table 4 (continued)
Acid Generating Potential of Waste Rock (1)
Pyritic Sulfur Evaluation
South Waste Rock Disposal Facility
Closure Plan

Sample No.	Rock Type	Pyritic Sulfur							Status (7)	Status (8)
		Pyritic Sulfur (%)	NP (2) (%)	NP (3) (T/1000T)	AP (4) (T/1000T)	ABP (5) (T/1000T)	Ratio of NP:AP (6)			
AO1TF	Tuff	0.01	4	40	0.31	39.69	128	non-generating	non-generating	
AO2TF	Tuff	0.01	5.8	58	0.31	57.69	186	non-generating	non-generating	
AO1BTF	Baked Tuff	0.01	2.6	26	0.31	25.69	83	non-generating	non-generating	
AO2BTF	Baked tuff	0.01	38.8	388	0.31	387.69	1242	non-generating	non-generating	
CBCC-RPB-10	Pit Area	0.32	5	50	10.00	40.00	5	non-generating	non-generating	
CBCC-LP-110X	Pit Area	0.01	2.6	26	0.31	25.69	83	non-generating	non-generating	
CBCC-QM-5P	Pit Area	0.36	1.8	18	11.25	6.75	2	uncertain	uncertain	
CBCC-QM-90X	Pit Area	0.01	1.5	15	0.31	14.69	48	uncertain	non-generating	
CBCC-LPG-6S	Pit Area	0.53	2	20	16.56	3.44	1	uncertain	uncertain	
CBCC-BFT-7S	Pit Area	1.4	2.7	27	43.75	-16.75	1	uncertain	potentially	
CBCC-PQM-80X	Pit Area	0.01	1.1	11	0.31	10.69	35	uncertain	non-generating	
CBCC-QM-1S	Pit Area	0.11	1.9	19	3.44	15.56	6	uncertain	non-generating	
CBCC-AP-30X	Pit Area	0.01	0.1	1	0.31	0.69	3	uncertain	non-generating	
CBCC-AP-2S	Pit Area	0.97	1.2	12	30.31	-18.31	0	uncertain	potentially	
CBCC-QM-4S	Pit Area	0.35	2.8	28	10.94	17.06	3	uncertain	uncertain	

Analytical results provided by ACZ Laboratories

Notes:

- (1) Reference: Acid Mine Drainage Prediction, Technical Document, US EPA, August 1994.
- (2) NP = Neutralization Potential in %.
- (3) NP = Neutralization Potential in T/1000T. Calculated by multiplying % NP by 10.
- (4) AP = Acid Potential in T/1000T. Calculated using AP = 31.25 * % sulfur
- (5) ABP = Acid Base Potential in T/1000T
- (6) Ratio of NP to AP helps predict acid generating potential based on:
 - Ratios greater 3:1 indicate a lower risk for acid drainage to develop
 - Ratios between 3:1 and 1:1 are referred to as a zone of uncertainty.
 - Ratios of 1:1 or less are more likely to generate acid.
- (7) Status based on :
 - Values of ABP >20T/1000T are non-generating
 - Values of ABP between -20 and 20 are uncertain
 - Values of ABP <-20 are potentially acid generating
- (8) Status based on:
 - Values of NP >3AP are non-generating
 - Values of NP between AP and 3AP are uncertain
 - Values of NP < AP are potentially acid generating

APPENDIX C

Acid Rock Drainage Evaluation



By: KRB Date: 10/26/94 Subject: Acid Rock Drainage Prediction Sheet No: of
Chkd: KAF Date: 11/29/94 Cyprus Bagdad Copper Corporation Proj No: 4112-001

Purpose:

Determine the Acid Rock Drainage (ARD) Potential of the waste rock material within the proposed South Waste Rock Disposal (SWRD) Facility . Determination of the ARD potential is important in determining the configuration and cover requirements of the SWRD Facility that will be generated by the proposed expansion of the existing open pit at the Cyprus Bagdad Copper Mine.

Methods:

Methods used in determining the ARD Potential are consistent with those found in the U.S. EPA's Technical Document: Acid Mine Drainage Prediction, August 1994. A qualitative prediction of the ARD potential was determined by comparing the Acid Base Potential (ABA) and the Acid Producing Potential (AP) to two empirical guidelines developed by SME in 1991 and by comparing the ratio of the Neutralization Potential (NP) to the AP using another set of empirical guidelines. The empirical guidelines state that:

- (1) Values of ABA > 20 T/1000T are non-generating
Values of ABA between -20 and 20 are uncertain
Values of ABA < -20 are potentially generating
- (2) Values of NP > 3AP are non-generating
Values of NP between AP and 3AP are uncertain
Values of NP < AP are potentially acid generating

Evaluating the ratio of NP to AP is compared to the guidelines that:

Ratios < 3:1 indicate a lower risk for acid drainage to develop
Ratios between 3:1 and 1:1 are referred to as a zone of uncertainty
Ratios 1:1 or less are more likely to generate acid.

Two approaches were evaluated during determination; the first considered the total sulfur in calculating the AP of the materials; and the second approach only considered the pyritic sulfur. Some concern exists that evaluating the potential using total sulfur may overestimate the acid producing potential by including sulfur that does not produce ARD.

✓ 11/29/94

OTITAN Environmental

By: KRB Date: 10/26/94 Subject: Acid Rock Drainage Prediction Sheet No: of
Chkd: KAF Date: 11/29/94 Cyprus Bagdad Copper Corporation Proj No: 4112-001

Results:

The acid generating potential of several soil samples from various known and unknown locations were considered for this evaluation. The known sample locations centered around the existing pit and proposed stockpile locations. Other soil samples were evaluated as potential waste rock sources that could be encountered in the pit expansion. Samples of particular interest in addition to the pit area samples include Quartz Monzonite, Alaskite Porphyry, Tuff and Gila Conglomerate all of which are predominate in the waste rock.

A majority of the potential waste rock source samples including the Gila Conglomerate yielded no acid generating potential from the total sulfur and pyritic evaluations. The non acid generating potential of these samples was further confirmed by a NP to AP ratio significantly greater than 3:1.

- However, some uncertainty as to the acid generating potential was determined from the Quartz Monzonite, Alaskite Porphyry and pit area samples. Potentials for these samples ranged from non-generating to potentially generating for both the total sulfur and pyritic sulfur evaluations. Comparing ratios of NP to AP confirmed six samples as more likely to generated acid using total sulfur. That number was reduced to three using pyritic sulfur. On the other hand, 4 samples were determined to be non-generating using total sulfur. The number of non-generating samples increased by one using pyritic sulfur. The remainder remained in a zone of uncertainty.

Supplemental information has been gathered to assist in determining the acid generating potential of the waste rock. In addition to the above mentioned static testing, kinetic testing such as humidity cell testing has been performed. Six of the pit area samples analyzed using the humidity cell exhibited potential to generate acid. It should however be noted that the humidity cell test is very aggressive as compared to natural conditions.

- This information coupled with supplemental documentation noting that a majority of the waste rock will be mineralized waste consisting of 2% to 3% pyritic sulfur (Plan of Operations for Tailings Facility Expansion and South Waste Rock Disposal Facility, CBCC and AGRA, Inc.) which is greater than any of the analyzed waste rock samples that exhibited ARD potential, the SWRD Facility exhibits characteristics of material likely to generate acid.

Acid Generating Potential of South Waste Rock Disposal Facility Constituents
Cyprus Bagdad Copper Mine
Bagdad, Arizona

Sample No.	Rock Type	Total Sulfur							Pyritic Sulfur								
		Total Sulfur (%)	NP (1) (%)	NP (2) (T/1000T)	AP (3) (T/1000T)	ABP (4) (T/1000T)	Ratio of NP:AP (5)	Status(6)	Status(7)	Pyritic Sulfur (%)	NP (1) (%)	NP (2) (T/1000T)	AP (3) (T/1000T)	ABP (4) (T/1000T)	Ratio of NP:AP (5)	Status (6)	Status (7)
AO1QM	Quartz Monzonite	1.19	2.4	24	37.19	13	1	uncertain	potentially	0.19	2.4	24	5.94	18.06	4	Nongenerating	Nongenerating
AO2QM	Quartz Monzonite	0.37	3.5	35	11.56	23	3	non-generating	non-generating	0.08	3.5	35	2.50	32.50	14	Nongenerating	Nongenerating
AO1GC	Gila Conglomerate	0.01	28.8	288	0.31	288	922	non-generating	non-generating	0.01	28.8	288	0.31	287.69	922	Nongenerating	Nongenerating
AO2GC	Gila Conglomerate	0.01	15.7	157	0.31	157	502	non-generating	non-generating	0.01	15.7	157	0.31	156.69	502	Nongenerating	Nongenerating
AO3GC	Gila Conglomerate	0.01	6.4	64	0.31	64	205	non-generating	non-generating	0.01	6.4	64	0.31	63.69	205	Nongenerating	Nongenerating
AO4GC	Gila Conglomerate	0.01	5.3	53	0.31	53	170	non-generating	non-generating	0.01	5.3	53	0.31	52.69	170	Nongenerating	Nongenerating
CBCC-D-1	Upper Butte Creek Dump	0.01	3	30	0.31	30	96	non-generating	non-generating	0.01	3	30	0.31	29.69	96	Nongenerating	Nongenerating
CBCC-D-2	Upper Butte Creek Dump	0.01	6.7	67	0.31	67	214	non-generating	non-generating	0.01	6.7	67	0.31	66.69	214	Nongenerating	Nongenerating
CBCC-D-3	Upper Butte Creek Dump	0.01	3.8	38	0.31	38	122	non-generating	non-generating	0.01	3.8	38	0.31	37.69	122	Nongenerating	Nongenerating
CBCC-D-4	Upper Mine Shop Dump	0.07	0.2	2	2.19	1	1	uncertain	potentially	0.02	0.2	2	0.63	1.38	3	uncertain	uncertain
CBCC-D-5	Upper Mine Shop Dump	0.01	5.3	53	0.31	53	170	non-generating	non-generating	0.01	5.3	53	0.31	52.69	170	Nongenerating	Nongenerating
CBCC-D-6	Upper Mine Shop Dump	0.19	4.8	48	5.94	48	8	non-generating	non-generating	0.01	4.8	48	0.31	47.69	154	Nongenerating	Nongenerating
AO1AP	Alaskite Porphyry	0.09	3	30	2.81	27	11	non-generating	non-generating	0.02	3	30	0.63	29.38	48	non-generating	non-gener.
AO2AP	Alaskite Porphyry	0.01	2.5	25	0.31	25	80	non-generating	non-generating	0.01	2.5	25	0.31	24.69	80	non-generating	non-generating
AO1GBR	Gabbro	0.33	2.6	26	10.31	16	3	uncertain	uncertain	0.06	2.6	26	1.88	24.13	14	non-generating	non-generating
AO2GBR	Gabbro	0.91	3.1	31	28.44	3	1	uncertain	uncertain	0.47	3.1	31	14.69	16.31	2	uncertain	uncertain
AO3GBR	Gabbro	0.01	5.7	57	0.31	57	182	non-generating	non-generating	0.01	5.7	57	0.31	56.69	182	non-generating	non-generating
AO1GD	Granodiorite	0.01	3.4	34	0.31	34	109	non-generating	non-generating	0.01	3.4	34	0.31	33.69	109	non-generating	non-generating
AO2GD	Granodiorite	0.01	5.7	57	0.31	57	182	non-generating	non-generating	0.01	5.7	57	0.31	56.69	182	non-generating	non-generating
AO1KPR	King Peak Rhyolite	0.09	1.5	15	2.81	12	5	uncertain	non-generating	0.01	1.5	15	0.31	14.69	48	uncertain	non-generating
AO2KPR	King Peak Rhyolite	0.03	2.4	24	0.94	23	26	non-generating	non-generating	0.01	2.4	24	0.31	23.69	77	non-generating	non-generating
AO1YS	Yavapai Series	0.25	4.8	48	7.81	40	6	non-generating	non-generating	0.06	4.8	48	1.88	46.13	26	non-generating	non-generating
AO2YS	Yavapai Series	0.01	6.5	65	0.31	65	208	non-generating	non-generating	0.01	6.5	65	0.31	64.69	208	non-generating	non-generating
AO1SR	Sulfidic Rock	0.72	3.3	33	22.50	11	1	uncertain	uncertain	0.36	3.3	33	11.25	21.75	3	nongenerating	uncertain
AO2SR	Sulfidic Rock	0.43	3	30	13.44	17	2	uncertain	uncertain	0.13	3	30	4.06	25.94	7	non-generating	non-generating
AO3SR	Sulfidic Rock	0.03	2.1	21	0.94	20	22	uncertain	non-generating	0.01	2.1	21	0.31	20.69	67	non-generating	non-generating
AO1SB	Sanders Basalt	0.01	16.1	161	0.31	161	515	non-generating	non-generating	0.01	16.1	161	0.31	160.69	515	non-generating	non-generating
AO2SB	Sanders Basalt	0.01	14.7	147	0.31	147	470	non-generating	non-generating	0.01	14.7	147	0.31	146.69	470	non-generating	non-generating
AO1WB	Wilder Basalt	0.01	13.6	136	0.31	136	435	non-generating	non-generating	0.01	13.6	136	0.31	135.69	435	non-generating	non-generating
AO2WB	Wilder Basalt	0.01	14.3	143	0.31	143	458	non-generating	non-generating	0.01	14.3	143	0.31	142.69	458	non-generating	non-generating
AO1TF	Tuff	0.01	4	40	0.31	40	128	non-generating	non-generating	0.01	4	40	0.31	39.69	128	non-generating	non-generating
AO2TF	Tuff	0.01	5.8	58	0.31	58	186	non-generating	non-generating	0.01	5.8	58	0.31	57.69	186	non-generating	non-generating
AO1BTF	Baked Tuff	0.01	2.6	26	0.31	26	83	non-generating	non-generating	0.01	2.6	26	0.31	25.69	83	non-generating	non-generating
AO2BTF	Baked tuff	0.01	38.8	388	0.31	388	1242	non-generating	non-generating	0.01	38.8	388	0.31	387.69	1242	non-generating	non-generating
CBCC-RPB-10	Pit Area	0.35	5	50	10.94	39	5	Non-generating	Non-generating	0.32	5	50	10.00	40.00	5	non-generating	non-generating
CBCC-LP-110X	Pit Area	0.01	2.6	26	0.31	26	83	Non-generating	Non-generating	0.01	2.6	26	0.31	25.69	83	non-generating	non-generating
CBCC-QM-5P	Pit Area	1.66	1.8	18	51.88	-34	0	potentially	potentially	0.36	1.8	18	11.25	6.75	2	uncertain	uncertain
CBCC-QM-90X	Pit Area	0.02	1.5	15	0.63	14	24	uncertain	Non-generating	0.01	1.5	15	0.31	14.69	48	uncertain	non-generating
CBCC-LPG-6S	Pit Area	0.65	2	20	20.31	0	1	uncertain	potentially	0.53	2	20	16.56	3.44	1	uncertain	uncertain
CBCC-BFT-7S	Pit Area	1.65	2.7	27	51.56	-25	1	potentially	potentially	1.4	2.7	27	43.75	-16.75	1	uncertain	potentially
CBCC-PQM-80X	Pit Area	0.01	1.1	11	0.31	11	35	uncertain	Non-generating	0.01	1.1	11	0.31	10.69	35	uncertain	non-generating
CBCC-QM-1S	Pit Area	0.66	1.9	19	20.63	-2	1	uncertain	potentially	0.11	1.9	19	3.44	15.56	6	uncertain	non-generating
CBCC-AP-30X	Pit Area	0.11	0.1	1	3.44	-2	0	uncertain	potentially	0.01	0.1	1	0.31	0.69	3	uncertain	non-generating
CBCC-AP-2S	Pit Area	2.16	1.2	12	67.50	-56	0	potentially	potentially	0.97	1.2	12	30.31	-18.31	0	uncertain	potentially
CBCC-QM-4S	Pit Area	1.09	2.8	28	34.06	-6	1	uncertain	potentially	0.35	2.8	28	10.94	17.06	3	uncertain	uncertain

Page C3

✓ R 12/15/14

Acid Generating Potential of South Waste Rock Disposal Facility Constituents
Cyprus Bagdad Copper Mine
Bagdad, Arizona

Sample No.	Rock Type	Total Sulfur							Pyritic Sulfur						
		Total Sulfur (%)	NP (1) (%)	NP (2) (T/1000T)	AP (3) (T/1000T)	ABP (4) (T/1000T)	Ratio of NP:AP (5)	Status(6)	Status(7)	Pyritic Sulfur (%)	NP (1) (%)	NP (2) (T/1000T)	AP (8) (T/1000T)	ABP (4) (T/1000T)	Ratio of NP:AP (5)

Reference: Acid Mine Drainage Prediction, Technical Document, US EPA, August 1994.

Notes:

- (1) NP = Neutralization Potential in % or T/100 T
- (2) NP = Neutralization Potential in T/1000T. Calculated by multiplying % NP by 10.
- (3) AP = Acid Potential in T/1000T. Calculated using $AP = 31.25 * \% \text{ sulfur}$
- (4) ABP = Acid Base Potential in T/1000T
- (5) Ratio of NP to AP helps predict acid generating potential based on:
 - Ratios greater 3:1 indicate a lower risk for acid drainage to develop
 - Ratios between 3:1 and 1:1 are referred to as a zone of uncertainty.
 - Ratios of 1:1 or less are more likely to generate acid.
- (6) Status based on:
 - Values of ABP >20T/1000T are non-generating
 - Values of ABP between -20 and 20 are uncertain
 - Values of ABP <-20 are potentially acid generating
- Status based on:
 - Values of NP >3AP are non-generating
 - Values of NP between AP and 3AP are uncertain
 - Values of NP < AP are potentially acid generating
- (8) AP calculated using $AP = \% \text{ pyritic sulfur} * 31.25$

36 12/5/94

ANALYTICAL
SUPPORT DATA

GEOCHEMICAL TESTING OF ROCK SAMPLES

Sample No.	Rock Type	Sample Composite	Depth Interval (feet)	Sample Size (grams)	REQUESTED ANALYSES ^{III}			
					Standard Sults	Acid-Base Accounting	Humidity ^{III} Cell	SMLP
AO1QM AO2QM	Quartz Monzonite Quartz Monzonite	AO4HB 03, 04 AO5HB 04, 05, 07	27-36 45-71	1600 1600	X X	X X		
AO1AP AO2AP	Alaskite Porphyry Alaskite Porphyry	AO6HB 03, 04 AO9HB 06, 13, 14	26-39 50-121	1600 1600	X X	X X		
AO1GBR AO2GBR AO3GBR	Gabbro Gabbro Gabbro	AO3HB 02, 03, 04 AO3HB 05, 06, 07 A11HB 31, 33, 34, 36, 37	12-35 38-57 281-344	1600 1600 —	X X X	X X X		X X X
AO1GD AO2GD	Granodiorite Granodiorite	A10HB 01, 02, 03, 04, 05, 06 A14HB 01, 02, 04, 05, 06, 07, 08	281-344 23-100	1600 1600	X X	X X		X X
AO1KPR AO2KPR	King Peak Rhyolite King Peak Rhyolite	AO2HB 01, 02, 03, 04, 05 AO2HB 06, 07	3-36 47-56	1600 1600	X X	X X		
AO1YS AO2YS	Yavapai Series Yavapai Series	AO7HB 04, 05, 06, 07, 08, 09 AO8HB 04, 05, 06, 07, 08	28-85 33-73	1600 1600	X X	X X		
AO1SR AO2SR AO3SR	Sulfite Rock Sulfite Rock Sulfite Rock	AO3HB 08, 09, 10 AO4HB 09, 11, 12 AO7HB 03	65-95 76-114 22-25	1600 1600 1600		X X X		X X X
AO1SB AO2SB	Sanders Basalt Sanders Basalt	AO1HB 01, 02 AO1GB 03, 04, 05, 06, 07	7-25 4-24	1600 1600	X X	X X		X X
AO1WB AO2WB	Wilder Basalt Wilder Basalt	A11HB 20, 21, 24, 25, 26, 27 AO1HB 09, 11, 12, 13, 14	178-249 163-234	1600 1600	X X	X X		X X
AO1TF AO2TF	Tuff Tuff	AO3BS AO9BS	— —	1600 1600	X X	X X		X X
AO1BTF AO2BTF	Baked Tuff Baked Tuff	AO2BS AO5BS	— —	1600 1600	X X	X X		

136 12/5/94

GEOCHEMICAL TESTING OF ROCK SAMPLES

Sample No.	Rock Type	Sample Composite	Depth Interval (feet)	Sample Size (grams)	REQUESTED ANALYSES ⁽¹⁾			
					Standard Suite	Acid-Base Accounting	Humidity ⁽²⁾ Cell	SMLP
AO1QM AO2QM	Quartz Monzonite Quartz Monzonite	AO4HB 03, 04 AO5HB 04, 05, 07	27-36 45-71	1600 1600	X X	X X		
AO1AP AO2AP	Alaskite Porphyry Alaskite Porphyry	AO6HB 03, 04 AO9HB 06, 13, 14	26-39 50-121	1600 1600	X X	X X		
AO1GBR AO2GBR AO3GBR	Gabbro Gabbro Gabbro	AO3HB 02, 03, 04 AO3HB 05, 06, 07 A11HB 31, 33, 34, 36, 37	12-35 38-57 281-344	1600 1600 ---	X X X	X X X		X X X
AO1GD AO2GD	Granodiorite Granodiorite	A10HB 01, 02, 03, 04, 05, 06 A14HB 01, 02, 04, 05, 06, 07, 08	281-344 23-100	1600 1600	X X	X X		X X
AO1KPR AO2KPR	King Peak Rhyolite King Peak Rhyolite	AO2HB 01, 02, 03, 04, 05 AO2HB 06, 07	3-36 47-56	1600 1600	X X	X X		
AO1YS AO2YS	Yavapai Series Yavapai Series	AO7HB 04, 05, 06, 07, 08, 09 AO8HB 04, 05, 06, 07, 08	28-85 33-73	1600 1600	X X	X X		
AO1SR AO2SR AO3SR	Sulfitic Rock Sulfitic Rock Sulfitic Rock	AO3HB 08, 09, 10 AO4HB 09, 11, 12 AO7HB 03	65-95 76-114 22-25	1600 1600 1600		X X X		X X X
AO1SB AO2SB	Sanders Basalt Sanders Basalt	AO1HB 01, 02 AO1GB 03, 04, 05, 06, 07	7-25 4-24	1600 1600	X X	X X		X X
AO1WB AO2WB	Wilder Basalt Wilder Basalt	A11HB 20, 21, 24, 25, 26, 27 AO1HB 09, 11, 12, 13, 14	178-249 163-234	1600 1600	X X	X X		X X
AO1TF AO2TF	Tuff Tuff	AO3BS AO9BS	--- ---	1600 1600	X X	X X		X X
AO1BTF AO2BTF	Baked Tuff Baked Tuff	AO2BS AO5BS	--- ---	1600 1600	X X	X X		

V36 12/5/94

GEOCHEMICAL TESTING OF ROCK SAMPLES								
Sample No.	Rock Type	Sample Composite	Depth Interval (feet)	Sample Size (grams)	REQUESTED ANALYSES ^{III}			
					Standard Suite	Acid-Base Accounting	Humidity ^{1b} Cell	SMLP
AO1GC	Gila Conglomerate	AO6BS	---	1600	X	X		X
AO2GC	Gila Conglomerate	AO7BS & AO8BS	---	1600	X	X		X
AO3GC	Gila Conglomerate	A11HB 14	123-125	1880	X	X		X
AO4GC	Gila Conglomerate	A15HB 03	30-32	1700	X	X		X

Notes: 1. Requested Analysis

- Standard Suite
 - Cation exchange capacity
 - Paste extractable calcium, magnesium and sodium
- Acid-Base Accounting
 - Maximum potential acidity
 - Neutralization potential
 - Organic sulfur
 - Pyritic sulfur
 - Total sulfur
 - Sulfur as sulfate
 - Paste pH
 - Paste Specific conductance

- Humidity Cell
 - ICP scans of selected metals
 - pH
 - EC
 - Alkalinity
 - Acidity
 - Sulfate

- Soluble Metal Leaching Procedure (EPA Method 1312)
 - Extracted leachate will be tested for dissolved fraction concentration of arsenic, cadmium, copper, chromium, lead, mercury, selenium, and silver.

2. Humidity cell testing will be based on the results of the acid-base accounting tests.

V136
12/15/77

Acid Base Potential
 AGRA Rock Samples
 E93-293

COMPOUND	Location ID	A01GB	A01HB	A01HB	A02BS	A02HB	A02HB
	Sample ID	A02SB	A01SB	A02WB	A01BTF	A01KPR	A02KPR
	Date	08/21/94	08/21/94	08/21/94	08/21/94	08/21/94	08/21/94
Acid Base Potential (T/100T)..		147.0	161.0	143.0	26.0	12.0	23.0
Cation Exch. Cap. (meq/100g)..		5.4	6.5	15.6	17.7	1.8	1.8
Neutralization Potential.....		14.7	16.1	14.3	2.6	1.5	2.4
Sulfur, organic.....		0.01	<0.01	<0.01	<0.01	0.09	0.03
Sulfur, pyritic.....		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur, sulfate.....		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur, total.....		0.01	<0.01	<0.01	<0.01	0.09	0.03
Calcium, soluble (meq/l).....		0.50	2.10	1.20	1.50	0.85	0.25
Magnesium, soluble (meq/l)....		0.41	0.99	1.15	0.49	0.33	0.08
Sodium, soluble (meq/l).....		3.44	1.39	1.87	0.39	1.74	2.18
pH (units).....		9.0	8.4	8.1	8.0	7.4	6.8
Conductivity (mmhos/cm).....		0.44	0.48	0.45	0.31	0.43	0.46
Laboratory.....		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Sample Type.....		Original	Original	Original	Original	Original	Original

(<) = Not Detected/Below HDL; (—) = Not Analyzed/Reported
 Concentrations in % unless otherwise indicated

Page C-9
 12/5/94

Acid Base Potential
 AGRA Rock Samples
 E93-293

COMPOUND	Location ID Sample ID Date	A03BS A01TF 08/21/94	A03HB A01GBR 08/21/94	A03HB A01SR 08/21/94	A03HB A02GBR 08/21/94	A04HB A01QM 08/21/94	A04HB A02SR 08/21/94
Acid Base Potential (T/100T)..		40.0	16.0	11.0	3.0	<13.0	17.0
Cation Exch. Cap. (meq/100g)..		14.0	5.7	—	3.8	5.4	—
Neutralization Potential.....		4.0	2.6	3.3	3.1	2.4	3.0
Sulfur, organic.....		0.01	0.22	0.32	0.41	0.88	0.24
Sulfur, pyritic.....		<0.01	0.06	0.36	0.47	0.19	0.13
Sulfur, sulfate.....		<0.01	0.05	0.04	0.03	0.12	0.05
Sulfur, total.....		0.01	0.33	0.72	0.91	1.19	0.43
Calcium, soluble (meq/l).....		6.69	11.30	—	7.83	4.64	—
Magnesium, soluble (meq/l)....		1.15	3.78	—	2.47	1.07	—
Sodium, soluble (meq/l).....		3.87	3.18	—	3.13	2.18	—
pH (units).....		8.4	6.9	8.2	7.5	8.1	8.5
Conductivity (mmhos/cm).....		1.11	1.48	0.72	1.22	0.75	0.58
Laboratory.....		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Sample Type.....		Original	Original	Original	Original	Original	Original

(<) = Not Detected/Below MDL; (—) = Not Analyzed/Reported
 Concentrations in % unless otherwise indicated

Acid Base Potential
 AGRA Rock Samples
 E93-293

COMPOUND	Location ID	A05BS	A05HB	A06BS	A06HB	A07BS	A07HB
	Sample ID Date	A02BTF 08/21/94	A02QH 08/21/94	A01GC 08/21/94	A01AP 08/21/94	A02GC 08/21/94	A01YS 08/21/94
Acid Base Potential (T/100T)..		388.0	23.0	288.0	27.0	157.0	40.0
Cation Exch. Cap. (meq/100g)..		22.4	7.7	17.1	4.1	13.9	5.3
Neutralization Potential.....		38.8	3.5	28.8	3.0	15.7	4.8
Sulfur, organic.....		0.01	0.28	<0.01	0.07	0.01	0.18
Sulfur, pyritic.....		<0.01	0.08	<0.01	0.02	<0.01	0.06
Sulfur, sulfate.....		<0.01	0.01	<0.01	<0.01	<0.01	0.01
Sulfur, total.....		0.01	0.37	<0.01	0.09	0.01	0.25
Calcium, soluble (meq/l).....		2.64	6.29	0.85	1.75	7.24	2.10
Magnesium, soluble (meq/l)....		1.07	3.29	0.56	0.74	1.97	1.97
Sodium, soluble (meq/l).....		1.31	5.48	6.22	2.57	24.40	2.48
pH (units).....		8.0	8.0	8.6	8.9	9.6	7.8
Conductivity (mmhos/cm).....		0.62	1.28	0.84	1.59	3.21	0.68
Laboratory.....		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Sample Type.....		Original	Original	Original	Original	Original	Original

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 Concentrations in % unless otherwise indicated

Acid Base Potential
 AGRA Rock Samples
 E93-293

COMPOUND	Location ID Sample ID Date	A07HB A03SR 08/21/94	A08HB A02YS 08/21/94	A09BS A02TF 08/21/94	A09HB A02AP 08/21/94	A10HB A01GD 08/21/94	A11HB A01WB 08/21/94
Acid Base Potential (T/100T)..		20.0	65.0	58.0	25.0	34.0	136.0
Cation Exch. Cap. (meq/100g)..		—	4.4	44.0	6.6	3.0	14.8
Neutralization Potential.....		2.1	6.5	5.8	2.5	3.4	13.6
Sulfur, organic.....		0.03	0.01	<0.01	0.01	<0.01	0.01
Sulfur, pyritic.....		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur, sulfate.....		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfur, total.....		0.03	0.01	<0.01	0.01	<0.01	0.01
Calcium, soluble (meq/l).....		—	0.50	0.40	1.30	0.60	0.55
Magnesium, soluble (meq/l)....		—	0.33	0.41	0.74	0.25	0.66
Sodium, soluble (meq/l).....		—	1.39	4.79	2.04	1.83	1.96
pH (units).....		6.9	8.4	8.6	8.1	8.8	8.7
Conductivity (mmhos/cm).....		0.36	0.29	0.58	1.49	0.30	0.33
Laboratory.....		ACZ	ACZ	ACZ	ACZ	ACZ	ACZ
Sample Type.....		Original	Original	Original	Original	Original	Original

(<) = Not Detected/Below MDL; (—) = Not Analyzed/Reported
 Concentrations in % unless otherwise indicated

Acid Base Potential
 AGRA Rock Samples
 E93-293

COMPOUND	Location ID Sample ID Date	A11HB A03GBR 08/21/94	A11HB A03GC 08/21/94	A14HB A02GD 08/21/94	A15HB A04GC 08/21/94
Acid Base Potential (T/100T)...		57.0	64.0	57.0	53.0
Cation Exch. Cap. (meq/100g)...		3.7	17.1	9.1	23.6
Neutralization Potential.....		5.7	6.4	5.7	5.3
Sulfur, organic.....		<0.01	<0.01	<0.01	0.01
Sulfur, pyritic.....		<0.01	<0.01	<0.01	<0.01
Sulfur, sulfate.....		<0.01	<0.01	<0.01	<0.01
Sulfur, total.....		<0.01	<0.01	<0.01	0.01
Calcium, soluble (meq/l).....		0.35	1.25	0.65	4.19
Magnesium, soluble (meq/l)....		0.49	1.56	0.49	5.10
Sodium, soluble (meq/l).....		1.35	2.09	1.96	21.10
pH (units).....		9.0	8.2	8.7	8.0
Conductivity (mmhos/cm).....		0.30	0.54	0.39	3.02
Laboratory.....		ACZ	ACZ	ACZ	ACZ
Sample Type.....		Original	Original	Original	Original

(<) = Not Detected/Below MDL; (—) = Not Analyzed/Reported
 Concentrations in % unless otherwise indicated

ACZ LABORATORIES, INC.

Acid Base Potential (ABP)

(NP*10) - (ST*31.25) = ABP

ANALYST: TJV

DATE: 1/29/93

PROJECT: CONVERSE

SDG NO: N/A

SAMPLE ID	LAB NO.	Neutralization Potential	Sulfur Total	= ABP CaCO3/1000 Tons
CBCC-LT-1	58	2.7	0.22	20
CBCC-LT-5	59	1.5	0.14	11
CBCC-MM-1	60	3.5	0.20	29
CBCC-MM-2	61	2.3	0.25	15
CBCC-MM-3	62	3.0	0.27	22
CBCC-MM-4	63	3.3	0.30	24
CBCC-KT-A	64	2.4	0.35	13
CBCC-KT-7	65	3.4	0.25	26
CBCC-KT-8	66	2.5	0.08	23
CBCC-KT-71	67	2.0	0.07	18
CBCC-KT-72	68	2.1	0.06	19
CBCC-KT-81	69	2.8	0.18	22
CBCC-MH-1	70	1.7	0.18	11
CBCC-MH-2	71	0.6	0.20	-0
CBCC-MH-3	72	2.4	0.10	21
CBCC-MH-4	73	2.3	0.37	11
CBCC-PGM-45	74	2.8	1.09	-6
CBCC-PGM-80X	75	1.1	<0.01	11
CBCC-AP-30X	76	0.1	0.11	-2
CBCC-QM-15	77	1.9	0.66	-2
CBCC-QM-5P	78	1.8	1.66	-34
CBCC-QM-90X	79	1.5	0.02	14
CBCC-LP-110X	80	2.6	<0.01	25
CBCC-LPG-65	81	2.0	0.65	-0
CBCC-RPB-10	82	5.0	0.35	39
CBCC-AP-25	83	1.2	2.16	-56
CBCC-EFT-75	84	2.7	1.65	-25
CBCC-UT-2	85	4.0	0.36	29
CBCC-UT-6	86	2.3	0.32	13

ACZ LABORATORIES, INC.

ANALYST: TJV

Acid Base Potential (ABP)

DATE: 1/29/93

Calculated from Pyritic Sulfur)

PROJECT: CONVERSE

SDG NO: N/A

SAMPLE ID	LAB NO.	Neutralization Potential	Pyritic Sulfur	= ABP CaCO ₃ /1000 Tons
CBCC-LT-1	58	2.7	0.08	25
CBCC-LT-5	59	1.5	<0.01	15
CBCC-MM-1	60	3.5	<0.01	35
CBCC-MM-2	61	2.3	0.04	22
CBCC-MM-3	62	3.0	0.19	24
CBCC-MM-4	63	3.3	0.19	27
CBCC-KT-A	64	2.4	0.09	21
CBCC-KT-7	65	3.4	0.06	32
CBCC-KT-8	66	2.5	0.02	24
CBCC-KT-71	67	2.0	<0.01	20
CBCC-KT-72	68	2.1	<0.01	21
CBCC-KT-81	69	2.8	0.04	27
CBCC-MH-1	70	1.7	0.04	16
CBCC-MH-2	71	0.6	<0.01	6
CBCC-MH-3	72	2.4	0.05	22
CBCC-MH-4	73	2.3	0.02	22
CBCC-PQM-45	74	2.8	0.35	17
CBCC-PQM-80X	75	1.1	<0.01	11
CBCC-AP-30X	76	0.1	<0.01	1
CBCC-QM-15	77	1.9	0.11	16
CBCC-QM-5P	78	1.8	0.36	7
CBCC-QM-90X	79	1.5	<0.01	15
CBCC-LP-110X	80	2.6	<0.01	26
CBCC-LPG-65	81	2.0	0.53	3
CBCC-RP13-10	82	5.0	0.32	40
CBCC-AP-25	83	1.2	0.97	-18
CBCC-BFT-75	84	2.7	1.40	-17
CBCC-UT-2	85	4.0	0.19	34
CBCC-UT-6	86	2.3	0.24	15

HUMIDITY CELL DATA

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00078: CBCC-QM-5P: CELL#22

Test Dates:02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	184	232	228	221	220	222	209	184
Leachate Vol., Cumulative	ml	184	416	644	865	1085	1307	1516	1700
pH	units	6.6	6.7	6.7	6.5	6.4	6.5	6.2	6.0
Conductivity	umhos/cm	270	220	200	170	150	120	120	80
Acidity	mg/L CaCO3	15	10	10	15	5	20	5	5
Acidity, Cumulative	mg CaCO3	2.8	5.1	7.4	10.7	11.8	16.2	17.3	18.2
Alkalinity	mg/L CaCO3	5	5	5	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	0.9	2.1	3.2	4.3	5.4	6.5	7.6	8.5
Iron	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Cumulative	mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sulfate	mg/L	130	101	99	86	69	58	51	42
Sulfate, Cumulative	mg	23.9	47.4	69.9	88.9	104.1	117.0	127.6	135.4

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	214	222	219	220				
Leachate Vol., Cumulative	ml	1914	2136	2355	2575				
pH	units	6.0	5.9	5.7	5.6				
Conductivity	umhos/cm	80	50	60	60				
Acidity	mg/L CaCO3	5	15	20	15				
Acidity, Cumulative	mg CaCO3	19.3	22.6	27.0	30.3				
Alkalinity	mg/L CaCO3	5	5	0	5				
Alkalinity, Cumulative	mg CaCO3	9.6	10.7	10.7	11.8				
Iron	mg/L	<0.02	<0.02	<0.02	<0.02				
Iron, Cumulative	mg	0.000	0.000	0.000	0.000				
Sulfate	mg/L	34	25	30	30				
Sulfate, Cumulative	mg	142.6	148.2	154.8	161.4				

Approved:




ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID:93-SI/00079: CBCC-QM-90X: CELL#23

Test Dates:02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	173	224	224	204	204	202	190	172
Leachate Vol., Cumulative	ml	173	397	621	825	1029	1231	1421	1593
pH	units	6.9	7.2	7.0	7.0	6.8	7.3	7.3	7.4
Conductivity	umhos/cm	20	20	10	10	<10	<10	<10	<10
Acidity	mg/L CaCO3	10	0	0	0	5	0	0	0
Acidity, Cumulative	mg CaCO3	1.7	1.7	1.7	1.7	2.8	2.8	2.8	2.8
Alkalinity	mg/L CaCO3	5	10	5	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	0.9	3.1	4.2	5.2	6.3	7.3	8.2	9.1
Iron	mg/L	0.05	0.08	0.03	0.12	0.14	0.10	0.17	0.13
Iron, Cumulative	mg	0.009	0.027	0.033	0.058	0.086	0.107	0.139	0.161
Sulfate	mg/L	8	6	5	5	4	4	4	3
Sulfate, Cumulative	mg	1.4	2.7	3.8	4.9	5.7	6.5	7.3	7.8

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	196	201	209	205				
Leachate Vol., Cumulative	ml	1789	1990	2199	2404				
pH	units	7.1	7.0	6.9	6.8				
Conductivity	umhos/cm	<10	<10	<10	<10				
Acidity	mg/L CaCO3	0	0	15	0				
Acidity, Cumulative	mg CaCO3	2.8	2.8	5.9	5.9				
Alkalinity	mg/L CaCO3	0	10	0	15				
Alkalinity, Cumulative	mg CaCO3	9.1	11.1	11.1	14.2				
Iron	mg/L	<0.02	0.04	<0.02	0.02				
Iron, Cumulative	mg	0.161	0.169	0.169	0.173				
Sulfate	mg/L	3	3	3	3				
Sulfate, Cumulative	mg	8.4	9.0	9.6	10.2				

Approved: *M. W. [Signature]*

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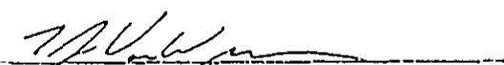
Humidity Cell Test – Summary of Data

Sample ID: 93-SI/00081: CBCC-LPG-6S: CELL#25

Test Dates: 02/02/93 – 04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	178	212	222	201	201	.200	188	174
Leachate Vol., Cumulative	ml	178	390	612	813	1014	1214	1402	1576
pH	units	7.9	7.7	8.1	7.7	7.2	7.2	7.0	7.1
Conductivity	umhos/cm	180	80	80	50	70	60	60	50
Acidity	mg/L CaCO ₃	0	0	0	0	0	0	0	0
Acidity, Cumulative	mg CaCO ₃	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity	mg/L CaCO ₃	10	10	10	10	5	5	5	5
Alkalinity, Cumulative	mg CaCO ₃	1.8	3.9	6.1	8.1	9.1	10.1	11.1	11.9
Iron	mg/L	0.03	0.03	0.05	0.03	0.03	0.03	0.03	<0.02
Iron, Cumulative	mg	0.005	0.012	0.023	0.029	0.035	0.041	0.047	0.047
Sulfate	mg/L	68	37	30	3	29	27	38	27
Sulfate, Cumulative	mg	12.1	19.9	26.6	27.2	33.0	38.4	45.6	50.3

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	190	201	202	209				
Leachate Vol., Cumulative	ml	1766	1967	2169	2378				
pH	units	6.9	7.1	6.9	6.7				
Conductivity	umhos/cm	60	40	30	30				
Acidity	mg/L CaCO ₃	5	0	10	5				
Acidity, Cumulative	mg CaCO ₃	1.0	1.0	3.0	4.0				
Alkalinity	mg/L CaCO ₃	5	5	5	10				
Alkalinity, Cumulative	mg CaCO ₃	12.9	13.9	14.9	17.0				
Iron	mg/L	<0.02	0.03	0.05	0.05				
Iron, Cumulative	mg	0.047	0.053	0.063	0.073				
Sulfate	mg/L	24	21	16	16				
Sulfate, Cumulative	mg	54.8	59.1	62.3	65.6				

Approved: 

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Humidity Cell Test – Summary of Data

Sample ID:93-SI/00075: CBCC-PQM-80X: CELL#19

Test Dates:02/02/93-

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	177	227	221	193	194	191	177	168
Leachate Vol., Cumulative	ml	177	404	625	818	1012	1203	1380	1548
pH	units	7.5	7.4	7.5	7.0	7.3	7.4	7.4	7.2
Conductivity	umhos/cm	20	10	10	10	<10	<10	<10	<10
Acidity	mg/L CaCO3	0	0	0	0	0	0	0	0
Acidity, Cumulative	mg CaCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity	mg/L CaCO3	10	10	10	10	5	5	5	10
Alkalinity, Cumulative	mg CaCO3	1.8	4.0	6.3	8.2	9.2	10.1	11.0	12.7
Iron	mg/L	0.05	0.02	0.03	0.08	0.06	0.10	0.16	0.04
Iron, Cumulative	mg	0.009	0.013	0.020	0.035	0.047	0.066	0.095	0.101
Sulfate	mg/L	9	5	5	5	4	4	4	3
Sulfate, Cumulative	mg	1.6	2.7	3.8	4.8	5.6	6.3	7.0	7.6

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	184	191	198	206				
Leachate Vol., Cumulative	ml	1732	1923	2121	2327	2327	2327	2327	2327
pH	units	7.6	7.1	7.0	7.0				
Conductivity	umhos/cm	<10	<10	<10	<10				
Acidity	mg/L CaCO3	0	0	0	0				
Acidity, Cumulative	mg CaCO3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alkalinity	mg/L CaCO3	10	10	0	5				
Alkalinity, Cumulative	mg CaCO3	14.5	16.4	16.4	17.5	17.5	17.5	17.5	17.5
Iron	mg/L	0.06	0.12	0.06	0.03				
Iron, Cumulative	mg	0.112	0.135	0.147	0.153	0.153	0.153	0.153	0.153
Sulfate	mg/L	3	3	3	<1				
Sulfate, Cumulative	mg	8.1	8.7	9.3	9.3	9.3	9.3	9.3	9.3

Approved: _____

M. W. [Signature]

Page 22

ACZ Laboratories, Inc.

Humidity Cell Test – Summary of Data

Sample ID: 93-SI/00077: CBCC-QM-1S: CELL#21

Test Dates: 02/02/93 – 04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	178	227	229	214	215	211	204	170
Leachate Vol., Cumulative	ml	178	405	634	848	1063	1274	1478	1648
pH	units	6.1	6.3	6.2	6.1	6.1	6.2	6.0	6.1
Conductivity	umhos/cm	290	220	220	170	120	100	90	70
Acidity	mg/L CaCO ₃	10	10	5	5	30	10	5	5
Acidity, Cumulative	mg CaCO ₃	1.8	4.1	5.2	6.3	12.7	14.8	15.8	16.7
Alkalinity	mg/L CaCO ₃	0	0	5	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO ₃	0.0	0.0	1.1	2.2	3.3	4.3	5.4	6.2
Iron	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Cumulative	mg	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sulfate	mg/L	148	113	115	85	57	46	42	40
Sulfate, Cumulative	mg	26.3	52.0	78.3	96.5	108.8	118.5	127.0	133.8

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	202	213	216	219				
Leachate Vol., Cumulative	ml	1850	2063	2279	2498				
pH	units	6.0	6.1	6.0	5.9				
Conductivity	umhos/cm	50	30	30	20				
Acidity	mg/L CaCO ₃	5	20	0	0				
Acidity, Cumulative	mg CaCO ₃	17.7	22.0	22.0	22.0				
Alkalinity	mg/L CaCO ₃	5	5	0	10				
Alkalinity, Cumulative	mg CaCO ₃	7.2	8.3	8.3	10.5				
Iron	mg/L	<0.02	0.04	<0.02	0.03				
Iron, Cumulative	mg	0.000	0.009	0.009	0.015				
Sulfate	mg/L	21	18	16	13				
Sulfate, Cumulative	mg	138.1	141.9	145.4	148.2				

Approved: 

ACZ Laboratories, Inc.

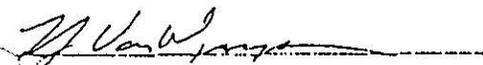
Humidity Cell Test – Summary of Data

Sample ID:93-SI/00076: CBCC-AP-30X: CELL#20

Test Dates:02/02/93-

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	169	235	216	189	193	191	173	164
Leachate Vol., Cumulative	ml	169	404	620	809	1002	1193	1366	1530
pH	units	5.2	5.4	5.5	5.5	5.4	5.6	5.6	5.7
Conductivity	umhos/cm	310	180	130	120	100	60	60	40
Acidity	mg/L CaCO3	15	10	10	5	5	0	5	5
Acidity, Cumulative	mg CaCO3	2.5	4.9	7.0	8.0	9.0	9.0	9.8	10.6
Alkalinity	mg/L CaCO3	5	0	0	5	5	5	5	5
Alkalinity, Cumulative	mg CaCO3	0.8	0.8	0.8	1.8	2.8	3.7	4.6	5.4
Iron	mg/L	1.52	0.36	0.23	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Cumulative	mg	0.257	0.341	0.391	0.391	0.391	0.391	0.391	0.391
Sulfate	mg/L	162	93	66	59	47	30	28	21
Sulfate, Cumulative	mg	27.4	49.2	63.5	74.6	83.7	89.4	94.3	97.7

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	171	194	192	198				
Leachate Vol., Cumulative	ml	1701	1895	2087	2285	2285	2285	2285	2285
pH	units	5.8	5.8	5.7	6.1				
Conductivity	umhos/cm	20	10	10	<10				
Acidity	mg/L CaCO3	5	5	10	10				
Acidity, Cumulative	mg CaCO3	11.5	12.5	14.4	16.4	16.4	16.4	16.4	16.4
Alkalinity	mg/L CaCO3	5	5	5	5				
Alkalinity, Cumulative	mg CaCO3	6.3	7.2	8.2	9.2	9.2	9.2	9.2	9.2
Iron	mg/L	0.15	0.02	0.19	0.05				
Iron, Cumulative	mg	0.417	0.421	0.457	0.467	0.467	0.467	0.467	0.467
Sulfate	mg/L	10	10	7	7				
Sulfate, Cumulative	mg	99.4	101.4	102.7	104.1	104.1	104.1	104.1	104.1

Approved: 



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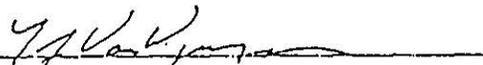
Humidity Cell Test – Summary of Data

Sample ID: 93-SI/00083: CBCC-AP-2S: CELL#28

Test Dates: 02/02/93-04/20/93

Parameter	Units	Week #1	Week #2	Week #3	Week #4	Week #5	Week #6	Week #7	Week #8
Leachate Vol.	ml	196	253	236	188	204	197	185	179
Leachate Vol., Cumulative	ml	196	449	685	873	1077	1274	1459	1638
pH	units	4.3	4.1	4.3	4.2	4.1	4.1	3.9	4.2
Conductivity	umhos/cm	160	200	110	90	100	80	60	80
Acidity	mg/L CaCO ₃	35	39	25	20	60	75	30	30
Acidity, Cumulative	mg CaCO ₃	6.9	16.7	22.6	26.4	38.6	53.4	59.0	64.3
Alkalinity	mg/L CaCO ₃	0	0	0	0	0	0	0	0
Alkalinity, Cumulative	mg CaCO ₃	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iron	mg/L	3.97	1.65	0.68	0.37	0.45	0.41	0.41	0.51
Iron, Cumulative	mg	0.778	1.196	1.356	1.426	1.517	1.598	1.674	1.765
Sulfate	mg/L	73	93	50	42	43	35	43	44
Sulfate, Cumulative	mg	14.3	37.8	49.6	57.5	66.3	73.2	81.2	89.0

Parameter	Units	Week #9	Week #10	Week #11	Week #12	Week #13	Week #14	Week #15	Week #16
Leachate Vol.	ml	186	196	199	201				
Leachate Vol., Cumulative	ml	1824	2020	2219	2420				
pH	units	4.0	4.0	3.9	3.9				
Conductivity	umhos/cm	100	80	80	90				
Acidity	mg/L CaCO ₃	20	30	35	35				
Acidity, Cumulative	mg CaCO ₃	68.0	73.9	80.9	87.9				
Alkalinity	mg/L CaCO ₃	0	0	0	5				
Alkalinity, Cumulative	mg CaCO ₃	0.0	0.0	0.0	1.0				
Iron	mg/L	0.55	0.67	0.48	0.42				
Iron, Cumulative	mg	1.868	1.999	2.094	2.179				
Sulfate	mg/L	36	34	33	38				
Sulfate, Cumulative	mg	95.7	102.4	109.0	116.6				

Approved: 

REFERENCES

FVI

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AGEP 10/5/94

TECHNICAL DOCUMENT

ACID MINE DRAINAGE PREDICTION

DRAFT

August 1994

U.S. Environmental Protection Agency
Office of Solid Waste
Special Waste Branch
401 M Street, SW
Washington, DC 20460



2.2 Static Tests

Static tests predict drainage quality by comparing the sample's maximum acid production potential (AP) with its maximum neutralization potential (NP). The AP is determined by multiplying the percent of total sulfur or sulfide sulfur (depending on the test) in the sample by a conversion factor ($AP = 31.25 \cdot \%S$). NP is a measure of the carbonate material available to neutralize acid. The value for NP is determined either by adding acid to a sample and back titrating to determine the amount of acid consumed or by direct acid titration of the sample; the endpoint pH is usually 3.5 (Ferguson and Morin 1991, Lapakko 1993a). Lapakko (1992) reported that using an endpoint pH of 3.5 measures a sample's acid neutralizing potential below 6.0, but noted that a drainage pH in the range of 3.5 may not be environmentally acceptable. The net neutralization potential (NNP), or acid/base account (ABA) is determined by subtracting the AP from the NP ($NNP = NP - AP$). A ratio of NP to AP is also used. An NNP of 0 is equivalent to an NP/AP ratio of 1 (Ferguson and Morin 1991). Units for static test results (AP, NP, and NNP) are typically expressed in mass (kg, metric ton, etc.) of calcium carbonate ($CaCO_3$) per 1000 metric tons of rock, parts per thousand.

If the difference between NP and AP is negative then the potential exists for the waste to form acid. If it is positive then there may be lower risk. Prediction of the acid potential when the NNP is between -20 and 20 is more difficult. If ratios are used, when the ratio of a sample's neutralization potential and acid production potential is greater than 3:1, experience indicates that there is lower risk for acid drainage to develop (Brodie et al. 1991). For ratios between 3:1 and 1:1, referred to as the zone of uncertainty, additional kinetic testing is usually recommended. Those samples with a ratio of 1:1 or less are more likely to generate acid. Prediction of drainage quality for a sample based on these values requires assumptions that reaction rates are similar and that the acid consuming minerals will dissolve (Lapakko 1992). When reviewing data on static tests, an important consideration is the particle size of the sample material and how it is different from the waste or unit being characterized.

Information on these and other static acid prediction tests, including summaries of test results, is available (Coastech 1989, Lapakko 1993b). The following descriptions are excerpted from Lapakko (1993b). Lapakko (1992) has also conducted comparison tests of static methods using mine waste samples from different mines. Additional summaries of static tests have been completed by Coastech (1989) as part of the MEND Project, and the California Mining Association (1991). Five static tests will be summarized here and in Table 5.

Used For Determining
Status

that the potential for economic mineralization in this area is very low. Drilling indicated that minor localized groundwater is largely confined to discrete geologic structures and fracture zones, with an overall hydrologic gradient sloping northward, resulting in shallow groundwater migrating to the pit. The geology, subsurface hydrology, surface drainage pattern, and proximity to the pit combine to make the South WRDF an ideal site for mineralized waste.

3.4.4 Waste Rock Characteristics

To date, the current dump activity on private and state land has involved several types of mine waste including relocated mill tailings, unmineralized Gila overburden, copper-oxide cemented Gila Conglomerate, and weakly mineralized, coarsely broken hard rock. None of these waste types, or those to be dumped in the future, are highly pyritic or significantly acid-generating. The majority of the material to be deposited in this area will be coarsely broken durable rock from the continued excavation of the pit.

Although subject to future revisions as the long-range mine plan and individual pushback designs evolve, the following table presents the current estimated tonnage for the five waste categories scheduled for the South WRDF.

<u>Material</u>	<u>Tonnage (thousands)</u>
Mineralized Waste	498,690
Gila Conglomerate	76,410
Relocated Mine Dump Material	18,460
Relocated Tailings	13,260
Low-grade Oxide Waste	<u>10,750</u>
Total	617,570

Mineralized Rock Waste - predominantly coarsely fragmented, hard, durable crystalline rock, having a non-economic copper content (generally in the range of 0.07 to 0.20 percent Cu), and a relatively low pyrite content (generally in the 2 to 3 percent range). Late Cretaceous quartz monzonite predominates, but Precambrian granitic and metamorphic rocks will be abundant in some parts of the dump. It is estimated that more than 70 percent of the tonnage will consist of rock fragments ranging from a few inches to about two feet in diameter.

Gila Conglomerate - poorly sorted and weakly cemented Miocene alluvial conglomerate, dirty sandstone, and sandy siltstone. The Gila Conglomerate consists of locally derived alluvial gravels representing unmineralized overburden on top of the Bagdad orebody. Where present in the mine, it generally ranges in thickness from several hundred to nearly a thousand feet. Because of its silt and clay content and unmineralized character, the Gila alluvium makes almost ideal capping material and is readily revegetated. Calcium carbonate cementation of the Gila Conglomerate is significant, helping to neutralize adjacent acidic conditions. Gila alluvial material may also be used for surfacing the coarse rock ramps and the dump levels to minimize tire wear and other maintenance costs.

Relocated Mine Dump Material - mostly oxidized and decomposed mineralized waste rock material from the old Mineral Creek and Alum Creek dumps in the west part of the mine area. Copper contents typically range from about 0.1 to 0.2 percent and the material is somewhat acid-generating because of residual pyrite.

Relocated Tailings - old Bagdad mill tailings that are truck or conveyor-transported to this area in order to clear the perimeter of the pit for future expansion. The current approved Plan of Operations reflects the ongoing relocation of these tailings into Bevering Gulch by the bucketwheel excavator and conveyor system. These tailings are weakly mineralized with copper contents typically in the range from 0.07 to 0.10 percent and pyrite contents averaging no more than 2 to 3 percent.

Low-grade Oxide Waste - partially oxidized, low-grade mineralized rock that will be mined below the 3250 feet elevation in the pit. It is similar to the mineralized rock waste except that its oxide mineralogy makes it more susceptible to copper leaching.

APPENDIX E SPECIAL STATUS SPECIES ANALYSIS

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Table E.1 Review of Special Status Species

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Amphibians						
Arizona toad (southwestern toad)	<i>Anaxyrus (Bufo) microscaphus</i>	SC			<p>Range: Historic range includes Arizona, California, New Mexico, Nevada, Utah and Mexico. Found in east to west central Arizona, canyons and flood plains south of the Mogollon Rim, but also found in East Clear Creek.</p> <p>Habitat: Rocky streams and canyons in the pine-oak belt. Also occurs in lower deserts, e.g. Agua Fria River area.</p> <p>Elevation: 480—8,400 feet</p>	None. Lack of suitable habitat within the project area. There are no perennial water sources within the project area.
Chiricahua leopard frog	<i>Lithobates (Rana) chiricahuensis</i>	T		WSC	<p>Range: US range includes mountain regions of central and southeastern Arizona, southwestern New Mexico, south in the Sierra Madre Occidental to Western Jalisco, Mexico.</p> <p>Habitat: Variety of permanent or nearly permanent aquatic habitats, including springs, livestock tanks, ponds, lakes, marshes, and headwater streams into which nonnative predators either have yet to invade or habitats are marginal for them.</p> <p>Elevation: 3,281—8,990 feet</p>	None. Lack of suitable habitat within the project area. The project area would not contribute to Chiricahua leopard frog dispersal or provide year-round suitable habitat for populations or metapopulations of Chiricahua leopard frog.
Lowland leopard frog	<i>Rana yavapaiensis</i>	SC	S	WSC	<p>Range: Historically this species ranged from southeastern California, extreme northwestern Arizona, and southwestern New Mexico to Sonora.</p> <p>Habitat: Preference for lotic systems, including small to medium-sized streams and occasionally small ponds. This species will often concentrate near deep pools in association with root masses of large riparian trees. This species is associated with riparian areas within grasslands, chaparral, and evergreen woodlands.</p> <p>Elevation: Less than 6,400 feet</p>	None. Lack of suitable habitat within the project area. There are no perennial water sources within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Northern leopard Frog	<i>Lithobates pipiens</i>		S	WSC	<p>Range: This species ranges throughout the Great Basin Region from northern Arizona, western Nevada and Washington to southern Canada; east to southeast Canada and New Jersey.</p> <p>Habitat: This species is usually found in permanent waters with rooted aquatic vegetation in a variety of habitats including grassland, brush land, woodland, and forest ranging high into mountains; also frequents ponds, canals, marshes, springs, and streams.</p> <p>Elevation: 2,640—9,155 feet</p>	None. Lack of suitable habitat within the project area. There are no perennial water sources within the project area.
Birds						
American peregrine falcon	<i>Falco peregrinus anatum</i>	SC, R	S	WSC	<p>Range: Breeding range is from Canada and Alaska south into Baja California, the central Mexican highlands, and northwest Mexico, including the continental US (except the southeast corner of the country). This species winters in South America, and breeds in the state wherever sufficient prey is available near cliffs. Areas of spectacular cliffs such as the Mogollon Rim, Grand Canyon and Colorado Plateau, contain most of Arizona's breeding peregrines.</p> <p>Habitat: Rocky, steep cliffs overlooking woodlands, riparian areas, or other habitats supporting an abundance of avian prey species. Nests on cliff ledges above or near water. Open landscapes surrounding these areas are critical for foraging.</p> <p>Elevation: 400—9,000 feet; (prefer 6,500-8,599 feet)</p>	Unlikely. Lack of suitable habitat within the project area. Transient individuals may pass through project area. Species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
American redstart	<i>Setophaga ruticilla</i>			WSC	<p>Range: This species nests throughout much of the continental US, including southern Alaska and Canada. Wintering occurs from southern Baja California, central Mexico and West Indies south into northern South America.</p> <p>Habitat: Breeding habitat is comprised of mature and second growth wooded habitats, requiring closed canopy with preference for dense midstory and understory, and well-developed undergrowth. Wintering and migration habitats are more diverse, including various kinds of forests, woodlands, scrublands, and thickets, as well as arborous agricultural areas and mangroves.</p> <p>Elevation: 5,190—7,365 feet</p>	<p>Unlikely. Lack of suitable habitat within the project area. Individuals may pass through project area during non-breeding periods. Species not known to occur in the project vicinity.</p>
Bald eagle	<i>Haliaeetus leucocephalus</i>	SC, R	S	WSC	<p>Range: Widespread across US and Canada, and into northwestern Mexico. In central Arizona, bald eagles are present year-round, with a wintering population spreading into the northern part of the state. The populations north and south of the 40th parallel are considered unique.</p> <p>Habitat: Forested areas along coasts, large lakes, and rivers, but also other areas. Known to roost in large trees and on ledges or cliffs near water bodies with abundant prey. Nests are generally found on the order of 600 lateral feet, and 300 vertical feet of the water body.</p> <p>Elevation: 460—7,930 feet</p>	<p>Unlikely. Lack of suitable breeding or nesting habitat. Transient individuals may pass through the project area. Species not known to occur in the project vicinity.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Belted kingfisher	<i>Megaceryle alcyon</i>			WSC	<p>Range: Sources vary, but indicate that breeding range spans Alaska and Canada, into the continental US as far south as South Dakota and east to Wisconsin. Winter range extends throughout the US and into Central and South America, with documented dispersal as far as Hawaii and the West Indies.</p> <p>Habitat: This species is found in or near persistent water sources, such as rivers, brooks, ponds, lakes, coasts, streams, tidal creeks, mangroves, swamps and estuaries</p> <p>Elevation: 1,840—8,400 feet</p>	None. Lack of suitable habitat within the project area. There are no perennial water sources within the project area.
California condor	<i>Gymnogyps californianus</i>	E,EXP N			<p>Range: Historically, the Pacific Coast between British Columbia and Baja California. Reintroduced in Arizona to Vermillion Cliffs and Hurricane Cliffs.</p> <p>Habitat: Condors in Arizona roost and nest in steep terrain with rock outcroppings, cliffs, and caves. High perches are necessary to create the strong updrafts the bird requires to lift into flight. Open grasslands or savannahs are essential to condors for searching for food.</p> <p>Elevation: 2,000—6,500 feet</p>	<p>None. Lack of suitable habitat within the project area.</p> <p>*Federal sources list this species as having potential presence in Yavapai County, but AGFD does not list it as having presence.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Common black-hawk	<i>Buteogallus anthracinus anthracinus</i>			WSC	<p>Range: This species occurs from Arizona to southern Texas and southward to Peru and Paraguay. Arrives in the US to breed as early as March-April, leaving by mid-October. Individuals occasionally overwinter in Arizona and New Mexico. The breeding range is along remote streams draining the Mogollon Rim, the Big Sandy and Virgin rivers drainages, and the upper Gila River drainages.</p> <p>Habitat: Riparian nester, dependent on mature, relatively undisturbed habitat supported by a permanent flowing stream. It may less commonly occur on intermittent streams if pools remain present. Prefer groves to single trees, and streams that are less than 30.0 cm deep, of low to moderate gradient with many riffles, runs, pools and scattered boulders or lapped with branches.</p> <p>Elevation: 1,750—7,080 feet</p>	None. Lack of suitable breeding, nesting, and foraging habitat. There are no perennial water sources within the project area.
Ferruginous hawk	<i>Buteo regalis</i>	SC	S	WSC	<p>Range: No records outside the Americas. Primarily found in the western states of North America, southern Canada and into central Mexico. Breeds across southern central Canada and into the US between the Great Plains and Rocky Mountains south to northern Arizona and New Mexico. Winter range is primarily from central Mexico north through the southwestern and mid-western US.</p> <p>Habitat: Open scrublands and woodlands, grasslands, and Semidesert Grassland – prefers open grasslands dotted with suitable low hills or short trees, which serve as perches.</p> <p>Elevation: 3,500—6,000 feet</p>	Unlikely. Some marginal foraging habitat may exist in the project area, but distance from suitable nesting habitat and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area. Species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Golden eagle	<i>Aquila chrysaetos</i>		S		<p>Range: Contiguous North America, Canada south to central Mexico, Northern Russia, Siberia, British Isles, Northern Africa, Asia minor, Persia, southern Tibet, Korea and Japan. This outline represents the combined ranges of several subspecies, only one of which (<i>A. c. canadensis</i>) is found in North America.</p> <p>Habitat: The species is found in open country, in prairies, arctic and alpine tundra, open wooded country and barren areas, especially in hilly or mountainous regions. They nest on rock ledges, cliffs or in large trees. In Arizona nests are found in mountainous areas and are virtually vacant after breeding in some desert areas.</p> <p>Elevation: 4,000—10,000 feet</p>	<p>Unlikely. Some marginal foraging habitat may exist in the project area, but distance from suitable nesting habitat and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area. Species not known to occur in the project vicinity.</p>
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T		WSC	<p>Range: From southern Utah and central Colorado south through Arizona, New Mexico, and western Texas to the mountains of central Mexico. Patchily distributed in Arizona in forested mountains statewide, along with steep canyons on the Colorado Plateau including the Grand Canyon.</p> <p>Habitat: Dense old growth mixed-conifer forests and canyons. Preferred nesting and breeding habitat includes high canopy closure, high stand density, a multilayered canopy, uneven-aged stands, numerous snags, and downed woody matter. Diverse dispersal habitat. Nearly all isolated patches of mixed conifer or ponderosa pine in the southwest could be reached by dispersing owls.</p> <p>Elevation: 2,720—9,600 feet</p>	<p>None. Lack of suitable breeding, nesting, and foraging habitat. There is no mature forest in or near the project area. The closest area of designated critical habitat is in Coconino County, approximately 125 miles from the project area.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Northern goshawk	<i>Accipiter gentilis atricapillus</i>	SC	S	S	<p>Range: This species breeds and winters extensively in North America, with some populations wintering south of the US border. In Arizona they breed in high, forested mountains and plateaus, usually above 6,000 feet.</p> <p>Habitat: Goshawks nest in a wide variety of forest types including deciduous, coniferous and mixed forests, though typically in mature or old growth forests, generally selecting larger tracts of forests over smaller tracts. In Arizona, they nest most commonly in ponderosa pine forests along the Mogollon Rim and on the Kaibab Plateau, and in Arizona pine and ponderosa pine forests in the southeastern mountains. Occasionally, they breed in relatively low elevation oak forests in the southeastern portion of the state, with the lowest-elevation nest found at 4,900 feet.</p> <p>Elevation: 4,750—9,120 feet</p>	<p>Unlikely. The project area is within the currently known geographic range, and some marginal foraging habitat may exist in the project area, but distance from suitable nesting habitat, elevation, and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area.</p>
Pine grosbeak	<i>Pinicola enucleator</i>			WSC	<p>Range: This species is found in most of Alaska, Canada, and throughout the Western US. Populations in Arizona are largely in the White Mountains, north Kaibab Plateau, and Oak Creek Canyon, and possibly the San Francisco Peaks.</p> <p>Habitat: Open coniferous (less commonly mixed coniferous-deciduous) forest and forest edge; in migration and winter also in deciduous forest, woodland, second growth and shrubbery. They prefer coniferous stands with large trees and low to intermediate canopy cover, usually near an edge.</p> <p>Elevation: 7,140—9,400 feet</p>	<p>None. Low elevation, lack of suitable breeding, nesting, and foraging habitat.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E		WSC	<p>Range: A neotropical migrant that winters in Mexico and Central America. Known to breed throughout the southwest US. In Arizona, this species breeds locally along the Colorado River in the Grand Canyon near mouth of Little Colorado River, and south of Yuma. Also breeds at the headwaters of the Little Colorado River near Greer and Eagar; very locally along the middle Gila, Salt, and Verde rivers; middle to lower San Pedro River; and upper San Francisco River near Alpine.</p> <p>Habitat: A riparian obligate that prefers dense canopy cover, large volume of foliage, and surface water during midsummer. They appear to avoid riparian areas found in steep, closed canyons.</p> <p>Elevation: 75—9,180 feet</p>	<p>None. Vegetation found within the project area has none of the documented and required habitat elements for this species. Lack of suitable riparian habitat necessary for breeding and foraging.</p>
Western burrowing owl	<i>Athene cunicularia hypugaea</i>	SC	S		<p>Range: Species breeds in North America and winters primarily south of the US-Mexico border. In Arizona, occurs locally in open areas, generally year-round, with only a few winter records on the Colorado Plateau.</p> <p>Habitat: Variable in open, well-drained grasslands, steppes, deserts, prairies, and agricultural lands, often associated with burrowing mammals. Burrowing owls are at times observed in open areas such as vacant lots near human habitation, golf courses and airports.</p> <p>Elevation: 650—6,140 feet</p>	<p>Unlikely. Some marginal foraging habitat may exist in the project area, but distance from suitable nesting habitat and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area. Species not known to occur in the project vicinity.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i> (western pop)	PT		WSC	<p>Range: A late spring migrant from South America, cuckoos breed throughout the western US. The species can be found in every county of Arizona, and is generally found in southern and central Arizona, and extreme northeast portion of state.</p> <p>Habitat: Suitable habitats is limited to narrow, and often widely separated, riparian cottonwood-willow galleries or salt cedar, or larger mesquite bosques. Dense understory foliage appears to be an important factor in nest site selection. They are rarely observed as transients in xeric desert or urban settings.</p> <p>Elevation: Less than 6,000 feet</p>	<p>None. Lack of suitable riparian habitat. Vegetation found within the project area has none of the documented and required habitat elements for this species.</p>
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	E		WSC	<p>Range: The species is distributed throughout the Lower Colorado River basin. In Arizona, they can be found on the Colorado River as far north as Lake Mead, Virgin River, Bill Williams River, the lower Gila River from near Phoenix to the Colorado River, and the lower Salt and Verde rivers. Occasionally recorded outside of this range.</p> <p>Habitat: This species breeds in freshwater marshes and also inhabit brackish water marshes and side waters, preferring the tallest, densest cattail and bulrush marshes.</p> <p>Elevation: 75—1,700 feet; occasionally found up to 2,200 feet</p>	<p>None. Lack of suitable riparian habitat. Vegetation found within the project area has none of the documented and required habitat elements for this species.</p> <p>*Federal sources do not list this species as having presence in Yavapai County, but AGFD considers presence possible.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Fish						
Colorado pikeminnow	<i>Ptychocheilus lucius</i>	E,EXP N	WSC		<p>Range: Historically widespread in the Colorado River basin from Wyoming to Arizona and California. Considered extirpated in Arizona, Colorado pikeminnow are restricted to two "experimental, non-essential" reintroduced populations in the state.</p> <p>Habitat: Spawning takes place over clean cobbles and rubble in relatively swift waters. Preferred temperatures for embryo development, juvenile growth, and adult spawning range from 20.0—26.0°C (68.0—78.8°F). Juveniles utilize slackwater, backwater, and side channel areas with low or no current velocity and silt/sand substrates. Larger individuals, greater than 200mm (7.9 in.) occur in turbid, deep, and strongly flowing waters.</p> <p>Elevation: Re-introduced at 1,960 feet</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Desert pupfish	<i>Cyprinodon macularius</i>	E		WSC	<p>Range: Historic range includes the lower Gila River basin and the lower Colorado River. No natural populations remain in Arizona, but populations have been reintroduced in several locations, including AD Wash in Yavapai County.</p> <p>Habitat: Pupfish occupy shallow waters of springs, small streams, and marshes. Often associated with areas of soft substrates and clear water.</p> <p>Elevation: 1,200—3,450 feet</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Desert sucker	<i>Catostomus clarki</i>	SC	S		<p>Range: Historic range includes Arizona, New Mexico, Nevada, Utah, and Mexico. Current range within the lower Colorado River drainage and the Gila River basin in Arizona-New Mexico, including the Bill Williams drainage.</p> <p>Habitat: Rapids and flowing pools of streams, primarily over bottoms of gravel-rubble with sandy silt in the interstices.</p> <p>Elevation: 480—8,840 feet</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Gila chub	<i>Gila intermedia</i>	E		WSC	<p>Range: Historically, populations have been recorded throughout the Gila River basin in northern Sonora, Mexico, central and southeastern Arizona, and western New Mexico. In Arizona, known to exist in the following drainages; Santa Cruz River, Middle Gila River, San Pedro River, Agua Fria River, and Verde River.</p> <p>Habitat: Pools in small streams, springs, and cienegas. Adults prefer deeper waters with cover including terrestrial vegetation, fallen logs, and boulders, while young prefer shallower waters.</p> <p>Elevation: 2,720—5,420 feet</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Gila longfin dace	<i>Agosia chrysogaster chrysogaster</i>	SC	S		<p>Range: Native to the Gila, and Bill Williams drainages in Arizona, and the Magdalena and Sonoyta drainages in Mexico. Distribution has increased in mountainous areas, probably due to climatic trends.</p> <p>Habitat: They tend to occupy relatively small or medium size streams with sandy or gravelly bottoms, eddies, pools near overhanging banks or other cover. Usually in water less than 0.6 feet (0.2 m) deep with moderate velocities.</p> <p>Elevation: Less than 4,900 feet; have been recorded up to 6,700 feet</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Gila topminnow	<i>Poeciliopsis occidentalis</i>	E		WSC	<p>Range: Historically occupied the Gila River drainage in New Mexico, Arizona, and Mexico. The Gila topminnow has been eliminated from almost all of its historic range. Currently, disjunct populations exist in 9-11 natural locations and 22-24 re-introduced locations within the Gila River drainage and one location in the Bill Williams River drainage.</p> <p>Habitat: Gila topminnows occupied headwater springs, and vegetated margins and backwater areas of intermittent and perennial streams and rivers. This species prefers shallow warm water in a moderate current with dense aquatic vegetation and algae mats.</p> <p>Elevation: Less than 5,000 feet</p>	<p>None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.</p>
Gila trout	<i>Oncorhynchus gilae</i>	T		WSC	<p>Range: Found historically in the Verde and Agua Fria drainages in Arizona. Fisheries surveys in 1993 revealed no Gila trout and they were considered extirpated from Arizona.</p> <p>Habitat: Gila trout are found in small mountain headwater streams, which are generally narrow and shallow, siltation is usually low and cobble is the predominate substrate. During drought years they tend to be confined to pools with sufficient depth and cover. Gila trout use cover extensively</p> <p>Elevation: 5,446—9,220 feet</p>	<p>None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.</p> <p>*Federal sources list this species as having potential presence in Yavapai County, but AGFD does not list it as having presence.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Headwater chub	<i>Gila nigra</i>	C			<p>Range: Gila River basin of Arizona and New Mexico. In Arizona, they are identified from Ash Creek, Tonto Creek, and Spring and Marsh Creeks. Also, in the Verde River system, they inhabit Upper Fossil Creek (above the diversion dam), East Verde River and Deadman Creek.</p> <p>Habitat: Middle and headwater reaches of middle-sized streams. They are associated with deep, near-shore pools adjacent to swift riffles and runs, and near obstructions. Cover consists of root wads, boulders, undercut banks, submerged organic debris, or deep water.</p> <p>Elevation: 4,200—5,000 feet</p>	<p>None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.</p>
Loach minnow	<i>Tiaroga cobitis</i>	E			<p>Range: Historic range includes many Arizona and New Mexico rivers and their tributaries, but is considered extirpated in much of its native range. In Arizona, they are found in Aravaipa Creek, the Blue River, and irregularly at the confluence of the north and east forks of the White River and the San Francisco River, between Clifton and the New Mexico border</p> <p>Habitat: Occupies turbulent, rocky riffles of mainstream rivers and tributaries, preferring moderate to swift current velocity and gravel or cobble substrates.</p> <p>Elevation: 2,325—8,240 feet</p>	<p>None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.</p> <p>*Federal sources list this species as having potential presence in Yavapai County, but AGFD does not list it as having presence.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Razorback sucker	<i>Xyrauchen texanus</i>	E		WSC	<p>Range: Endemic to large rivers of the Colorado River Basin from Wyoming to Mexico. Presently natural adult populations exist in Arizona only in Lake Mohave, Lake Mead, and Lake Havasu.</p> <p>Habitat: Use a variety of habitat types from mainstem channels to slow backwaters of medium and large streams and rivers, sometimes around cover. In impoundments they prefer depths of a meter or more over sand, mud or gravel substrates.</p> <p>Elevation: 181—5,000 feet</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Roundtail chub	<i>Gila robusta</i>	C		S	<p>Range: Mainstem Colorado River and its larger tributaries in the upper Colorado River basin in Wyoming, Utah and Colorado; and in the lower Colorado River basin. Populations in Arizona are found locally in several rivers and tributaries, including 8 tributaries in the Bill Williams basin.</p> <p>Habitat: Cool to warm water over a wide range of elevations in rivers and streams. Cover is usually present and consists of large boulders, tree rootwads, submerged large trees and branches, undercut cliff walls, or deep water. Smaller chubs generally occupy shallower, low velocity water adjacent to overhead bank cover.</p> <p>Elevation: 1,210—7,220 feet (typically 2,000—5,000 feet)</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Sonora sucker	<i>Catostomus insignis</i>	SC	S		<p>Range: Gila and Bill Williams systems (Colorado River drainage) New Mexico, Arizona, and northern Sonora, Mexico. Currently widespread in the Gila and Bill Williams river basins in Arizona.</p> <p>Habitat: Lentic and pool habitats and are found in a variety of habitats from warm water rivers to trout streams.</p> <p>Elevation: 1,210—8,730 feet</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Speckled dace	<i>Rhinichthys osculus</i>	SC	S		<p>Range: Native to all major western drainages from the Columbia and Colorado Rivers south to Sonora, Mexico. In Arizona, found in Colorado, Bill Williams, and Gila River drainages, except slower and warmer portions of Colorado River mainstream.</p> <p>Habitat: Speckled dace is a bottom dweller, found in rocky riffles, runs, and pools of headwaters, creeks, and small to medium rivers.</p> <p>Elevation: 1,550—9,843 feet (most commonly above 6562 feet)</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.
Spikedace	<i>Meda fulgida</i>	E		WSC	<p>Range: Historically, spikedace were common and locally abundant throughout the upper Gila River basin of Arizona and New Mexico. Present populations in Arizona are limited, but include 35 miles of the Verde River in Yavapai County.</p> <p>Habitat: Shallow riffles of moderate to large perennial streams with sand, gravel, and rubble substrates.</p> <p>Elevation: 1,620—4,500 feet (historically much more diverse)</p>	None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Woundfin	<i>Plagopterus argentissimus</i>	E,EXP N			<p>Range: Historically occurred in the Lower Colorado River Basin below the Grand Canyon the Virgin River in Utah, Arizona, and Nevada; and the lower and middle Gila River drainages in Arizona. The species has been extirpated from almost all of its historical range except the mainstream Virgin River, from Pah Tempe Springs to Lake Mead in northwestern Arizona (Mohave County).</p> <p>Habitat: Inhabits shallow, warm, turbid, fast-flowing water. Tolerates high salinities and relatively warm water temperatures.</p> <p>Elevation: Less than 4,500 feet</p>	<p>None. Lack of suitable aquatic habitat. There are no perennial streams or rivers within the project area.</p> <p>*Federal sources list this species as Experimental/Non-Essential in Yavapai County, but AGFD does not list it as having presence.</p>
Invertebrates						
Balmorhea saddle-case caddisfly	<i>Protoptila balmorhea</i>	SC			<p>Range: This species is found only in Reeves County, Texas and the age Springs/Bubbling Ponds/Lolomai Springs/Oak Creek Complex in Yavapai County, Arizona.</p> <p>Habitat: Swift spring outfalls with sufficient cobble substrate to support the algal grazing habits of the larvae.</p> <p>Elevation: 3,500 feet</p>	<p>None. Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.</p>
Brown springsnail	<i>Pyrgulopsis sola</i>	SC	S		<p>Range: Endemic to type locality of Brown Spring, Yavapai County, northwestern Arizona.</p> <p>Habitat: The genus <i>Pyrgulopsis</i> is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing. Specific habitat needs undefined.</p> <p>Elevation: 3,160—5,600 feet</p>	<p>None. Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Fossil springsnail	<i>Pyrgulopsis simplex</i>	SC	S		<p>Range: Spring near Strawberry, Gila County, along with Fossil Springs, Yavapai County, Arizona.</p> <p>Habitat: Typically found only in the headspring and upper sections of the outflow. The genus <i>Pyrgulopsis</i> is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing.</p> <p>Elevation: 4,140—4,310 feet</p>	None. Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.
Maricopa tiger beetle	<i>Cicindela oregona Maricopa</i>	SC			<p>Range: This species is restricted to the state of Arizona, and may occur statewide. Historically or recently collected in all counties except Apache, La Paz, Santa Cruz, and Yuma.</p> <p>Habitat: The beetle is found in several different habitats within its range, most commonly on sandy stream banks and less commonly on gravels and clays along stream banks.</p> <p>Elevation: 1,092—6,940 feet</p>	None. Lack of suitable habitat within the project area.
Montezuma well springshail	<i>Pyrgulopsis monteumensis</i>	SC	S		<p>Range: Montezuma Well, Yavapai County, Arizona.</p> <p>Habitat: The endemic location is a freshwater, bethnic, spring. The genus <i>Pyrgulopsis</i> is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing.</p> <p>Elevation: 3,600 feet</p>	None. Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Page spring micro caddisfly	<i>Metrichia nigratta</i>	SC			<p>Range: No data (presumed to be endemic to Page Spring, Yavapai County, Arizona).</p> <p>Habitat: No data</p> <p>Elevation: No data</p>	None. Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area.
Page springsnail	<i>Pyrgulopsis morrisoni</i>	C	S		<p>Range: Page Spring and several nearby springs in Verde Valley, Yavapai County, and central Arizona.</p> <p>Habitat: Typically occurs on firm substrates such as rocks, vegetation, floating algal mats and submerged woody debris in association with slow to moderate flows of head springs, seeps and lateral spring runs.</p> <p>Elevation: 3,300—3,600 feet</p>	None. Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.
Parker's cyloepus riffle beetle	<i>Cyloepus parkeri</i>	SC			<p>Range: Only known habitat occurs in Yavapai County, Arizona, in spring fed Roundtree Canyon in Bloody Basin within the Tonto National Forest. May also occur in Tangle Creek, also located in Bloody Basin.</p> <p>Habitat: Permanent, clean, slow moving small streams, with loose gravelly substrate and very little sand.</p> <p>Elevation: 2,850—4,000 feet</p>	None. Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Verde rim springsnail	<i>Pyrgulopsis glandulosa</i>	SC	S		<p>Range: Nelson Place Spring complex, consisting of two springs, separated by 150 meters, that form the headwaters of Sycamore Creek, Yavapai County, central Arizona.</p> <p>Habitat: Freshwater, bethnic, spring-spingsbrook. The genus <i>Pyrgulopsis</i> is generally found on rock or aquatic macrophytes in moderate current. Because springsnails have only a partial operculum, they cannot withstand any desiccation, and occur only in water that is perennially flowing.</p> <p>Elevation: 5,280 feet</p>	<p>None. Lack of suitable habitat within the project area. There are no perennial streams or rivers within the project area. Species endemic to distal location.</p>
Mammals						
Allen's big-eared bat (Allen's lappet-browed bat)	<i>Idionycteris phyllotis</i>	SC	S		<p>Range: In the US, this species is known from Arizona, Nevada, Utah, and southwestern New Mexico. Specimens taken across most of Arizona, but not known from the southwestern deserts of Arizona.</p> <p>Habitat: This species is found in ponderosa pine forest, oak-piñon-juniper-pine transition, and riparian cottonwood-sycamore forest. Often associated with water. Roosts in caves, and abandoned mine shafts.</p> <p>Elevation: 1,320—9,800 feet (mostly 3,500—7,500 feet)</p>	<p>Unlikely. Lack of suitable foraging habitat within the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Arizona myotis	<i>Myotis occultus</i>	SC	S		<p>Range: Southwest US and Mexico, including southeastern California, Arizona, New Mexico (except perhaps extreme northeast), southern Colorado, and perhaps southern Utah and western Texas.</p> <p>Habitat: In summer, found in ponderosa pine and oak-pine woodland near water. Also found along permanent water or in riparian areas in some desert areas. Vegetation zone is not thought to be an important influence.</p> <p>Elevation: 3,200—8,000 feet (rare records at 150—1,000 feet)</p>	<p>None. Lack of suitable roosting or foraging habitat in the project area. There are no perennial streams or rivers within the project area.</p>
Big free-tailed bat	<i>Nyctinomops macrotis</i>	SC			<p>Range: Widely dispersed throughout central and western North America, as well as Central and South America. Widespread through most of state, with majority of occurrences in northern Arizona. Scattered observations from southeast part of state, but seems to be absent from southwestern and eastern portions.</p> <p>Habitat: This species primarily inhabits rugged, rocky country, roosting in rock crevices (vertical or horizontal) in cliffs, caves, buildings, and occasionally tree holes, and riparian areas. Winter range and habitat unknown.</p> <p>Elevation: 1,810—8,475 feet (primarily below 5,900 feet)</p>	<p>Unlikely. Lack of suitable foraging habitat within the project area. Some marginally suitable roosting habitat may be present, though, species not known to occur in the project vicinity.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Black-footed ferret	<i>Mustela nigripes</i>	E,EXP N	WSC		<p>Range: This species historic range spanned the western US intermountain and prairie grasslands, from Canada to Mexico. Now exists in the wild at 18 reintroduction sites across 8 states, Canada, and Mexico. Current range includes a reintroduced population in Coconino County.</p> <p>Habitat: Prairie and grassland habitat. This species is highly dependent on prairie dog colonies as prairie dogs are this species primary food source, and prairie dog burrows are required for shelter. Since 1967, this species has been listed as endangered across its entire range, except for several reintroduced experimental populations.</p> <p>Elevation: 5,250—6,234 feet</p>	None. Lack of suitable habitat within the project area; there are no prairie dog colonies in the vicinity.
California leaf-nosed bat	<i>Macrotus californicus</i>	SC	S	WSC	<p>Range: Species range from northern Sinaloa and southwestern Chihuahua, Mexico, north to southern Nevada and California; also range into Baja California and Tamaulipas, Mexico. In Arizona found primarily south of Mogollon Plateau; additional reports in extreme southeastern and in summer extreme northwestern Mohave County.</p> <p>Habitat: Mostly found in the Sonoran desertscrub with roost sites with large areas of ceiling and flying space including a variety of manmade structures, rock shelters and mines.</p> <p>Elevation: All Arizona records below 4,000 feet with most below 2,500 feet.</p>	Unlikely. Lack of suitable habitat within the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity or elevation.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Camp Verde cotton rat	<i>Sigmodon arizonae arizonae</i>			WSC	<p>Range: Camp (Fort) Verde, Yavapai County, Arizona.</p> <p>Habitat: Species at large known to live in desert areas, usually characterized by mesquite and tumbleweeds with a small amount of grass. Also live in less arid areas along canals and banks of small streams with weeds and brush. It is estimated that 90-95% of all habitat is found within 10 miles of waterways and drainages of southern Arizona.</p> <p>Elevation: 3,200 feet</p>	None. Lack of suitable roosting or foraging habitat in the project area. There are no perennial streams or rivers within the project area.
Cave myotis	<i>Myotis velifer incautus; brevis</i>	SC	S		<p>Range: This species ranges from Honduras to Kansas, and west to southeastern California. Found in much of the state of Arizona, except for the extreme southwestern part of the state.</p> <p>Habitat: The species roost in caves, tunnels, and mineshafts, and under bridges, and sometimes in buildings within a few miles of water in areas of desertscrub of creosote, brittlebush, palo verde and cacti. Winter roosts in Arizona are wet mine tunnels above 6000 feet, where preferred temperatures reported as 8°-11° C.</p> <p>Elevation: Active from 300—5,000 feet</p>	Unlikely. Marginally suitable foraging habitat may be present in the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Fringed myotis	<i>Myotis thysanodes thysanodes</i>	SC			<p>Range: Western North America from British Columbia into Mexico. Found throughout much of Arizona, though not known from northeast or southwest corners. Their winter range in Arizona shifts to the southernmost counties and Mohave County.</p> <p>Habitat: Found in middle elevation habitats ranging from deserts, grasslands, and woodlands, and most frequently captured in oak-piñon woodlands and other open, coniferous, middle-elevation forests. Roosts in caves, mine tunnels, in large snags, under exfoliating bark, and in buildings.</p> <p>Elevation: 4,000—8,437 feet</p>	<p>Possible. Potentially suitable foraging habitat occurs in or near the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity.</p>
Hualapai Mexican vole	<i>Microtus mexicanus hualapaiensis</i>	E		WSC	<p>Range: Restricted to Arizona, in Mohave, Coconino, and Yavapai Counties.</p> <p>Habitat: Preferred habitat is grassy areas usually in or adjacent to spruce-fir, ponderosa pine, or Gambel's oak stands at higher elevations (above 6,000 feet), and piñon-juniper woodland or sagebrush at lower elevations (below 6,000 feet). Presently found only in moist, grass/sedge habitats along permanent and semi-permanent waters, but may be capable of occupying drier areas when grass/forb habitats are available.</p> <p>Elevation: 3,080—8,400 feet</p>	<p>Unlikely. Some marginal foraging habitat may exist in the project area, but distance from ideal habitat and availability of more suitable foraging habitat outside of project area suggests species presence is rare in the project area. Species not known to occur in the project vicinity.</p> <p>*Federal sources do not list this species as having presence in Yavapai County, but AGFD considers presence possible.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Long-legged myotis	<i>Myotis volans interior</i>	SC			<p>Range: Found from southern Alaska and western Canada, southward into northern Mexico. The species is found in forested mountains of Apache, Cochise, Coconino, Gila, Greenlee, Mohave, Navajo, and Yavapai counties. Absent from desert and desert mountains of southwestern part of the state.</p> <p>Habitat: Although primarily a coniferous forest bat, it can also be observed in riparian and desert habitats. This species utilizes a variety of roosts including abandoned buildings, cracks in the ground, crevices in cliff faces and spaces behind exfoliating tree bark. Caves and mine tunnels are used as hibernacula. In the summer, they apparently do not use caves as a daytime roost site.</p> <p>Elevation: 4,000—12,000 feet</p>	<p>Unlikely. Lack of suitable foraging and roosting habitat located within the project area. Species may winter in nearby abandoned mines, though, species not known to occur in the project vicinity.</p>
Pale Townsend's big-eared bat	<i>Corynorhinus townsendii pallescens</i>	SC	S		<p>Range: Widespread in Arizona, this species is found throughout western Canada, the western US to southern Mexico; a few isolated populations exist in the midwestern US.</p> <p>Habitat: In Arizona, summer day roosts are found in caves and mines from desert scrub up to woodlands and coniferous forests. Night roosts may often be in abandoned buildings. In winter, they hibernate in cold caves, lava tubes and mines mostly in uplands and mountains from the vicinity of the Grand Canyon to the southeastern part of the state.</p> <p>Elevation: 550—8,437 feet (few records below 3,000 feet)</p>	<p>Possible. Suitable foraging habitat may be present in the project area. Suitable roost sites may be available in nearby abandoned mines, though, species not known to occur in the project vicinity.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Spotted bat	<i>Euderma maculatum</i>	SC	S	WSC	<p>Range: Locally distributed throughout central western North America from southern British Columbia and Montana, south through California and Big Bend, Texas to Durango and Queretaro, Mexico. Local populations known to exist at several sites throughout Arizona.</p> <p>Habitat: Varied. In Arizona, most are captured in dry, rough desertscrub with a few captured or heard in ponderosa pine forest. This bat has been found from low desert in southwestern Arizona to high desert and riparian habitats in northwestern Arizona and Utah, and conifer forests in northern Arizona and other western states. Limited observations suggest that they prefer to roost singly in crevices and cracks in cliff faces. Believed to be an elevational migrant.</p> <p>Elevation: 110—8,670 feet</p>	<p>Possible. Suitable foraging habitat may be present in the project area. Suitable roost sites may be available in nearby abandoned mines, though, species not known to occur in the project vicinity.</p>
Western red bat	<i>Lasiurus blossevillii</i>			WSC	<p>Range: Western Canada, western US and western Mexico to Central America. Generally distributed in south central to southern and southeastern Arizona, with a few observations along the Colorado River near Bill Williams.</p> <p>Habitat: Preferred habitat includes riparian and wooded areas, roosting during the day in trees. Summer roosts usually in tree foliage, sometimes in leafy shrubs or herbs. They may also roost in saguaro boots, and occasionally in cave-like situations although they generally avoid caves and buildings during both summer and winter.</p> <p>Elevation: 1,900—7,200 feet</p>	<p>None. Lack of suitable riparian foraging and roosting habitat within the project area.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Western small-footed myotis	<i>Myotis ciliolabrum</i>	SC			<p>Range: From southern British Columbia, Alberta, and Saskatchewan to the southwestern US. Found in Cochise, Coconino, Graham, Mohave, Pinal, and Yavapai counties in Arizona.</p> <p>Habitat: This species is more common in montane and coniferous forests, rarely occurring below the level of ponderosa pine. Roosts singly or in small groups in cracks and crevices in rock, caves, mines, under tree bark, in abandoned swallow nests, and in buildings.</p> <p>Elevation: 2,100—8,670 feet</p>	<p>Unlikely. Lack of suitable foraging habitat within the project area. Suitable roosting habitat may be present in nearby abandoned mines, though, species not known to occur in the project vicinity.</p>
Plants						
Aquarius milkvetch	<i>Astragalus newberryi</i> var. <i>aquarii</i>	S			<p>Range: Burro Creek, Mohave County, Arizona.</p> <p>Habitat: The seraphic islands on which this species grows do not support Sonoran Desert dominants such as creosote bush and foothill palo verde. Occurs with other rare plants, mostly in the BLM Clay Hills Area of Critical Environmental Concern.</p> <p>Elevation: 2,000—2,600 feet</p>	<p>None. Lack of suitable habitat within the project area.</p>
Aravaipa wood fern	<i>Thelypteris puberula</i> var. <i>sonorensis</i>		S		<p>Range: Arizona, including Yavapai County, southwestern California to western Mexico.</p> <p>Habitat: This species is found in moist soil in the shade of boulders in mesic canyons, on riverbanks, seepage areas, and meadow habitats.</p> <p>Elevation: 2,220—4,500 feet</p>	<p>None. Lack of suitable habitat within the project area.</p>

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Arizona cliffrose	<i>Purshia subintegra</i>	E		HS	<p>Range: Endemic to Arizona.</p> <p>Habitat: Rolling, rocky, limestone hills and slopes within Sonoran deserts scrub. The species occurs where the winters are mild, summers are hot, and rainfall is evenly distributed between summer and winter rainfall periods.</p> <p>Elevation: 2,120—4,000 feet</p>	None. Lack of suitable habitat within the project area.
Arizona giant sedge	<i>Cares ultra</i>	S			<p>Range: Species occurs only in southeast Arizona, extreme southwest New Mexico and northern Mexico.</p> <p>Habitat: Moist soil near perennially wet springs and streams in undulating rocky-gravelly terrain.</p> <p>Elevation: 2,040—6,000 feet</p>	None. Lack of suitable habitat within the project area.
Cameron water-parsley	<i>Cymopterus megacephalus</i>	SC			<p>Range: Endemic to northern Arizona. From eastern Coconino County, north and south of Cameron, and north of Gray Mountain, northeast of Flagstaff. Also collected in Yavapai County near Montezuma Castle.</p> <p>Habitat: In Yavapai County, collected on Canotia hillsides with limey soil.</p> <p>Elevation: Not available</p>	None. Lack of suitable habitat within the project area.
Flannel bush	<i>Fremontodendron californicum</i>		S	SR	<p>Range: Central Arizona, southern California, and Baja California, Mexico. Specific range in Arizona includes several locations in southern Yavapai County.</p> <p>Habitat: Mainly well-drained rocky hillsides and ridges, in chaparral and oak/pine woodland. In Arizona, usually on dry, north slopes in canyons.</p> <p>Elevation: 1,312—6,562 feet</p>	Possible. Suitable habitat may be present in the project area, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Hohokam agave	<i>Agave murpheyi</i>	SC	S	HS	<p>Range: Found in wild from central Arizona to Sonora, Mexico. Most instances centered around Hank Raymond Lake bordered by Yavapai and Maricopa counties.</p> <p>Habitat: In central Arizona, usually found on benches or alluvial terraces on gentle bajada slopes (not steep slopes or drainage bottoms) above major drainages in desert scrub, with pre-Columbian agricultural and settlement features, having been cultivated by the Hohokam. The species requires a well-drained soil, being susceptible to root-rot.</p> <p>Elevation: 1,300—3,200 feet</p>	None. Lack of suitable habitat within the project area.
Mogollon fleabane	<i>Erigeron anchana</i>	SC			<p>Range: Known mainly from the mountains of central Arizona, Gila County, including the Sierra Ancha, Pine, Mazatzal, and Mescal mountains. One location from the Superstition Mountains in Pinal County. The Sierra Ancha's are the center of their range.</p> <p>Habitat: Granite cliff faces, chaparral through pine forests; rock crevices or ledges on boulders and vertical rock faces, usually in canyons.</p> <p>Elevation: 3,500—7,000 feet</p>	Possible. Suitable habitat may be present in the project area, though, species not known to occur in the project vicinity.
Parish's alkali grass	<i>Puccinellia parishii</i>	SC		HS	<p>Range: Historically five small, widely disjunct sites from California, Nevada, Arizona and New Mexico. A population was located in Yavapai County in a tributary to Little Shipp Wash.</p> <p>Habitat: Alkaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes. This species requires continuously damp soils during its late winter to spring growing period.</p> <p>Elevation: 2,780—7,350 feet</p>	None. Lack of suitable habitat within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Pima Indian mallow	<i>Abutilon parishii</i>	SC	S	SR	<p>Range: Presently known from 84 populations in 17 mountain ranges from Bagdad to Nachopouli Canyon, Sonora, Mexico.</p> <p>Habitat: Mesic situations in full sun within higher elevation Sonoran desertscrub. On rocky hillsides, cliff bases, canyon bottoms, lower side slopes and ledges of canyons among rocks and boulders. In riparian zones, occurs on flat secondary terraces but typically not in canyon bottoms.</p> <p>Elevation: 1,720—4,900 feet</p>	Unlikely. Lack of suitable habitat in the project area. A population is known to occur in Little Shipp Wash drainage, 3—10 miles from the project area, but hydrologically disconnected.
Ripley wild-buckwheat	<i>Eriogonum ripleyi</i>	SC		SR	<p>Range: Known from five widely separated localities in central to northwestern Arizona, where it seems to be restricted to white, calcareous substrates.</p> <p>Habitat: In Tertiary lakebeds on well-drained powdery soils derived from limestone, sandstone, or volcanic tuffs and ashes.</p> <p>Elevation: 2,000—6,000 feet</p>	None. Lack of suitable habitat in the project area.
Tonto Basin agave	<i>Agave delamateri</i>	SC		HS	<p>Range: Small geographic area in Central Arizona.</p> <p>Habitat: Usually found atop benches at edges of slopes, and on open hilly slopes in desert scrub, overlooking major drainages and perennial streams. Occasionally found in chaparral or juniper-grassland. Species requires a well-drained soil, being susceptible to root-rot.</p> <p>Elevation: 2,190—5,100 feet</p>	Unlikely. Marginally suitable habitat may be present in the project area, though, species not known to occur in the project vicinity.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Tusayan flame flower	<i>Phemeranthus validulus</i>	SC		SR	<p>Range: Present only in several separate localities in Coconino and Yavapai Counties, Arizona. Locations in Yavapai County include the Juniper Mountains, Big Black Mesa, and Black Hills.</p> <p>Habitat: Open mountain meadows with very shallow rocky clay soils derived from basalt in ponderosa pine forest, and shallow basins at rims of canyons and flat ridgetops with cherty gravels from Kaibab limestone in piñon-juniper woodland.</p> <p>Elevation: 5,590— 7,700 feet</p>	None. Lack of suitable habitat in the project area.
Verde Valley sage	<i>Salvia dorrii ssp. mearnsii</i>	SC		SR	<p>Range: Verde Valley and Upper Verde River, Yavapai County; and near Sedona, Coconino County, Arizona.</p> <p>Habitat: Restricted to open creosotebush-shrub community on gypseous limestone.</p> <p>Elevation: 3,120—5,120 feet</p>	None. Lack of suitable habitat in the project area.
Reptiles						
Banded Gila monster	<i>Heloderma suspectum cinctum</i>	SC			<p>Range: Mainly northwestern Arizona, with immediately adjacent isolated populations in Utah, Nevada and California. They have also been found in western Arizona in northwest Maricopa County and southwest Yavapai County.</p> <p>Habitat: In Arizona, primarily in Sonoran Desert and extreme western edge of Mohave Desert, less frequent in desert-grassland and rare in oak woodland. Most common in undulating rocky foothills, bajadas and canyons.</p> <p>Elevation: 0—5,000 feet</p>	Unlikely. Some marginal habitat may exist in the project area. Species presence limited to rare transients.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Narrow-headed gartersnake	<i>Thamnophis rufipunctatus rufipunctatus</i>	PT		WSC	<p>Range: Mountains of central and eastern Arizona and west-central New Mexico. A second disjunct population found in Northern Sonora and Chihuahua, south in the Sierra Madre Occidental to central Durango, Mexico.</p> <p>Habitat: Highly aquatic species found in permanently flowing streams in piñon-juniper and pine-oak woodland into ponderosa pine forest. Strongly associated with clear, rocky streams, using predominantly pool and riffle habitat that includes cobbles and boulders, sometimes sheltered by broadleaf deciduous trees. Has also been observed using lake shoreline habitat.</p> <p>Elevation: 2,440—8,080 feet; primarily 4,000—6,000 feet</p>	None. Lack of suitable aquatic habitat within the project area.
Northern Mexican gartersnake	<i>Thamnophis eques megalops</i>	PT		WSC	<p>Range: Historically found in New Mexico, Arizona, and Mexico. In Arizona, its distribution has been reduced to less than 10 percent of its former range along mainstem rivers. The species is likely extant in fragmented populations within the middle/upper Verde River drainage, middle/lower Tonto Creek, and the Cienega Creek drainage, as well as a small number of isolated wetland habitats in southeastern Arizona.</p> <p>Habitat: Three general habitat types are used: 1) source area ponds and cienegas; 2) lowland river riparian forests and woodlands; 3) upland stream gallery forests. Most abundant in densely vegetative habitat.</p> <p>Elevation: 3,000—5,000 feet; may reach 8,500 feet</p>	None. Lack of suitable habitat within the project area.

Species		Legal Protection Status			Preferred Habitat	Potential for Occurrence in the Project Area
Common Name	Scientific Name	ESA	BLM	AZ		
Sonoran Desert tortoise	<i>Gopherus morafkai</i>	C		WSC	<p>Range: The tortoise ranges from northern Sinaloa north to southern Nevada and southwestern Utah, and from south central California east to southeastern Arizona. The desert tortoise is divided into 2 populations for purposes of the Endangered Species Act: the threatened Mojave population occurs north and west of the Colorado River, and the Candidate designated Sonoran population occurs south and east of the Colorado River.</p> <p>Habitat: The Sonoran population of the desert tortoise occurs primarily on rocky slopes and bajadas of Mojave and Sonoran deserts scrub. In the Lower Colorado River Valley subdivision, caliche caves in cut banks of washes (arroyos) are also used for shelter sites. Shelter sites are rarely found in shallow soils.</p> <p>Elevation: Sonoran population 510—5,300 feet</p>	<p>Possible. Some suitable habitat exists in the project area. Species known to occur in the project vicinity.</p>
<p>Guide for potential for occurrence:</p> <p>None: no suitable habitat is present or the species is not found within the elevation range of the Project site</p> <p>Unlikely: no documentation; low or marginal habitat quality; outside, but close to, currently known geographic or elevational distribution; species may pass/migrate through Project site</p> <p>Possible: no documentation but suitable habitat within range occurs</p> <p>Present: species have been documented to occur</p>						
<p>Sources:</p> <p>Arizona Game and Fish Department. 2014. Special Status Species by County, Taxon, Scientific Name. Revised January 6, 2014. Retrieved from: http://www.azgfd.gov/w_c/edits/hdms_species_lists.shtml.</p> <p>_____. 2014. Plant and Animal Abstracts, Distribution Maps, & Illustrations. Retrieved from: http://www.azgfd.gov/w_c/edits/hdms_abstracts.shtml.</p> <p>US Fish & Wildlife Service (USFWS). 2014. Environmental Conservation Online System. Species by County Report: Yavapai County, AZ. Retrieved from: http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=04025.</p> <p>_____. 2013. Arizona Ecological Services Field Office. Listed and Sensitive Species in Yavapai County. Revised October 30, 2013. Retrieved from: http://www.fws.gov/southwest/es/arizona/Documents/CountyLists/Yavapai.pdf.</p>						

Special status plant and wildlife species are subject to regulations under the authority of federal and state agencies. Federal special status species include threatened and endangered species protected pursuant to the Endangered Species Act (ESA) of 1973, Section 4, as amended. Species designations prior to 1973 were originally appointed by the predecessor of the ESA, the Endangered Species Preservation Act of 1966. Additional USFWS designations include Proposed, Candidate, Species of Concern, and Delisted Monitoring. The BLM has designated some species as Sensitive. Species designations are defined as:

- E Endangered species are those species in danger of extinction throughout all or a significant portion of their range.
- T Threatened species are those species likely to become endangered in the foreseeable future.
- C Candidate species are those species for which FWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species are not protected under the ESA.
- R Recovery species are those which have previously been listed as threatened or endangered and have had that listing removed or reduced while remaining species of concern.
- SC Species of Concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species. Species of Concern is an informal term that refers to those species that the USFWS believes may be in need of concentrated conservation actions. Conservation actions, such as monitoring, vary depending on the health of the populations and degree and type of threats.
- PT Proposed Threatened
- EXPN Experimental, Nonessential Population designations imply the experimental population is not essential for the continued existence of the species.
- S BLM Sensitive are those taxa occurring on BLM managed lands which are considered sensitive by the Arizona State Office.
- *S BLM Proposed Sensitive species; species that are not currently considered Sensitive, but are proposed to be listed as Sensitive
- WSC Wildlife of Special Concern in Arizona. Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by the AGFD.
- HS Highly Safeguarded- no collection allowed under the Arizona Native Plant Law
- SR Salvage Restricted- collection only with permit under the Arizona Native Plant Law

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APPENDIX F HANDLING GUIDELINES FOR SONORAN DESERT TORTOISE

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GUIDELINES FOR HANDLING SONORAN DESERT TORTOISES
ENCOUNTERED ON DEVELOPMENT PROJECTS
Arizona Game and Fish Department
Revised October 23, 2007

The Arizona Game and Fish Department (Department) has developed the following guidelines to reduce potential impacts to desert tortoises, and to promote the continued existence of tortoises throughout the state. These guidelines apply to short-term and/or small-scale projects, depending on the number of affected tortoises and specific type of project.

The Sonoran population of desert tortoises occurs south and east of the Colorado River. Tortoises encountered in the open should be moved out of harm's way to adjacent appropriate habitat. If an occupied burrow is determined to be in jeopardy of destruction, the tortoise should be relocated to the nearest appropriate alternate burrow or other appropriate shelter, as determined by a qualified biologist. Tortoises should be moved less than 48 hours in advance of the habitat disturbance so they do not return to the area in the interim. Tortoises should be moved quickly, kept in an upright position parallel to the ground at all times, and placed in the shade. Separate disposable gloves should be worn for each tortoise handled to avoid potential transfer of disease between tortoises. Tortoises must not be moved if the ambient air temperature exceeds 40° Celsius (105° Fahrenheit) unless an alternate burrow is available or the tortoise is in imminent danger.

A tortoise may be moved up to one-half mile, but no further than necessary from its original location. If a release site, or alternate burrow, is unavailable within this distance, and ambient air temperature exceeds 40° Celsius (105° Fahrenheit), the Department should be contacted to place the tortoise into a Department-regulated desert tortoise adoption program. Tortoises salvaged from projects which result in substantial permanent habitat loss (e.g. housing and highway projects), or those requiring removal during long-term (longer than one week) construction projects, will also be placed in desert tortoise adoption programs. *Managers of projects likely to affect desert tortoises should obtain a scientific collecting permit from the Department to facilitate temporary possession of tortoises.* Likewise, if large numbers of tortoises (>5) are expected to be displaced by a project, the project manager should contact the Department for guidance and/or assistance.

Please keep in mind the following points:

- . These guidelines do not apply to the Mojave population of desert tortoises (north and west of the Colorado River). Mojave desert tortoises are specifically protected under the Endangered Species Act, as administered by the U.S. Fish and Wildlife Service.
- . These guidelines are subject to revision at the discretion of the Department. We recommend that the Department be contacted during the planning stages of any project that may affect desert tortoises.
- . Take, possession, or harassment of wild desert tortoises is prohibited by state law. Unless specifically authorized by the Department, or as noted above, project personnel should avoid disturbing any tortoise.